Application for a Category B Assent

Revolution Wind Project

June 30, 2021

Submitted to

Rhode Island Coastal Resources Management Council

Submitted by

Revolution Wind | Powered by Ørsted & Eversource

Prepared by

vhb

COASTAL RESOURCES MANAGEMENT COUNCIL CATEGORY B ASSENT APPLICATION

Revolution Wind Project

Rhode Island State Waters and Onshore Project Components in North Kingstown, Rhode Island

PREPARED FOR

Revolution Wind | Powered by Ørsted & Eversource

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JUNE 2021

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Acronyms and Abbreviations

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AC	alternating current
ADCP	Acoustic Doppler Current Profiler
ADLS	Aircraft Detection Lighting System
AEM	aquatic environmental monitor
ALARP	As Low As Reasonably Practicable
AMAPPS	Atlantic Marine Assessment Program for Protected Species
ANSI	American National Standards Institute
AP	Assessor's Plat
APE	Area of Potential Effects
APRA	Access to Public Records Act (RIGL § 38-2-1)
ASCE	American Society of Civil Engineers
ASMFC	Atlantic States Marine Fisheries Commission

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BMP	best management practice
BOEM	Bureau of Ocean Energy Management

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CBI	Chlorophyll Bloom Index
CEC	chemical contaminants of emerging concern
CETAP	Cetacean and Turtle Assessment Program
CFE	Controlled Flow Excavation
CFR	Code of Federal Regulations
Cm	Centimeter(s)
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea 1972
COP	Construction and Operations Plan
CRMP	Coastal Resource Management Program
CVA	Certified Verification Agent
CWA	Clean Water Act of 1972
Cy	cubic yard(s)
CZMA	Coastal Zone Management Act

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DO	dissolved oxygen
DoD	United States Department of Defense
DP	dynamic positioning
DPS	distinct population segment

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EA	Environmental Assessment
EFH	essential fish habitat
EIS	Environmental Impact Statement
EMF	electric and magnetic fields
EO	Executive Order
EPA	United States Environmental Protection Agency
ERM	effects range median (water quality) or RIDEM Environmental Resource Map
ERP/OSRP	Emergency Response Plan/Oil Spill Response Plan
ESA	Endangered Species Act of 1973

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FAA	Federal Aviation Administration
FAB/HAB	Fishermen's Advisory Board and Habitat Advisory Board
FDR	Facility Design Report
FEMA	Federal Emergency Management Agency
FIR	Fabrication and Installation Report or Fishing Industry Representatives
FIRM	Flood Insurance Rate Map
FOIA	Freedom of Information Act (5 U.S.C. § 552)
ft	foot or feet
ft^2	square foot (feet)

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$g\ C\ m^{-2}\ day^{-1}$	grams of carbon per meter squared per day
G&G	geophysical and geotechnical
Gal	gallon
GHG	greenhouse gas
GIS	geographic information system
GLD	Geographic Location Description

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Ha	hectare
HDD	horizontal directional drilling

HDPE	high-density polyethylene
HTM	Human Transported Materials
HVAC	High voltage alternating current
Hz	hertz

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IAC	Inter-Array Cable
ICF	Interconnection Facility
IEEE	Institute of Electrical and Electronics Engineers
IMO	International Maritime Organization
IPaC	Information Planning and Conservation
in	inch or inches
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kg	kilogram(s)
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kV	kilovolt(s)
kW	kilowatt(s)

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L	liter
Lbs	pounds
LNM	Local Notice to Mariners

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MA	Massachusetts
m/s	meter(s) per second
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m^3	cubic meter(s)
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NO_3	nitrate
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NPCC	Northeast Power Coordinating Council, Inc.
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NRCS	Natural Resources Conservation Service
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NSF	National Sanitation Foundation International
NTSC	National Transportation Safety Council
NUWC	U.S. Navy Undersea Warfare Command
NYSERDA	New York State Energy Research and Development Authority

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O&M	operations and maintenance

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OCSLA	Outer Continental Shelf Lands Act
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OnSS	Onshore Substation
OPAREA	Special Operating Area
Ocean SAMP	Ocean Special Area Management Plan
OSRP	Oil Spill Response Plan
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OWTS	Onsite wastewater treatment systems

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PAPE	Preliminary Area of Potential Effects
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PCB	polychlorinated biphenyl
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PM	particulate matter
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in aerodynamic diameter
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POI	Point of Interconnection
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Project	Revolution Wind Farm Project

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QDC	Quonset Development Corporation
QMA	Qualified Marine Archaeologist

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RARMS	Risk Assessment with Risk Mitigation Strategy
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TJB	Transition joint bay
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TSS	total suspended solids

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URI	University of Rhode Island
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USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UXO	unexploded ordnance

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VHB	Vanasse Hangen Brustlin, Inc.
VRA	Visual Resources Assessment
VSA	Visual Study Area
VSR	Visually Sensitive Resources

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WEA	Wind Energy Area
WTG	wind turbine generator
WWTF	wastewater treatment facilities

Glossary and Terms

Term	Definition
Bundle	Two or more wires joined together to operate as a single phase.
Cable	A fully insulated conductor installed underground.
Circuit	A system of conductors (three conductors or three bundles of conductors) through which an electric current is intended to flow, and which may be supported above ground by transmission structures or placed underground.
Conduit	Pipes, typically encased in concrete to house and protect underground power cables or other subsurface utilities.
Certified Verification Agent ("CVA")	An individual or organization, experienced in the design, fabrication, and installation of offshore marine facilities or structures, who will conduct specified third-party reviews, inspections, and verifications in accordance with 30 Code of Federal Regulations ("CFR") 585.705.
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Duct Bank	A group of ducts or conduit usually encased in concrete in a trench.
Facility Design Report and Fabrication and Installation Report ("FDR"/"FIR")	The FDR provides specific details of the design of any facilities, including cables and pipelines that are outlined in a BOEM-approved Construction and Operations Plan ("COP"). The FIR demonstrates how the facilities will be fabricated and installed in a manner that conforms to developer responsibilities listed in CFR §585.105(a).
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Gauss ("G")	A unit of measure for magnetic fields. 1G equals 1,000 milliGauss.
Glacial till	Type of surficial geologic deposit that consists of boulders, gravel, sand silt, and clay mixed in various proportions. These deposits are predominantly nonsorted, nonstratified sediment and are deposited directly by glaciers.
Hertz (Hz)	A measure of the frequency of alternating current; expressed in units of cycles per second.
Horizontal Directional Drill (HDD)	Subsurface installation technique that will create an underground conduit through which an export cable may be installed through the intertidal zone.
Inter-Array Cable ("IAC")	Cables that connects individual wind turbine generators ("WTGs") and transfers power between the WTGs and the Offshore Substation ("OSS").
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Term	Definition
Interconnection Right of Way ("ROW")	ROW of underground transmission lines between the Onshore Substation ("OnSS") and the ICF.
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Mechanical cutter	Method of submarine cable installation equipment that involves a cutting wheel or excavation chain to cut a narrow trench into the seabed allowing the cable to sink under its own weight or be pushed to the bottom of the trench via a cable depressor.
Mechanical plow	Method of submarine cable installation equipment that involves pulling a plow along the cable route to lay and bury the cable. The plow's share cuts into the soil, opening a temporary trench which is held open by the side walls of the share, while the cable is lowered to the base of the trench via a depressor. Some plows may use additional jets to fluidize the soil in front of the share.
Offshore Substation	Substation facility that collects electric energy generated by the WTG through the IACs for transmission through the Revolution Wind Export Cable ("RWEC"). Mounted on dedicated foundation or co-located on one foundation with a WTG. The Project will include up to two OSSs.
Onshore Substation	New substation facility to be located adjacent to the existing TNEC Davisville substation.
Onshore Transmission Cable	New onshore transmission cable between the Transition Joint Bays ("TJBs") and the OnSS.
OSS-Link Cable	Submarine transmission cable connecting the two OSSs (presuming two OSSs).
Operations and Maintenance ("O&M") Facility	An ancillary facility of the Project that may be located at an existing port facility. The O&M facility will support remote monitoring of the wind farm and offshore maintenance activities.
Overhead ("OH")	Electrical facilities carried above-ground on supporting structures.
Power Purchase Agreement ("PPA")	A financial agreement between two parties. This Project has three PPAs with the States of Connecticut and Rhode Island
Power Transformer	A device used to transform voltage levels to facilitate the efficient transfer of power from the generating plant to the customer. A step-up transformer increases the voltage while a step-down transformer decreases it. Power transformers have a high voltage and a low voltage winding for each phase.
Pre-lay grapnel run ("PLGR")	Process to remove possible obstructions and debris (such as abandoned fishing nets, wires, and hawsers) by pulling a grapnel along the proposed routes of the inter-array and export cables.
Revolution Wind, LLC	Owner and future operator of the Project and the Project Applicant.
Revolution Wind Export Cable ("RWEC")	Comprised of an alternating current ("AC") electric cable that will connect the RWF to the existing onshore regional electric transmission grid in North Kingstown, Rhode Island. The export cable located in both federal waters along the outer continental shelf ("RWEC-OCS") and Rhode Island state waters ("RWEC-RI") RWEC-OCS: the submarine segment of the export cable buried beneath the seabed within federal waters on the OCS from the OSS to the boundary of Rhode Island state waters.

Term	Definition
	RWEC-RI: the submarine segment of the export cable buried beneath the seabed within state territorial waters from the boundary of Rhode Island state waters to the onshore transition joint bay at Quonset Point.
Revolution Wind Farm (“RWF”)	Comprised of up to 100 WTGs, IACs, OSS-Link Cable and up to two OSSs, all of which will be located within federal waters on the outer continental shelf (“OCS”).
Right-of-way	Right-of-way. Corridor of land within which a utility company holds legal rights necessary to build, operate and maintain power lines.
Substation	A fenced-in yard containing switches, power transformers, line terminal structures, and other equipment enclosures and structures. Voltage change, adjustments of voltage, monitoring of circuits and other service functions take place in this installation.
Supervisory Control and Data Acquisition (“SCADA”)	Fiber optic system embedded in the Project cables that provides remote wind farm monitoring and control between the WTG, substations, and remote operation center(s). The SCADA provides a live status of environmental conditions within the RWF, as well as mechanical and electrical state of each WTG.
Time of Year (“TOY”) Restriction	Period of time during any calendar year when construction activity is restricted to minimize impact to sensitive species.
Transition Joint Bay	An underground vault where the RWEC is jointed with the Onshore Transmission Cable. In each TJB, each RWEC cable will be spliced into 3-single conductor onshore cables.
Transmission Line	An electric power line operating at 69,000 or more volts.
Wetland	Land, including submerged land, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial or floodplain by the USDA, Natural Resources Conservation Service. Wetlands include federally jurisdictional wetlands of the U.S. and navigable waters, freshwater wetlands or coastal resources regulated by a state or local regulatory authority. Jurisdictional wetlands are classified based on a combination of soil type, wetland plants, and hydrologic regime, or state-defined wetland types.
Wind Turbine Generator	Electricity-generating wind turbine made of a tower, nacelle, rotor, and blades, with a nameplate capacity of 8 to 12 megawatts (“MW”) per turbine.

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Revolution Wind Farm ("RWF")	Comprised of up to 100 WTGs, IACs, OSS-Link Cable and up to two OSSs, all of which will be located within federal waters on the outer continental shelf ("OCS").
Right-of-way	Right-of-way. Corridor of land within which a utility company holds legal rights necessary to build, operate and maintain power lines.
Substation	A fenced-in yard containing switches, power transformers, line terminal structures, and other equipment enclosures and structures. Voltage change, adjustments of voltage, monitoring of circuits and other service functions take place in this installation.
Supervisory Control and Data Acquisition ("SCADA")	Fiber optic system embedded in the Project cables that provides remote wind farm monitoring and control between the WTG, substations, and remote operation center(s). The SCADA provides a live status of environmental conditions within the RWF, as well as mechanical and electrical state of each WTG.
Time of Year ("TOY") Restriction	Period of time during any calendar year when construction activity is restricted to minimize impact to sensitive species.
Transition Joint Bay	An underground vault where the RWEC is jointed with the Onshore Transmission Cable. In each TJB, each RWEC cable will be spliced into 3-single conductor onshore cables.
Transmission Line	An electric power line operating at 69,000 or more volts.
Wetland	Land, including submerged land, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial or floodplain by the USDA, Natural Resources Conservation Service. Wetlands include federally jurisdictional wetlands of the U.S. and navigable waters, freshwater wetlands or coastal resources regulated by a state or local regulatory authority. Jurisdictional wetlands are classified based on a combination of soil type, wetland plants, and hydrologic regime, or state-defined wetland types.
Wind Turbine Generator	Electricity-generating wind turbine made of a tower, nacelle, rotor, and blades, with a nameplate capacity of 8 to 12 megawatts ("MW") per turbine.

Assent Application Form & Checklist

State of Rhode Island
Coastal Resources Management Council
Oliver H. Stedman Government Center
4808 Tower Hill Road, Suite 3
Wakefield, RI 02879-1900

(401) 783-3370
Fax (401) 783-2069

APPLICATION FOR STATE ASSENT

To perform work regulated by the provisions of Chapter 279 of the Public Laws of 1971 Amended.

Project Location North Kingstown and offshore RI waters (No. / Street / City/Town)	File No. (CRMC USE ONLY)
Owner's Name Revolution Wind, LLC c/o Kenneth Bowes	Plat: 179 Lot(s): 001,030
Mailing Address 56 Exchange Terrace, Suite 300 City/Town Providence State RI Zip Code 02903	Contact No.: 860-883-5830 Email Address: kenneth.bowes@eversource.com
Contractor RI Reg. # N/A Address N/A	Email address: / Tel. No. N/A
Designer VHB Address 1 Cedar St, Suite 400, Providence, RI 02903	Tel. No. 401-272-8100
Name of Waterway Narragansett Bay	Estimated Project Cost (EPC): Provided under separate cover. Application Fee: Provided under separate cover.

Describe accurately the work proposed. (Use additional sheets of paper if necessary and attach this form.)

Revolution Wind, a 50/50 joint venture between Orsted North America Inc. ("Orsted") and Eversource Investment LLC ("Eversource"), propose to construct the Revolution Wind Project (Project). The project components applicable to this Category B Assent Application include the Revolution Wind Export Cable within RI-State waters (RWEC-RI), installation of two underground transition joint bays within the Landfall Work Area to connect the RWEC-RI with the Onshore Transmission Cable, and the construction and operation of an Onshore Substation. All project components are detailed within the included Project narrative and supporting application documentation.

Have you or any previous owner filed an application for and/or received an assent for any activity on this property? (If so please provide the file and/or assent numbers): 1998-10-061

Is this site within a designated historic district? ☐ YES ■ NO

Is this application being submitted in response to a coastal violation? ☐ YES ■ NO

If YES, you must indicate NOV or C&D Number: ________

Name/mailing addresses of adjacent property owners whose property adjoins the project site. Accurate mailing addresses will insure proper notification. ______ Applicant must initial to certify accuracy of adjacent property owners and accuracy of mailing addresses.

Please see the attached abutter notification list and figure in appendices of the application narrative.

STORMTOOLS (Http://www.beachsamp.org/resources/stormtools/) is a planning tool to help applicants evaluate the impacts of sea level rise and storm surge on their projects. The Council encourages applicants to use STORMTOOLS to help them understand the risk that may be present at their site and make appropriate adjustments to the project design.

NOTE: The applicant acknowledges by evidence of their signature that they have reviewed the Rhode Island Coastal Resources Management Program, and have, where possible, adhered to the policies and standards of the program. Where variances or special exceptions are requested by the applicant, the applicant will be prepared to meet and present testimony on the criteria and burdens of proof for each of these relief provisions. The applicant also acknowledges by evidence of their signature that to the best of their knowledge the information contained in the application is true and valid. If the information provided to the CRMC for this review is inaccurate or did not reveal all necessary information or data, then the permit granted under this application may be found to be null and void. Applicant requires that as a condition to the granting of this assent, members of the CRMC or its staff shall have access to the applicant's property to make on-site inspections to insure compliance with the assent. This application is made under oath and subject to the penalties of perjury. 08/04

Kenneth Bowes Kenneth Bowes

Owner's Signature (sign and print)

PLEASE REVIEW REVERSE SIDE OF APPLICATION FORM

STATEMENT OF DISCLOSURE AND APPLICANT AGREEMENT AS TO FEES

The fees which must be submitted to the Coastal Resources Management Council are based upon representations made to the Coastal Resources Management Council by the applicant. If after submission of this fee the Coastal Resources Management Council determines that an error has been made either in the applicant's submission or in determining the fee to be paid, the applicant understands that additional fees may be assessed by the Coastal Resources Management Council. These fees must be paid prior to the issuance of any assent by the Coastal Resources Management Council.

The applicant understands the above conditions and agrees to comply with them.

Kenneth Bowes (signature) — 06/28/2021

Signature — Date

Kenneth Bowes, Eversource, 107 Selden Street, Berlin, CT 06037

Print Name and Mailing Address

NOTICE TO APPLICANTS

The Coastal Resources Management Council regulations require that the following must accompany every application otherwise these applicants will be deemed incomplete and returned.

ALL OF THE FOLLOWING REQUIRED APPLICATION DOCUMENTS **MUST BE ORGANIZED INTO FOUR (4) SEPARATE ASSEMBLED PACKETS** WHEN SUBMITTED TO BE CONSIDERED A COMPLETE APPLICATION

****PLEASE NOTE** When submitting large scale plans, four (4) physical copies as well as one (1) digital copy (sent via email to cstaff1@crmc.ri.gov) are both REQUIRED. This is for submitting new applications as well as any revisions or modifications made.**

1. **Four copies** of completed application form including plans are required. If the project requires a type "B" or involves work in the waterway, plans must be 8 1/2" x 11". If the project is type "P" or Prohibited, a Special Exception form will be required, staff will provide you with the necessary forms.

   For Formal Applications (Category B): **Site Plans must also be submitted in PDF format and if possible, application materials as well in PDF format.**

2. **Application fee – Please have a currently dated check. Checks older than 2 weeks will not be accepted. (See attached CRMC Fee Schedule for Application fee amount).**

3. **Proof of Ownership**. The CRMC requires a letter from the local tax assessor stating ownership of the property.

4. A completed and signed **CRMC Building Official letter** stating that a building permit will be issued upon receipt of a CRMC permit, with the exception of recreational boating facilities.

5. Supply **photos of coastal feature construction site**.

In addition, where these additional items are applicable, they are also required:

- Affirmation that the proposed structure will be serviced by municipal sewers. (For large projects, local community approval and construction details of the tie-in are required).
- An approved Onsite Wastewater Treatment System (OWTS) permit from DEM/OWTS, 291 Promenade Street, Providence, RI, 02908; phone (401) 222-2306.
- An approved "Change of Use" permit from DEM/OWTS is required in un-sewered areas when an increase in the number of bedrooms, an increase in "flow units", or a change from season to year-round use is proposed.
- Completed Coastal Hazards Application Worksheet -- www.crmc.ri.gov/coastalhazardapp
- Structural Lot Calculations (as applicable) 650-RICR-20-00-01 Section 1.1.11
- Stormwater Calculations 650-RICR-20-00-01 Section 1.3.1(F)

Your application receives a thorough review by our staff biologists and engineers during which they may require additional information to complete their review. If this becomes necessary you will receive a separate information request form.

You are urged during this process to be as complete as you can in fulfilling all informational requirements. In addition, you are also urged to adhere as closely as you can to all the Coastal Resources Program requirements. Failure to do so could cause delays in processing your application.

We thank you for your cooperation in this matter and look forward to working with you in protecting our coastal environment.

/ajt 03-2020

<u>CRMC FEE SCHEDULE</u>

(***CURRENT DATED CHECK OR MONEY ORDER ONLY***)

Project Description	Description/Comments	Fee
Residential Boating Facility	New Facility	$1,500.00
New Structural Shoreline Protection Facility	First 100 linear feet Each additional linear foot	$1,500.00 $15.00/ft
Residential Development Project (condominiums, subdivisions, paper subdivisions, etc.)	First 6 units/lots Each additional unit/lot Infrastructure (roads, drainage, etc.)	$3,500.00 $400.00 (.005 * EPC)
Review of units/lots within a Council approved Subdivision	Submitted in accordance with all Council conditions/stipulations	1/2 of the All Others fee
Buffer Zone Alterations and Management Plans	For areas less than or equal to 1 acre For areas between 1 and 5 acres For areas greater than 5 acres	$100.00 $250.00 $500.00
Onsite Wastewater Treatment Systems (OWTS) -- with new construction	New Construction	All Others Fee
OWTS Repair or Alteration Only	Repair, Alterations	Single Family Home $80.00 All Other $105.00
All Others Fee (includes Section 320 reviews)	Based on Estimated Project Cost: EPC is less than or equal to $1,000 EPC Between $1,000.01 - $2,500 $2,500.01 - $5,000 $5,000.01 - $10,000 $10,000.01 - $25,000 $25,000.01 - $50,000 $50,000.01 - $100,000 $100,000.01 - $150,000 $150,000.01 - $200,000 $200,000.01 - $250,000 $250,000.01 - $300,000 $300,000.01 - $350,000 $350,000.01 - $400,000 $400,000.01 - $450,000 $450,000.01 - $500,000 $500,000.01 - $20,000,000 EPC greater than $20,000,000	 $50.00 $100.00 $150.00 $200.00 $250.00 $500.00 $750.00 $1,000.00 $1,250.00 $1,500.00 $1,750.00 $2,000.00 $2,250.00 $2,500.00 $2,750.00 ($2,750.00 + .005 * EPC beyond $500,000.00) ($100,250.00 + .0025 * EPC beyond $20,000,000)

EPC = Estimated Project Cost. The EPC shall include all costs associated with site preparation (e.g., earthwork, landscaping, etc.) sewage treatment (e.g., cost of OWTS, sewer tie-ins, etc.) and construct costs (e.g., materials, labor, and installation of all items necessary to obtain a certification of occupancy).

Preliminary Determinations	**Fee**
Individual residential homeowner/potential homeowner	$150.00
All other projects (e.g., subdivisions, commercial, industrial, etc.)	$1,000.00
Jurisdictional determinations	$100.00
Jurisdictional Determination for Individual Lot Development of Residential Properties Adjacent to New Sewer Lines that no longer require an ISDS for Development	$25.00
Coastal Feature verification	$300.00

Other Fees	**Fee**
Single Family Residence Assent Renewal/Extension	$75.00
All Other Assent Renewal/Extension	$250.00
Modification-Single Family Residence w/no public hearing	$100.00
Modification of under 50% of a recreational boating facility	$250.00
All other Modification Requests	All Other fee or $250.00 whichever is greater
Lightering Permits	$250.00
Beach Vehicle Permits: Rhode Island registration Out-of-State registration	$100.00 $200.00
Declaratory Rulings	$1,000.00
Petitions for regulation changes	$1,000.00
Contested cases with sub-committee hearings	Applicant pays all costs of hearing process
Temporary Dock Application	$100.00
Dock Registration	$20.00
Transatlantic Cable Fee (effective August 16, 2012)	$40,000 per year
-- One time fee per inactive cable	$2,500.00

/ajt 11/2019

Administrative Fees for Activities which have occurred without a valid CRMC Approval

1. Administrative Reviews

   All such activities will be assessed an application fee based on above plus:

   a) Illegally constructed structures and unauthorized activities located in tidal waters and/or on adjacent coastal or shoreline features (See RICRMP Section 1.2.1 and Section 1.2.2) shall be assessed **$500.00** administrative fee;

   b) Illegal activities excluding those classified as maintenance activities under the RICRMP shall be assessed a **$250.00** administrative fee; and,

   c) Unauthorized maintenance activities shall be assessed a **$100.00** administrative fee.

2. Applications before the Council

   a) In accordance with Council regulations, all activities or alterations which have already occurred, or have been constructed or partially constructed without a Council Assent shall be subject to the fee schedule contained in Section 1.4.7. In addition, the Council shall assess an appropriate administrative fee based on a recommendation by the Executive Director. The recommended administrative fee shall take into account the impact on coastal resources, additional demand on Council resources, and hardship on an applicant (see RICRMP Section 1.1.12).

Hardships

Where an applicant can demonstrate that the fee schedule described herein presents an undue hardship, the Council may adjust the application fee, administrative fee, and/or contested case fees.

** NOTE: All fees are Summative. In addition, all fees are filing fees and non-refundable.*

***NOTE: Applicants should consult Section 1.4 of the CRMC's Management Procedures for a more detailed description of the CRMC's fee schedule.*

Coastal Resources Management Council Assent Checklist

Table 1 Required Information Accompanying CRMC Assent Form

Application Requirement	Where Provided in Application
Photo(s)	Refer to Appendix H.
Application fee	Revolution Wind has submitted application fee estimate under separate confidential cover because it contains confidential commercial information not subject to disclosure under Access to Public Records Act (RIGL § 38-2-1) or Freedom of Information Act (5 USC § 552)
1. Four copies of completed application form	Revolution Wind will provide four (4) paper copies containing the application forms with site plans and relevant supporting information.
2. Proof of property ownership	**Onshore:** › Proof of ownership is provided herein. **Offshore:** › **CRMC:** Revolution Wind will obtain a submerged lands lease for the portion of the Project in state territorial waters after the requested Assent is approved. › **BOEM:** Revolution Wind has applied for a right-of-way grant from BOEM for the portion of the Project on the outer continental shelf.
3. Sewage disposal permit	Not applicable.
4. Local approval	Pre-emption— Local government that, absent the Energy Facility Siting Board Act (the Act), would have the authority to act upon permits, licenses, variances and other approvals are instead required by the Act to issue advisory opinions to the Energy Facility Siting Board (EFSB). These advisory opinions will cover: the North Kingstown Department of Public Works on road opening if required and traffic impact; Quonset Development Corporation on compliance with its land use and other regulations; and North Kingstown Planning Commission on land use and noise ordinance requirements. Revolution Wind filed with the EFSB in December 2020 and anticipates approval between Q4 2021 and Q1 2022.
5. Location map	See Figure 1.1-1.
6. RICRMC Coastal Hazard Application Worksheet	Provided in Appendix C.
7. Site plans	Provided in Appendix A.
8. Cross sections	Provided in Appendix A.
9. Details and specifications	Revolution Wind reviewed the RICRMP and RI Ocean SAMP standards for those relevant to the Project. See Section 2, Project Siting and Description, and Appendix A, Site Plans, for detailed information regarding the amount of materials to be used,

Application Requirement	Where Provided in Application
	volume of excavation proposed, methods of construction, times of construction, start and completion, etc.
10. Written requirements of RICRMP	Revolution Wind is submitting an application for a Category B Assent for all Project components[1] and has addressed the requirements for a Category B Assent. See Section 4, CRMP Regulatory Standards. Revolution Wind has also addressed the requirements established through the RI Ocean SAMP. See Section 5, Ocean SAMP Regulatory Compliance.
11. Written description	See Section 2, Project Siting and Description, and Section 3, Affected Environment, Potential Impacts, and Proposed Avoidance, Minimization, and Mitigation.
12. Specific projects	Not applicable.
13. Contact information for permit application	Kenneth Bowes Authorized Representative – Revolution Wind 107 Seldon Street Berlin, CT 06307 (860) 883-5830 kenneth.bowes@eversource.com Mark Roll Permit Manager – Revolution Wind 56 Exchange Terrace, Suite 300 Providence, RI 02903 (857) 360-8811 MROLL@orsted.com
14. Contact information for questions regarding monitoring and permit compliance during construction	Kenneth Bowes Authorized Representative – Revolution Wind 107 Seldon Street Berlin, CT 06307 (860) 883-5830 kenneth.bowes@eversource.com James Neveu Environmental Compliance Manager 56 Exchange Terrace, Suite 300 Providence, RI 02903 (857) 210-9152

1 An Interconnection Facility and associated overhead interconnection circuits to the existing Davisville Substation will also be constructed by Revolution Wind within CRMC's jurisdiction as part of the overall Project. A separate Application to Alter a Freshwater Wetland has been filed with CRMC for construction and operation of this Project component by co-applicants Revolution Wind and The Narragansett Electric Company d/b/a National Grid under the Rules and Regulations Governing the Protection and Management of Freshwater Wetlands in the Vicinity of the Coast (650-RICR-20-00-2) on June 30, 2021.

Application Requirement	Where Provided in Application
	JANEV@orsted.com
15. Contact information of abutting property owners	Provided in Appendix Z.
16. RIHPHC review and comment	Revolution Wind has submitted the results of the marine and terrestrial archaeological investigations to the RIHPHC for review. The Bureau of Ocean Energy Management, as lead federal agency, will also submit the archaeological reports, as well as the above-ground historic properties assessment and visual impact assessment, to the RIHPHC as part of their Section 106 consultation process.

Building Official Form

TO: **Coastal Resources Management Council**
4808 Tower Hill Road Suite 3
Wakefield, RI 02879
Phone: (401) 783-3370

FROM: Building Official

DATE: June 22, 2021

SUBJ: Application of: Revolution Wind Project: Rhode Island State Waters and Onshore Facilities - Category B Assent Application

Location: Revolution Wind Export Cable within Rhode Island State Waters (beginning at mouth of Narragansett Bay and extending to three-natuical miles. The Onshore component of the Project begins at the Landfall Work Area at Quonset Business Park in North Kingstown, RI and extends landward to the proposed Onshore Substation location off of Camp Avenue in North Kingstown, RI.

Address: 574 and 594 Camp Avenue North Kingstown, Rhode Island Plat No. 179 Lot No. 001 & 030

To Construct: Revolution Wind, a 50/50 joint venture between Orsted North America Inc. ("Orsted") and Eversource Investment LLC ("Eversource"), propose to construct the the Revolution Wind Export Cable (RWEC-RI), which includes two submarine export cables, aach measuring up to 23 mi (37 km); Preparation of a 3.1 ac (1.3 ha) Landfall Work Area and installation of two underground Transition Joint Bays for jointing the RWEC-RI to the Onshore Transmission Cable; Onshore Tranmission Cable (1 mi); Onshore Substation and underground interconnection circuits.

I hereby certify that I have reviewed _____ foundation plan(s).
_____ plan(s) for entire structure
_____ site plans

Titled: Revolution Wind Proposed Onshore Substation; 16 sheets; prepared by Vanasse Hangen Brustlin, Inc.; dated May 5, 2021; latest revisions June 11, 2021

Date of Plan (last revision): June 11, 2021

____ and find that the issuance of a local building permit is not required as in accordance with Section _____ of the Rhode Island State Building Code.

✓ and find that the issuance of a local building permit is required. I hereby certify that this permit shall be issued once the applicant demonstrates that the proposed construction/activity fully conforms to the applicable requirements of the RISBC.

____ and find that a Septic System Suitability Determination (SSD) must be obtained from the RI Dept. of Environmental Management.

____ and find that a Septic System Suitability Determination (SSD) need not be obtained from the RI Dept. of Environmental Management.

____ and find that said plans conform with all elements of the zoning ordinance, and that if said plans require zoning board approval, that the applicant has secured such approval and that the requisite appeal period has passed with no appeal filed or appeal is final. The Zoning Board approval shall expire on ____________________.

[signature] 6.22.21
Building Official's Signature Date

____ and find that said plans conform with all elements of the zoning ordinance, and that if said plans require zoning board approval, that the applicant has secured such approval and that the requisite appeal period has passed with no appeal filed or appeal is final.

____
Zoning Officer's Signature Date

rev. 5/11/2001

Proof of Ownership

CONFIDENTIAL: Contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552)

Executive Summary

Revolution Wind, LLC (formerly known as DWW Rev I, LLC) ("Revolution Wind"), which is a 50|50 joint venture partnership between Orsted North America Inc. ("Orsted") and Eversource Investment LLC ("Eversource"), proposes to construct the Revolution Wind Project ("Project"), an offshore wind farm that will deliver approximately 704 megawatts ("MW") of renewable energy to the States of Rhode Island and Connecticut. The Project will provide clean, reliable offshore wind energy that will significantly increase the renewable energy pool available to Rhode Island and Connecticut and reduce carbon emissions across the region. The Project will displace electricity generated by fossil fuel-powered plants, improve energy system reliability and security, and enhance economic competitiveness by attracting new investments and job growth opportunities.

Revolution Wind developed the Project in direct response to the ambitious clean energy goals of the State of Rhode Island. The Project significantly advances Rhode Island's renewable energy directives set forth in the State energy plan – Energy 2035 – which calls for Rhode Island to "increase sector fuel diversity, produce net economic benefits, and reduce greenhouse gas emissions by 45 percent by the year 2035" in part "through support for state and federal offshore wind projects." The Project plays an integral role in advancing Rhode Island's goal of procuring 1,000 MW of renewable energy by 2020 and a 100 percent Renewable Energy Future by 2030, as set forth in former Governor Gina Raimondo's Executive Order No. 20-01. Moreover, the Project helps to meet the State of Rhode Island's needs under the Resilient Rhode Island Act to reduce greenhouse gas emissions to eighty percent (80%) below 1990 levels by the year 2050.

Rhode Island and Connecticut have awarded Revolution Wind five Power Purchase Agreements ("PPAs") to-date, totaling approximately 704 MW of generation capacity. These PPAs help meet the region's expressed need and demand for additional renewable energy resources. The Project will fulfill Revolution Wind's obligations to both Connecticut and Rhode Island in accordance with the PPAs and provide substantial environmental and economic benefits. Revolution Wind is also committed to supporting offshore wind education and supply chain and workforce development for the growing offshore wind industry in Rhode Island and Connecticut. Revolution Wind has memoranda of understanding with both states setting forth the specific initiatives and commitments to be undertaken—positioning both states as offshore wind leaders.

Project components include wind turbine generators ("WTGs"), a network of inter-array cable ("IAC"), offshore substations ("OSS"), and an OSS-Link cable in federal waters on the Outer Continental Shelf ("OCS") and within the designated Bureau of Ocean Energy Management ("BOEM") Renewable Energy Lease Area OCS-A 0486 ("Lease Area"), which at its closest edge, is approximately 15 miles southeast of the Rhode Island coast. The boundaries of this Lease

Area were established by BOEM utilizing the diverse and detailed research datasets commissioned for the preparation of the National Oceanic and Atmospheric Administration ("NOAA") Office of Coastal Management federally-approved Coastal Resources Management Council ("CRMC") Ocean Special Area Management Plan ("Ocean SAMP"). The Project's two subsea export cables (referred to as the "RWEC") travel north from the Lease Area before trending in a northwest direction after entering Rhode Island state waters. The RWEC travels north through the West Passage of Narragansett Bay to a landfall location at Quonset Point in the Town of North Kingstown. The Project's point of interconnection is The Narragansett Electric Company d/b/a National Grid's ("TNEC") Davisville Substation, also in North Kingstown.

Revolution Wind is submitting this Category B Assent application in compliance with 650- Rhode Island Code of Regulations ("RICR")-20-00-1 for the installation and operation of approximately 23 miles of the RWEC within Rhode Island state waters ("RWEC-RI"); preparation of a Landfall Work Area and installation of two Transition Joint Bays ("TJBs"); installation and operation of an approximate 1-mi (1.6-km) -long underground Onshore Transmission Cable; and construction and operation of a new Onshore Substation ("OnSS") and associated underground interconnection circuits.

An Interconnection Facility ("ICF") and associated overhead interconnection circuits to the existing Davisville Substation will also be constructed by Revolution Wind within CRMC's jurisdiction as part of the overall Project. A separate Application to Alter a Freshwater Wetland has been filed for construction and operation of this Project component by co-applicants Revolution Wind and TNEC under the Rules and Regulations Governing the Protection and Management of Freshwater Wetlands in the Vicinity of the Coast (Freshwater Wetland Rules) (650-RICR-20-00-2). The ICF will be constructed by Revolution Wind on property owned by TNEC; TNEC will own and operate this facility after it is constructed by Revolution Wind. The Application to Alter a Freshwater Wetland for the ICF and associated overhead circuits was filed with CRMC on June 30, 2021.

The Coastal Resources Management Plan ("CRMP") and in particular the Ocean SAMP recognize the detrimental effects unmitigated climate change threatens to marine ecology and the existing uses of the Rhode Island coastal and offshore regions and acknowledges the importance Rhode Island offshore renewable energy production can play in mitigating these effects. Revolution Wind collected, assembled, and analyzed extensive resource data sets characterizing the Project Area and leveraged the pioneering research and data synthesis completed by the CRMC and BOEM to strike a balance between the needs for clean renewable energy with the protection of Rhode Island's and the region's ocean based resources and existing uses during the Project design. Revolution Wind believes This Project complies with the goals, policies, and standards contained within the CRMP, the Ocean SAMP and the Freshwater Wetland Rules and offers a meaningful opportunity to reduce future carbon emissions in the Rhode Island region. Revolution Wind has reviewed Table 1 in Section 1.1.5 in the CRMP and has determined that a Category B Assent application is required for the Project. Revolution Wind respectfully requests that the Council approve this Category B Assent application.

1

Introduction

1.1 Project Summary and Location

Revolution Wind, LLC (formerly known as DWW Rev I, LLC) ("Revolution Wind"), a 50|50 joint venture partnership between Orsted North America Inc. ("Orsted") and Eversource Investment LLC ("Eversource"), proposes to construct the Revolution Wind Project (Project). The Project involves installation of an offshore wind farm and associated transmission facilities that will deliver approximately 704 megawatts ("MW") of clean wind power to the States of Rhode Island and Connecticut. The Project will provide clean, reliable offshore wind energy that will significantly increase the renewable energy delivered to Rhode Island and Connecticut, reducing carbon emissions across the region. The Project will displace electricity generated by fossil fuel-powered plants, improve energy system reliability and security, and enhance economic competitiveness by reducing energy costs to attract new investments and job growth opportunities.

The State of Rhode Island has set ambitious clean energy goals. Consistent with the State Guide Plan Energy 2035, former Governor Gina Raimondo proposed to increase the State's clean energy portfolio ten-fold to 1,000 MW by 2020, in large part through support for state and federal offshore wind projects. Building on this foundation, the Governor issued an Executive Order in January 2020 committing Rhode Island to be powered by 100 percent renewable electricity by 2030. Executive Order No. 20-01, Advancing a 100% Renewable Energy Future for Rhode Island by 2030 (January 17, 2020). These goals have made Rhode Island a national leader with respect to climate change resiliency. The Project will play an integral role in meeting these aggressive targets and was developed in direct response to Rhode Island's and Connecticut's needs to increase the renewable energy load serving each State. Beyond mere consistency with State policies, the Project will facilitate the plans of both Rhode Island and Connecticut to meet their targets for renewable energy, economic growth in the renewable energy sector, and greenhouse gas reductions.

Project components include wind turbine generators ("WTGs"), a network of inter-array cable ("IAC"), offshore substations ("OSS"), and an OSS-Link cable in federal waters on the Outer Continental Shelf ("OCS") and within the designated Bureau of Ocean Energy Management ("BOEM") Renewable Energy Lease Area OCS-A 0486 ("Lease Area"), which at its closest edge, is approximately 15 miles (mi) southeast of the Rhode Island coast. The boundaries of this

Lease Area were established by BOEM utilizing the diverse and detailed research data sets commissioned for the preparation of the National Oceanic and Atmospheric Administration ("NOAA") Office of Coastal Management federally-approved Coastal Resources Management Council ("CRMC") Ocean Special Area Management Plan ("Ocean SAMP"). The Project's subsea export cable (referred to as the "RWEC"; "RWEC-RI" for the portion in Rhode Island state waters) travels north from the Lease Area before trending in a northwest direction after entering Rhode Island state waters. The RWEC-RI travels north through the West Passage of Narragansett Bay to a landfall location at Quonset Point in the Town of North Kingstown. The Project's point of interconnection is The Narragansett Electric Company d/b/a National Grid's ("TNEC") Davisville Substation, also located in North Kingstown.

This Category B Assent application addresses the following Project components proposed in Rhode Island state waters or onshore and within the CRMC's jurisdiction:

- The RWEC-RI, which includes two submarine export cables, each measuring approximately 23 mi (37 km; approximately 13 mi [21 km] in Rhode Island Sound and 10 mi [16 km] in the West Passage of Narragansett Bay);
- An approximate 3.1-ac (1.3-ha) Landfall Work Area onshore and in North Kingstown, Rhode Island, where two underground Transition Joint Bays ("TJBs") for jointing the RWEC-RI to the Onshore Transmission Cable will be located;
- An approximate 1-mi (1.6-km) -long Onshore Transmission Cable in North Kingstown, Rhode Island; and
- A new Onshore Substation ("OnSS") in North Kingstown, Rhode Island with an operational footprint[2] of approximately 4 ac (1.6 ha) and associated underground interconnection circuits ("Interconnection right-of-way ["ROW"]").

Figure 1.1-1 depicts the overall location of the Project and shows the limits of CRMC jurisdiction applicable to this Category B Assent application. As shown, Project components onshore and within Rhode Island state waters to the mouth of Narragansett Bay are subject to the CRMP whereas the portion of the RWEC-RI in Rhode Island Sound is subject to the Ocean SAMP. The policies, standards, and definitions contained in the RI CRMP for Type 4 waters that are also in the Ocean SAMP (Subchapter 650-Rhode Island Code of Regulations ["RICR"]-20-05) boundary, are superseded by general policies and regulations found in § 11.10 of the Ocean SAMP beginning at the mouth of Narragansett Bay and extending to the three-nautical mile limit of state waters. The RWEC-RI is also located within a recently proposed renewable energy cable corridor.[1] However, at the time of this Category B Assent application submission, regulations establishing this corridor and establishing standards for projects proposed within the corridor have not been adopted by CRMC.

Separate from review of this Category B Assent application, CRMC will review the entirety of the Project pursuant to Section 307 of the Coastal Zone Management Act ("CZMA").

An Interconnection Facility ("ICF") and associated overhead interconnection circuits to the existing Davisville Substation will also be constructed by Revolution Wind as part of the overall Project. The Application to Alter a Freshwater Wetland for the ICF and associated

2 Operational footprint refers to the area inside of the OnSS perimeter fence.

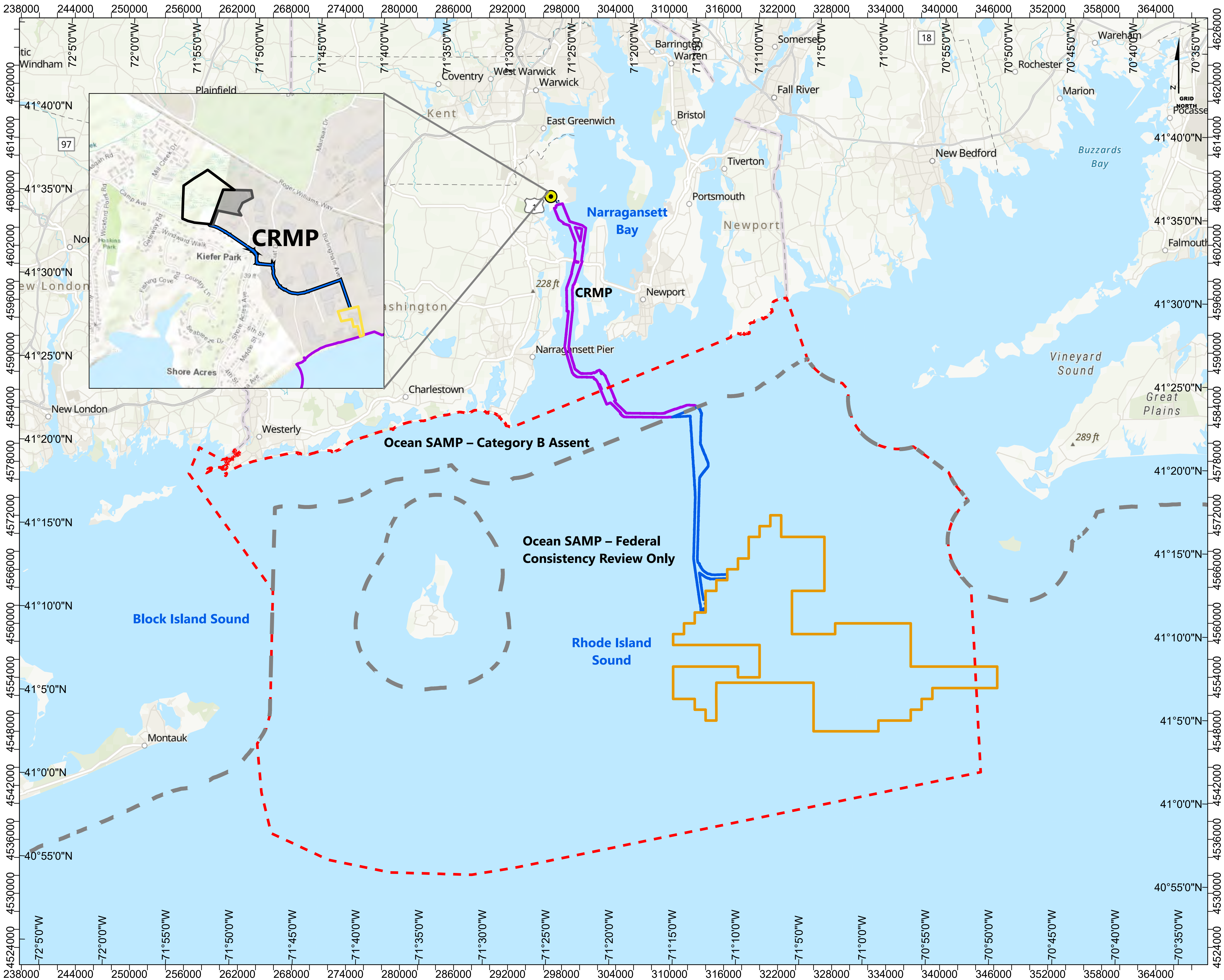
overhead interconnection circuits was filed separately by co-applicants Revolution Wind and TNEC under the Rules and Regulations Governing the Protection and Management of Freshwater Wetlands in the Vicinity of the Coast (Freshwater Wetland Rules)(650-RICR-20-00-2). The ICF will be constructed by Revolution Wind on property owned by TNEC; TNEC will own, operate, and maintain this facility after it is constructed by Revolution Wind. The Application to Alter a Freshwater Wetland for the ICF and associated overhead interconnection circuits was filed with CRMC on June 30, 2021.

This narrative, supporting documents, and the accompanying design plans are Revolution Wind's application for a Category B Assent. The narrative of this application is organized as follows:

- Section 1 outlines the requirements of a Category B Assent that are described in further detail in Sections 4 and 5, describes the Project's purpose and need, and summarizes other local, state, and federal approvals required for the Project;
- Section 2 describes the Project siting and design;
- Section 3 describes the affected environment, potential Project impacts, and proposed avoidance, minimization, and mitigation measures; and
- Sections 4 and 5 provide the analyses of Project activities against the specific policies and regulations in CRMC's CRMP (650-RICR-20-00-1 et seq.) and Ocean SAMP, respectively.

Revolution Wind

Figure 1.1-1
Project Location and CRMC Regulatory Jurisdiction

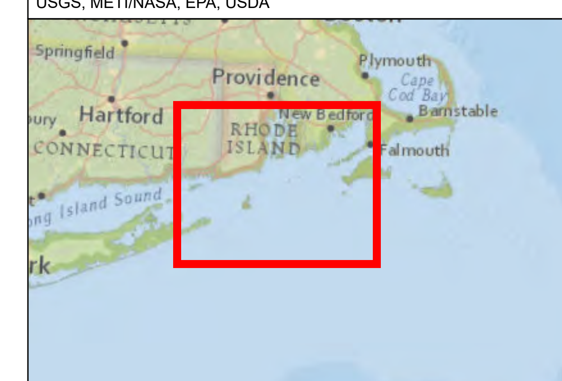


Legend

- OnSS
- RWEC-OCS Project Area
- RWEC-RI Project Area
- RWF Boundary Lease Area OCS-A 0486
- Ocean SAMP Study Area
- 3-Nautical Mile State Water Boundary
- Onshore Transmission Cable
- Parcel ID 179-030 & 179-001
- Parcel ID 179-005*
- Landfall Work Area

*Not part of this Category B Assent application; refer to separate Application to Alter Freshwater Wetlands filed on June 30, 2021.

Service Layer Credits: National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
World Topographic Map: Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS
World Topographic Map: MassGIS, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA



Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 4000 8000 12000 Meters

0 10,000 20,000 30,000 Feet

Date: 05/19/2020
Document no:

Created by: S. PELLETIER
Checked by: S. MOBERG
Approved by: STEPW

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1.2 CRMC Category B Regulatory Requirements

The Project requires a Category B Assent pursuant to the CRMC CRMP (650-RICR-20-00-1 et seq.) and Submerged Lands License and/or Commercial Lease, as appropriate, pursuant to CRMC's Enabling Act, R.I. Gen. Laws Section 46-23-1 et seq, and applicable CRMC regulations for the following proposed activities inland of the 200-foot Contiguous Area and extending seaward in state waters to the three-nautical mile limit:

- Installation, operation and maintenance of the RWEC-RI, which consists of two submarine export cables, each measuring up to 23 mi (37 km) in Type 4 and Type 6 Waters;
- Placement of fill in state waters to protect segments of the RWEC-RI and existing utilities. Fill may consist of rock bags, concrete mattresses, fronded mattresses, and/or rock berms in Type 4 Waters;
- Installation of the RWEC-RI at the Project's proposed landfall location utilizing Horizontal Directional Drilling ("HDD") with work including temporary excavation of two offshore exit pits in Type 6 Waters and two onshore entry pits at a previously developed site in Quonset Point Business Park. Onshore HDD operations will occur landward of the 200-foot CRMC contiguous area as measured from the Shoreline Feature (top of Manmade Shoreline);
- Preparation of an approximate 3.1-ac (1.3-ha) Landfall Work Area and installation of two underground TJBs for jointing the RWEC-RI to the Onshore Transmission Cable;
- Installation and operation of an approximate 1-mi (1.6-km) long Onshore Transmission Cable. A segment of this cable duct bank will be installed within the existing Circuit Drive paved travel surface that is within 50-feet of a coastal, non-tidal, freshwater wetland. The Onshore Transmission Cable will also pass through a stormwater infiltration system approved by the CRMC on Plat 179 Lot 011, CRMC File No. 1997-10-061; and
- Construction and operation of a new OnSS with an operational footprint[2] of approximately 4 ac (1.6 ha) and associated underground Interconnection ROW. This work will include clearing within Area of Land within 50 Feet of a Swamp (Wetland 3) and Marsh (Wetland 4) both of which are regulated as Freshwater Wetlands in the Vicinity of the Coast. A small portion of the OnSS yard (0.11 ac [0.05 ha]) will be constructed within the Area of Land within 50 Feet of Wetlands.

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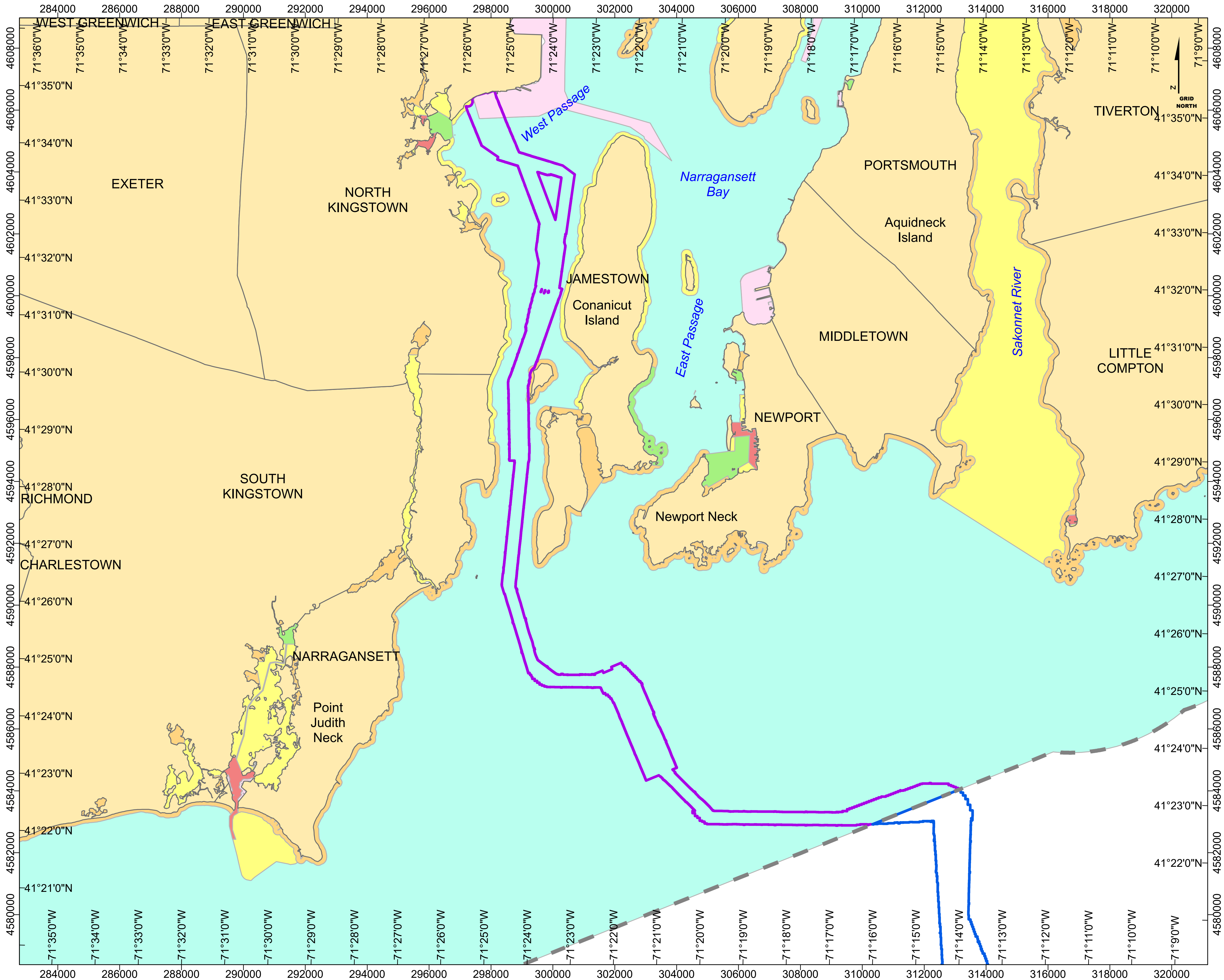
Figure 1.2-1
CRMC Water Use Types



Legend

- RWEC-OCS Project Area
- RWEC-RI Project Area
- 3-Nautical Mile State Water Boundary

CRMC Water Use Types

- Commercial & Recreational Harbor
- Type 1:Conservation Area
- Type 2: Low Intensity Use
- Type 3: High Intensity Boating
- Type 4: Multi-Purpose Water
- Type 6: Industrial Waterfronts and Commercial Navigation Channels

Service Layer Credits: National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 1000 2000 3000 Meters

0 4,000 8,000 12,000 Feet

Date: 05/19/2020
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Approved by: STEPW

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Most of the RWEC-RI is within Type 4: Multipurpose Waters (see Figure 1.2-1). A small portion of the cable corridor at and near the landfall location is within Type 6: Industrial Waterfront and Commercial Navigation Channels. A very small portion is also immediately adjacent, but not within, Type 2: Low Intensity Use waters near the landfall location. Type 4 Multipurpose Waters include large expanses of open water in Narragansett Bay and the Sounds that support a variety of commercial and recreational activities while maintaining good value as a fish and wildlife habitat and open waters adjacent to shorelines that could support water dependent commercial, industrial, and/or high intensity recreational activities. Type 6 Industrial Waterfronts and Commercial Navigation Channels are waters that are extensively altered to accommodate commercial and industrial water dependent and water enhanced activities.

1.2.1 CRMC Category B Application Requirements/Checklist

Section 1.3.1(A)(1) of the CRMP outline the Category B Assent application requirements. Table 1.3-1 summarizes where each of these requirements are addressed in this narrative and provides additional information where necessary. In addition, Section 4 addresses the CRMP regulatory standards that are applicable to the Project.

Table 1.2-1 Checklist of Responses and Data Supporting Category B Application Requirements

Category B Application Requirements	Response/Applicable Section
a. Demonstrate the need for the proposed activity or alteration.	Section 1.3 Purpose and Need
b. Demonstrate that all applicable local zoning ordinances, building codes, flood hazard standards, and all safety codes, fire codes, and environmental requirements have or will be met; local approvals are required for activities as specifically prescribed for nontidal portions of a project in §§ 1.3.1(B), (C), (F), (H), (I), (K), (M), (O) and (Q) of this Part; for projects on state land, the state building official, for the purposes of this section, is the building official;	Section 1.4 Other Project Approvals and Permits Section 4.6.2 CRMP
c. Describe the boundaries of the coastal waters and land area that is anticipated to be affected;	Figure 1.1-1 Section 3 Affected Environment, Potential Impacts, and Mitigation
d. Demonstrate that the alteration or activity will not result in significant impacts on erosion and/or deposition processes along the shore and in tidal waters;	Section 2.2.4 Environmental Compliance, Protective Measures, and Monitoring Section 3.1.2 Coastal Features and Wetlands Appendix A Soil Erosion and Sediment Control ("SESC") Plans
e. Demonstrate that the alteration or activity will not result in significant impacts on the abundance and diversity of plant and animal life;	Section 3 Affected Environment, Potential Impacts and Mitigation

Category B Application Requirements	Response/Applicable Section
f. Demonstrate that the alteration will not unreasonably interfere with, impair, or significantly impact existing public access to, or use of, tidal waters and/or the shore;	Section 2.1 Landfall Work Area and Onshore Transmission Cable Section 3.2.8 Commercial and Recreational Fishing Section 3.2.9 Recreational Boating and Tourism Section 3.2.10 Commercial Shipping
g. Demonstrate that the alteration will not result in significant impacts to water circulation, flushing, turbidity, and sedimentation;	Section 3.2.2 Water Quality
h. Demonstrate that there will be no significant deterioration in the quality of the water in the immediate vicinity as defined by DEM;	Section 3.2.2 Water Quality
i. Demonstrate that the alteration or activity will not result in significant impacts to areas of historic and archaeological significance;	Section 3.1.7 Terrestrial Archaeological Resources Section 3.2.7 Marine Archaeological Resources
j. Demonstrate that the alteration or activity will not result in significant conflicts with water dependent uses and activities such as recreational boating, fishing, swimming, navigation, and commerce, and;	Section 3.2.8 Commercial and Recreational Fishing Section 3.2.9 Recreational Boating and Tourism Section 3.2.10 Commercial Shipping
k. Demonstrate that measures have been taken to minimize any adverse scenic impact (see § 1.3.5 of this Part).	Section 3.1.8 Visual Resources

1.2.2 Freshwater Wetlands in the Vicinity of the Coast

CRMC has jurisdiction over certain inland freshwater wetlands under its Rules and Regulations Governing the Protection and Management of Freshwater Wetlands in the Vicinity of the Coast (650-RICR-20-00-2). These wetlands are within and proximate to the proposed OnSS. Relevant sections of 650-RICR-20-00-2 are addressed for work activities related to construction of the OnSS in this Request for Category B Assent as part of Section 1.1.4(D) of the CRMP. See Appendix B for additional information addressing the Freshwater Wetland Rules, which include documenting avoidance, minimization, and mitigation review criteria.

1.2.3 Shoreline Change Special Area Management Plan

The Shoreline Change SAMP provides for applicants to address potential coastal hazards including sea level rise ("SLR"), storm surge and associated coastal flooding and shoreline erosion. The Landfall Work Area, the Onshore Transmission Cable and OnSS all fall within the boundaries of the Shoreline Change SAMP. Coastal Hazard Application Worksheets have been completed for these components of the Project and responses to policies and standards included in Section 1.1.6(I) of the CRMP are provided in Section 4.2.3 and Appendix C of this Category B Assent application.

1.2.4 Ocean Special Area Management Plan

The Ocean SAMP is an extension and refinement of CRMC's policies for Type 4 Multipurpose Waters as described in the RICRMP. The Ocean SAMP Study Area begins at the mouth of Narragansett Bay and extends to its 30 miles (48 km) furthest offshore boundary. However, CRMC's jurisdiction for review of this application under Ocean SAMP Policies and Regulations is limited to the portion of the Ocean SAMP Study Area within state waters (i.e., from the mouth of the Narragansett Bay to the state water boundary.

Chapter 11 of the Ocean SAMP consolidates the General Policies and Regulations contained within the Ocean SAMP. Section 5 of this Category B Assent application reviews the portion of the RWEC-RI in the Ocean SAMP area against the General Policies and Regulations of the Ocean SAMP.

In addition to direct regulatory jurisdiction over Project components within state waters, the Ocean SAMP policies and regulations are components evaluated for Federal Consistency Certification separate from this application. CRMC will review the entirety of the Project pursuant to Section 307 of the CZMA and its regulations (15 Code of Federal Regulations ["CFR"] Part 930, subpart E) and Section 11.10 of Ocean SAMP (see Table 1.4-1).

1.3 Purpose and Need

The purpose of the Project is to provide clean, reliable offshore wind energy that will significantly increase the renewable energy supply available to Rhode Island and Connecticut consumers and reduce carbon emissions across the region. The Project will displace electricity generated by fossil fuel-powered plants, improve energy system reliability and security, and enhance economic competitiveness by reducing energy costs to attract new investments and job growth opportunities.

Revolution Wind developed the Project in direct response to the expressed needs of the States of Rhode Island and Connecticut to increase the renewable energy load serving each state. Specifically, the Project significantly advances Rhode Island's renewable energy directives set forth in the State energy plan – Energy 2035 – which calls for Rhode Island to "increase sector fuel diversity, produce net economic benefits, and reduce greenhouse gas emissions by 45 percent by the year 2035" in part "through support for state and federal offshore wind projects." The Project also contributes 400 MW of renewable energy toward Rhode Island's ambitious goal of procuring 1,000 MW of renewable energy by 2020 and converting Rhode Island to 100% renewable energy by 2030, set forth in former Governor Gina Raimondo's executive orders. Moreover, the Project contributes to the State of Rhode Island's needs under the Resilient Rhode Island Act to reduce greenhouse gas emissions to 80 percent below 1990 levels by the year 2050.

In response to this expressed need and demand, Rhode Island[3] and Connecticut[4] have awarded Revolution Wind five Power Purchase Agreements ("PPAs") to-date, totaling approximately 704 MW of generation capacity. These PPAs help meet the region's expressed need and demand for additional renewable energy resources. The Project will fulfill Revolution Wind's obligations to both Rhode Island and Connecticut in accordance with the PPAs and provide substantial environmental and economic benefits.

BOEM is the federal regulatory authority over offshore energy development including renewable energy production from wind, waves, and currents and must comply with the National Environmental Policy Act ("NEPA") before approving a lessee's Construction and Operations Plan ("COP") for a wind or other renewable energy production project on the OCS. BOEM published a Notice of Intent ("NOI") on April 30, 2021 for the Project that initiates the NEPA scoping of the environmental review, identifies stakeholders, and begins the public participation process. The NEPA documentation prepared under this process will further establish the purpose and need for the Project and disclose environmental effects on the natural and human environment both detrimental and beneficial.

1.4 Other Project Approvals and Permits

In addition to a Category B Assent, the Project requires permits and approvals from other state and federal regulatory agencies. Table 1.4-1 provides a summary of the other required approvals and permits along with dates of approval or estimated dates of approvals for those permits that have not been issued.

3 Offshore Wind Generation Unit Power Purchase Agreement between The Narragansett Electric Company, d/b/a National Grid, as Buyer and DWW Rev I, LLC as Seller, dated December 6, 2018, which the Rhode Island Public Utilities Commission approved in Report and Order No. 23609 dated June 7, 2019.

4 There are four separate PPAs between Revolution Wind and electric utilities in Connecticut. These PPAs are: (1) RPS Class I Renewable Generation Unit Power Purchase Agreement between The Connecticut Light and Power Company d/b/a Eversource Energy and DWW Rev I, LLC, dated October 1, 2018, (2) RPS Class I Renewable Generation Unit Power Purchase Agreement between The United Illuminating Company and DWW Rev I, LLC, dated October 1, 2018, (3) Amended and Restated Zero Carbon Emissions Class I Renewable Generation Unit Power Purchase Agreement between The United Illuminating Company [Buyer] and DWW Rev I, LLC [Seller], dated November 22, 2019, and (4) Amended and Restated Zero Carbon Emissions Class I Renewable Generation Unit Power Purchase Agreement between The Connecticut Light and Power Company d/b/a Eversource Energy [Buyer] and DWW Rev I, LLC [Seller], dated November 22, 2019. PURA approved the first two of the Connecticut PPAs in its Decision dated December 19, 2018 in Docket No. 18-06-37, PURA approves the third and fourth of the Connecticut PPAs in its Decision dated November 27, 2019 in Docket No. 18-05-04.

Table 1.4-1 Summary of the Project's Federal, State, & Local Permits or Approvals

Regulatory Authority	Permit, Approval, or Consultation	Date of Approval or Anticipated Approval
Federal Permits, Approvals, and Consultations		
BOEM	Commercial Lease of Submerged Lands for Renewable Energy Development on the OCS, in accordance with the Outer Continental Shelf Lands Act ("OCSLA") (43 U.S.C. §§ 1331 et seq.); Section 388 of the Energy Policy Act of 2005, BOEM implementing regulations (30 CFR § 585)	OCS-A 0486 Lease effective on October 1, 2013
	Site Assessment Plan ("SAP") approval pursuant to 30 CFR §§ 585.610-618	Approved October 12, 2017
	COP approval pursuant to 30 CFR §§ 585.621-627	Anticipated between Q1 and Q3 2023
	Facility Design Report ("FDR") approval pursuant to 30 CFR 585.701 (33 U.S.C. § 1221)	To be reviewed by a Certified Verification Agent ("CVA") and submitted to BOEM after COP approval
	Fabrication and Installation Report ("FIR") approval pursuant to 30 CFR § 585.700	To be reviewed by a CVA and submitted to BOEM after COP approval
	Consultation pursuant to Section 7 of the Endangered Species Act ("ESA") (16 U.S.C. §§ 1531 et seq.), with National Marine Fisheries Service ("NMFS") and United States Fish and Wildlife Service ("USFWS")	Anticipated between Q1 and Q3 2023
	Essential Fish Habitat ("EFH") Consultation pursuant to the Magnuson-Stevens Fishery Conservation and Management Act ("MSFCMA") (16 U.S.C. §§1801 et seq.)	Anticipated between Q1 and Q3 2023
	Consultation pursuant to the Migratory Bird Treaty Act ("MBTA") (16 U.S.C. §§ 703 et seq.) and Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668 et seq.)	Anticipated between Q1 and Q3 2023
	Review pursuant to the NEPA (42 U.S.C. §§4321 et seq.), BOEM regulations (30 CFR §§ 585.646,585. 648(b)), and other relevant regulations in consultation with the USACE, Department of Defense ("DoD"), Advisory Council on Historic Preservation, and other cooperating regulatory agencies	Anticipated between Q1 and Q3 2023
USACE New England District	Section 10 Individual Permit pursuant to the Rivers and Harbors Appropriation Act of 1899 (33 U.S.C. §§ 401 *et seq.*)	Anticipated between Q1 and Q3 2023

Regulatory Authority	Permit, Approval, or Consultation	Date of Approval or Anticipated Approval
	Section 404 Individual Permit pursuant to the Clean Water Act of 1972 ("CWA") (33 U.S.C. § 1344)	Anticipated between Q1 and Q3 2023
United States Coast Guard ("USCG"), District 1	Private Aids to Navigation ("PATON") Permit pursuant to 33 CFR § 66 (49 U.S.C. § 44718)	Issued four weeks prior to offshore construction
	Local Notice to Mariners ("LNM")	Issued two weeks prior to vessel mobilization for offshore construction
United States EPA New England (Region 1)	OCS Air Quality Permit pursuant to 40 CFR § 55 (Clean Air Act., 42 U.S.C. § 7627)	Anticipated between Q1 and Q3 2023
Federal Aviation Administration ("FAA")	Determination of No Hazard to Air Navigation pursuant to 14 CFR §77	Anticipated between Q3 and Q4 2022
NOAA	Request Incidental Take Authorization pursuant to the Marine Mammal Protection Act ("MMPA") (16 U.S.C. §§ 1361 et seq.)	Anticipated between Q1 and Q3 2023
	Request for Incidental Take Statement ("ITS") pursuant to Section 7 of the ESA of 1973 (16 U.S.C. §§ 1531 *et seq*.)	
State Permits, Approvals, and Consultation		
Rhode Island Energy Facility Siting Board	License pursuant to the Energy Facility Siting Act (Rhode Island General Laws ["RIGL"] §§ 42-98-1 *et seq*.)	Anticipated between Q4 2021 and Q1 2022
Rhode Island Coastal Resources Management Council	Federal Consistency Determination pursuant to Section 307 of the CZMA (16 U.S.C. § 1456) and § 11.10 of RI Ocean Special Area Management Plan [Ocean SAMP] (650-RICR-20-05-2.1 *et seq*.)	Anticipated between Q1 and Q3 2023
	Permit to Alter Freshwater Wetland in the Vicinity of the Coast for the ICF (650-RICR-20-00-2)[5]	Anticipated between Q4 2022 and Q2 2023
Rhode Island Department of Environmental Management ("RIDEM")	Water Quality Certificate ("WQC") pursuant to RIGL § 46-12-3 and 250-RICR-150-05-1.1 *et seq.* (federal authority delegated to the State pursuant the CWA, 33 U.S.C. §§ 1341-1342). To be filed concurrently with Rhode Island Pollutant Discharge Elimination System ("RIPDES") authorization (below).	Anticipated between Q1 and Q3 2022

5 The Application to Alter Freshwater Wetland is filed with CRMC separately by co-applicants Revolution Wind and TNEC for the ICF which will be constructed on property owned by TNEC.

Regulatory Authority	Permit, Approval, or Consultation	Date of Approval or Anticipated Approval
Office of Water Resources	Authorization under the RIPDES General Permit for Stormwater Discharge Associated with Construction Activity (Construction General Permit or CGP). To be field concurrently with WQC Application.	Anticipated between Q1 and Q3 2022
RIDEM and RI CRMC	Dredge permit pursuant to the Rules and Regulations for Dredging and the Management of Dredged Materials (250-RICR-150-05-2.1 *et seq*.) for temporary excavation and backfill of HDD exit pits.	Anticipated between Q1 and Q3 2022
Quonset Development Corporation ("QDC")	Development Review Process (RIGL 42-64.10-5; QDC Development Regulations, 880-RICR-00-00-4 *et seq.*)	Anticipated between Q3 2021 and Q4 2021

2

Project Siting and Description

2.1 Project Siting

The wind farm portion of the Project is proposed within the Lease Area on the OCS, which was established by BOEM through a coordinated data collection and planning process, much of it documented in the Ocean SAMP, consistent with the objectives of the National Ocean Policy and NEPA and considering the policies and objectives of the State of Rhode Island and the Commonwealth of Massachusetts. BOEM reduced the limits of the original Lease Area based on environmental constraints, efforts to decrease user group conflicts, navigational safety, public health and safety, and stakeholder concerns (e.g., commercial fishing).

Transmission and interconnection facilities are required to export the electricity generated by the offshore wind farm to the broader electrical transmission grid. Siting of the Project components addressed in this Category B Assent application (i.e., the RWEC-RI, Landfall Work Area, Onshore Transmission Cable, and OnSS/Interconnection ROW) are discussed further in the following subsections.

2.1.1 RWEC-RI and Point of Interconnection

Identification of a suitable export cable route configuration must take into account a variety of factors including:

› Interconnection point to the onshore transmission grid having:
  - Existing infrastructure with sufficient capacity to accept the electricity produced by the Project, and
  - Proximity to the coastline to minimize the onshore transmission routes;

› Minimal conflicts with existing environmental and anthropogenic constraints and uses both onshore and offshore; and

› Proximity to the Lease Area.

Initial analysis of reconnaissance level geophysical data collected by Revolution Wind in 2017 identified origin points within the Lease Area where the RWEC could exit the Lease Area heading north towards an anticipated cable route to shore. One origin point was identified in the northwest quadrant of the Lease Area proximate to the East and West Passages of the Narragansett Bay. A second origin point was identified in the northern tip of the Lease Area proximate to the Sakonnet River.

Between the Lease Area and shore, Revolution Wind reviewed available data potentially affecting the route suitability such as seabed slope, geological hazards, tidal currents, subsea utilities, dumping grounds, shipwrecks and other seafloor obstructions, unexploded ordnances ("UXO"), Munitions and Explosives of Concern ("MEC"), existing cable crossings, anchorage/mooring areas, Pilot boarding zones, navigational safety zones, and DoD military practice areas. Subsequently, two potentially viable routes between the Lease Area and the entrances to the East and West Passages of Narragansett Bay, and a third potentially viable route between the Lease Area and the Sakonnet River, were identified.

To further support routing of the RWEC to a specific landfall location, with an intent to minimize the length of the submarine transmission route, Revolution Wind evaluated a number of potential grid interconnection points ("POIs") in southeastern Massachusetts, Rhode Island, and the eastern coast of Connecticut. In order to accept the maximum electricity produced by the Project at the most cost effective location, the Project only evaluated substations with operating capacities of 115-kV or higher as potential POIs. The following existing substations were identified as POIs (see Figure 2.1-1):

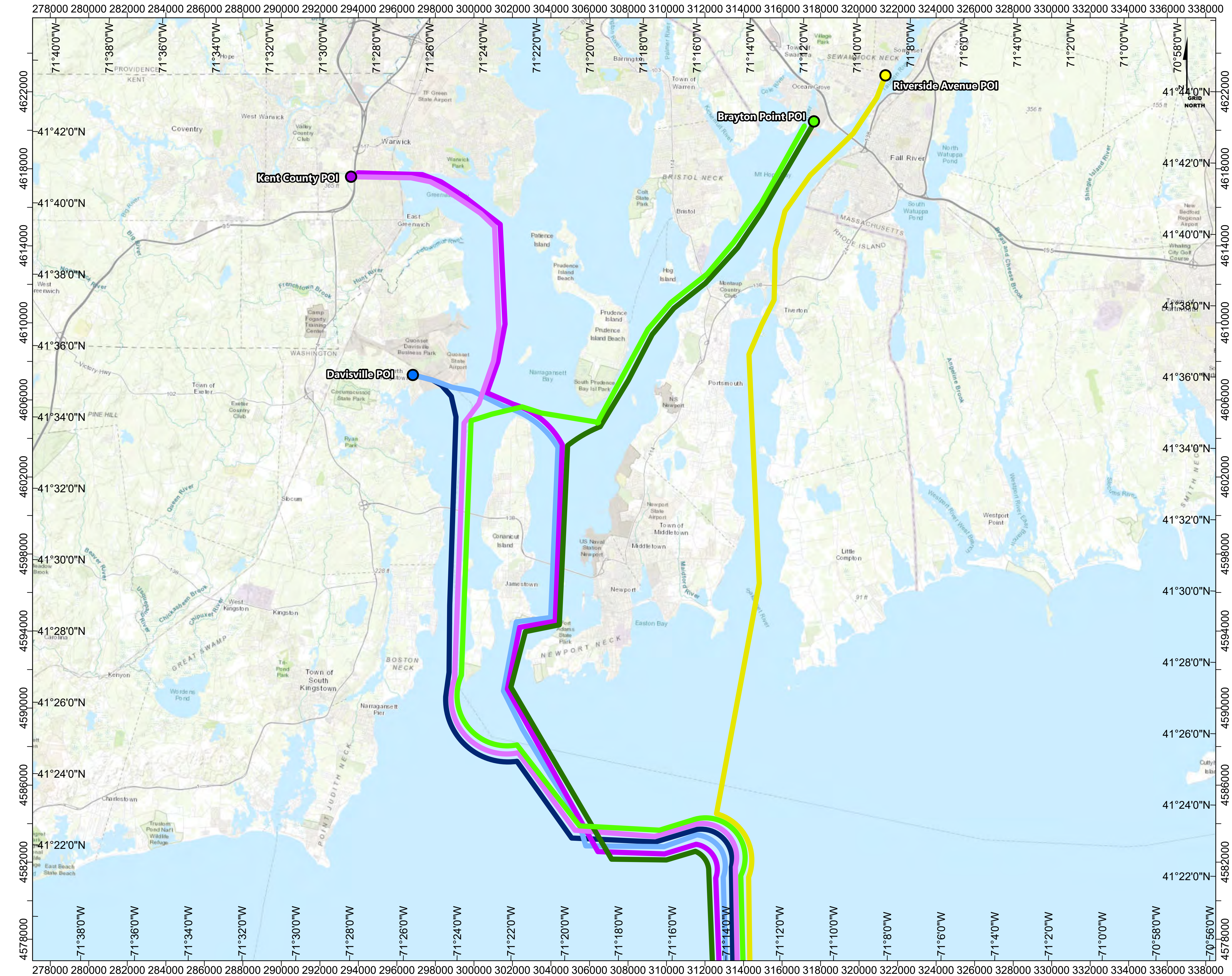
- Brayton Point 345-kV Substation, Somerset, Massachusetts
- Pottersville 115-kV Substation, Somerset, Massachusetts
- Kent County 115-kV and 345-kV Substation, Warwick, Rhode Island
- TNEC Davisville 115-kV Substation, North Kingstown, Rhode Island

Ultimately, Revolution Wind identified the preferred route for the RWEC as entering Narragansett Bay via the West Passage and interconnecting at the TNEC Davisville Substation. This route accommodates the full generation capacity of the Project and results in minimal resource impacts due to the shortest overall transmission route offshore and onshore, existing baythmetry, favorable geology, avoidance of use conflicts and environmental constraints, available land for interconnection equipment, favorable zoning and beneficial reuse of contaminated properties. Routing of the RWEC-RI is located within the recently public noticed CRMC-proposed rule for the *Narragansett Bay West Passage Renewable Energy Cable Corridor* (RI CRMC, 2021).

Revolution Wind

Figure 2.1-1

Export Cable Routing Alternative



Legend

- Brayton Point POI
- Davisville POI
- Kent County POI
- Riverside Avenue POI
- Brayton Point Potenetial Route 1
- Brayton Point Potential Route 2
- Davisville Potnetial Route 1
- Davisville Potential Route 2
- Kent County Potential Route 1
- Kent County Potential Route 2
- Riverside Avenue Potential Route

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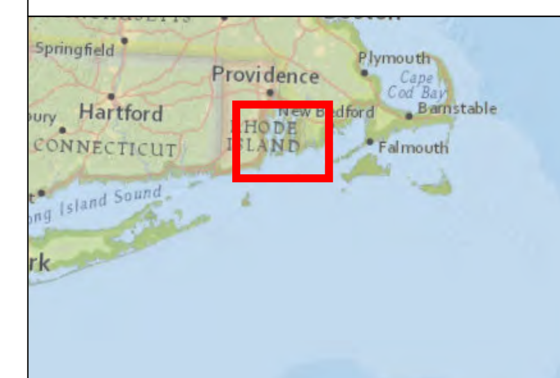
World Topographic Map: MassGIS, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS



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Projection: UTM Zone 19N

0 2000 4000 6000 Meters

0 6,000 12,000 18,000 Feet

Date: 05/19/2020
Document no:

Created by: S. PELLETIER
Checked by: S. MOBERG
Approved by: STEPW

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2.1.2 Landfall Work Area and Onshore Transmission Cable

The assessment of potential Onshore Transmission Cable routes relied on an evaluation of local zoning ordinances, bedrock, hazardous materials, coastal land uses, wetlands, Environmental Justice Areas, floodplain, property ownership, rare, threatened, and endangered species habitat, and cultural resources.

Based on the preferred RWEC route (i.e., entering Narragansett Bay via West Passage) and interconnection location (i.e., the Davisville Substation), evaluation of potential Landfall Work Areas and Onshore Transmission Cable routes began with identification and evaluation of specific landfall sites around Quonset Point in North Kingstown, Rhode Island. Four potential landfall sites were identified based on real estate, engineering, and environmental considerations, referred to as the Quonset Business Park Alternative, Blue Beach Alternative, Whitecap Drive Alternative, and Hayward West Alternative landfall locations (see Figure 2.1-2). After coordination with state and federal resource agencies and property owners, and consideration of environmental, cost and reliability factors, the Quonset Business Park Alternative was selected as the preferred landfall location. This landfall location provided a balance of property availability, minimal environmental impacts, and fewer constructability issues, while addressing the concerns of state and local agencies.

From the Landfall Work Area south of Burlingham Avenue, the Onshore Transmission Cable will follow Circuit Drive northwest to 135 Circuit Drive, where it will cross this property and continue in a northwest direction to Camp Avenue (referred to as the Parking Lot By-Pass). The route then follows Camp Avenue to the OnSS location on the north side of Camp Avenue (see Figure 2.1-2).

Revolution Wind
Figure 2.1-2
Onshore Cable Route and Landfall Alternatives
NORTH KINGSTOWN, RI

Legend
- Parcel ID 179-030 & 179-001
- Parcel ID 179-005*
- Landfall Evaluation Area
- Onshore Cable Route
- Onshore Cable Route Alternative
- Blue Beach Alternative
- Quonset Business Park Alternative
- Hayward West Alternative
- White Cap Drive Alternative
- Parcel Boundary

*Not part of this Category B Assent application; refer to separate Application to Alter Freshwater Wetlands filed on June 30, 2021.

Service Layer Credits: RIDEM/Tax_Parcels: RI State, 37 Towns
National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
Rhode Island Aerial Photographs (Spring 2018; State Plane):

Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 60 120 180 Meters
0 200 400 600 Feet

Date: 05/19/2020
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Approved by: STEPW

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2.1.3 OnSS/Interconnection ROW

The new OnSS and associated interconnection circuits will be constructed to support interconnection to the existing TNEC Davisville Substation within the Quonset Business Park in North Kingstown, Rhode Island. The TNEC Davisville Substation operates at 115-kV and connects to the regional transmission grid via two 115-kV transmission tap lines. The existing substation is within North Kingstown Assessor's Plat ("AP") 179 Lot 005. Revolution Wind conducted an alternatives analysis for the OnSS.[6] The OnSS analysis evaluated three potential properties, the QDC Davisville Substation Properties, the Fujifilm Substation Property, and the QDC Mainsail Substation Property. All the properties were evaluated based on size, topography, accessibility, soil conditions, contamination, wetlands, floodplains, rare species, vegetation clearing, land use and zoning, sensitive receptors, noise impacts, visual impacts, real estate, and existing utility conflicts. The QDC Davisville Substation Property was identified as the preferred alternative based on the proximity to the POI, which balances environmental concerns and cost, and support of QDC and the Town of North Kingstown.

2.2 Proposed Project Design and Activities

This section describes design, construction, O&M, and decommissioning of the Project components addressed in this Category B Assent application (i.e., the RWEC-RI, Landfall Work Area, Onshore Transmission Cable, and OnSS/Interconnection ROW). This section also details Revolution Wind's commitments to environmental compliance and monitoring.

2.2.1 OnSS/Interconnection ROW

2.2.1.1 Design

The OnSS is designed to meet Rhode Island State Building Code/2015 International Building Code, American Society of Civil Engineers ("ASCE") Standard 7-10, ASCE 113, ASCE 24-14, all applicable Institute of Electrical and Electronics Engineers ("IEEE") standards, and local climate and geotechnical conditions. The engineering of these facilities currently proposes gas-insulated switchgear system bay positions. Major equipment associated with the OnSS is summarized in Table 2.2-1.

Table 2.2-1 Equipment in the OnSS

Equipment	Maximum Number Required
Major Electrical Equipment	
Synchronous Condenser Transformer	2
Auto Transformer	2

6 An expanded alternatives analysis is provided in Appendix B, Section A.3 Avoidance, in the response to review criteria (3) from 650-RICR-20-00-02 Sections 2.10.B.4.

Equipment	Maximum Number Required
Shunt Reactor	4
Harmonic Filter	2
275kV and 115kV Gas Insulated Switchgear	1 (lot)
Synchronous Condenser Heat Exchanger	2
Control House	1
Synchronous Condenser Building Equipment	
Synchronous Condenser	2
Lube Oil Skid	2
Water Skid	2
Vacuum Pump	2
Auxiliary Transformer	2

The OnSS will occupy an operational footprint[2] of approximately 4 ac (1.6 ha). Connection to the separately permitted ICF will be made with two 115-kV underground transmission cables located within the Interconnection ROW. The northern cable (cable a) is approximately 375 feet (114.3 m) long and the southern cable (cable b) is approximately 527 feet (160.6 m) long. Maximum height of OnSS equipment will be up to 45 feet (13.7 meter) with shielding masts measuring up to 65 feet (19.8 m) tall. The OnSS will include a compacted gravel driveway, stormwater management features, and associated landscaped or managed vegetated areas totaling up to 7.1 acres (2.9 ha) inclusive of the up to 4acres (1.6-ha) operational footprint of the facility. The underground transmission line ROW will be maintained free of woody vegetation that exceeds 15 feet in height. The maximum limits of work of the OnSS are shown on the OnSS Site Plans in Appendix A. These plans are provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552).

The OnSS will be equipped with a Supervisory Control and Data Acquisition ("SCADA") system. The SCADA system's main function will allow for operation and monitoring of local systems remotely by dispatch type personnel. Backup power for the OnSS will be provided via a 50-kW generator fed by portable propane tanks.

The OnSS will require various oils, fuels, and lubricants to support its operation. Equipment will be mounted on concrete foundations with concrete secondary containment for insulating fluid designed for 110 percent containment and in accordance with industry and local utility standards. A Spill Prevention, Control, and Countermeasure ("SPCC") plan will be developed in support of National Pollutant Discharge Elimination System ("NPDES") permitting. Sulfur hexafluoride ("SF_6") gas will be used for electrical insulation in some switchgear components; OnSS devices containing SF_6 will be equipped with integral low-pressure detectors to detect SF_6 gas leakage, which will notify the dispatch center for response should they occur.[7] Gas insulation technology for electrical substations originated in Japan in the 1960s, where there was a critical need to develop substations with a greatly reduced footprint.

2.2.1.2 Construction

Construction of the OnSS will require temporary disturbance of up to 7.1 additional acres (2.9 ha) inclusive of the 4-ac (1.6-ha) operational footprint of the facility. Contingency staging and laydown areas also include previously disturbed areas owned by the QDC; staging/laydown in these areas will not require grading but may require graveling, erosion control, fencing, etc. The temporary disturbances will be associated with temporary work areas and staging/laydown areas. OnSS equipment and steel support structures are expected to be supported by reinforced concrete foundations on drilled shafts suitable for existing soil conditions and coastal storm/flood events.

The sequence for constructing the OnSS under normal circumstances is described in Table 2.2-2. Once construction is complete, temporary disturbance areas beyond the operational footprint of the OnSS will be restored to pre-construction conditions. It is anticipated that construction of the OnSS will take up to 18 months. It is assumed construction of the OnSS will generate approximately 1,500 cubic yards ("cy") (1,147 m^3) of solid waste. This material will be disposed of in a landfill and/or recycling center in accordance with applicable regulations.

Table 2.2-2 Expected OnSS Construction Sequence

Activity/Action	Construction Summary
Surveys and Protection of Sensitive Areas	Work at the OnSS site will begin with the survey, staking and protection of any sensitive areas. Access to the work site will then be established and the required safety measures will be implemented. Surveys for UXO and MEC will be performed by certified technicians prior to and during excavation activities in accordance with applicable guidance, if required.
Soil Erosion Controls, Clearing, and Grading	The work site perimeter will be cleared of vegetation to facilitate installation of perimeter sediment control socks. As the site is cleared additional temporary stormwater controls such as swales and sediment traps will be installed in accordance with the SESC Plan. These controls will be maintained until the site is restored and stabilized. The work site will be graded; the disturbed areas outside of the final site footprint will be restored.
Installation of Foundations and Equipment	Excavation will be required to install of equipment foundations, underground utilities and components of the stormwater management facility. Blasting is not anticipated; however, if required, the appropriate blasting plans and approvals will be obtained prior to any such activity. All the major equipment will be installed upon completion of concrete foundations and cable duct banks. The equipment will be rigged and placed on the concrete foundations. The rigging company who acts as sub-contractor to the equipment manufacturer is responsible for all

7 Gas insulation technology for electrical substations originated in Japan in the 1960, where there was a critical need to develop substations with greatly reduced footprints. It is employed at the OnSS to minimize impacts to Freshwater Wetlands. https://www.cedengineering.com/userfiles/An%20Introduction%20to%20Gas%20Insulated%20Electrical%20Substations%20R1.pdf

Activity/Action	Construction Summary
	logistical services (e.g. engineered rigging and hauling plans, routing, permitting, clearance checking, escort, police escort, load analysis of transport, as well as dimensional restrictions). Upon installation of the equipment on the foundations, alignment checking will be performed, and when required, anchoring and temporary protection from weather will be applied. Upon placing the equipment, all attachments will be completed associated with each equipment. When required, the equipment will be filled with insulating fluid and/or insulating gas.
Restoration	Restoration of any disturbed areas and appropriate wildlife enhancement plantings and landscaping will be installed. Perimeter sediment controls will be removed after the area is completely stabilized.
Commissioning	Upon the acceptance testing of the OnSS control center and upon TNEC's Davisville Substation upgrades being completed and put into service, the commissioning of the OnSS will commence. Prior to energization, all equipment will be tested to confirm proper operation. Energization is a sequential process that energizes the equipment and facilities in a logical order to coordinate with the equipment and system requirements to meet the Project milestones. The testing and commissioning will be performed by licensed testing personnel. The work will be performed in accordance with the applicable industry standards. The commissioning will be performed in strict adherence to ISO's protocol on receiving permits and clearances.

2.2.1.3 Operations and Maintenance

Revolution Wind will monitor the OnSS remotely on a continuous basis. The equipment in the OnSS will be configured with systems ("SCADA") that will alarm upon detecting equipment problems, unintended shutdowns, or other issues. In addition, the OnSS will be inspected at periodic intervals, in accordance with manufacturer recommendations. Revolution Wind will put in place an established and documented program for the maintenance of all equipment critical to reliable operation.

In addition, a reliability maintenance program will be implemented. Preventive maintenance will be performed on the OnSS and line equipment, and planned outages will be conducted in accordance with the North American Electric Reliability Corporation ("NERC")/ Northeast Power Coordinating Council, Inc. ("NPCC") Standard-TOP-003-1, and protective system maintenance will be performed in accordance with the NPCC PRC 005-2 standard. Equipment will be maintained in accordance with Eversource standards; maintenance will be completed by qualified personnel in accordance with applicable industry standards and good utility practice to provide maximum operating performance and reliability.

Vegetation management will occur on the OnSS parcel. The OnSS will have a 30-foot-wide perimeter around the fence line that will be maintained free of trees that could create a hazard and the Interconnection ROW will have a 40-foot maintained ROW. Per Eversource's Specifications for Rights-of-Way Vegetation Management, vegetation the OnSS Interconnection ROW will be managed to promote a low-growing plant community dominated by low shrubs, forbs and grasses. All woody vegetation including trees and shrubs that can grow above 15 feet in height will be removed and discouraged from becoming established by on-going Integrated Vegetation Management ("IVM") maintenance, including manual cutting, mowing and the prescriptive use of herbicides plus the use of environmental controls. The method of control is determined following inspections of the site scheduled for maintenance. The current maintenance cycle for vegetation control utilizing IVM practices is three or four years depending on the vegetation composition, facilities, and site conditions. IVM selects for plants that have mature heights less than 15 ft and this selected vegetation acts to suppress recolonization by plant species which grow taller. The cycle is based on the average growth rates of targeted species following maintenance. If vegetation is so thick or tall that they interfere with testing or maintenance, a narrow path directly over the conduit can be mowed. The allowed mature plant height may be modified, up to 15 ft (4.6 m) in height at maturity by species, to accommodate established herbaceous or woody plant communities that not only protect the electrical facility and reduce long-term maintenance, but also enhance wildlife habitat, forest ecology and aesthetic values.

Methods for tree removal involve the use of manual climbing crews, skidder bucket equipment, aerial saws and tree harvesting machines. The location of the work, type of work and the degree or amount of work determine the type of crews and equipment to be employed.

2.2.2 Onshore Transmission Cable

2.2.2.1 Design

The Onshore Transmission Cable will consist of three individual cables in two circuits (six total cables). The Onshore Transmission Cable will be encased within a single thermal concrete duct bank. There will also be one fiber optic cable per circuit (two total fiber optic cables) installed within the duct bank. The typical installation configuration of underground onshore transmission circuits is provided on sheet PG-17 of the Onshore Transmission Cable plans in Appendix A.

Given the proposed length to the OnSS, splice vaults are required for the Onshore Transmission Cable. Two splice vaults per circuit will be required. One set of splice vault will be located within Circuit Drive between cable station 42+55 and 43+15, just east of the Blue Beach parking lot (Refer to the Revolution Wind Onshore Cable Route plans. The second set of splice vaults will be within the property otherwise known as 135 Circuit Drive LLC between cable station 31+00 and 31+70.

The OnSS will be equipped with two above ground circuit terminals that are connected to the 275-kV substation equipment. The Onshore Transmission Cable will terminate at these steel structures, transitioning them from underground to above ground and thereby completing the connection from the offshore wind farm to the OnSS. The maximum design scenario for the Onshore Transmission Cable is provided in Table 2.2-3.

Table 2.2-3 Onshore Transmission Cable Maximum Design Scenario

Onshore Transmission Cable Characteristics	Design Scenario
Number of High Voltage Alternating Current ("HVAC") Cables / Fiber Optic Cables	6 / 2
Voltage of Cable Circuit	275 kV
Cable Diameter	5.1 in (13 centimeters ["cm"])
Target Burial Depth (below ground level)	3 to 6 ft (0.9 to 1.8 m)
Maximum Disturbance Depth	13 ft (4 m); 15 ft (4.6 m) at Splice Vaults
Approximate Cable Length	1 mi (1.6 km)
Disturbance Corridor (Total Width)[1]	25 ft (7.6 m)
Disturbance Area at nested Splice Vaults (Total Width by Total Length)[2]	30 x 75 ft (9.1 x 22.8 m)
Temporary Ground Disturbance[3]	3.1 ac (1.3 ha)
Operational ROW (Total Width)[4]	20 ft (6 m)

1 The disturbance corridor reflects the area needed for installation of the Onshore Transmissions Cable. Within this area, an approximate 8-ft (2.4-m)-wide trench will be excavated to support installation of the duct banks.

2 Two splice vault per circuit (four total) will be required at the approximate midway point along the Onshore Transmission Cable route.

3 Permanent ground disturbance is not anticipated with construction of the Onshore Transmission Cable as the cable will be installed underground and areas disturbed during construction will be restored to pre-existing conditions post-construction.

4 The operational ROW for the Onshore Transmission Cable reflects the maximum corridor needed to support future access to the concrete duct bank or splice vaults located on private land and beyond the limits of the public road ROW.

2.2.2.2 Construction

Construction of the Onshore Transmission Cable will involve site preparation, duct bank installation, cable installation, cable jointing, final testing, and final restoration, as described in Table 2.2-4. Installation of the Onshore Transmission Cable will generally require excavation of an approximate 8-ft (2.4-m)-wide trench within a 25-ft (7.6-m)-wide temporary disturbance corridor; however, the disturbance area at the splice vaults will be 30-ft (9.1-m)-wide by 75-ft (22.8-m)-long. The Onshore Transmission Cable will be installed within a duct bank, buried to a target depth of 3 to 6 ft (0.9 to 1.8 m) to the top of duct bank and consistent with local utility standards. The splice vaults will be buried to a depth of up to 16 ft (5 m) to the bottom of the vault. The entire temporary disturbance corridor will be restored to pre-construction conditions following installation of the Onshore Transmission Cable.

The Onshore Transmission Cable route is shown in plans entitled "275-kV and 115-kV Transmission Line Onshore Cable Route" by Burns & McDonnell. The Onshore Transmission Cable plan views and profiles are provided on Drawing Nos. PG-4 to PG-14 in Appendix A. This route originates at the OnSS and follows Camp Avenue to Shore Acres Avenue where it cuts across the existing industrial property at 135 Circuit Drive to reach Circuit Drive.

Landscape trees on the industrial property along Shore Acres Avenue will be cleared to install the duct bank and the duct bank will also cross under the south end of a stormwater infiltration basin before reaching Circuit Drive. The work in the infiltration basin will be performed to minimize disturbance to the basin bottom and the Onshore Transmission Cable Trench will be backfilled with a bank run gravel or sand that will remain pervious after compaction.

The Onshore Transmission Cable will then follow Circuit Drive to Burlingham Avenue and the property where the TJBs will be installed. The Onshore Transmission Cable installation will result in up to 3.1 ac (1.3 ha) of temporary ground disturbance; there will be no permanent ground disturbance with installation of the Onshore Transmission Cable (Table 2.2-3). It is anticipated that construction of the Onshore Transmission Cable will take approximately 12 months.

Table 2.2-4 Expected Underground Transmission Cable Construction Sequence

Activity/Action	Construction Summary
Site Preparation	Site preparation involves the surveying and staking the Onshore Transmission Cable alignment, implementation of the traffic control measures to perform the work. Identification of existing underground utilities (DigSafe and test pits) along the proposed alignment.
Clearing and Grading	The cable route work area will be cleared of vegetation. Portions of the work area may require grading. Temporary environmental erosion and sediment controls will be installed in accordance with Soil Erosion and Sedimentation Control Plan. Controls will be maintained until the site is restored and stabilized.
Vault and Duct Bank Installation	The conduits will be encased in a concrete duct bank installed via open trench for the majority of the Project. The open trench will be supported by a shoring system during conduit installation inside the trench. The conduits will be arranged per the design drawings and held in place with conduit spacers so that concrete poured between each duct does not form air pockets or voids. The concrete will be allowed to set up to a specific strength before the trench is backfilled. This operation will be repeated until all conduit and concrete has been installed to the specified jointing locations (i.e., manholes, termination structures, etc.). At the completion of the installation, all conduits will be proofed and mandreled[1] to verify continuity of the raceway for cable installation.
Cable Installation	After proofing, the cable will be pulled through the raceway and will be cut leaving a sufficient slack to perform the jointing operations. Once pulling has been completed, each cable jacket integrity test will be completed. The cables will then be sealed to prevent moisture ingress until jointing operations can be performed.
Cable Splicing/Jointing	Cable jointing refers to the splicing and/or terminating of the cables. Splicing and terminating is performed once all the cables for a specific section have been successfully pulled into the jointing bay or termination structure. Once splicing and terminating is complete, the cables and accessories will be secured to the associated racking systems. This mitigates lateral movements experienced by the cable during operation.

Activity/Action	Construction Summary
Final Restoration Activities	Once the duct bank has been installed, permanent restoration will be completed. For conduit in roadway this will include reconstruction of the road subbase and base layers followed by the surface layer (i.e., concrete or asphalt). For installations outside of roadways, final restoration typically involves backfilling, installation of topsoil to the original grade elevation, and seedbed preparation followed by hydroseeding to achieve vegetated soil stabilization.

1 Mandrels are used to test the integrity of the conduit runs and remove small amounts of debris.

2.2.2.3 Operation and Maintenance

To support O&M of the Onshore Transmission Cable sited on private land and beyond public road ROW, a 20-ft (6-m)-wide operational ROW centered on the cables will be maintained.

2.2.3 RWEC-RI

The RWEC-RI will transfer the electricity from the OSSs on the OCS and will be jointed with the Onshore Transmission Cable at the TJBs. The RWEC will traverse both federal and Rhode Island state waters (the portion of the RWEC that is within Rhode Island [i.e., RWEC-RI] state waters is subject to this Category B Assent application). The purpose of a TJB is to provide a clean, dry environment for the jointing of the RWEC and Onshore Transmission Cable as well as protecting the finished joint. TJBs are comprised of cast-in-place or precast concrete vaults placed within an excavation in the Landfall Work Area. There will be two TJBs (i.e., one for each cable of the RWEC). In each TJB, each RWEC cable will be spliced into 3-single conductor onshore cables. The sheaths from the RWEC and the Onshore Transmission Cable will be terminated into the Link Box in the TJBs. The fiber optic cables from the RWEC and Onshore Transmission Cable will be joined inside the communications handhole which is adjacent to the TJB. There will be two TJBs, two Link Boxes, and two Fiber Optic Cable handholes. Refer to sheet PG-22 in the Onshore Transmission Cable plans in Attachment A for a depiction of the TJBs.

The TJBs will be located entirely within the up to 3.1-ac (1-ha) Landfall Work Area. Access to the Fiber Optic Handhole near the TJBs will be via manhole covers. The splices would be housed in the TJB, with manhole risers and covers for access from grade.

The following subsections describe the design and construction the RWEC-RI.

2.2.3.1 Design

The RWEC-RI will consist of two 275 kV HVAC subsea cables located within the same approximate 1,312-ft (400-m)-wide submarine ROW. Based on site-specific conditions (e.g., water depth and seabed constraints), each cable of the RWEC-RI will be spaced, where practical, a minimum spacing of 164 ft (50 m) apart; spacing between each cable will be less where the RWEC-RI comes ashore at the landfall location (e.g., approximately 23-49 ft [7-15 m]). Each cable of the RWEC-RI will consist of three bundled copper or aluminum conductor cores surrounded by layers of cross-linked polyethylene (“XPLE”) insulation and various protective armoring and sheathing to protect the cable from external damage and keep it watertight. Several fiber optic cables will also be included in the interstitial space between the three conductors for continuous monitoring of the wind farm. The maximum design scenario for the RWEC is provided in Table 2.2-5.

Table 2.2-5 RWEC-RI Maximum Design Scenario

Export Cable Characteristics	Maximum Design Scenario
Number of Cables	2
Voltage per Cable	275 kV
Cable Diameter	11.8 in (300 mm)
Target Burial Depth (below seabed)	4 to 6 ft (1.2 to 1.8 m)[1]
Maximum Disturbance Depth	10 ft (3 m)[2]
Corridor Length (RI state waters)	23 mi (37 km)
Disturbance Corridor (Total Width per Cable)[3]	up to 131 ft (40 m)
Operational ROW (Total Width)[4]	approximate 1,312 ft (400 m)

1 Burial of the RWEC will typically target a depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth for the RWEC will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment.

2 These maximum depths are exceeded for the landfall transition which will be installed using HDD.

3 The disturbance corridor reflects the maximum area that will be subject to seafloor preparation prior to cable installation.

4 An operational ROW for the RWEC will be requested in accordance with 30 CFR § 585.200(b). The two cables of the RWEC will be sited within this corridor. The Project will also seek a license and/or commercial lease of submerged lands for renewable energy development, as appropriate, from CRMC pursuant to CRMC's Enabling Act, R.I. Gen. Laws Section 46-23-1 et seq, and applicable CRMC regulations.

2.2.3.2 Construction

The RWEC-RI will be laid and buried using industry standard subsea cable lay and burial methods. Installation techniques will vary by segment of the RWEC-RI. Therefore, there are separate subsections below describing construction of the RWEC at the landfall location and more generally in the offshore environment.

Landfall Construction

Landfall of the RWEC-RI will be accomplished using HDD. This involves work on land and in Type 6 waters, and avoids disturbance of the intertidal zone, Coastal Beach and Manmade Shoreline by boring underneath these features to install conduit. A summary of the HDD operation is as follows:

- **Onshore site preparation and equipment setup**: A workspace will be prepared for HDD equipment mobilization and setup. Once equipment is in place, the HDDs are proposed to be conducted simultaneously, beginning with the excavation of the onshore entry pits. A temporary sheet pile anchor wall may be installed onshore to provide stability of the HDD rig while conducting drilling activities. If required, this sheet pile anchor wall will be approximately 30 feet long and will be driven to a depth of approximately 20 feet. In addition to the anchor wall, the workspace may also require the installation of other temporary sheet piles to aid in anchoring of the rig and/or to provide soil stabilization of the excavated area.

- **Offshore site preparation and equipment setup**: The marine spread will consist of jack-up barges and support vessels and equipment. Offshore exit pits will be excavated using a backhoe excavator with a bucket or similar. The maximum footprint of the base of each excavation is not expected to exceed 110 feet in length or 30 feet in width. The sides of the excavation will be graded for stability and as such the overall footprint will be larger. The depth of the excavation will be approximately 15 feet but will depend on the seabed elevation at the time of excavation. Excavated material will be temporarily loaded onto a support barge for reuse during backfill. No side-casting of the excavated material will occur. The excavated pits will be temporarily filled with rock bags to prevent naturally backfilling during the HDD operation.
- **Pilot bore and casing pipe installation**: A steerable drill bit is advanced along the design alignment for the eventual cable conduit from the onshore entry pits to the offshore exit pits. A casing pipe to house the pilot bore drill bit and string once it exits the seafloor will be driven into the seafloor at an angle close to the pilot bore using a pneumatic hammer. The casing pipe will further be supported by "goal post" steel piles driven into the seabed, either with a pneumatic hammer or vibratory hammer. The casing pipe provides a means to collect and process drilling fluids on the deck of a jack-up barge. Fluids will either be processed offshore and reused for drilling operations or collected and stored on the jack-up barge or support barge for proper disposal.
- **Reaming**: The pilot bore is enlarged, often involving more than one back and forth pass, to a diameter that can accept the high-density polyethylene ("HDPE") conduit that will house the landfall cables.
- **Swab pass**: After reaming is completed, the condition of the HDD bore is assessed by completing a "swab pass" through the bore. A slightly smaller diameter barrel or ball reamer is drawn through the fully reamed bore from start to finish in the direction of the anticipated installation (offshore to onshore) while the drill rig torque and thrust/pullback forces are monitored, in order to determine if the bore is ready for the HDPE conduit installation stage.
- **HDPE conduit pullback**: The final stage of conduit installation consists of continuously pulling/installing the fully assembled HDPE conduit from the offshore exit pits to the onshore HDD drill rig.
- **Post installation conduit verification**: Once the HDPE conduit is installed, testing will be completed to verify the condition of the conduit. This will involve pigging of the pipe with a calibration tool encompassing a gauging plate equal to 90 percent of the average inner diameter of the HDPE conduit. At the same time the calibration tool ("pig") is advanced through the pipe, a sacrificial messenger rope wire will be installed for cable pull in purposes.
- **Cable pull-in**: Once the HDPE conduit is installed and tested, the rock bags placed within the offshore exit pits will removed to a support barge and cable pull-in will occur from offshore to onshore. Following cable pull-in, concrete mattresses or equivalent

protection will be used to protect the HDPE conduit at the exit pits and the exit pits will be backfilled using the material that was excavated.

During HDD operations, water-based drilling fluids, consisting of a mixture of water and bentonite, and sometimes mixed with polymers are used. Bentonite is a naturally occurring soil clay mineral that can meet National Sanitation Foundation International ("NSF")/ American National Standards Institute ("ANSI")-60 Drinking Water Additive Standards and is used in potable water wells. Soda ash is used to raise the pH of the drilling fluid and can also meet NSF/ANSI-60 Drinking Water Additive Standards. The exact mixture of fluids is typically determined by the contractor based on the inferred sediment characteristic from borings and actual geotechnical materials encountered within the bore. The fluids can be modified based on the performance of the drilling equipment as the drilling process progresses. A typical drilling fluid consists of 95 percent water, 4 percent bentonite and less than one percent polymers.

Controlling and managing drilling fluid flow within the bore is critical to the success of an HDD installation. Installation risks significantly increase when the slurry circulation is not maintained within the HDD bore. While HDD installations carry a risk of an inadvertent drilling fluid return, these risks can be reduced along most of the alignment by providing an appropriate depth of cover so that overlying sediments resist the necessary fluid pressures and by modifying the pump rates as the pilot bore approaches the exit point. A conservative design depth of the proposed profile has been selected to limit the potential for inadvertent returns. Revolution Wind will prepare and implement an HDD Contingency Plan to minimize the potential risks associated with release of drilling fluids.

Offshore Construction

Offshore the RWEC-RI (inclusive of two cables) will be installed within the approximate 1,312-ft (400-m)-wide operational ROW. The total width of the disturbance corridor for installation of the RWEC-RI will be up to 131 feet (40 m) per cable, inclusive of any required sandwave leveling and boulder clearance (see Sandwave Leveling and Boulder Clearance subsection below). Dynamic positioning ("DP") vessels will generally be used for cable burial activities. If anchoring (or a pull ahead anchor) is necessary during cable installation it will occur within an approximate 1,312 ft (400-m) wide ROW. Anchors associated with cable laying vessels will have a maximum penetration depth of 15 ft (4.6 m).

Burial of the RWEC-RI will typically target a depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth for the RWEC will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment. Where burial cannot occur, sufficient burial depth cannot be achieved, or protection is required due to cables crossing other cables or pipelines, additional cable protection methods may be used (cable protection is discussed further below). The location of the RWEC-RI and associated cable protection will be provided to NOAA Office of Coast Survey after installation is completed so that they may be marked on nautical charts.

Installation of the RWEC-RI consists of a sequence of events, including pre-lay cable surveys, seabed preparation, cable installation, joint construction, cable installation surveys, and cable protection, as summarized in Table 2.2-6. It is anticipated that construction of the RWEC will be completed within approximately 8 months (not necessarily consecutive months), inclusive of the portion in federal waters not subject to this permit. In addition to the summary below the following subsections describe seabed preparation, cable installation methodologies, and cable protection strategies in more detail

Table 2.2-6 Expected Export Cable Construction Sequence

Activity/Action	Construction Summary
Pre-lay Cable Surveys	Prior to installation, geophysical surveys will be performed to check for debris and obstructions that may affect cable installation
Seabed Preparation	Seabed preparation will include required sandwave leveling, boulder clearance and removal of any Out of Service Cables. Boulder clearance trials may be performed prior to wide-scale seabed preparation activities to evaluate efficacy of boulder clearing techniques
Pre-Lay Grapnel Run ("PLGR")	PLGR runs will be undertaken to remove any seabed debris along the export cable route. A specialized vessel will tow a grapnel rig along the centerline of each cable route to recover any debris to the deck for appropriate licensed disposal ashore.
Cable Installation	The offshore cable laying vessel will move along the pre-determined route. Cable laying and burial may occur simultaneously using a lay and bury tool, or the cable may be laid on the seabed and then trenched post-lay. Alternatively, a trench may be pre-cut prior to cable installation. Cable lay and burial trials within the 131-ft (40-m) wide disturbance corridor may be performed prior to main cable installation activities to test equipment.
Joint Construction	Installation of the RWEC-RI will require offshore subsea joints due to the length of the RWEC-RI (up to two per cable planned). The joints will be located within the 131-ft (40-m) wide disturbance corridor. The subsea joint will be protected by marinized housing approximately four times the cross-sectional diameter of the cable. The joint housing will be protected using similar methods to those described below for Cable Protection. In case of repair due to damage additional joints may be required during construction.
Cable Installation Surveys	Cable installation surveys will be required, including pre- and post-installation surveys, to determine the cable burial depth. Depending on the instruments selected, type of survey, length of cable, etc. the survey will be completed by equipment mounted to a vessel and/or remote operated vehicle.
Cable Protection	Cable protection in the form of rock berms, rock bags and/or mattresses will be installed as determined necessary by the Cable Burial Risk Assessment. Cable protection will be installed from an anchored or DP support vessel that will place the protection material over the designated area(s).

2.2.3.3 Sandwave Leveling and Boulder Clearance

Prior to installation of the RWEC-RI, seabed preparation activities including sandwave leveling and boulder clearance will be required. As noted above, any required sandwave leveling and boulder clearance will occur within the 131-ft (40-m) -wide disturbance corridor for each cable of the RWEC-RI.

Based on collected geophysical data, Revolution Wind estimates up to 7% of each cable route of the RWEC-RI will require sandwave leveling before the cables can be installed. This is a conservative estimate as it assumes that all seabed features along the route are mobile; the actual number will be refined following the results of the geophysical surveys and additional sediment mobility studies. Sandwave leveling is typically completed for the following reasons:

- Many of the cable installation tools proposed require a relatively flat seabed surface to ensure operational criteria (pitch and roll) of the tools are not exceeded; and
- Sandwaves are generally mobile in nature, therefore, the export cables must be buried in a manner to prevent cable exposure over time. In areas where larger sandwaves exist, this is achieved by removing a portion of the mobile features before installation takes place.

Sandwave leveling and/or deeper cable burial may require use of a Trailing Suction Hopper Dredger ("TSHD") or Controlled Flow Excavation ("CFE"). Any sediment removed will be relocated within the local area.

- TSHD is mainly used for excavating loose and soft soils such as sand, gravel, silt or clay. One or two suction tubes, equipped with a drag head, are lowered on the seabed, and the drag head is trailed over the bottom to excavate a trench. This method is typically used for sandwave leveling.
- CFE is a non-contact methodology. The jetting tool draws in seawater from the sides and then jets this water out at a specified pressure and volume. The tool can be positioned over the sandwaves to level the seabed.

Boulder clearance may be required to relocate boulders within the RWEC-RI route. Revolution Wind assumes up to 70% of each cable route of the RWEC-RI will require boulder clearance. The following two techniques may be used to complete boulder clearance during installation of the RWEC-RI. Boulder clearance will occur prior to installation and will be completed by a support vessel based on pre-construction surveys.

- **Boulder Grab**: A grab is lowered to seabed, over the targeted boulder. Once "grabbed", the boulder is relocated away from the RWEC route.
- **Boulder Plow**: Boulder clearance is completed by a high-bollard pull vessel, with a towed plow generally forming an extended V-shaped configuration, splaying from the rear of the main chassis. The V-shaped configuration displaces any boulders to the extremities of the plow, thus establishing a clear corridor. Multiple passes may be required.

Prior to wide-scale seabed preparation activities, boulder clearance trials may occur within cable corridors to test that the equipment is working properly and is appropriate for the seabed conditions. Each trial would include the deployment and towing of boulder clearing equipment and/or use of boulder grab tool; each trial would be approximately 0.62 mi (1 km, 0.53 nm) in length. It is anticipated that approximately 5 to 10 trials may be necessary in different areas. The trials may also include pre- and post-trial geophysical survey work potentially utilizing a remotely operated vehicle and bathymetric survey equipment. Because trials will occur within cable corridors, the temporary seabed disturbance from these trials is accounted for in estimates provided in Table 2.2-7. Later in this document disturbance of 730 acres of seafloor during cable installation is classified as short-term disturbance and the 22 acres of cable protection is considered long-term because the protection may convert a soft-bottom seafloor to a hardened concrete or rock substrate that will support different infauna.

Table 2.2-7 Maximum Seabed Disturbance for RWEC-RI Installation[1]

RWEC-RI Disturbance	Construction Footprint	Operation Footprint
General Disturbance Corridor[2]	730 ac (295 ha)	-
Boulder Clearance (70% of route for each cable)	511.3 ac (206.9 ha)	-
Sandwave Leveling/Dredging (7% of route for each cable) [3]	51.1 ac (20.7 ha)	-
Secondary Cable Protection (10% of route for each cable)	-	22.0 ac (8.9 ha)

1 Disturbance estimates presented in this table are not additive as disturbance types may overlap (e.g., cable protection placed in areas where boulders were cleared). Vessel anchoring disturbances are not included; if anchoring (or a pull ahead anchor) is necessary during cable installation it will occur within a 1,312 ft (400 m) wide ROW.

2 The general disturbance corridor for the RWEC–RI is 131-ft (40-m)-wide. Boulder clearance, sandwave leveling, excavation, and secondary cable protection will not extend beyond this corridor. Also, if they are performed along the RWEC-RI, boulder clearance and cable lay/burial trials will occur within this general disturbance corridor.

3 Accounts for use of CFE and/or TSHD.

2.2.3.4 Offshore Export Cable Installation Methodology

Revolution Wind (Fugro 2020) has completed geophysical and geotechnical ("G&G") surveys of the RWEC-RI corridor to inform cable routing and selection of the most appropriate tools for installation of the RWEC-RI. Based on these G&G surveys and Revolution Wind's understanding of site-specific conditions between the landfall and the RWEC-RI, Revolution Wind will use the following burial tools as the primary installation methodologies.

- **Jet-Plow:** This technique involves the use of water jets to fluidize the soil temporarily opening a channel to enable the cable to be lowered under its own weight or be pushed to the bottom of the trench via a cable depressor. The cable is either installed simultaneously to cable lay operations or after the cable has been laid on the seabed. Typical types of jet-plows include towed jet sleds, tracked jet-trencher, or vertical injectors. Backfill of the trench is expected to occur naturally shortly after installation due to settlement of fluidized sediments and/or trench collapse. Immediately after installation a depression will likely be visible on the seabed as well as tracks/skids from the installation equipment; however, over time this will backfill to the original seabed level. No permanent seabed impacts are associated with this installation methodology.
- **Mechanical Plowing:** There are three types of mechanical plowing used for cable installation:
  - Simultaneous lay and bury involves pulling a plow along the cable route to simultaneously lay and bury the cable. The plow's share cuts into the soil, opening a temporary trench which is held open by the side walls of the share, while the cable is lowered to the base of the trench via a depressor. This narrow trench infills itself

behind the tool, primarily by collapse of the trench walls and/or by natural infill, usually over a relatively brief period. Some plows may use additional jets to fluidize the soil in front of the share. The plow pulling force is either provided by bollard pull (moving vessel) or winches (anchored vessel). Backfill of the trench is expected shortly after installation due to trench collapse. Immediately after installation a trench will likely be visible on the seabed as well as tracks/skids from the installation equipment; however, over time this will restore to the original seabed level. No permanent seabed impacts are associated with this installation methodology.

- Pre-cut plowing involves pre-cutting a trench in advance of the cable lay operations. Following cable lay, the trench is backfilled naturally and/or via an additional pass using the displaced material to provide sufficient protection to the cable. Trenching may require multiple passes. Pre-cut plowing is suitable to a range of soil conditions and is usually preferred over simultaneous lay and bury plowing when localized challenging ground conditions are expected (i.e., very hard soils and/or where subsurface boulder risk is high). Given that the tool is commonly used to target challenging ground conditions (i.e., very hard soils and/or where subsurface boulder risk is high), the disturbed area created by the plow is not expected to recover quickly. The volume of disturbed material is calculated from the cross-sectional area of the trench along its length; the disturbed area also includes the temporary berms created on the seabed. Temporary seabed impacts include the total area of the skids in contact with the seabed, the trench itself, and spoil on the sides of the trench.

› **Mechanical Cutters** employ either a cutting wheel or an excavation chain to cut a narrow trench into the seabed allowing the cable to sink under its own weight or be pushed to the bottom of the trench via a cable depressor. This installation methodology is typically used for post lay burial operations. Seabed disturbance associated with mechanical cutting is less than that associated with pre-cut plowing, as described above.

Prior to the main cable installation activities, cable lay and burial trials may occur within the 131-ft (40-m) wide disturbance corridor to test the equipment is working properly and is appropriate for the seabed conditions. Each trial includes operating the installation equipment within a portion of the cable corridor, offset from the cable centerline, and may also include installing a proportion of cable. It is anticipated that approximately 5-10 trials may be necessary to test the various pieces of equipment. The trial cable would be recovered towards the end of the cable installation process.

The final G&G survey data is being used to complete final cable route engineering. The purpose of the final cable routing process is to avoid, where possible, features along the route which have the potential to impact cable installation. In the event that features cannot be avoided (such as boulder fields), Revolution Wind will plan appropriate mitigation measures to manage the risks. In addition to final cable routing, the Revolution Wind will complete a Cable Burial Risk Assessment in which the site conditions will be described in detail, identifying features such as boulder distribution and dimensions, sandwave height and mobility, soil strength and classification, seabed obstructions and UXO and MEC (see Preliminary Cable Burial Feasibility Assessment in Appendix D, which is provided under confidential cover because it contains confidential commercial information not subject to disclosure under Access to Public Records Act (“APRA”; RIGL § 38-2-1) or Freedom of

Information Act ("FOIA"; 5 U.S.C. § 552)). Final cable route engineering and a final Cable Burial Risk Assessment ("CBRA") will be included in the Facility Design Report ("FDR") and Fabrication and Installation Report ("FIR"), to be reviewed by the CVA and submitted to BOEM and CRMC prior to construction.

2.2.3.5 MEC/UXO Risk Mitigation

Prior to seafloor preparation, cable routing, and micrositing of all assets, Revolution Wind will implement a MEC/UXO Risk Assessment with Risk Mitigation Strategy ("RARMS") designed to evaluate and reduce risk in accordance with the As Low As Reasonably Practicable ("ALARP") risk mitigation principle. The RARMS consists of a phased process beginning with a Desktop Study and Risk Assessment that identifies potential sources of MEC/UXO hazard based on charted MEC/UXO locations and historical activities, assesses the baseline (pre-mitigation) risk that MEC/UXO pose to the Project, and recommends a strategy to mitigate that risk to ALARP.

Avoidance is the preferred approach for MEC/UXO mitigation; however, it is anticipated that there may be instances where confirmed MEC/UXO avoidance is not possible due to layout restrictions, presence of archaeological resources, or other factors that preclude micrositing. In such situations, confirmed MEC/UXO may be removed through in-situ disposal or physical relocation. Selection of a removal method will depend on the location, size, and condition of the confirmed MEC/UXO, and will be made in consultation with a MEC/UXO specialist and in coordination with the appropriate agencies.

In-situ disposal will be done with low noise methods like deflagration of the MEC/UXO or cutting the MEC/UXO to extract the explosive components. The MEC/UXO might also be relocated through a "Lift and Shift" operation. The relocation would be to another suitable location on the seabed within the RWEC-RI corridor or previously designated disposal areas for either wet storage or disposal through low noise methods as described for in situ disposal. For all MEC/UXO clearance methods, safety measures such as the use of guard vessels, enforcement of safety zones, and others will be identified in consultation with a UXO/MEC specialist and the appropriate agencies and implemented as appropriate.

2.2.3.6 Secondary Cable Protection

Secondary cable protection may be applied where burial cannot occur, sufficient burial depth cannot be achieved due to seabed conditions, or to avoid risk of interaction with external hazards. The need for secondary cable protection in specific locations will be based on the Cable Burial Risk Assessment. Revolution Wind assumes that 10 percent of the route for each cable comprising the RWEC-RI will require secondary cable protection. The area of impact for secondary cable protection is accounted for in Table 3.2-2. It is assumed that secondary cable protection will measure up to 39 feet (12 meter) wide.

One or more of the following cable protection solutions may be used for secondary cable protection. Cable protection solutions implemented will be of the type that minimizes the potential for gear snags, as feasible, and can include the following:

- Rock berm involves dumping or placing rock overtop of a cable.
- Concrete mattresses are composed of cast concrete blocks interlinked to form a flexible, articulated mat, which can be placed on the seabed over a cable.
- Fronded mattresses are concrete mattress with 'fronds' that are designed to slow down current and naturally allow sediment to deposit and form a bank over the mattress.
- Rock bags are rock-filled mesh bags placed over the cable.

As noted previously, the location of the RWEC and associated cable protection will be provided to NOAA's Office of Coast Survey after installation is completed so that they may be marked on nautical charts.

2.2.3.7 Cable Crossings

The RWEC-RI crosses existing submarine assets. There are seven potential existing assets that have been identified to-date along the RWEC-RI, some of which are in close proximity to each other (see Revolution Wind RWEC Design plans in Appendix A). Their asset status is unknown at this stage and will require further investigation and engineering assessment for determining their status which will be identified in the FDR/FIR.

Cable protection at these crossings will be applied for both In-Service assets as well as Out-of-Service assets that cannot be safely removed and pose a risk to the RWEC-RI. Rock berm, rock bag or concrete mattress separation layers will be installed prior to cable installation, while the rock berm, rock bag or concrete mattress cover layers will be installed after cable installation. Any rock berm separation and cover layers and will be installed using suitably approved rock material. The rock berm separation and cover layers are defined by minimum geometry and vertical and horizontal tolerances. The amount of cable protection will be as required for suitable coverage and technical agreements with respective asset owners. It is assumed that up to 1,640 feet (500 m) of cable protection will be required per crossing. The cable protection required for cable crossings is in addition to the secondary cable protection requirements previously described above.

Final crossing designs will be completed in coordination with asset owners and formalized in crossing and proximity agreements, in line with International Cable Protection Committee recommendations.

The total area of seafloor hardening with cable protection and utility crossings is estimated to be 22 acres (refer to Table 2.2-7).

2.2.3.8 Measurement Buoys

Up to two near-shore floating bottom mounted Acoustic Doppler Current Profiler ("ADCP") systems will be deployed during construction in the nearshore area at the landfall and along the RWEC-RI route to support cable installation activities. Bottom mounted ADCPs collect current measurements, including direction and velocity through the water column by sending pulses through the water column at varying frequencies. This data may be stored internally and transferred upon equipment recovery, or for real-time monitoring. The data may be transmitted via telemetry to a satellite gateway to an onshore server using a transmission buoy. The number and locations of ADCPs will be determined as the cable route is further defined and in coordination with stakeholders.

The typical ADCP configuration includes an upward facing ADCP mounted on a seabed frame, a groundline connecting the frame to the ground weight, and a data storage/recovery system. The groundline will be relatively taut, with generally no sweep occurring throughout the tides. The seabed frame has an approximately 11 ft^2 (1 m^2) footprint. It is 1.6 to 3.3 ft (0.5 to 1 m) in height and weighs 220 to 1,100 lbs (100 to 500 kg). The frame may consist of simple tripod designs with gimbal and/or trawl resistant features such as low profile and protected sides. ADCPs are powered by alkaline or lithium batteries. There are two standard mooring configurations that may be used. One includes a surface marker buoy that can be used for telemetry and navigation and acts as the primary recovery method. If used, the marker buoy may be affixed to the ground weight by chain or rope mooring. The second configuration does not have a surface marker and relies on an acoustic system to release floats, which are attached to the ADCP frame. ADCP deployment will be conducted in accordance with manufacturer specifications by trained personnel. Deployment and recovery of ADCP frames and moorings can generally be conducted on a small workboat or cat equipped with on-deck crane, winch, and bow roller.

2.2.3.9 Operations and Maintenance

Pursuant to 30 CFR § 585.200(b), Revolution Wind has the right to one or more easements, without further competition, as necessary for the full utilization of the lease, and under applicable regulations in 30 CFR § 585. The Project will also seek a license and/or commercial lease of submerged lands for renewable energy development, as appropriate, from CRMC pursuant to CRMC's Enabling Act, R.I. Gen. Laws Section 46-23-1 et seq, and applicable CRMC regulations. The easement would include up to 1,312 ft (400 m) in width (centered on each offshore export cable) to support necessary O&M activities, particularly should a cable repair be required.

Revolution Wind will employ a proprietary state-of-the-art asset management system to inspect offshore transmission assets including, but not limited to, the RWEC-RI. This system provides a data-driven assessment of the asset condition and allows for prediction and assessment of whether inspections and/or maintenance activities should be accelerated or postponed. This approach allows the Project to maximize O&M efficiencies.

It is possible submarine cables may need to be repaired or replaced during the operational life of the Project. Also, it is expected that a maximum of 10 percent of the cable protection placed during installation may require replacement/remediation over the lifetime of the Project. These maintenance activities are considered non-routine. If cable repair/replacement or remedial cable protections are required, the Project will obtain necessary approvals. These activities will result in a short-term disturbance of the seabed similar to or less than what is anticipated during construction; these activities will be limited to the disturbance corridors previously defined for construction of the RWEC-RI.

The ADCPs, as described above in Section 2.2.3.8, will operate for one-year post-construction. At the end of the measurement period, each of the buoys would be decommissioned and removed. The buoys are typically fitted with satellite data transmission options for data transmittal and are not expected to require frequent maintenance. The need for servicing the ADCP is primarily based on the battery life of the instrumentation and biofouling of the instrument sensors but is assumed to be between 30 and 90 days. If redeployment is required, servicing can generally be done at sea, with new batteries installed for the instrumentation, biofouling removed, and mooring consumables replaced.

2.2.4 Decommissioning

At the end of the Project's operational life, it will be decommissioned in accordance with a detailed Project decommissioning plan that will be developed in compliance with applicable laws, regulations, and Best Management Practices ("BMPs") at that time. BOEM regulations require removal of all facilities to a depth of 15 ft (4.6 m) below the mudline, unless otherwise authorized by BOEM (30 CFR § 585.910(a)). Care will be taken to handle waste in a hierarchy that prefers re-use or recycling, and leaves waste disposal as the last option. Absent permission from BOEM, Revolution Wind will complete decommissioning within two years of termination of the Project's lease.

Revolution Wind will develop a final decommissioning and removal plan for the Project that complies with all relevant permitting requirements. This plan will account for changing circumstances during the operational phase of the Project and will reflect new discoveries particularly in the areas of marine environment, technological change, and any relevant amended legislation.

2.2.5 Environmental Compliance, Protective Measures, and Monitoring

Prior to the commencement of construction, operation, and decommissioning activities, a facility-specific environmental compliance manual will be prepared for the Project outlining specific construction and operating obligations. This manual, in conjunction with an Emergency Response Plan for the construction and operation of the Project, will ensure that no adverse impacts on public services in area communities result throughout the Project life cycle. The following subsections describe best management practices, applicant-proposed environmental protection measures, and monitoring that Revolution Wind is committed to implementing.

2.2.5.1 Best Management Practices

Best management practices are structural or non–structural measures, practices, techniques or devices employed to avoid or minimize impact to sensitive resources. This section describes BMPs the Revolution Wind will employ during construction and include:

- Time of Year ("TOY") Restrictions
- Construction work hours
- Installation of erosion and sediment controls
- Dewatering methods
- Chemical and Waste Management

Time of Year Restrictions

Revolution Wind has coordinated with RIDEM and NOAA NMFS regarding time of year TOY restrictions in state waters. Based on the coordination conducted to-date, in general, offshore site preparation for and installation of the RWEC-RI north of the Convention on the International Regulations for Preventing Collisions at Sea ("COLREGS") line of demarcation will occur between the day after Labor Day and February 1 to avoid and minimize impacts to winter flounder (*Pseudopleuronectes americanus*) and shellfish. Revolution Wind will continue to coordinate with RIDEM and NOAA NMFS regarding TOY restrictions through the permitting process and will adhere to requirements imposed by these agencies.

Construction Work Hours

Consistent with the Town of North Kingstown noise ordinance (Town Code Article VI), typical construction work hours for the Project will be 7:00 a.m. to 6:00 p.m. Monday through Friday when daylight permits and 7:00 a.m. to 5:00 p.m. on Saturdays. Revolution Wind will generally comply with these standard hours. However, some work tasks, such as concrete pours, HDD and landfall installation and cable pulling or splicing, once started, must be continued through to completion and occur outside these standard construction hours. In addition, the nature of transmission line construction requires line outages for certain procedures such as transmission line connections, equipment cutovers, or stringing under or over other transmission lines. These outages are dictated by ISO-NE and can be very limited based on regional system load and weather conditions. Work requiring scheduled outages and crossings of certain transportation and utility corridors may need to be performed on a limited basis outside of normal work hours, including Sundays and holidays.

Installation of Erosion and Sediment Controls

Following vegetation clearing and at the initiation of site preparation activities outside of vegetated areas, appropriate erosion control devices such as straw bales, straw wattle, compost mulch tubes, and siltation fencing will be installed using the procedures identified in the Rhode Island Soil Erosion and Sediment Control Handbook ("RISESCH"), and in accordance with approved plans and permit requirements. The installation of these erosion control devices will be supervised by an environmental monitor. The devices will function to mitigate construction-related soil erosion and sedimentation and will also serve as a physical boundary to separate construction activities from resource areas.

Revolution Wind has prepared SESC Plans for the OnSS (Appendix E) and the Onshore Transmission Cable and Landfall Work Area (Appendix F) to protect adjacent wetland and water resources during construction. The SESC Plans specify BMPs including erosion and sediment controls and spill protection measures. Revolution Wind will implement the SESC BMPs in accordance with applicable permit requirements consistent with the Eversource BMP Manual.

Dewatering

Excavation for installation of the onshore Project components might require dewatering. Dewatering is required when it is necessary to remove water from an excavation during construction and is driven by field conditions. Several methods can be used to temporarily divert and dewater from areas of excavation, including:

- Filter bags and straw bale containment areas may be used when there is a potential for discharged water to flow overland into wetlands or waterbodies. These containment areas will be located in well-vegetated areas outside of wetlands and more than 100 ft (30.5 m) from a waterbody or stream bank.
- Discharge hose filter socks may be used when there isn't enough space to construct sediment basins or enough suitable uplands for overland flow and infiltration. Filter "socks" or bags may be attached to the end for the discharge hose of the pump and used for dewatering. Additional measures such as straw bales may be installed around the filter device for added protection.

If dewatering is required during excavation, one of the abovementioned methods will be used and the SESC Plan and Eversource's BMPs will be implemented to avoid adverse impacts to surface and groundwater. If contaminated groundwater is encountered during dewatering, it will be managed in accordance with the RIDEM Remediation General Permit.

Chemical and Waste Management

During construction, all chemicals needed for maintenance and operation of equipment will be brought to site aboard vessels and be transported in manufacturer's original packaging or in National Transportation Safety Council ("NTSC") approved tote containers. It is anticipated that any chemicals to be stored on site will be integral with associated equipment and will not be transported independently from this equipment.

During construction, chemicals transfers may take place daily depending on operational requirements of the various contractors. Chemical transfers will be executed in accordance with industry best practices considering health, safety, and environment, and will be in compliance with local, state, and federal regulations. Chemical transfer volumes will be determined by operational requirements of the various contractors, and will be in compliance with all local, state, and federal regulations.

Any chemicals to be treated or disposed of will be transported to typical onshore waste receiving sites within the area that conform to safe and environmentally friendly methods in accordance with local, state, and federal regulations. Revolution Wind will also implement an Emergency Response Plan/Oil Spill Response Plan ("ERP/OSRP") (see Appendix G).

Revolution Wind will meet applicable regulations and standards, as set by the International Maritime Organization's ("IMO") International Convention for the Prevention of Pollution from Ships ("MARPOL"), the USCG, and the State of Rhode Island, for treatment and disposal of solid and liquid wastes generated during all phases of the Project.

2.2.5.2 Proposed Avoidance, Minimization, and Mitigation Measures

The Project was sited, planned, and designed to avoid and minimize impacts. To the extent there are potential adverse impacts that cannot be avoided, these will be mitigated. Potential impacts to resources from the RWEC-RI and onshore Project components are expected to be limited temporally and/or spatially. Tables 2.2-8 and 2.2-9 below outline the protective measures and modifications that have been incorporated into the Project to avoid or minimize environmental impacts.

Table 2.2-8 Avoidance, Minimization, and Mitigation Measures for Natural Resources

Project Component	Avoidance, Minimization, and Mitigation Measures: Natural Resources
Design Phase	
RWEC-RI	› To the extent feasible, the RWEC-RI will typically target a burial depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment. › The RWEC-RI will be sited to avoid and minimize impacts to sensitive habitats (e.g., hard bottom habitats) to the extent practicable. › Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region. › A preconstruction submerged aquatic vegetation ("SAV") survey will be completed to identify any new or expanded SAV beds. The Project design will be refined to avoid impacts to SAV to the extent practicable.
Onshore Project Components	› Onshore Project components were sited within previously disturbed and developed areas to the extent practicable. › In accordance with Section 2.9(B)(1)(d) of the Freshwater Wetland Rules, the onshore Project components were designed to avoid and minimize impacts to freshwater wetlands to the maximum extent practicable. Any wetlands that will be impacted as a result of the Project will be mitigated via the federal and state permitting process in accordance with Section 404 of the CWA and the Freshwater Wetland Rules.
Construction Phase	

RWEC-RI	› To the extent feasible, installation of the RWEC-RI will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
	› Construction and operational lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations.
	› Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region.
	› RWEC-RI will avoid identified shallow hazards to the extent practicable.
	› Exclusion and monitoring zones for marine mammals and sea turtles will be established for impact and pneumatic hammering and vibratory pile driving activities.
	› Revolution Wind will comply with FAA and USCG requirements for lighting while using lighting technology (e.g., low-intensity strobe lights) that minimizes impacts on avian species.
	› A ramp-up or soft-start will be used at the beginning of each pile segment during pile driving to provide additional protection to mobile species in the vicinity by allowing them to vacate the area prior to the commencement of pile driving activities.
	› Environmental protection measures will be implemented for pile driving activities. These measures will include seasonal restrictions, soft-start measures, shut-down procedures, marine mammal and sea turtle monitoring protocols, the use of qualified and NOAA-approved protected species observers, and noise attenuation systems such as bubble curtains, as appropriate.
	› Vessels:
	  › Vessels will follow NOAA and BOEM guidelines for marine mammal and sea turtle strike avoidance measures, including vessel speed restrictions.
	  › All personnel working offshore will receive training on marine mammal and sea turtle awareness and marine debris awareness.
	  › Vessels providing construction or maintenance services will use low sulfur fuel, where possible.
	  › Vessel engines will meet the appropriate EPA air emission standards for nitrogen oxide(s) ("NO_X") emissions when operating within Emission Controls Areas.
	  › Marine engines with a model year of 2007 or later and non-road engines complying with the Tier 3 standards (in 40 CFR 89 or 1039) or better will be used to satisfy Best Available Control Technology or Lowest Achievable Emission Rate.
	  › Revolution Wind will require all construction and operations vessels to comply with regulatory requirements related to the prevention and control of spills and discharges.
	  › Accidental spill or release of oils or other hazardous materials offshore will be managed through the Oil Spill Response Plan.
	  › DP vessels will be used for installation of the RWEC to the extent possible.
	  › A plan for vessels will be developed prior to construction to identify no-anchorage areas to avoid documented sensitive resources.
	  › All vessels will comply with USCG and EPA regulations that require operators to develop waste management plans, post informational placards, manifest trash sent to shore, and use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Vessels will also comply with BOEM lease stipulations that require adherence to NTL 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process.

Project Component	Avoidance, Minimization, and Mitigation Measures: Natural Resources
	› Revolution Wind will document any dead (or injured) birds/bats found incidentally on vessels and structures during construction and post-construction and provide an annual report to BOEM and USFWS. › HDD drilling fluids will be managed within a contained system following punch out of the pilot drilling to be collected for reuse as necessary. An HDD Contingency Plan will be prepared and implemented to minimize the potential risks associated with release of drilling fluids.

Onshore Project Components	› General environmental protective measures that apply to all Onshore Project components (i.e., Landfall Work Area, Onshore Transmission Cable, OnSS, and Interconnection ROW):
	  › Compliance with the RIPDES General Permit for Stormwater Discharges associated with Construction Activities which requires the implementation of an SESC Plan and spill prevention and control measures.
	  › A SESC Plan, including erosion and sedimentation control measures, will be implemented to minimize potential water quality impacts during construction and operation of the onshore Project components.
	  › The operator must implement the site-specific SESC Plan and maintain it during the entire construction process until the entire worksite is permanently stabilized by vegetation or other means. The measures employed in the SESC Plan use BMPs to minimize the opportunity for turbid discharges leaving a construction work area.
	  › Accidental spill or release of oils or other hazardous materials will be managed through the Oil Spill Response Plan.
	  › The spill prevention and control measures mandate that the operator identify all areas where spills can occur and their accompanying drainage points. The operator must also establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. Spill prevention and control training will be provided for relevant personnel.
	  › Construction and operational lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations.
	  › Onshore Project components equipment and fuel suppliers will provide equipment and fuels that comply with the applicable EPA or equivalent emission standards.
	  › To the extent feasible, tree and shrub removal for onshore Project components will occur outside the avian nesting and bat roosting period; May 1 through August 15. If tree and shrub removal cannot avoid this season, Revolution Wind will coordinate with appropriate agencies to determine appropriate course of action.
	› The Onshore Transmission Cables will be buried; therefore, avoiding the risk to avian and bat species associated with overhead lines.
	› The documented sickle-leaved golden aster population on the OnSS parcel will be protected during construction.

Post-Construction Phase	
RWEC-RI	› Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region. › Revolution Wind is developing an Avian Post-Construction Monitoring Plan for the Project that will summarize the approach to monitoring; describe overarching monitoring goals and objectives; identify the key avian species, priority questions, and data gaps unique to the region and Project Area that will be addressed through monitoring; and describe methods and time frames for data collection, analysis, and reporting. Post-construction monitoring will assess impacts of the Project with the purpose of filling select information gaps and supporting validation of the Project's Avian Risk Assessment. Focus may be placed on improving knowledge of ESA-listed species occurrence and movements offshore, avian collision risk, species/species-group displacement, or similar topics. Where possible, monitoring conducted by Revolution Wind will build on and align with post-construction monitoring conducted by the other Orsted/Eversource offshore wind projects in the Northeast region. Revolution Wind will engage with federal and state agencies and environmental groups ("eNGOs") to identify appropriate monitoring options and technologies, and to facilitate acceptance of the final plan. › Revolution Wind will document any dead (or injured) birds/bats found incidentally on vessels and structures during construction and post-construction and provide an annual report to BOEM and USFWS.
Onshore Project Components	› The perimeter surrounding onshore Project components will be managed to encourage the growth of native grasses, ferns, and low growing shrubs. The management strategy will include the removal of invasive plants in compliance with state and federal regulations (e.g. herbicide use will not be permitted within regulated wetlands). › Construction and operational lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations.

Note: Onshore Project components applicable to this Category B Assent application include the Landfall Work Area, Onshore Transmission Cable, Onshore Substation, and Interconnection Transmission ROW.

Table 2.2-9 Avoidance, Minimization, and Mitigation Measures for Socioeconomic, Cultural, and Visual Resources

Project Component	Avoidance, Minimization, and Mitigation Measures
Design Phase	
RWEC-RI	› The RWEC-RI will be sited to avoid or minimize impacts to potential submerged cultural sites and paleolandforms, to the extent practicable. › Native American Tribal representatives were involved, and will continue to be involved, in marine survey protocol design, execution of the surveys, and interpretation of the results. › RWEC-RI was sited to avoid conflicts with DoD use areas and navigational areas identified by the USCG, as applicable. › Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region. › Communications and outreach with the commercial and recreational fishing industries will be guided by the Project-specific Fisheries Communication Plan.
Onshore Project Components[1]	› Onshore Project components will be sited within previously disturbed and developed areas to the extent practicable. › Onshore Project components will be sited to avoid or minimize impacts to potential terrestrial archeological resources, to the extent practicable. › Native American Tribal representatives were involved, and will continue to be involved, in terrestrial survey protocol design, execution of the surveys, and interpretation of the results.
Construction Phase	
RWEC-RI	› Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region. › Communications and outreach with the commercial and recreational fishing industries will be guided by the Project-specific Fisheries Communication Plan. › Where possible, local workers will be hired to meet labor needs for Project construction and O&M. › A plan for vessels will be developed prior to construction to identify no-anchorage areas to avoid documented sensitive resources. › Revolution Wind will consult with USCG, the U.S. Navy Undersea Warfare Command ("NUWC") Newport RI, Northeast Marine Pilots Association and regional ferry service operators to avoid or reduce use conflicts. › Project construction and O&M activities will be coordinated with appropriate contacts at USCG, the NUWC Newport, and the Northeast Marine Pilots. › A comprehensive communication plan will be implemented during offshore construction to inform all mariners, including commercial and recreational fishermen, and recreational boaters of construction activities and vessel movements. Communication will be facilitated through a Fisheries Liaison, Project website, and public notices to mariners (in coordination with USCG). › As appropriate and feasible, BMPs will be implemented to minimize impacts on fisheries, as described in the Guidelines for Providing Information on Fisheries Social and Economic Conditions for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 (BOEM, 2015).
Onshore Project Components	› Revolution Wind will use Aircraft Detection Lighting System ("ADLS") (or a similar system), pursuant to approval by the FAA and commercial and technical feasibility at the time of FDR/FIR approval. › Where possible, local workers will be hired to meet labor needs for Project construction and O&M. › The onshore Project components construction schedule will be designed to minimize impacts to the local community during the summer tourist season, generally between Memorial Day and Labor Day. › Revolution Wind will coordinate with local authorities during construction of onshore Project components to minimize local traffic impacts; further, these Project components will be constructed in compliance with applicable regulations related to environmental and community concerns (e.g., traffic and erosion). In addition, traffic will be temporary and will not impact long term property values. › The Onshore Transmission Cables will be buried; therefore, minimizing potential impacts to adjacent properties. › Investigation and remediation of contaminated soil and groundwater must be carried out in accordance with RIDEM regulations and policies regarding Environmental Justice Focus Areas including enhanced stakeholder outreach. › An Unanticipated Discovery Plan ("UDP") will be implemented that will include stop-work and notification procedures to be followed if a potentially significant archaeological resource is encountered during construction. › An UDP will be implemented that will include stop-work and notification procedures to be followed if a cultural resource is encountered during installation.

Project Component	Avoidance, Minimization, and Mitigation Measures
Post-Construction Phase	
RWEC-RI	› Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region. › Communications and outreach with the commercial and recreational fishing industries will be guided by the Project-specific Fisheries Communication Plan. › Where possible, local workers will be hired to meet labor needs for Project construction and O&M. › Project construction and O&M activities will be coordinated with appropriate contacts at USCG, NUWC Newport, and the Northeast Marine Pilots.
Onshore Project Components	› Where possible, local workers will be hired to meet labor needs for Project construction and O&M. › Screening will be implemented at the OnSS to the extent feasible, to reduce potential visibility and noise.

Note: Onshore Project components applicable to this Category B Assent application include the Landfall Work Area, Onshore Transmission Cable, Onshore Substation, and Interconnection Transmission ROW.

2.2.5.3 Monitoring

Onshore Construction Environmental Compliance Monitoring

Throughout the entire onshore construction process, the services of an environmental monitor will be retained. The primary responsibility of the monitor will be to confirm compliance with federal, state, and local environmental permit requirements. At least weekly and following precipitation events of ¼ inch of rain in 24 hours, the monitor will inspect all onshore construction areas to determine that the environmental controls are functioning properly and to make recommendations for correction or maintenance, as necessary. In addition to retaining the services of an environmental monitor, the construction contractor will be required to designate an individual to be responsible for the daily inspection and upkeep of environmental controls. This person will also be responsible for providing direction to the other members of the construction crew regarding matters such as wetland access and appropriate work methods. Installation and repair of BMPs and other compliance issues are tracked on an inspection form or action log that is updated and distributed weekly to appropriate personnel. Additionally, all construction personnel will be briefed on Project environmental issues and obligations prior to the start of construction. Regular construction progress meetings will reinforce the contractor's awareness of these issues.

Offshore Construction Environmental Compliance Monitoring

Revolution Wind will use an aquatic environmental monitor ("AEM") throughout the entire offshore construction process in RI state waters. The primary responsibility of the AEM will be to confirm compliance with federal, state, and local environmental permit requirements, environmental regulations, and Project environmental policies and procedures while working in Rhode Island state waters. The AEM will inspect and monitor offshore construction activities and areas to determine that the environmental controls are functioning properly and to make recommendations for corrective actions and/or maintenance, as necessary. The AEM will ensure completion of any required WQ monitoring and sampling, environmental inspections, environmental forms/checklists, and have knowledge of TSS monitoring/sampling techniques, seabed cable installation methodologies, jet trenching tools and operation, pre-lay grapnel runs, in-water HDD installations, and reporting requirements for regulatory agencies. The AEM will also be responsible for providing direction to the other members of the offshore construction crew regarding environmental compliance conditions and BMPs and ensure compliance documents are logged and tracked on the Compliance Management Software Tool. Additionally, all offshore construction personnel will be briefed on Project environmental issues and obligations prior to the start of construction. Regular construction progress meetings will reinforce the contractor's awareness of these issues.

Bathymetry/Cable Burial Surveys

To evaluate integrity of the assets, Revolution Wind intends to conduct an as-built multi-beam survey along the entirety of the cable routes within state waters following installation and the placement of any secondary cable protection. Bathymetry surveys will also be performed one year after commissioning, two to three years after commissioning, and five to eight years after commissioning. Survey frequency thereafter will depend on the findings of the initial surveys (i.e., site seabed dynamics and soil conditions). A survey may also be conducted after a major storm event (i.e., greater than 10-year event). Surveys of the cables may be conducted in coordination with scour surveys at the foundations. Should the periodic bathymetry surveys indicate that a portion or portions of the cables no longer meet an acceptable burial depth (as determined by the CBRA), the following actions may be taken:

- Alert the necessary regulatory authorities, as appropriate;
- Undertake an updated cable burial risk assessment to establish whether cable is at risk from external threats (i.e., anchors, fishing, dredging);
- Survey monitoring campaign for the specific zone around the shallow buried cable; and
- Assess the risk to cable integrity.

Based on the outcome of these assessments, several options may be undertaken, as feasible, permitted, and practical:

- Remedial burial if feasible and practical;
- Secondary protection (rock protection, rock bags or mattresses); and/or
- Increased frequency of bathymetry surveys to assess reburial.

Fisheries and Benthic Habitat Monitoring

As outlined in Tables 2.2-8 and 2.2-9, Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries and benthic monitoring studies are being planned to assess the potential impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region. In addition, Revolution Wind is collaborating with RIDEM Division of Marine Fisheries for monitoring within state waters. The Project's Fisheries and Benthic Monitoring Plan was submitted to CRMC under separate cover on June 7, 2021.

3

Affected Environment, Potential Impacts, and Proposed Avoidance, Minimization, and Mitigation

This section describes the onshore and offshore affected environment within CRMC jurisdiction; potential impacts associated construction, operations and maintenance, and decommissioning of Project components applicable to this Category B assent application (i.e., the RWEC-RI, Landfall Work Area, Onshore Transmission Cable, and OnSS/Interconnection ROW); and proposed avoidance, minimization, and mitigation measures to address these potential impacts. Generally, decommissioning impacts are commensurate with construction phase impacts and are therefore discussed together.

The Project was sited, planned, and designed to avoid and minimize impacts. To the extent there are potential adverse impacts that cannot be avoided, these will be mitigated. All proposed avoidance, minimization, and mitigation measures proposed for the Project are in Tables 2.2-8 and 2.2-9 in Section 2.2.4.2. Potential impacts to resources from the RWEC-RI and onshore Project components are expected to be limited temporally and/or spatially. Post-construction environmental monitoring of various resources will take place and will include, at a minimum, coordination and data sharing with regional monitoring efforts. Monitoring plans will also be developed in coordination with the relevant agencies prior to construction.

3.1 Onshore Environmental Setting, Project Impacts, and Proposed Avoidance, Minimization, and Mitigation Measures

This section provides an overview of the onshore environmental setting (i.e., affected environment) (see Site Photos in Appendix H) within the Onshore Project Area, potential Project impacts, and proposed avoidance, minimization, and mitigation measures. For the purposes of this discussion, the Onshore Project Area was defined as a 500-foot (152-m) radius from the Landfall Work Area, Onshore Transmission Cable, and OnSS parcel (see Figure 3.1-1). Summaries from the following technical studies and reports that have been prepared for the Project are included in the following applicable subsections:

- Visual Resources Assessment Revolution Wind Onshore Facilities (EDR, 2020) (Appendix I)
- Vernal Pool Survey Memorandum for Revolution Wind Onshore Facilities (VHB, 2020) (Appendix J)
- Terrestrial Archaeological Resources Assessment (PAL, 2020) (Appendix K)

3.1.1 Surficial Geology and Soils

3.1.1.1 Surficial Geology Affected Environment

Overall, the Onshore Project Area is generally characterized by high levels of historic human disturbance. Historically, the area was part of the Quonset Point Naval Air Station and the Davisville Naval Base, which was built between 1940 and 1942. Currently, onshore Project components are located within the Quonset Business Park, which is managed by the QDC. Quonset Point is part of the large Pleistocene outwash plain. Holocene deposits also present in this area include:

- **Coastal Beach:** Areas of unconsolidated, accreted, usually unvegetated sediments commonly subject to wave action, extending from mean low water landward to an upland rise or backed by a dune or marsh. The beaches within the Onshore Project Area range from sandy to cobbly or stony.
- **Salt Marsh:** Deposits of partially decomposed Holocene-age plant matter in areas typically inundated twice per day during each tidal cycle.
- **Freshwater Wetland:** Areas outside of the limits of tidal influence which support hydrophytic vegetation and where organic materials accumulated under the influence of prolonged periods of inundation or saturated soil conditions.
- **Human Transported Materials (HTM):** Areas where the natural soil or surficial geological deposits have been altered, typically by grading, filling, or excavation. These actions obscure the structure of the original surficial deposits and soil forming processes. This unit includes areas where dredge spoils were disposed of on land.

3.1.1.2 Soils Affected Environment

A total of 11 named soil series and 13 soil map units (lower taxonomic units than series) have been mapped within the Onshore Project Area. Descriptions of soil types were obtained from the Natural Resources Conservation Service ("NRCS") Web Soil Survey (NRCS, 2019), the Soil Survey of Rhode Island (Rector, 1981), and from on-site investigations conducted by VHB. The Soil Survey delineates map units that may consist of one or more soil series and/or miscellaneous non-soil areas that are closely and continuously associated on the landscape. In addition to the named series, map units include specific phase information that describes the texture and stoniness of the soil surface and the slope class.

Table 3.1-1 lists the characteristics of the 13 soil map units found within the Onshore Project Area. Brief descriptions of each soil map unit are below the table. See also Figure 3.1-1.

Table 3.1-1 Summary of Soil Map Units within the Onshore Project Area

Soil Map Unit Symbol	Soil Phase	Amount in Project Area (Acres)	Drainage Class	Percent Slope
Bax	Beaches, boulders	0.5	N/A	0 to 8
FtA	Fortress sand	5.5	mwd	0 to 3
MU	Merrimac-Urban land complex	53.2	swed	0 to 8
NP	Newport urban land complex	12.9	wd	1 to 15
QoA	Quonset gravelly sandy loam	2.4	ed	0 to 3
QoC	Quonset gravelly sandy loam, rolling	12.9	ed	3 to 15
Rc	Raypol silt loam	0.9	pd	N/A
SwA	Swansea muck	7.9	vpd	0 to 1
UD	Udorthents-Urban land complex	7.9	N/A	0 to 15
Ur	Urban land	36.2	N/A	N/A
UrS	Urban land, sandy substratum	15.6	N/A	0 to 5
Wa	Walpole sandy loam	14.5	pd	0 to 3
WgB	Windsor loam sand	5.6	ed	3 to 8

Source: USDA NRCS Web Soil Survey

Notes: ed – excessively drained; mwd: moderately well drained; pd – poorly drained (often hydric); wd – well drained; vpd – very poorly drained (hydric); swed – somewhat excessively drained; N/A – not available

- **Beaches and boulders complex (Bax)** is a non-soil miscellaneous unit which describes the highly dynamic coastline characterized by accreted sands. Boulders can represent lag deposits, but in the case of the Landfall Transition Area rocks were dumped to dissipate coastal scouring forces.
- **Fortress sand complex (FtA)** is used to describe sandy dredge spoils that have been graded near level. This soil is classified as HTM.
- **Merrimac-Urban land complex (MU)** consists of two parts: a deep, somewhat excessively drained soil formed in outwash with a windblown mantle of sandy loam and a non-soil miscellaneous unit, Urban land, which typically consists of rooftops, roads, and paved parking lots.
- **Newport-Urban land complex (NP)** is similar to the unit described above; however, the natural soil component is a deep, well-drained soil formed in glacial till parent material. Newport soils typically have a dense till or "hardpan" within two or three feet of the soil surface.
- **Quonset gravelly sandy loam complexes (QoA and QoC)** are two mapping units containing deep, excessively drained soils formed in gravelly outwash. The C slope unit describes rolling terrain whereas the A slope is near level.
- **Raypol silt loam complex (Rc)** is a deep, near level, poorly drained soil formed in outwash overlain by a windblown silt loam mantle. Raypol soils are hydric and found in wetlands.
- **Swansea muck complex (SwA)** is a deep, near level, very poorly drained soil with a surface tier of muck. These soils are hydric and are found in wetlands.

- **Udorthents-Urban land complex (UD**) is a complex of regraded, cut or filled soils and a non-soil urban land component.
- **Urban land complex (Ur)** is similar to the other Urban land complex descriptions above.
- **Urban land complex (UrS)** this map unit is similar to Urban land complexes described above but is underlain by sandy deposits.
- **Walpole sandy loam complex (Wa)** is a deep, near level, poorly drained soil similar to the Raypol series but with a sandy loam or loamy sand surface texture. This hydric soil is associated with wetlands.
- **Windsor loamy sand complex (WgB)** is a deep, excessively drained (droughty soil) made up almost exclusively of sand without gravels. Often thought to develop on dunes formed in the paraglacial climate that persisted after deglaciation.

In addition, the rolling map unit for Quonset soils (QoC) may have slopes up to 15 percent and is classified as potentially highly erodible land (PHEL) with an erodibility factor (K) of 0.10.[8] The erodibility of a soil is dependent upon the slope of the land occupied by the soil and the texture of the soil. NRCS has characterized soil map units as "highly erodible", "potentially highly erodible", or "not highly erodible" due to sheet and rill erosion (USDA, 1993). Soils are given an erodibility factor (K), which is a measure of the susceptibility of the soil to erosion by water.

8 Soils having the highest K values are the most erodible. K values in Rhode Island range from 0.10 to 0.64, with the erodibility factor increasing as the K value increases.

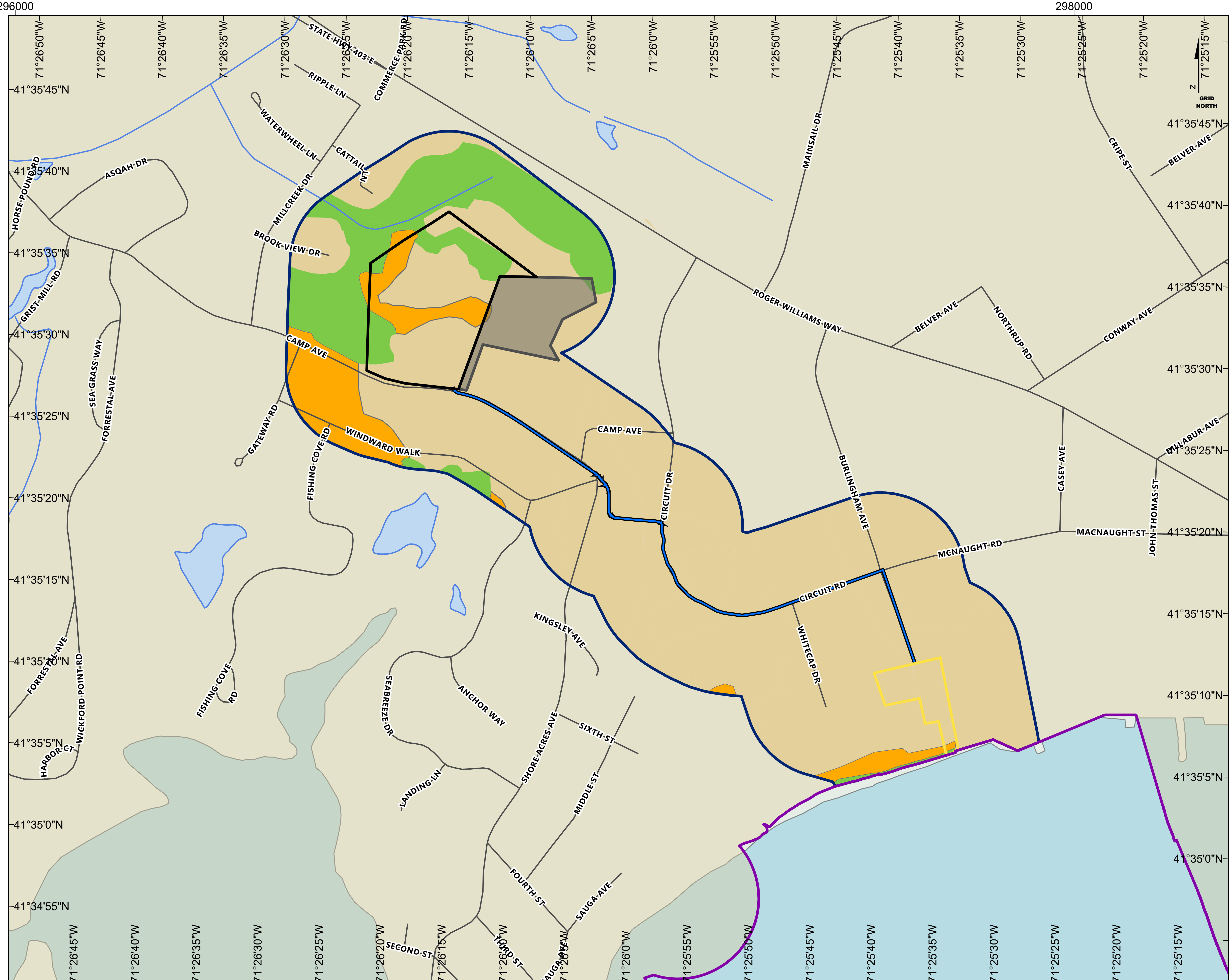

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Figure 3.1-1
Soil Map Onshore
NORTH KINGSTOWN, RI

Legend
- Parcel ID 179-030 & 179-001
- Parcel ID 179-005*
- Onshore Transmission Cable
- Landfall Work Area
- Onshore Project Area
- RWEC-RI Project Area

Hydric Soils and Steep Sloped Soils
- Hydric Soil
- Potentially Highly Erodable
- Other Lands

*Not part of this Category B Assent application; refer to separate Application to Alter Freshwater Wetlands filed on June 30, 2021.

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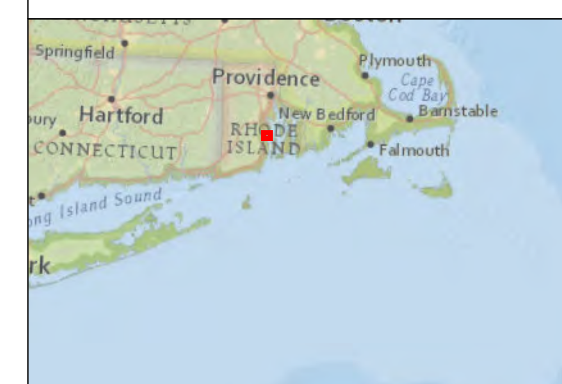

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Projection: UTM Zone 19N

0 80 160 240 Meters

0 240 480 720 Feet

Date: 6/29/2021
Document no:

Created by: S. PELLETIER
Checked by: S. MOBERG
Approved by: STEPW

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3.1.1.3 Potential Project Impacts

Construction and Decommissioning

Construction and decommissioning activities for the Landfall Work Area, Onshore Transmission Cable, and OnSS/Interconnection ROW will generally occur in developed areas where geology and soils are already disturbed (e.g., roadways, parking lot, landfill, etc.).

The Landfall Work Area will temporarily disturb up to 3.1 acres (1.2 ha) and was sited in a currently developed area to avoid and minimize impacts. The HDD operation at the Landfall Work Area will involve excavating two HDD entry pits, and a temporary sheet pile anchor wall to stabilize the HDD drill rig may be required within the Landfall Work Area. If required, this sheet pile anchor wall will be approximately 30 feet (9 m) long and will be driven to a depth of approximately 20 feet (6 m). Other excavation support may also be required around the work area to stabilize the soil in the excavated area and/or anchor the rig. This work will occur in a developed site where the natural soils and surficial geology have been largely altered. As shown on sheet SESC-13 of the Proposed Onshore Transmission Facilities SESC Plan (see Appendix A), the coastal features and Narragansett Bay will be protected from erosion and sedimentation from erosion controls and will be stabilized with crushed stone or asphalt after work is complete.

The Onshore Transmission Cable will require a 25-foot-wide (7.6 m) disturbance area for the approximate one-mile (1.6 km) length of the cable for a disturbance corridor of approximately 3.1 acres (1.3 ha) (refer to Onshore Transmission Cable plans in Appendix A). An approximate eight-foot-wide trench will be excavated within existing paved roads to a depth of approximately 3 to 6 feet (0.9 to 1.8 m) with a maximum disturbance depth of 13 feet (4 m) to install the Onshore Transmission Cable beneath existing roads. This excavation will result in the mixing of soil materials during backfill. The Onshore Transmission Cable will also require two sets of two splice vaults (four total) along its route to the OnSS. The splice vaults will require a larger area of disturbance, with each requiring a 30- by 75-foot (9 by 22.9 m) area and will require excavation down to approximately 15 feet (4.6 m). See splice vault details on sheets PG-20 and PG-21 in the Onshore Transmission Cable plans in Appendix A. Like the Landfall Work Area, erosion and sedimentation controls will be implemented along the Onshore Transmission Cable as necessary, including compost filter socks and catch basin protection (see Onshore Transmission Facilities SESC Plan in Appendix A).

The OnSS and Interconnection ROW will be constructed over a closed landfill and other areas of buried demolition along with some areas of native soils. The OnSS and Interconnection ROW will require temporary disturbance of up to 7.1 ac (2.9 ha) to facilitate construction, which consists of an operational footprint of approximately 4 ac (1.6 ha). Construction includes limited grading activities, principally associated with the construction of the new OnSS. Minor grading will be necessary to construct new access roads, stormwater management features, and prepare the Project footprint for construction. Soil erosion controls will be implemented along the limit of work to prevent erosion and sedimentation (see OnSS plans in Appendix A, which are provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552)).

Operations and Maintenance

Operation and maintenance of the TJBs, Onshore Transmission Cable, and OnSS is not expected to result in ground disturbance unless a repair is required. Therefore, geology and soils are not expected to be impacted during O&M unless repairs are needed. Such repairs are considered non-routine maintenance.

3.1.1.4 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to onshore surficial geology and soils:

- Onshore Project components were sited within previously disturbed and developed areas to the extent practicable.
- Compliance with the RIPDES General Permit for Stormwater Discharges associated with Construction Activities which requires the implementation of an SESC Plan and spill prevention and control measures.
- An SESC Plan, including erosion and sedimentation control measures, will be implemented to minimize potential water quality impacts during construction and operation of the onshore Project components.
- The operator must implement the site-specific SESC Plan and maintain it during the entire construction process until the entire worksite is permanently stabilized by vegetation or other means. The measures employed in the SESC Plan use BMPs to minimize the opportunity for turbid discharges leaving a construction work area.
- Accidental spill or release of oils or other hazardous materials will be managed through the Oil Spill Response Plan.
- The spill prevention and control measures mandate that the operator identify all areas where spills can occur and their accompanying drainage points. The operator must also establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. Spill prevention and control training will be provided for relevant personnel.

3.1.2 Coastal Features and Wetlands

3.1.2.1 Coastal Features and Wetlands Affected Environment

CRMC has jurisdiction over all shoreline features and all lands within 200 feet of these features. There are four types of Coastal Features within the Project Area (Figure 3.1-2):

Coastal Beach

The first coastal feature encountered as the RWEC-RI transitions to the Landfall Work Area is Coastal Beach. The CRMP defines Coastal Beach as expanses of unconsolidated, usually unvegetated sediment commonly subject to wave action, but may also include a vegetative beach berm. Beaches extend from mean low water landward to an upland rise, usually the base of a dune, headland bluff, or coastal protection structure, pilings, or foundation.

Manmade Shoreline

The Coastal Beach present at the Landfall Work Area is backed by Manmade Shoreline. The CRMP defines Manmade Shoreline as those shorelines that are characterized by concentrations of shoreline protection structures and other alterations, to the extent that natural shoreline features are no longer dominant. They most commonly abut Type 3, 5, and 6 waters. In this case the Manmade Shoreline consists of a cast in place concrete seawall fronted by riprap. The seawall, or revetment, functions to protect and retain fill used to construct the developments in the Quonset Industrial Park from erosive coastal forces. At the Landfall Work Area at Burlingham Avenue the limit of the CRMC 200-foot Contiguous Area is measured from the top of this revetment.

Coastal Wetland

Coastal wetlands are present south of the Onshore Transmission Cables. Coastal wetlands are defined in the CRMP "*as salt marshes and freshwater or brackish wetlands contiguous to salt marshes or physiographical features. Areas of open water within coastal wetlands are considered a part of the wetland. In addition, coastal wetlands also include freshwater and/or brackish wetlands that are directly associated with non-tidal coastal ponds and freshwater or brackish wetlands that occur on a barrier beach or are separated from tidal waters by a barrier beach*" (RI CRMC, 2020).

The central area of the marsh bordering Blue Beach is dominated by salt meadow cordgrass *(Spartina patens)* and the perimeter is mostly composed of common reed *(Phragmites australis)*, maritime marsh-elder *(Iva frutescens)* and groundsel tree *(Baccharis halimifolia)*. The common reed established along the perimeter of the tidal salt marsh is considered invasive.

Inland, the coastal wetland transitions to brackish and freshwater conditions proximate to Circuit Drive where a storm drainage system contributes flows to the wetland. Area of Land within 50 feet of this wetland extends into Circuit Drive where the Onshore Transmission Cable is proposed.

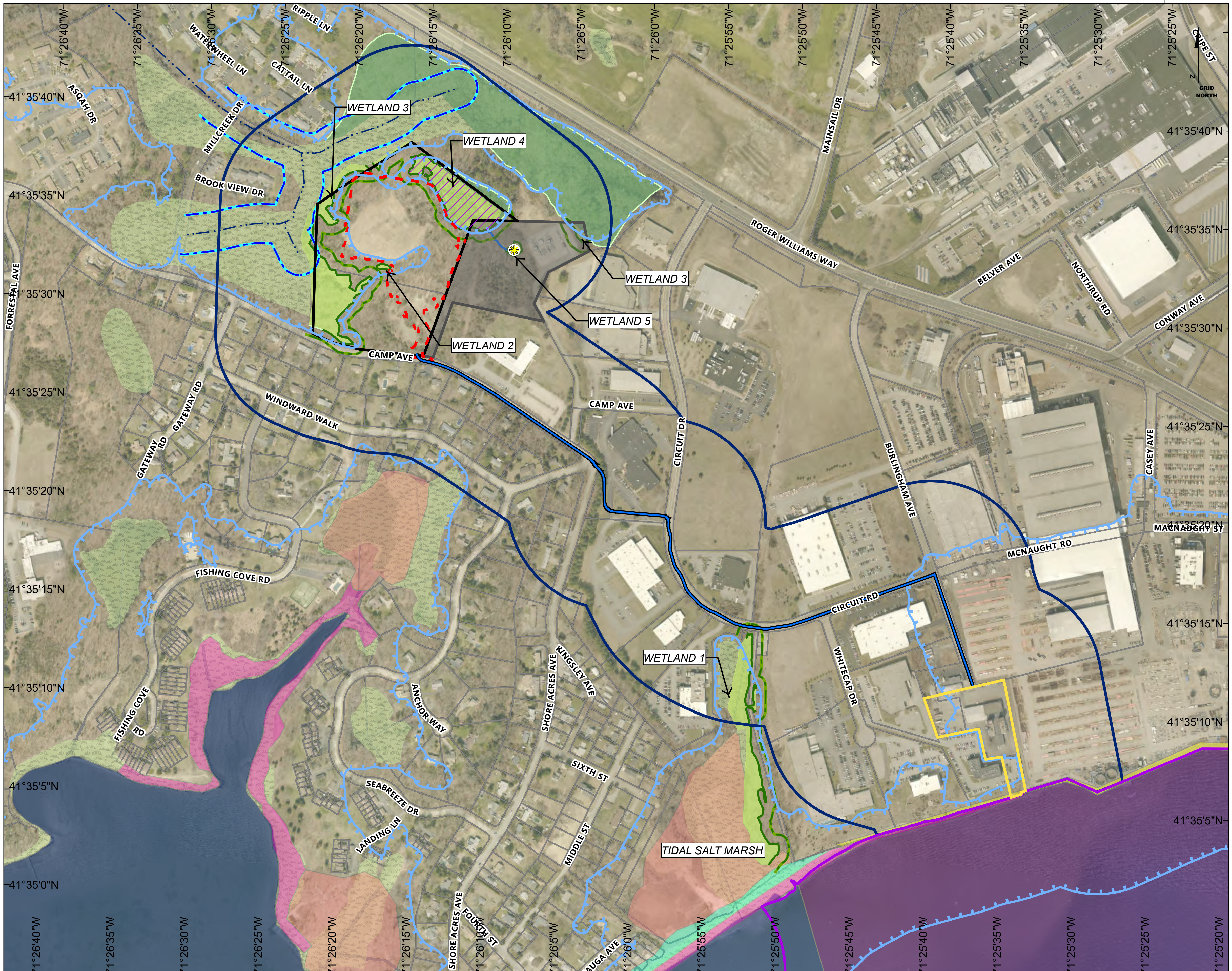

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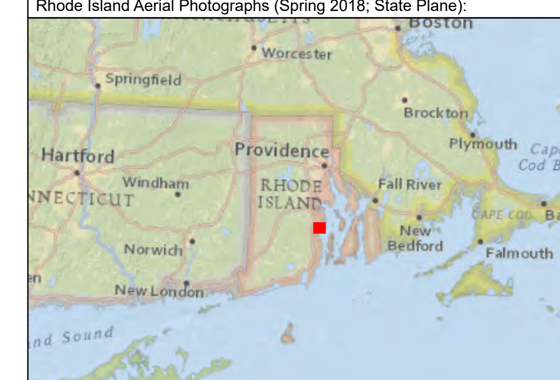
Figure 3.1-2
Coastal Features and Wetlands
NORTH KINGSTOWN, RI

Legend
- Onshore Transmission Cable
- Onshore Project Area
- OnSS Limit of Work
- Parcel ID 179-030 & 179-001
- Parcel ID 179-005*
- Landfall Work Area
- RWEC-RI Project Area
- Parcel Boundary
- One-Percent Annual Chance Flood Hazard Area
- Potential Vernal Pool
- Area of Land within 50' of Wetland
- 100' Riverbank Wetland
- LEC Delineated ASSF
- Approximate Stream
- VHB Delineated Wetland Edge
- LEC Delineated Wetland Edge
- Approximate Wetland Edge
- Delineated Wetland Resources
- Interpolated Wetland
- Coastal Beach
- Coastal Dune
- Manmade Shoreline
- Tidal Salt Marsh
- Coastal Bank
- Wetland (NWI)
- Vernal Pool Area

CRMC Water Use Types
- Type 2: Low Intensity Use
- Type 6: Industrial Waterfronts and Commercial Navigation Channels

*Not part of this Category B Assent application; refer to separate Application to Alter Freshwater Wetlands filed on June 30, 2021.

Service Layer Credits: RIDEM/Tax_Parcels: RI State, 37 Towns
National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
Rhode Island Aerial Photographs (Spring 2018; State Plane):



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Projection: UTM Zone 19N

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The salt marsh inland from the Blue Beach transitions to a contiguous Coastal Wetland that is non-tidal fresh and identified as Coastal Wetland 1. During wetter times of the year this wetland discharges freshwater into the northeastern part of the salt marsh. Forested parts of this wetland are dominated by red maple *(Acer rubrum)* with an understory of highbush blueberry (*Vaccinium corymbosum*), arrowwood *(Viburnum dentatum),* with skunk cabbage *(Symplocarpus foetidus),* cinnamon fern *(Osmundastrum cinnamomeum)* and jewelweed *(Impatiens capensis)* common in the herbaceous stratum. Cutover areas near Circuit Drive are dominated by shrubs including alder *(Alnus incana)* and willow *(Salix sp.)*. The closed drainage in Circuit Drive discharges into this wetland forming an Area Subject to Storm Flowage ("ASS”") interior to the wetland. Examples of wildlife eastern gray squirrels (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*) and red-shouldered hawk (*Buteo lineatus*).

Coastal Wetland Functions and Values

Table 3.1-2 below provides the functions and values of the salt marsh and the contiguous freshwater wetland north of the saltmarsh that extends to Circuit Drive west of the Blue Beach parking lot. This evaluation follows the USACE descriptive approach (USACE, 1999).

Table 3.1-2 Functions and Values of Tidal Salt Marsh and Coastal Wetland 1

	Biological			Hydrologic		Water Quality			Societal Values	
Wetland Type	Fish/Shellfish Habitat	Wildlife Habitat	Production Export	Groundwater Discharge/ Recharge	Flood Alteration	Sediment Toxicant Removal	Nutrient Removal/ Transformation	Sediment Stabilization	Recreation & Aesthetics	RTE Species Habitat
Tidal Salt Marsh	P	P	P	-	X	X	X	P	X	-
Coastal Wetland 1	-	X	X	P	-	X	X	X	X	-

3.1.2.2 Freshwater Wetlands Affected Environment

Non-tidal Freshwater Wetlands in the Vicinity of the Coast are present within the OnSS Project Area. These wetlands are subject to the Rules and Regulations Governing the Protection and Management of Freshwater Wetlands in the Vicinity of the Coast (650-RICR-20-00-2) (Freshwater Wetland Rules). These Freshwater Wetland Rules are incorporated into the CRMP by reference, however, the criteria for describing and evaluating wetlands, documenting avoidance, minimization, and mitigation and responding to specific review criteria differ from the CRMP. Brief descriptions of the resources are presented here. Further details are presented in Appendix B.

Wetland 2 is a small Forested Wetland that is isolated from Wetland 3 by the closed Camp Avenue landfill. It likely represents a remnant of Wetland 3 that was isolated by filling prior to wetland the promulgation of protection laws. The small feature only supports saturated soil at the beginning of the growing season to meet the criteria for wetland regulation.

Wetland 3 is a Swamp which is mostly west and north of the OnSS Project Area. This wetland provides wildlife habitat, hydrologic and water quality functions at a significant level as seen in Table 3.1-3.

Wetland 4 is a Marsh that has been encroached into with fill. The most notable function of this wetland is the provision of vernal pool habitat utilized by pool breeding amphibians and fairy shrimp (*Eubranchipus* sp.).

Wetlands 3 and 4 are assigned as an Area of Land within 50 feet of Wetlands under the Freshwater Wetlands Rules. These dimensional setbacks from the palustrine wetland resource are treated as freshwater wetlands under the Freshwater Wetland Rules.

Table 3.1-3 Functions & Values of Freshwater Wetlands in the OnSS Project Area

Wetland No.	Wetland Area (ac)[1]	Biological			Hydrologic		Water Quality			Societal Values	
		Fish/Shellfish Habitat	Wildlife Habitat	Production Export	Groundwater Discharge/ Recharge	Flood Alteration	Sediment Toxicant Removal	Nutrient Removal/ Transformation	Sediment Stabilization	Recreation & Aesthetics	RTE Species Habitat
Wetland 2	0.03	-	-	-	X	-	P	-	-	-	-
Wetland 3	26.7	X[2]	P	X	P	P	P	X	X	-	-
Wetland 4	2.1	-	P	X	X	X	X	X	X	-	-

Notes: P=Primary or Principal Function; X = Secondary Function possible provided at a significant level; - = Unlikely to be provided. 1: Area of contiguous wetland east of Mill Creek Drive. 2: This function only provided offsite in tributaries to Mill Creek.

3.1.2.3 Potential Project Impacts

Coastal Features and Wetlands

There will be no impacts to coastal features or Coastal Wetlands during construction, operations and maintenance, or decommissioning of the onshore Project components.

Freshwater Wetlands

<u>Construction and Decommissioning</u>

In accordance with Section 2.9(B)(1)(d) of the Freshwater Wetland Rules, the onshore Project components were designed to avoid and minimize impacts to freshwater wetlands to the maximum extent practicable. The only terrestrial resource area that could not be completely avoided are Areas of Land within 50 feet of Wetlands associated with Freshwater Wetlands 3 and 4 within the OnSS limit of work (Figure 3.1-3). However, the impacts are not significant, with construction resulting in 0.11 acres (0.04 ha) of permanent fill, 0.35 ac (0.14 ha) of temporary disturbance, which includes tree removal. The tree removal will be restored with native vegetation and will result in a conversion of forested habitat to maintained herbaceous/shrub cover. A complete functions and values analysis, response to Sections 2.10.B.4 addressing the Avoidance, Minimization, and Mitigation criteria and Section 2.10.E addressing the Review Criteria for Applications to Alter Freshwater Wetlands per the Freshwater Wetlands Regulations (650-RICR-20-00-02), are provided in Appendix B.

Operations and Maintenance

During O&M, the 0.35 acres of conversion will be part of routine vegetative management on the OnSS parcel, which will not result in a significant impact. Per Eversource's Specifications for Rights-of-Way Vegetation Management, vegetation the OnSS will be managed to promote a low-growing plant community dominated by low shrubs, forbs and grasses. All woody vegetation including trees and shrubs that can grow above 15 feet (4.6 m) in height will be removed and discouraged from becoming established by on-going IVM maintenance, including manual cutting, mowing and the prescriptive use of herbicides plus the use of environmental controls. The method of control is determined following inspections of the site scheduled for maintenance. The current maintenance cycle for vegetation control utilizing IVM practices is three or four years depending on the vegetation composition, facilities, and site conditions. See Section 2.1.3 for additional information on vegetation management.

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Figure 3.1-3
Freshwater Wetlands at OnSS Parcels
NORTH KINGSTOWN, RI

Legend

- Onshore Transmission Cable
- OnSS Limit of Work
- Parcel ID 179-030 & 179-001
- Parcel ID 179-005*
- Parcel Boundary
- One-Percent Annual Chance Flood Hazard Area
- Area of Land within 50' of Wetland
- 100' Riverbank Wetland
- Delineated Wetland Edge
- Approximate Wetland Edge
- LEC Delineated ASSF
- Approximate Stream
- Delineated Wetland Resources
- Interpolated Wetland
- Vernal Pool Area
- Wetland (NWI)

*Not part of this Category B Assent application; refer to separate Application to Alter Freshwater Wetlands filed on June 30, 2021.

Service Layer Credits: RIDEM/Tax_Parcels: RI State, 37 Towns
National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
Rhode Island Aerial Photographs (Spring 2018; State Plane):

Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 20 40 60 Meters

0 60 120 180 Feet

Date: 05/19/2020
Document no:

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Checked by: S. MOBERG
Approved by: STEPW

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3.1.2.4 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to coastal features and wetlands:

- In accordance with Section 2.9(B)(1)(d) of the Freshwater Wetland Rules, the Onshore Project components were designed to avoid and minimize impacts to freshwater wetlands to the maximum extent practicable. Any wetlands that will be impacted as a result of the Project will be mitigated via the federal and state permitting process in accordance with Section 404 of the CWA and the Freshwater Wetland Rules.
- Onshore Project components were sited within previously disturbed and developed areas to the extent practicable.
- HDD drilling fluids will be managed within a contained system following punch out of the pilot drilling to be collected for reuse as necessary. An HDD Contingency Plan will be prepared and implemented to minimize the potential risks associated with release of drilling fluids.
- Compliance with the RIPDES General Permit for Stormwater Discharges associated with Construction Activities which requires the implementation of an SESC Plan and spill prevention and control measures.
- An SESC Plan, including erosion and sedimentation control measures, will be implemented to minimize potential water quality impacts during construction and operation of the onshore Project components.
- The operator must implement the site-specific SESC Plan and maintain it during the entire construction process until the entire worksite is permanently stabilized by vegetation or other means. The measures employed in the SESC Plan use BMPs to minimize the opportunity for turbid discharges leaving a construction work area.
- Accidental spill or release of oils or other hazardous materials will be managed through the Oil Spill Response Plan.
- The spill prevention and control measures mandate that the operator identify all areas where spills can occur and their accompanying drainage points. The operator must also establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. Spill prevention and control training will be provided for relevant personnel.

3.1.3 Surface Waters

3.1.3.1 Affected Environment

One stream, an unnamed tributary to Mill Creek, is within the Onshore Project Area and is approximately 190 feet (58 m) west of the OnSS limit of work (refer to OnSS Site Plans in Appendix A and Figure 3.1-4). These plans are provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under Access to Public Records Act (“APRA”; RIGL § 38-2-1) or Freedom of Information Act (“FOIA”; 5 U.S.C. § 552).There are no surface waters within the onshore

Project components footprint. The RIDEM Water Quality Regulations (250-RICR-150-05-1) assigns a Use Classification, which is defined by the most sensitive uses it is intended to protect. Waters are classified according to specific physical, chemical, and biological criteria which establish parameters of minimum water quality necessary to support the water Use Classification. The unnamed tributary to Mill Creek (Waterbody ID RI0007027R-06) is classified as Class B, which are waters designated for fish and wildlife habitat and primary and secondary recreational activities (RIDEM, 2021a). See Figure 3.1-4.

Coastal Wetland 1 can be seen in the Underground Transmission Line Construction Drawings Sheet PG-11. This wetland is not depicted in the RIDEM Environmental Resource Map ("ERM") and therefore has not been assigned a Water Use Classification.

3.1.3.2 Potential Project Impacts

There are no anticipated impacts associated with onshore surface waters during construction, operations and maintenance, or decommissioning as there are no waterbodies within the footprints of onshore Project components and the measures stated in 3.1.3.3 below will be implemented.

3.1.3.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to surface waters:

- Onshore Project components were sited within previously disturbed and developed areas to the extent practicable.
- HDD drilling fluids will be managed within a contained system following punch out of the pilot drilling to be collected for reuse as necessary. An HDD Contingency Plan will be prepared and implemented to minimize the potential risks associated with release of drilling fluids.
- Compliance with the RIPDES General Permit for Stormwater Discharges associated with Construction Activities which requires the implementation of an SESC Plan and spill prevention and control measures.
- An SESC Plan, including erosion and sedimentation control measures, will be implemented to minimize potential water quality impacts during construction and operation of the onshore Project components.
- The operator must implement the site-specific SESC Plan and maintain it during the entire construction process until the entire worksite is permanently stabilized by vegetation or other means. The measures employed in the SESC Plan use BMPs to minimize the opportunity for turbid discharges leaving a construction work area.
- Accidental spill or release of oils or other hazardous materials will be managed through the Oil Spill Response Plan.

- The spill prevention and control measures mandate that the operator identify all areas where spills can occur and their accompanying drainage points. The operator must also establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. Spill prevention and control training will be provided for relevant personnel.

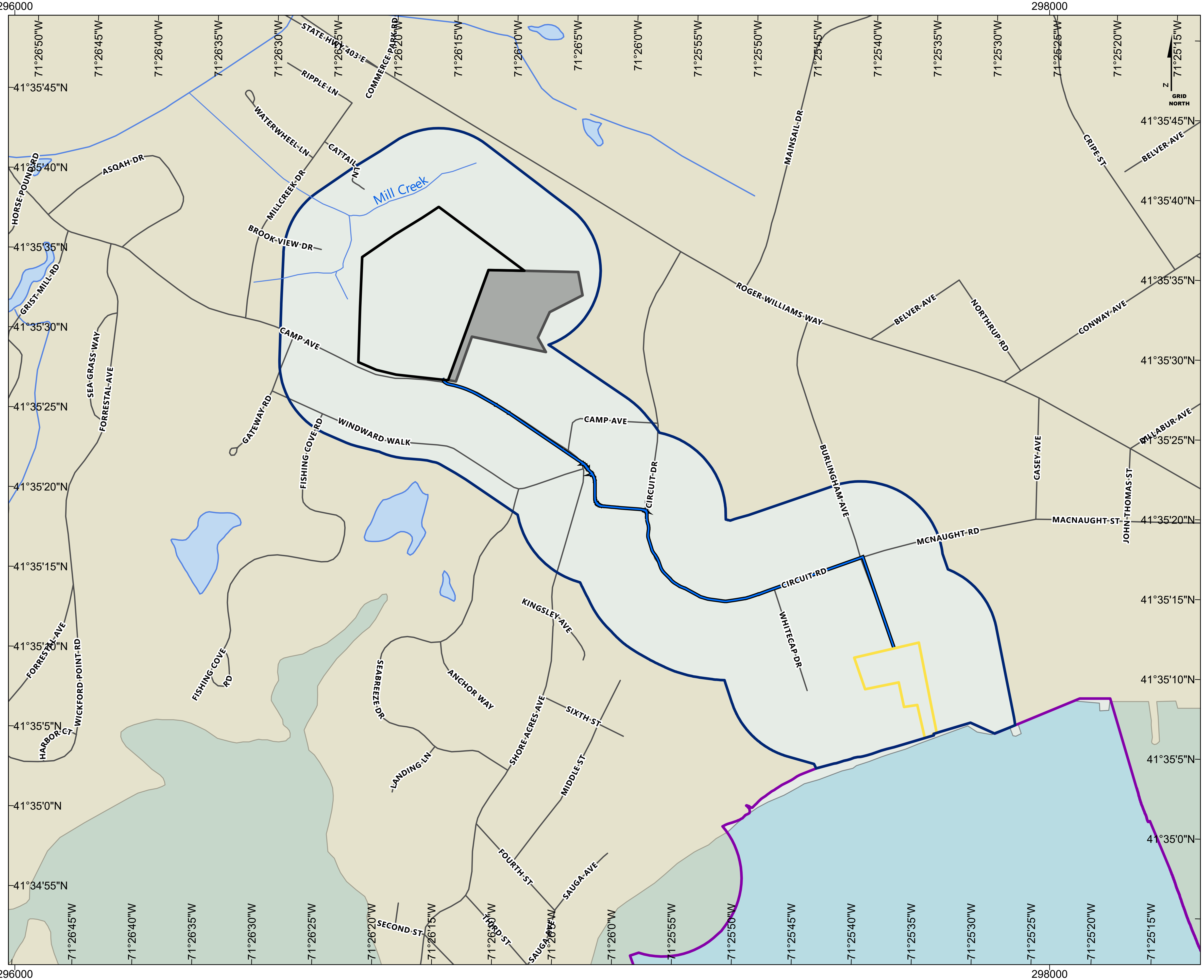

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Figure 3.1-4

Surface Water Onshore

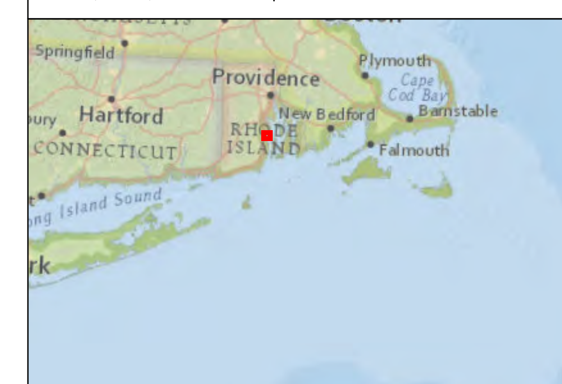
NORTH KINGSTOWN, RI

Legend

- Parcel ID 179-030 & 179-001
- Parcel ID 179-005*
- Onshore Transmission Cable
- Landfall Work Area
- Onshore Project Area
- RWEC-RI Project Area
- Class B Waterbody

*Not part of this Category B Assent application; refer to separate Application to Alter Freshwater Wetlands filed on June 30, 2021.

Service Layer Credits: National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.



Reference system: NAD83 (2011)
Projection: UTM Zone 19N

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0 240 480 720 Feet

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3.1.4 Groundwater

3.1.4.1 Affected Environment

The Onshore Project Area is not within a community wellhead protection area, groundwater recharge area, or sole source aquifer (RIDEM ERM, accessed 10/8/2020).

RIDEM established groundwater quality standards and preventative action limits by classes to protect public health. The Onshore Project Area is mapped as both Class GA and Class GB for groundwater classification. Class GA waters are presumed to be suitable for drinking without treatment and Class GB may not be suitable for drinking without treatment and are serviced by public water systems. See Figure 3.1-5.

3.1.4.2 Potential Project Impacts

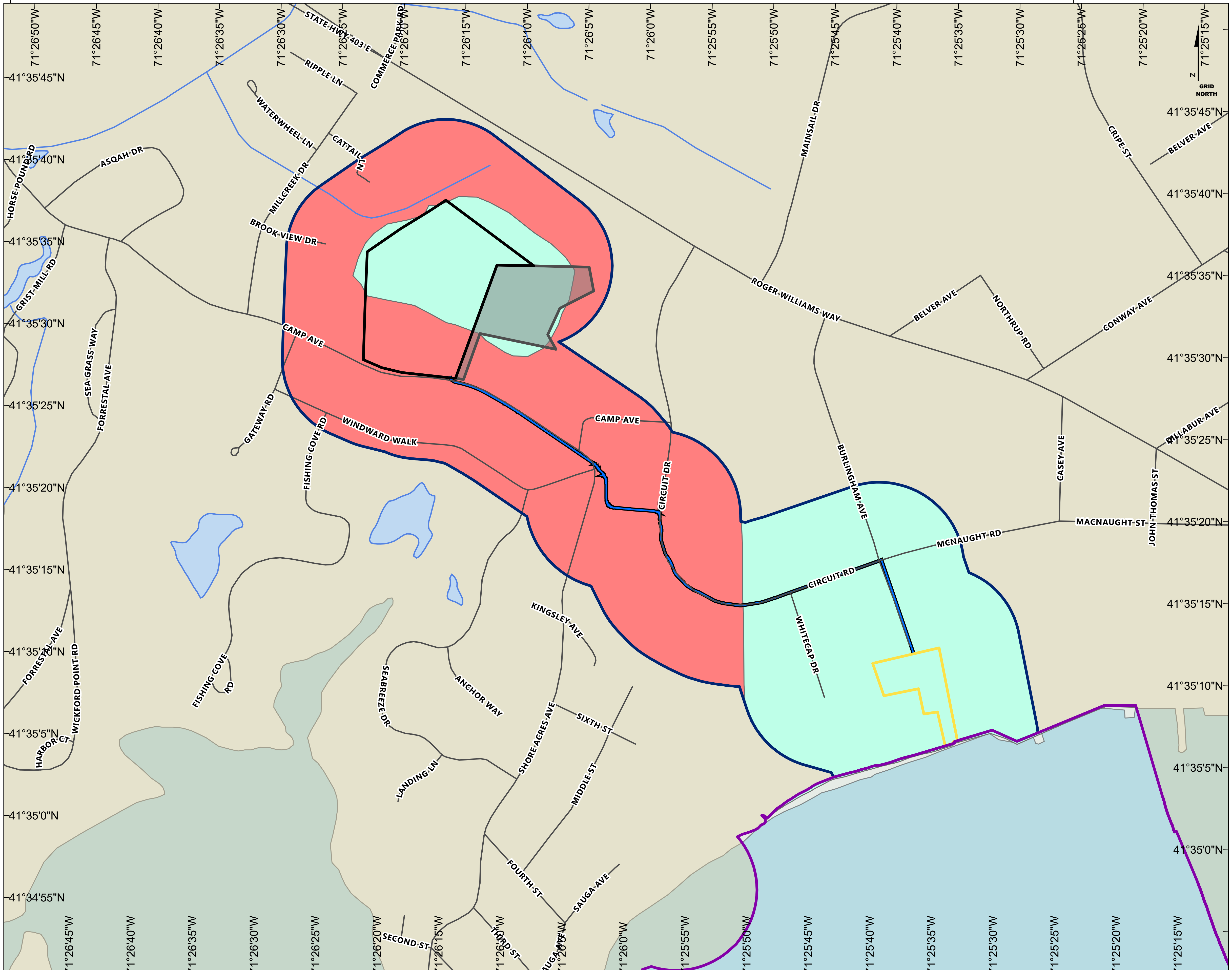
There are no anticipated impacts to groundwater during construction, operations and maintenance, or decommissioning of the onshore Project components. There are no wellhead protection areas, groundwater recharge areas, or sole source aquifers within the onshore Project footprint and therefore there are no anticipated impacts to these resources. In addition, the protective measures discussed in Section 3.1.4.3 below will be implemented to protect groundwater.

3.1.4.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to groundwater:

- HDD drilling fluids will be managed within a contained system following punch out of the pilot drilling to be collected for reuse as necessary. An HDD Contingency Plan will be prepared and implemented to minimize the potential risks associated with release of drilling fluids.
- Compliance with the RIPDES General Permit for Stormwater Discharges associated with Construction Activities which requires the implementation of an SESC Plan and spill prevention and control measures.
- An SESC Plan, including erosion and sedimentation control measures, will be implemented to minimize potential water quality impacts during construction and operation of the onshore Project components.
- The operator must implement the site-specific SESC Plan and maintain it during the entire construction process until the entire worksite is permanently stabilized by vegetation or other means. The measures employed in the SESC Plan use BMPs to minimize the opportunity for turbid discharges leaving a construction work area.
- Accidental spill or release of oils or other hazardous materials will be managed through the Oil Spill Response Plan.

- The spill prevention and control measures mandate that the operator identify all areas where spills can occur and their accompanying drainage points. The operator must also establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. Spill prevention and control training will be provided for relevant personnel.



Revolution Wind

Figure 3.1-5
Groundwater Resources Map
Onshore
NORTH KINGSTOWN, RI

Legend

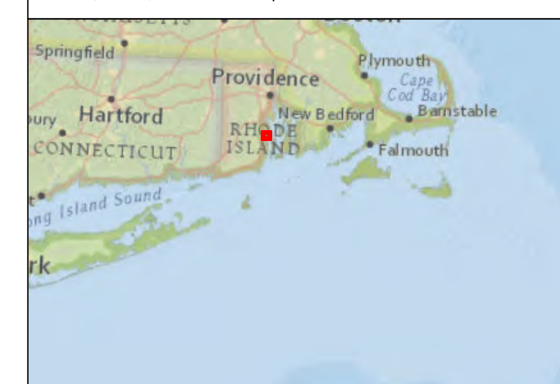
- Parcel ID 179-030 & 179-001
- Parcel ID 179-005*
- Onshore Transmission Cable
- Landfall Work Area
- Onshore Project Area
- RWEC-RI Project Area

Groundwater Types

- GA
- GB

*Not part of this Category B Assent application; refer to separate Application to Alter Freshwater Wetlands filed on June 30, 2021.

Service Layer Credits: National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.



Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 80 160 240 Meters

0 240 480 720 Feet

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3.1.5 Wildlife

3.1.5.1 Affected Environment

The wildlife species present within the Onshore Project Area vary according to the habitat resources present. The Rhode Island Wildlife Action Plan ("RI WAP") (RIDEM et al. 2015) defines habitat as a place where an animal normally lives, often characterized by a dominant plant form or physical characteristic (e.g., a stream or a deciduous forest). In addition to the type of vegetative cover, habitat also includes the resources, such as food and water, and conditions present in an area that produces occupancy—including survival and reproduction—by a given organism (Hall et al., 1997). A species may utilize one or several resource areas or vegetation cover types for its habitat. Rhode Island's varied bedrock and surficial geology, soils, topography, and hydrology support a range of plant communities that supports a complex ecological framework for Rhode Island's fish and wildlife diversity (RIDEM et al., 2015).

Wildlife surveys were conducted at the OnSS Project Area on May 6, and May 20, 2021 with a focus on mammals, herptiles, and breeding songbirds. Vernal pool surveys were conducted in spring 2020 and the memo documenting these findings is included in Appendix J. Wildlife observations were also recorded in the summer of 2019 and winter of 2020-2021 during other site investigations.

VHB recorded several wildlife observations within the OnSS Project Area for species that are not specifically wetland dependent but may use wetlands as part of their habitat mosaic. Throughout the OnSS Project Area, including Area of Land within 50 feet of Wetlands 3 and 4, evidence of eastern white-tailed deer *(Odocoileus virginianus)*, eastern cottontail (*Sylvilagus floridanus*), eastern gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), southern redback vole (*Myodes gapperi*), and eastern coyote (*Canis latrans x Canis lycaon*) was observed. It is likely that striped skunk (*Mephitis mephitis*), Virginia opossum (*Didelphis virginiana*), and raccoon (*Procyon lotor*) also visit the site including wetlands but no direct evidence was observed.

Several resident and migratory passerines suited to woodland habitat were observed including black-capped chickadee (*Poecile atricapillus*), tufted titmouse (*Baeolophus bicolor*), white-breasted nuthatch (*Sitta carolinensis*), downy woodpecker (*Dryobates pubescens*), red bellied woodpecker (*Melanerpes carolinus*) and woodland edges such as Carolina wren (*Thryothorus ludovicianus*), mourning dove (*Zenaida macroura*), American robin (*Turdus migratorius*), eastern towhee (*Pipilo erythrophthalmus*) and warbling vireo (*Vireo gilvus*) were observed.

Several bird species were also observed flying over the OnSS Project Area but there was no indication that they utilize terrestrial habitats within this area. These include chimney swift (*Chaetura pelagica*), herring gull (*Larus argentatus*), osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), and turkey vulture (*Cathartes aura*).

No wading birds or waterfowl were observed within these wetlands and suitable habitats for these wildlife guilds are not thought to be present. The evaluation unit for Wetland 3 extends north and west of the OnSS Project Area to Mill Creek Drive and Roger Williams Way.

Tables in Appendix L provide a list of birds, reptiles and amphibians, and mammals that were observed during field investigations or that have the potential to occur based on habitat preferences. Note that these species tables are not exhaustive. Species that are listed under the 2015 RI WAP as species of greatest conservation need ("SGCN") have been indicated in the tables in bold.

3.1.5.2 Potential Project Impacts

Construction and Decommissioning

Although construction and decommissioning impacts are discussed together for potential wildlife impacts, decommissioning activities will result in fewer impact because the habitat conversion and loss will occur during the construction phase. See Appendix B for additional discussion regarding wildlife habitat and functions and values within wetlands.

There will be no significant impacts on wildlife and plant species diversity associated with the construction of the Landfall Work Area and along the Onshore Transmission Cable because the construction activities will take place in a developed corridor in Quonset Business Park and along public roads, which do not provide any significant habitat.

The OnSS and Interconnection ROW will require disturbing approximately 7.1 acres for construction, including the clearing of approximately 3.3 ac (1.3 ha) of forest. Forest clearing was minimized by siting the OnSS over a closed landfill and through the use of retaining walls to shorten slope lengths. In addition to the OnSS facility will have a compacted gravel driveway and stormwater management features, including a large infiltration basin. Land disturbance as it relates to vegetation clearing may result in the injury or mortality of wildlife. However, impacts on mortality and injury from the construction operations will be minimized by avoiding vegetation removal during the breeding season of bats and avian species to the extent feasible and, if not feasible, coordinating with appropriate agencies to determine appropriate course of action.

The construction of the OnSS and Interconnection ROW will result in 0.35 acres (0.14 ha) of habitat conversion (i.e., converting forest to a maintained herbaceous/shrub plant community). In addition, the operational footprint of the OnSS (less the 0.35 acres [0.14 ha] of conversion which will support shrubland habitat) will create approximately 1.7 ac (0.7 ha) habitat loss when forested upland and some portions of Area of Land within 50 feet of Wetlands are cleared and replaced with hard structures with crushed gravel yards that are not capable of supporting plants or wildlife. The Interconnection ROW will be constructed underground and will therefore not result in habitat loss.

Impacts to wildlife during decommissioning will be lesser than during construction because new vegetation clearing, and grading will not be required.

Operations and Maintenance

Wildlife impacts from vegetation management during O&M may include a reduction in habitat quality via the spread of invasive species. However, the spread of invasive species will be controlled with periodic vegetation management and invasive species management will be implemented as required in permits from applicable agencies.

3.1.5.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to wildlife:

- Onshore Project components were sited within previously disturbed and developed areas to the extent practicable.
- The Onshore Transmission Cables will be buried; therefore, avoiding the risk to avian and bat species associated with overhead lines.
- To the extent feasible, tree and shrub removal for onshore Project components will occur outside the avian nesting and bat roosting period; May 1 through August 15. If tree and shrub removal cannot avoid this season, Revolution Wind will coordinate with appropriate agencies to determine appropriate course of action.
- Construction and operational lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations.
- The perimeter surrounding onshore Project components will be managed to encourage the growth of native grasses, ferns, and low growing shrubs. The management strategy will include the removal of invasive plants in compliance with state and federal regulations (e.g. herbicide use will not be permitted within regulated wetlands.

3.1.6 Rare, Threatened, and Endangered Species

3.1.6.1 Affected Environment

To assess whether any federal or state listed rare, threatened, and endangered ("RTE") species or SGCN were present within the Onshore Project Area, VHB evaluated information from the USFWS Information Planning and Conservation ("IPaC") tool and the RIDEM ERM (See Appendix M USFWS Official Species List). Additionally, special attention was made during the biological reconnaissance and wetland delineation field visits to identify occurrences of rare plants. General wildlife records are based on observations made during site investigations in July, August, and September 2019; winter observations were made during February of 2021; and breeding bird surveys in May of 2021. The RI WAP for species tied to specific Key Habitats within the Onshore Project Area, and other pertinent literature, including New England Wildlife (DeGraaf and Yamasaki 2001) were also reviewed.

VHB reviewed online data hosted by the RIDEM ERM (accessed on December 28, 2020). There are no Natural Heritage Database records of state-listed species within the Onshore Project Area; however, VHB biologists identified occurrences of sickle-leaved golden aster (*Pityopsis falcata*), a plant species of state concern within Rhode Island within an apparent former gravel excavation pit on the OnSS and Interconnection ROW parcels that sits at a lower elevation than the surrounding grade and has transitioned to a sand barren over time in the southeast corner of Plat 179 Lot 001 (Figure 3.1-6). Sickle-leaved golden aster is a highly restricted endemic plant that is found only on sandy glacial deposits (Native Plant Trust, 2021). This plant is identifiable by its yellow tubular disk flowers in the center and yellow ray flowers around the center. The RINHP has records of this species occurring within a mapped natural heritage polygon approximately 400 ft (120 m) west of the OnSS parcel boundary.

In addition to review of state-managed databases, VHB generated an Official Species List ("List") from the USFWS using the IPaC tool on September 28, 2019 and December 28, 2020 for onshore portions of the Project and the List indicated that the federally threatened northern long-eared bat (*Myotis septentrionalis*; "NLEB") has the potential to occur within the Project Area. The List indicated that there are no Critical Habitats associated with the NLEB within the Project Area. The List did not identify any other federally protected species or critical habitats within the onshore portions of the Project.

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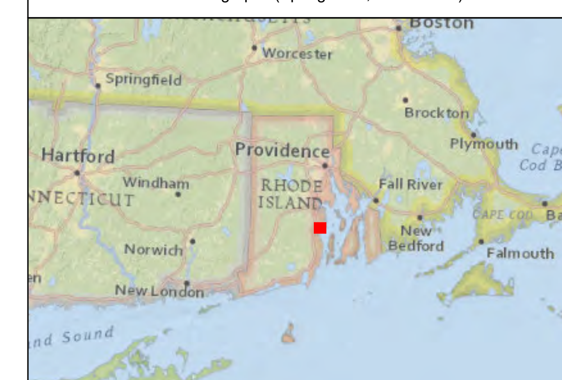
Figure 3.1-6
State-Listed Species
NORTH KINGSTOWN, RI

Legend
- Onshore Transmission Cable
- Landfall Work Area
- OnSS Limit of Work
- Parcel ID 179-030 & 179-001
- Parcel ID 179-005*
- RWEC-RI Project Area
- State Species of Concern: Sickle-leaved golden aster
- Potential Habitat for Sickle-leaved golden aster
- Natural Heritage Areas
- Parcel Boundary

*Not part of this Category B Assent application; refer to separate Application to Alter Freshwater Wetlands filed on June 30, 2021.

Service Layer Credits: RIDEM/Tax_Parcels: RI State, 37 Towns
National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
Rhode Island Aerial Photographs (Spring 2018; State Plane):



Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 60 120 180 Meters

0 200 400 600 Feet

Date: 05/19/2020
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VHB biologists conducted a presence/potential absence acoustic survey targeting NLEB during July 2020 in accordance with survey guidelines developed by USFWS. Five full-spectrum detectors were deployed within suitable summer habitat along the Onshore Transmission Cable route and within the OnSS and Interconnection ROW parcels. The survey spanned two consecutive calendar nights from July 29-31, 2020 for a total of 10 detector nights. A detector-night spans the evening and early morning hours of two calendar dates. Call analysis determined that there was no indication of NLEB occurring within the survey area and a determination of potential absence was made and submitted to USFWS. For information regarding threatened and endangered avian species, refer to Section 3.2.6.

Section 7 consultation under the ESA is on-going as part of the NEPA process lead by BOEM. Appendix L includes a list of all the species observed within the Onshore Project Area.

3.1.6.2 Potential Project Impacts

There are no anticipated impacts to State or federally listed species during construction, operations and maintenance, and decommissioning of the onshore Project components. The acoustic surveys targeting the NLEB resulted in a determination of probable absence of this species and the Onshore Project Area does not include habitat that is suitable for the piping plover (refer to Section 3.2.6 for more information on piping plover). In addition, sickle-leaved golden aster is the only state-listed species identified within the Onshore Project Area and will be avoided. The Project seeks to avoid impacts to RTE species through the implementation of avoidance, minimization and mitigations measures detailed below.

3.1.6.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to rare, threatened, and endangered species:

- Onshore Project components were sited within previously disturbed and developed areas to the extent practicable.
- The Onshore Transmission Cables will be buried; therefore, avoiding the risk to avian and bat species associated with overhead lines.
- To the extent feasible, tree and shrub removal for onshore Project components will occur outside the avian nesting and bat roosting period; May 1 through August 15. If tree and shrub removal cannot avoid this season, Revolution Wind will coordinate with appropriate agencies to determine appropriate course of action.
- The documented sickle-leaved golden aster population on the OnSS parcel will be protected during construction.
- Construction and operational lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations.
- Revolution Wind will document any dead (or injured) birds/bats found incidentally on vessels during construction and post-construction and provide an annual report to BOEM and USFWS.
- Revolution Wind is developing an Avian Post-Construction Monitoring Plan for the Project that will summarize the approach to monitoring; describe overarching

monitoring goals and objectives; identify the key avian species, priority questions, and data gaps unique to the region and Project Area that will be addressed through monitoring; and describe methods and time frames for data collection, analysis, and reporting. Post-construction monitoring will assess impacts of the Project with the purpose of filling select information gaps and supporting validation of the Project's Avian Risk Assessment. Focus may be placed on improving knowledge of ESA-listed species occurrence and movements offshore, avian collision risk, species/species-group displacement, or similar topics. Where possible, monitoring conducted by Revolution Wind will build on and align with post-construction monitoring conducted by the other Orsted/Eversource offshore wind projects in the Northeast region. Revolution Wind will engage with federal and state agencies and environmental groups ("eNGOs") to identify appropriate monitoring options and technologies, and to facilitate acceptance of the final plan.

3.1.7 Terrestrial Archaeological Resources

Revolution Wind has performed surveys to identify buried archaeological sites in areas of potential ground disturbance focusing on the Onshore Project Area. Revolution Wind is continuing to investigate the potential for impacts to terrestrial archaeological resources in consultation with the Rhode Island Historic Preservation and Heritage Commission ("RIHPHC") and Native American Tribes. A copy of the Project's current Terrestrial Archaeological Resources Assessment is provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552) (Appendix K).

In accordance with BOEM's Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585, avoidance and mitigation actions for cultural resources will be developed through Section 106 consultation with BOEM as the lead federal agency, the RIHPHC and Native American Tribes. The Project will avoid adverse impacts to historic and archaeological resources to the extent practicable

3.1.8 Visual Resources

3.1.8.1 Affected Environment

A Visual Resources Assessment ("VRA") was completed for all above-ground onshore components of the Project, including the OnSS (see Appendix I). This section discusses existing visual resources within the Visual Study Area ("VSA"). In order to define the maximum area of potential visual effect associated with the Project, the VSA was defined as all areas within 3 miles of the Project's limit of onshore disturbance. The VSA includes approximately 30.5 square miles within the Town of North Kingstown and small portions of Warwick and East Greenwich, Rhode Island. In addition, the VSA includes a portion of Narragansett Bay. The VSA was used to characterize the landscape, assess potential Project visibility, and identify visually sensitive resources of national, regional, and statewide significance.

Existing Landscape Types

Specific landscape types ("LT") within a viewshed area can be used as a framework for the potential visibility of a facility. Seven LTs were identified within the VSA and are discussed below.

Developed Land comprises the second largest proportion of the VSA, making up approximately 30 percent of the total area. This LT is primarily comprised of industrial land associated with the Quonset Business Park, Quonset Point Naval Air Station, the Quonset Davisville Business Park, and other commercial and industrial areas within the Town of North Kingstown. Developed areas also include dense suburban residential developments located north and west of the business parks along the State Route 403, US Route 1, and Davisville Road corridors within the VSA. Open views within this LT are generally limited by the presence of foreground buildings and vegetation.

The Forest LT occurs in small pockets around and including the OnSS Project Area, but collectively makes up almost 26 percent of the VSA. Larger contiguous areas of forest land occur in the southern and western portions of the VSA and are associated with Cocumcussoc State Park, Black Swamp, and Calf Pasture Beach. Forest land also occurs between suburban residential developments in the northern portion of the VSA and include several wetlands unsuitable for residential development. Views within the Forest LT are generally restricted by the dense forest canopy and understory vegetation.

Open Space occurs throughout approximately 8 percent of the VSA and includes areas that are developed for the purpose of recreation, stormwater management, or managed vacant land. The largest representative example in this VSA is the North Kingstown Golf Course, located adjacent to and north of the Project site. Open space areas have a greater potential for outward, long-distance views than other terrestrial LTs within the VSA.

The remaining LTs, wetlands, beach, and agricultural land, collectively make up approximately 1.6 percent of the entire VSA and are scattered throughout in non-contiguous areas, thus making them a minor and inconsequential constituent of the VSA.

Existing Visually Sensitive Resources

The VSA included researching and identifying VSR that have been identified by national, state, or local governments, organizations, and/or Native American Tribes. These important sites are given some level of protection or recognition and avoiding or minimizing impacts to these sites is an important consideration during project planning and design. Table 3.1-4 below identifies the visually sensitive resources identified. In addition to the Visually Sensitive Resources ("VSRs") identified below, approximately 10 residences are within 150 feet from the OnSS properties and were therefore informally considered.

Table 3.1-4 Visually Sensitive Resources Identified within the VSA

Type of Resource	Number of Resources within the VSA
Historic Resources (State or National Register of Historic Places)	17
Rhode Island Historical Cemeteries	63
State Parks	1
Rhode Island State Scenic Areas	4
State Nature Preserve	1
Public Boat Launch and Fishing Access	5
State Lands	2
Ferry Ports	1
Major Waterbodies	1
Total	**95**

Source: Visual Resource Assessment Revolution Wind Onshore Facilities (EDR, 2020)

3.1.8.2 Potential Project Impacts

Construction and Decommissioning

Construction of the OnSS and Interconnection ROW will occur adjacent to the existing TNEC Davisville substation in lots surrounded by mature trees. Construction activities are expected to take approximately 18 months and includes clearing and grading, excavation, and the installation of foundations, and construction of the facility. None of the identified VSRs within the 3-mi VSA will experience adverse visual impacts. However, the construction will likely be visible to residential neighborhoods immediately adjacent to the OnSS and Interconnection ROW parcels.

Construction and decommissioning of the onshore Project components will typically involve work during daylight hours and the installation of temporary security and safety lighting at night. Also, construction and decommissioning of the OnSS will result in temporary increased vehicular traffic patterns.

Operations and Maintenance

The OnSS is the only above-ground Project component subject to this Category B Assent application; all other Project components will be installed underground. The VRA illustrates that being within the viewshed of the OnSS does not necessarily indicate that the OnSS will result in visual impacts to the VSRs present within the VSA. In fact, based on the VRA, visibility will only include the upper portions of a few proposed transmission structures. As the line of sight cross sections indicate from Wickford Historic District and Wickford Harbor/Wickford Village State Scenic Area, Narragansett Bay and the Quonset Point Naval Air Station, the onshore Project components will be barely perceptible amongst the buildings and vegetation present in the Quonset Business Park. This is particularly the case for viewpoints and viewers located greater than 1 mile from the onshore Project components.

The onshore Project components may be potentially visible from approximately 15% of the entire VSA and five of the 95 (5%) identified VSRs within the VSA. However, field review suggested that visibility of onshore Project components would likely be significantly less than suggested by the viewshed analysis due to the presence of landscape vegetation present along roadways, which was not considered in the viewshed analysis.

The OnSS, where visible at near foreground distances, will introduce new industrial/utility structures into the landscape. At a maximum height of 60 feet and set back over 400 feet from Camp Avenue, the proposed OnSS will not be out of scale or character with the existing types of development currently present in the vicinity, such as the existing Davisville Substation, or the structures at nearby Quonset Business Park. As such, it is anticipated that the Project will not result in significant visual impacts to the public resources present in the VSA. Some Camp Avenue residences are likely to experience limited visual impacts as a result of the vegetative clearing associated with the OnSS and the associated access driveway. While these impacts are expected to alter the existing views experienced by the residents directly adjacent to the OnSS, they are generally localized and will be minimized through the use of mitigation, such as visual screening. See plan sheets W1.01 and W2.01 in the OnSS plans in Appendix A for planting details. Note, the OnSS plans are provided under confidential cover to this Category B Assent application because they contain confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552).

3.1.8.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to visual resources:

- Construction and operational lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations.
- The Onshore Transmission Cables will be buried; therefore, minimizing potential impacts to adjacent properties.
- Screening will be implemented at the OnSS to the extent feasible, to reduce potential visibility and noise.

3.2 Revolution Wind Export Cable – Rhode Island Environmental Setting, Potential Impacts, and Proposed Avoidance, Minimization, and Mitigation Measures

This section provides an overview of the offshore environmental setting (i.e., affected environment), potential Project impacts, and proposed avoidance, minimization, and mitigation measures for the RWEC-RI Project Area. The RWEC-RI Project Area is variable, with it being approximately 10,500-ft (3,200-m) at its widest point and approximately 1,300-ft (396 m) at its narrowest. See Figure 1.1-2 in Section 1.2. Summaries from the following technical studies and reports that have been prepared for the Project are included in the following applicable subsections:

- Marine Archaeological Resources Assessment (SEARCH, 2021) (Appendix N)
- Integrated Geotechnical and Geophysical Report ("G&G Report") prepared for the Project (Fugro 2020)
- Technical Report Hydrodynamic and Sediment Transport Modeling Report – Rhode Island State Waters (RPS, 2021) (Appendix O)
- RWEC-RI Benthic Habitat Maps and Report (Appendix P)
- Essential Fish Habitat Assessment Revolution Wind Offshore Wind Farm (INSPIRE, 2020) (Appendix Q)
- Assessment of Impacts to Marine Mammals, Sea Turtles, and ESA-Listed Fish Species Revolution Wind Farm (CSA, 2021) (Appendix R)
- Commercial and Recreational Fisheries Technical Report Revolution Wind Offshore Wind Farm (INSPIRE, 2021) (Appendix S)
- Navigation Safety Risk Assessment (DNV-GL, 2020) (Appendix T)

3.2.1 Surficial Geology

3.2.1.1 Affected Environment

The surficial geology within portions of the Narragansett Bay and RWEC-RI Project Area has been previously described by J. King Consulting, LLC (J. King, LLC, undated), prepared by analyzing published work by Needell et al. (1983), McMaster (1984), Oakley (2012), and by re-analyzing open file data from these surveys (McMullen et al. 2009). More recent data are also available from a multiyear seismic reflection survey conducted by the University of Rhode Island between 2004 and 2008. Finally, the entire RWEC-RI Project Area was evaluated by Fugro in their G&G Report (Fugro, 2020). The site-specific data collected by Fugro during 2019/2020 surveys are being used to identify potential geologic and anthropogenic hazards that could affect the design, installation, and operation of the RWEC- RI, as well as other offshore components of the Project.

General Characterization of Surficial Geology in Narragansett Bay

King (Undated) defined an obstruction as outcropping or shallow bedrock (less than 16 ft (5 m) below the seafloor) or sediment containing boulders. The West Passage of Narragansett Bay includes several islands that are bedrock cored along with bouldery glacial till and moraine deposits. McMaster (1984) documented the presence of gas bearing silt-clay estuarine deposits in the Narragansett Bay that should be avoided. Entrapped gas is detected in seismic reflectivity surveys by abruptly extinguished return signals. J. King, LLC (undated) identified three sub-areas that are located along the RWEC–RI:

- Rhode Island Sound and Lower West Passage sub-area
- Middle West Passage sub-area
- Upper West Passage sub-area

These areas, as described by J. King, LLC (undated), are characterized further in the following subsections. Figure 3.2-2 below shows the three sub-areas identified by King.

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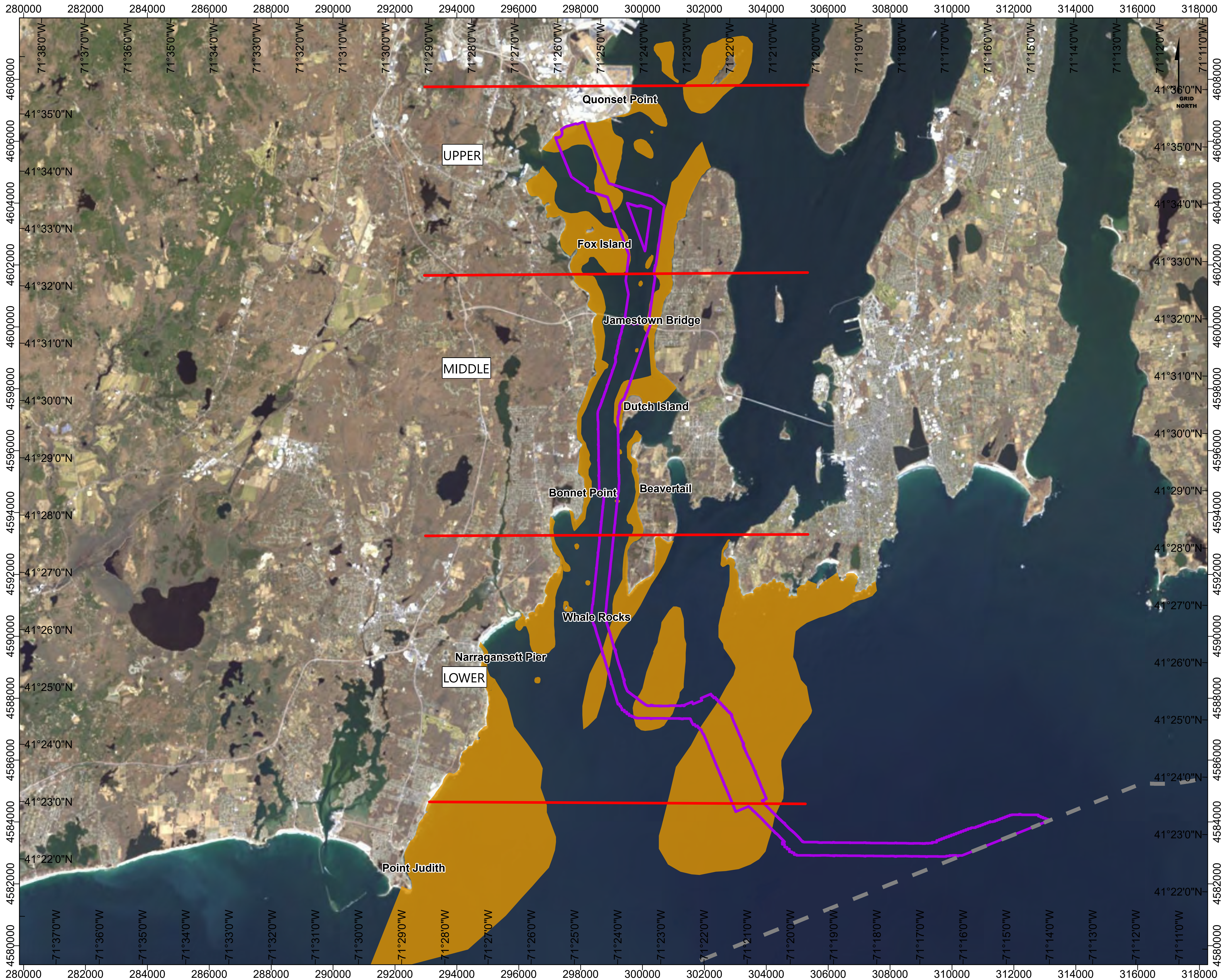
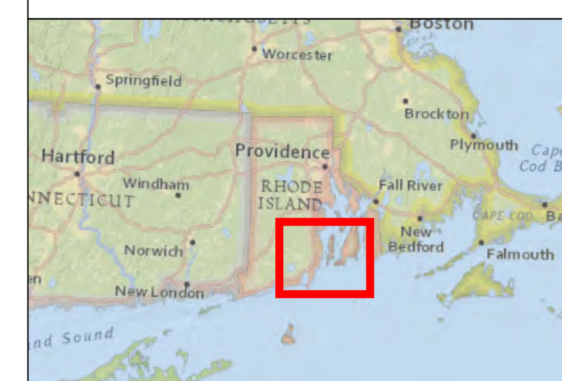
Figure 3.2-1
RWEC-RI Geologic Hazards



Legend
- RWEC-RI Project Area
- Geological Obstructions (King)
- 3-Nautical Mile State Water Boundary

Service Layer Credits: Landsat 8 Imagery: Bathymetric with DRA: National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
World_Ocean_Base: Esri, DeLorme, NaturalVue



Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 1000 2000 3000 Meters

0 3,000 6,000 9,000 Feet

Date: 05/19/2020
Document no:

Created by: S. PELLETIER
Checked by: S. MOBERG
Approved by: STEPW

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Rhode Island Sound and Lower West Passage Sub-Area

This sub-area begins in Rhode Island Sound and continues north to Beavertail on Conanicut Island (Jamestown). Shallow bedrock was encountered in several areas in this sub-area including submerged continuations of Aquidneck and Conanicut Islands that extend several miles (km) south from their coastlines. This includes outcrops of bedrock near Brenton Reef.

King reports that this bedrock is the same suite associated with the islands, a late Paleozoic meta-sedimentary rock rich in carbon. Boulder fields and bedrock outcrops extend offshore from Point Judith to Narragansett Pier. Part of this boulder field is associated with the Point Judith and Buzzards Bay recessional moraines. J. King, LLC (undated) notes that seismic reflections from this boulder field end about 0.9 miles (1.5 km) from the shoreline, but NOAA charts indicate that this obstruction is continuous to the shore.

Other obstructions in this sub-area include named features such as Whale Rock, Jones Ledge and River Ledge. These all represent outcropping bedrock or rocky seafloor conditions.

Middle West Passage Sub-Area

This sub-area begins at Bonnet Point at the south and continues north to the Jamestown Verrazano Bridge (Jamestown Bridge). J. King, LLC (undated) used Compressed High Impact Radar Pulse ("CHIRP") seismic reflection data collected by the University of Rhode Island to evaluate obstructions. J. King, LLC describes this reach of the West Passage as mostly unobstructed. Shallow depths to bedrock are reported along the western coastline of Conanicut Island and the rocky shorelines of Narragansett, Saunderstown and North Kingstown. Borings completed in 1979 for the Jamestown Bridge indicated 16 ft (5 m) and 33 ft (10 m) of sediment over bedrock along the eastern third of the bridge approaching Jamestown. The area around Dutch Island, including Dutch Harbor contains bouldery till or shallow bedrock.

Oakley (2012) studied the stratigraphy of Glacial Lake Narragansett and identified two glacial deltaic deposits fed by subglacial flows emerging at the ice front in this area: The Dutch Island Delta west of Dutch Island and the Annaquatucket Delta near the Jamestown Bridge. J. King, LLC (undated) noted that these thick sand and gravel deposits are unlikely to contain obstructions but cautioned that the seismic reflection data collected was not sufficient to confirm the absence of obstructions.

Upper West Passage Sub-Area

This sub-area begins north of the Jamestown Bridge and continues north to the landfall location at Quonset Business Park in North Kingstown. The surveys in the sub-area revealed several potential obstructions including shallow bedrock and bouldery till. Seismic data in the vicinity of Fox Island showed the area to be very rocky and that these obstructions were continuous as it approached the mid-point of the West Passage with only a narrow unobstructed corridor remaining. Prominent obstructions are also present on the seafloor south of Quonset Point. Approaching the landfall location, Fugro (2019) identified a line of boulder piles with an 820 ft (250 m) gap where the RWEC–RI will need to be routed.

Summary of Site-Specific Survey Date

Data collected by Fugro (2020) within the RWEC-RI Project Area is more detailed but generally does not conflict with King's general characterization of surficial geology in the bay and is discussed below. This site-specific G&G Report is being used in siting the RWEC-RI and identifying potential geological constraints.

Beginning near the shore, the surficial geology of the seafloor is predominantly comprised of fine-grained sediment in the upper 10 ft (3 m), with potential bedrock and/or glacial till exposed in localized areas. Bedrock/glacial till is exposed in the eastern portion of the Project Area and is interpreted to only be 33 ft (10 m) deep in the western portion.

West Passage of Narragansett Bay

Beginning at the landfall location, the RWEC-RI Project Area crosses an area of limited sediment thickness as it proceeds south. A north-south trending feature described on nautical charts as "ledge" may represent shallow glacial till or rock. Before reaching the Jamestown-Verrazzano Bridge, a prominent flood shoal or bar feature comprised of 10 ft (3 m) of coarse-grained deposits is passed. This bar feature may shift during tidal currents or varying flow conditions in the river system. As the Jamestown-Verrazzano Bridge is approached, bouldery glacial till deposits are exposed in the eastern portion of the RWEC-RI Project Area and large amounts of debris from the demolition of the former Jamestown-Verrazzano Bridge were observed. The main part of the channel appears to be naturally deep in this area, which is indicative of strong tidal currents.

South of the bridge, the upper 10 ft (3 m) is comprised of very soft to firm fine-grained deposits. The main part of the channel is naturally deep and, based on hydrodynamic studies, is prone to strong ebb and flood tidal currents. Continuing south toward Dutch Island, the naturally deepened channel achieves depths of 33 ft (10 m) to 66 ft (20 m). A prominent bar deposit crosses the channel at a northwest-southeast orientation. This feature may be the result of high ebb and flood tidal currents and is an area with high potential seabed mobility conditions. Glacial till outcrops are present in localized areas along the eastern perimeter of the survey corridor. South of Dutch Island headed to the mouth of the West Passage glacial till deposits were interpreted to be present within 1 to 3 ft (0.3 to1 m) of the seafloor surface. Bedrock may also be present beneath the till surface.

Rhode Island Sound

Within the Rhode Island Sound, the typical stratigraphy consists of approximately 0.5 m thick layer of sand overlying soft to firm clay to Brenton Reef. At Brenton Reef, shallow bedrock is exposed or covered by sediment mantles of ranging from sand to clay texture. Crystalline bedrock outcrops are present that typically extend approximately 3.3 feet (1 m) to 6.5 feet (2 m), but a suitable cable route is available through the reef.

3.2.1.2 Potential Project Impacts

Construction and Decommissioning

The RWEC-RI installation will require a temporary disturbance corridor of approximately 131 feet (40 m) for 23 miles (37 km) for each cable, which is a total disturbance corridor of approximately 730 acres (295 ha) (see Table 2.2-7). Impacts to geological resources will be limited to the area of the seafloor disturbed during preparation for and installation of the two export cables, which includes boulder clearance, sandwave leveling, cable installation, and installation of secondary cable protection. It is estimated that approximately 22 acres (8.9 ha) of secondary cable protection will be required (approximately 10% for each cable route in state waters).

The RWEC-RI will be installed to a target burial depth of approximately 4 to 6 feet (1.2 to 1.8 m) below the seabed. Installation of the RWEC-RI will mostly affect surficial geology, but not to such an extent that there would be a perceptible change in overall regional geological resources. The RWEC-RI will be installed to avoid shallow hazards using equipment such as a mechanical cutter, mechanical plow, or jet plow to the extent practicable. These installation techniques are not expected to result in any permanent seabed impacts because the trench naturally backfills with the temporarily suspended sediment. The use of a TSHD and/or CFE may be required in certain locations. In addition, DP vessels will be used to the extent possible during installation of the RWEC-RI. DP vessels do not require anchors to maintain their position and therefore avoid additional geological impacts. If DP vessels cannot be used in certain locations, vessels that require anchoring will be used, which will result in temporary seafloor disturbance in isolated locations. “No anchorage areas” will be identified prior to construction to avoid any documented sensitive resources.

In addition, DP vessels will be used to the extent possible during installation of the RWEC-RI. DP vessels do not require anchors to maintain their position and therefore avoid additional geological impacts. If DP vessels cannot be used in certain locations, vessels that require anchoring will be used, which will result in short-term seafloor disturbance. These impacts cannot be quantified at this time, but anchoring will be limited to within the RWEC-RI’s 1,312-ft (400-m) ROW. “No anchorage areas” will also be identified prior to construction to avoid any documented sensitive resources.

Sediment suspension and deposition for seabed preparation activities, installation of the offshore RWEC-RI, and installation of the RWEC-RI at the landfall location have been modeled (see Appendix O). For surficial geology, sediment deposition was evaluated for potential impacts. For the offshore RWEC-RI, deposition was modeled using CFE, TSHD split bottom, TSHD continuous overflow, and jet plow. For the RWEC-RI at the landfall location, it was modeled using HDD. The area where deposition is 10 mm or greater in thickness was predicted to be 453.4 ac (183.5 ha), 481.9 ac (195.0), 48.0 ac (194.3), and 7.4 ac (3.0) for CFE, TSHD split bottom, TSHD continuous flow, and HDD, respectively. The jet plow did not have any predicted depths of 10 mm or greater. The spatial extent of deposition of 10 mm or greater was 688.8 ft (210 m), 1,033.2 ft (315 m), 85.28 ft (260 m) and 738 ft (225 m) for CFE, TSHD split bottom, TSHD continuous flow, and HDD, respectively.

Once the RWEC–RI is installed, the disturbance corridor will recover as part of processes associated with dynamic marine sediments. The RWEC-RI has no maintenance requirements unless a cable repair is required. Repair or replacement of cables or cable protection are considered non-routine maintenance activities and will potentially result in the same or lesser impacts as construction.

3.2.1.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to surficial geology:

- RWEC-RI will be sited to avoid identified shallow hazards to the extent practicable.
- To the extent feasible, installation of the RWEC-RI will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
- DP vessels will be used for installation of the RWEC to the extent practicable to avoid the need for anchoring.
- A plan for vessels will be developed prior to construction to identify no-anchorage areas to avoid documented sensitive resources.

3.2.2 Water Quality

3.2.2.1 Affected Environment

This section includes surface water quality for the RWEC-RI. Several parameters were evaluated, including dissolved oxygen ("DO"), chlorophyll *a*, nutrient content, turbidity, and anthropogenic activities that have in the past or currently impact water quality. The description of the affected environment and assessment of potential impacts for water quality were determined by reviewing public data sources and conducting project-specific studies including the following: Rhode Island Ocean SAMP; Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Continental Shelf Offshore Rhode Island and Massachusetts, Revised Environmental Assessment (RI-MA WEA) (BOEM, 2013); National Coastal Condition Report IV ("NCCR") (US EPA, 2012); Narragansett Bay Commission ("NBC") Snapshot of Upper Narragansett Bay data; State of Narragansett Bay and Its Watershed Technical Report ("NBWTR") (Narragansett Bay Estuary Program ["NBEP"], 2017) and Revolution Wind Integrated Geotechnical and Geophysical Site Characterization Study (Fugro, 2020). Available surface and quality data were also reviewed with available RIGIS data and the RIDEM Water Quality Regulations (RIDEM, 2018a). Most of the RWEC-RI is mapped as SA, which are waters designated for shellfish harvesting for direct human consumption, primary and secondary contact recreational activities, and fish and wildlife habitat. The landfall location is mapped as SB, which are waters designated for primary and secondary contact recreational activities, shellfish harvesting for controlled relay and depuration, and fish and wildlife habitat. Both SA and SB waters have good aesthetic value. See Figure 3.2-2.

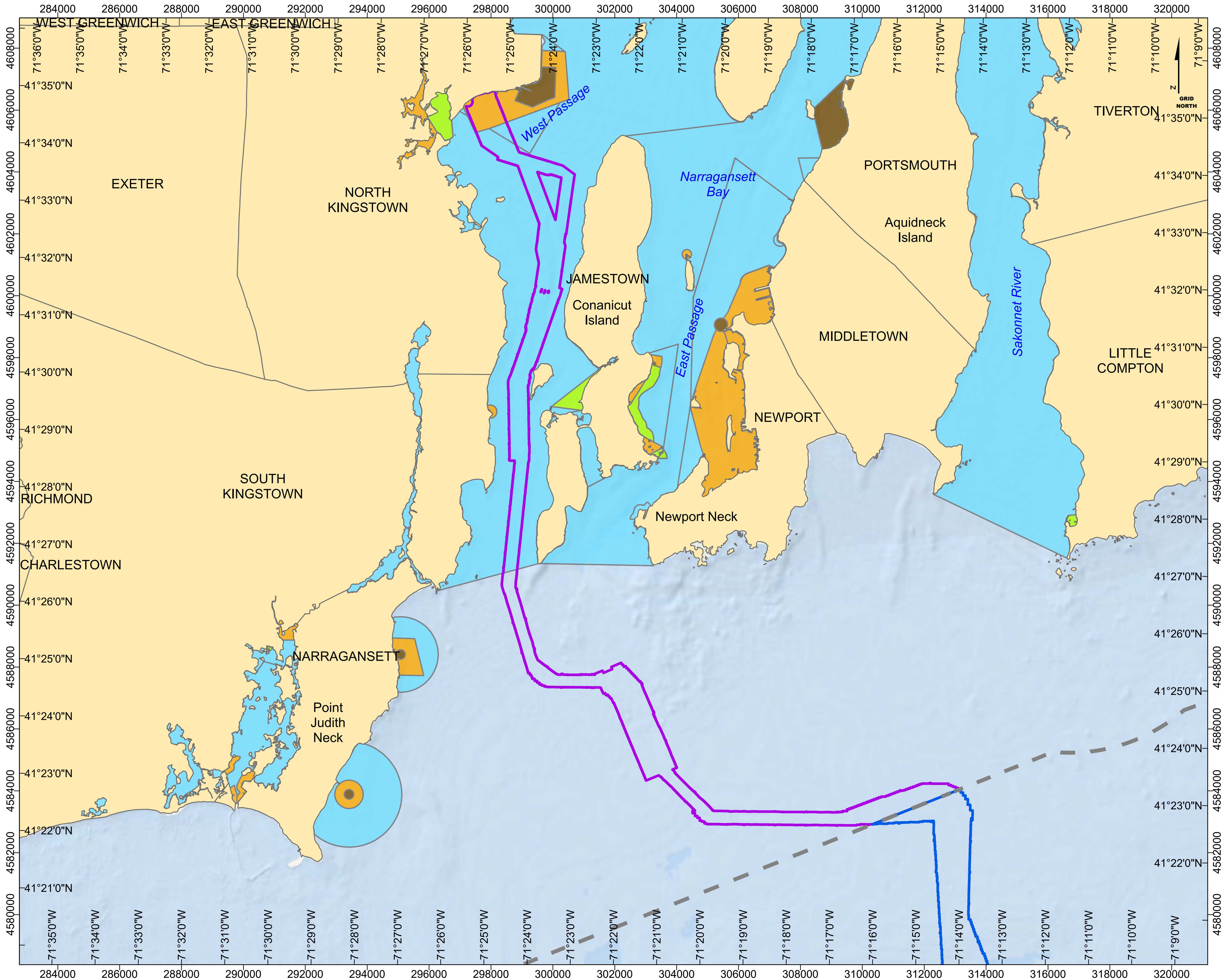

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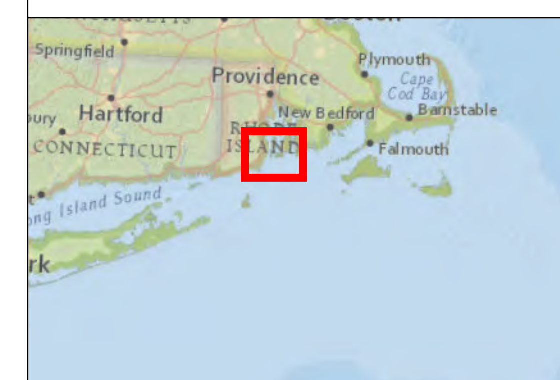
Figure 3.2-2
Offshore Water Quality Standards

Legend
- RWEC-OCS Project Area
- RWEC-RI Project Area
- 3-Nautical Mile State Water Boundary

Estuarine Water Quality Standard
- SA
- SA{b}
- SB
- SB1

Service Layer Credits: National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
World Ocean Base: Esri, DeLorme, NaturalVue



Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 1000 2000 3000 Meters

0 4,000 8,000 12,000 Feet

Date: 05/19/2020
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Checked by: S. MOBERG
Approved by: STEPW

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3.2.2.1 RWEC Rhode Island Sound

Dissolved Oxygen

DO refers to the concentration of oxygen present in water. The source of the DO may be the atmosphere and from photosynthesis from aquatic plants including phytoplankton. Low levels of oxygen (hypoxia) or no oxygen levels (anoxia) can occur when excess organic material, such as produced during large algal blooms are decomposed by microorganisms (LICAP, 2016). Water sampling conducted at four stations in Rhode Island Sound in 2002 by the USACE found that DO concentrations both at the surface and in bottom waters remained above established levels for the "highest quality marine waters" and suggests that hypoxic and anoxic conditions do not typically occur in those areas (RI CRMC, 2010).

Chlorophyll a

Chlorophyll a is measured as a surrogated to determine concentrations of phytoplankton, which can indicate overproduction of algae and degraded water quality (NCCR, US EPA 2012). For this reason, chlorophyll a is used as a metric of plant production, called "primary production" because of the ability of plants to capture energy from sunlight and is measured in units of grams of carbon per meter squared per day (g C m-2 day-1).

The RI CRMC Ocean SAMP adapted a table (Table 3.2-1) from Hyde (2009) to compare the range of primary production throughout the year for Ocean SAMP waters and nearby ecosystems. Primary production in the Ocean SAMP area is comparable to other coastal systems and is just slightly lower than the value ranges presented for Narragansett Bay and New York Bight. Chlorophyll a sampling at four locations in Rhode Island Sound found concentrations ranging from six to nine µg 1-1 (USACE 2002), which is "consistent with oceanic systems and slightly lower than an average estimate of phytoplankton production on continental shelves (Mann 2000)," (RI CRMC 2010).

Table 3.2-1 Comparison of the Range of Primary Production (g C m-2day-1)

Ecosystem	Production ($g\ C\ m^{-2}\ d^{-1}$)	Reference
Ocean SAMP	143-204	Hyde, 2009
Narragansett Bay	160-619	Oviatt et al., 2002
Massachusetts Bay	160-570	Keller et al., 2001; Oviatt et al., 2007; Hyde et al., 2008
New York Bight	370-480	Malone and Chervin, 1979

Nutrients

Nutrients are chemical elements that all living organisms need to sustain life and for growth. Problems may arise when too much of a particular nutrient is introduced into the environment through human activities (i.e., eutrophication). In surface waters, excess nutrients fuel algal blooms which can lead to water quality degradation. Severe or harmful algal blooms can result in the depletion of oxygen in the water column and benthos that aquatic life needs for survival. Algal blooms also reduce water clarity, which reduces desirable plant growth, such as seagrasses, reduces the ability of aquatic life to find food, and clog fish gills. Freshwaters are more sensitive to excess phosphorus, while in coastal waters, nitrogen is the nutrient of highest concern. In some cases, both nutrients may interact and contribute to a water pollution problem (RIDEM, 2010).

Dissolved nutrients reach the RWEC from Narragansett Bay, Long Island Sound, and Buzzards Bay. Table 3.2-2 below was taken from the RI CRMC Ocean SAMP (2010), which published the Oviatt and Pastore 1980 nutrient sample results for the Rhode Island Sound. Research on Block Island Sound water quality suggests that nutrient concentrations (measured in micromoles, µM) have seasonal variation, with peaks in the autumn, and nearly undetectable levels in the late spring and early summer months (Staker and Bruno, 1977). Although additional sampling is required, the data suggest that nutrient availability may be a limiting factor, resulting in lower primary production.

Table 3.2-2 Nutrient Concentrations Measured in the Rhode Island Sound (Oviatt and Pastore, 1980)

	Concentration (µM)		
Nutrient	**Station 16 (mouth of Narragansett Bay)**	**Station 17 (just outside mouth of Narragansett Bay)**	**Time**
Ammonia (NH_3)	-	0	Jan-May
	1	1.5-2	Jun-Aug
	3-4	2-2.5	Nov-Dec
Nitrite + Nitrate (NO_2 + NO_3)	6	6	Jan
	1-2	5	Feb
	0.5	0.5	Mar
	5	4	Apr
	0	1-2	May-Aug
	6	6	Nov
	12	10	Dec
Orthophosphate (PO_4)	1-2	1-1.5	Jan-Aug
	1.5	1.5-2	Nov-Dec

Pathogens

There is little information on the algal and bacteria dynamics in Rhode Island Sound. According to RI CRMC (2010), there were no documented reports of harmful algal blooms or waterborne pathogen outbreaks Rhode Island Sound as of 2010.

Contamination

Data on water-column contaminant levels in Rhode Island Sound are limited. Organic contaminants (polychlorinated biphenyls ["PCBs"] and pesticides) measured in 2001 and 2002 were generally below method detection limits for these analytes (USACE, 2004). For example, total PCB concentrations were less than 46 nanograms per liter (ng/L), and total dichlorodiphenyltrichloroethanes were less than 4 ng/L. Water-column dissolved metals concentrations in Rhode Island Sound were also low, with concentrations generally less than 1 microgram per liter (µg/L). Dissolved metal concentrations appeared similar throughout the year and throughout Rhode Island Sound. Metals, PCBs, and organic and inorganic pollutant concentrations measured in the water column within the Ocean SAMP area in 2002 were well below ambient RIDEM water quality criteria (RI CRMC, 2010).

Turbidity

Turbidity is the measure of cloudiness or haziness (opacity) of water caused by suspended solids (e.g., sediments or algae). Ocean waters beyond 3 mi (4.8 km) offshore typically have very low concentrations of suspended particles and low turbidity. Turbidity in Rhode Island Sound from five studies cited by the USACE (2004) ranged from 0.1 to 7.4 milligrams per liter (mg/L) of total suspended solids. Bottom currents may re-suspend silt and fine-grained sands, causing higher suspended particle levels in benthic waters. Storm events, particularly frequent intense wintertime storms, may also cause a short-term increase in suspended sediment levels. (BOEM, 2013)

Anthropogenic Activities

Current anthropogenic activities that are sources of water quality degradation include point source pollution and nonpoint source pollution. Point source pollutants, which enter waterways at well-defined locations, such as pipe or sewer outflows, are common sources of water pollution. There are no direct municipal wastewater or industrial point sources of pollution into or within the Project Area. Vessels may release discharges that have the potential to impact water quality.

3.2.2.2 RWEC Narragansett Bay

Dissolved Oxygen

The Narragansett Bay Fixed Site Monitoring Network ("NBFSMN") is a multi-agency collaborative that continuously collects data, including DO, at 13 fixed stations throughout the Narragansett Bay. The data collected at the fixed stations shows that the majority of the stations experience or are vulnerable to periodic episodes of hypoxia and occasional anoxia (RIDEM, [ND]). In addition, although the NCCR (EPA, 2012) states that the overall condition of DO in the Northeast Coast region is fair, more extensive data collection, such as that by NBFSMN and Brown University, have shown that the Narragansett Bay has a higher incidence of hypoxia.

DO within the Bay was also evaluated by the NBEP, which used a Hypoxia Index. The Hypoxia Index evaluated data from the NBFSMN to identify sample areas that experience hypoxia and combined the duration that this condition persisted. The Hypoxia Index "measures of the amount or magnitude that bottom water DO concentrations fell below a fixed threshold, and how long they stayed below the threshold" (NBEP, 2017). NBEP used a threshold of 2.9 mg/L and the Hypoxia Index to identify acute hypoxia, which evaluated each individual site/year as the sum of all deficit-durations from mid-May through mid-October (NBEP, 2017). The occurrences of hypoxia at given sites varied from year to year, with precipitation playing a factor. Wetter years experienced greater incidents of hypoxia. NBEP also found that periods of hypoxia have a higher chance of occurrence during the summer months, when the warm waters support high productivity and respiration rates and the Bay is thermally stratified with poor exchange between strata (NBEP, 2017). The proposed RWEC-RI will make landfall at Quonset Business Park within North Kingstown and pass within a portion of the Upper West Passage that is prone to sporadic hypoxic events (NBEP, 2017).

Chlorophyll a

A Chlorophyll Bloom Index ("CBI") was developed to quantify phytoplankton blooms based on a time series of chlorophyll measurements and data from ten NBSFMN sites that were analyzed (NBEP, 2017). The CBI measured the surplus-duration of an event, which is both the intensity and time period of the event. Since the State of Rhode Island has not established water quality criteria for chlorophyll a concentrations, the federal threshold of 20 µg/L was used. Although long-term trends could not be readily identified, the CBI indicated that spikes in chlorophyll a levels in Narragansett Bay are most frequent in the summer and show a spatial gradient decrease when moving north to south throughout the Bay with the Upper West Passage having values ranging from five to nine µg/L (NBEP, 2017). This is likely the result of nutrient inputs from rivers and wastewater treatment facilities ("WWTF") (i.e., riverine loading) (NBEP 2017).

The NBC also monitored chlorophyll a in the Providence and Seekonk River estuaries within the upper Narragansett Bay. Table 3.2-8 below was adapted from available 2019 NBC data from the two buoys (Bullock Reach Buoy and Conimicut Point Buoy) maintained proximate to the southern terminus of the Providence River at Upper Narragansett Bay. Samples were taken 1.6 to 3.3 ft (0.5-1 m) below the surface. As shown in Table 3.2-3, the chlorophyll a levels exceeded the federal threshold (20 µg/L) on June 19, 2019 at the Bullock Reach Buoy and on August 15, 2019 at both the Bullock Reach Buoy and the Conimicut Point Buoy.

Table 3.2-3 2019 Chlorophyll a Levels from NBC Data Collected at Bullock Reach Buoy and Conimicut Point Buoy

Collection Date	Station	Chl a (µg/L)	Station	Chl a (µg/L)
1/3/2019	Bullock Reach Buoy Surface	2.2302	Conimicut Point Surface	0.36123
3/13/2019	Bullock Reach Buoy Surface	0.8307	Conimicut Point Surface	7.13
3/27/2019	Bullock Reach Buoy Surface	3.5457	Conimicut Point Surface	2.7547

Collection Date	Station	Chl a (µg/L)	Station	Chl a (µg/L)
4/10/2019	Bullock Reach Buoy Surface	7.0368	Conimicut Point Surface	7.7439
4/24/2019	Bullock Reach Buoy Surface	7.9713	Conimicut Point Surface	19.647
5/8/2019	Bullock Reach Buoy Surface	1.7406	Conimicut Point Surface	1.7828
5/21/2019	Bullock Reach Buoy Surface	3.3849	Conimicut Point Surface	4.1268
6/5/2019	Bullock Reach Buoy Surface	3.1776	Conimicut Point Surface	2.709
6/19/2019	Bullock Reach Buoy Surface	30.393	Conimicut Point Surface	14.577
7/3/2019	Bullock Reach Buoy Surface	9.3984	Conimicut Point Surface	5.1741
7/17/2019	Bullock Reach Buoy Surface	10.909	Conimicut Point Surface	9.3837
7/31/2019	Bullock Reach Buoy Surface	1.8061	Conimicut Point Surface	2.1052
8/15/2019	Bullock Reach Buoy Surface	33.026	Conimicut Point Surface	48.981

Nutrients

There is limited data available for nutrient levels within Narragansett Bay. However, NBEP monitors nitrogen and phosphorus levels with a focus on WWTFs and riverine discharges. Data suggests that nutrient levels have dropped within a 15-year period since Rhode Island enacted a statute to reduce summer nutrient loading into the Bay from WWTFs (NBEP, 2017). Table 3.2-4 was adapted from the NBWTR (NBEP, 2017) and summarizes a comparison of WWTF nitrogen loading levels from 2000-2004, 2007-2010, and 2013-2015. The data indicates a decrease in total nitrogen discharging from WWTFs in the Coastal Narragansett Bay Basin.

Table 3.2-4 NBEP Data for Nitrogen Loading Levels from Wastewater Treatment Facilities

	WWTF Total Nitrogen Loading (x10^3 lbs/year)		
	Nixon et al (2008)	Krumholz (2012)	NBEP Study
Coastal Narragansett Bay Basin	2000-2004	2007-2010	2013-2015
Narragansett Bay	5,253	4,420	2,777
Ten Mile River	379	328	170
Woonasquatucket River	134	45	52

Total phosphorus was similarly analyzed for discharges from WWTFs and it was found that WWTFs that directly discharge to "Narragansett Bay account for 74 percent of total phosphorus loading" (NBEP, 2017). Table 3.2-5 was adapted from the NBWTR (NBEP, 2017) and summarizes a comparison of phosphorus loading levels from 2000-2004, 2007-2010, and 2013-2015.

Table 3.2-5 NBEP Data for Phosphorus Loading from Wastewater Treatment Facilities

	WWTF Total Nitrogen Loading (x10^3 lbs/year)		
	Nixon et al (2008)	Krumholz (2012)	NBEP Study
Coastal Narragansett Bay Basin	2000-2004	2007-2010	2013-2015
Narragansett Bay	551	618	526
Ten Mile River	26	3	3
Woonasquatucket River	21	1	1

Pathogens

The NBEP monitors Narragansett Bay for pathogens to monitor potential health concerns regarding recreation (e.g., swimming and boating) and shellfishing by testing for Escherichia coli, general fecal coliform, and Enterococci bacteria (NBEP, 2017). Sources of these pathogens include WWTFs, stormwater runoff, septic systems, and wildlife. It was found that 20 percent of streams and rivers and 97 percent of lakes and ponds in the Coastal Narragansett Bay area were acceptable for recreational use (NBEP, 2017). For shellfishing, 63 percent of Narragansett Bay was classified as approved, 13 percent was classified as conditionally approved, and 24 percent was classified as prohibited in 2015. However, the sampling locations at the Mouth of the Bay and the West Passage, where the Project will occur, each have 90 percent classified as approved for shellfishing, indicating good water quality regarding pathogens.

Contamination

NBEP monitors both of what it considers legacy and emerging contaminants in Narragansett Bay. Legacy contaminants are those such as heavy metals that have been present and regulated for many years and may persist in the environment (NBEP, 2017). Research conducted during the 1980s and 1990s on legacy contaminants found that there was a north-south gradient in the Bay, with the northern reaches having the highest concentrations of legacy contaminants. NBEP also evaluated legacy contaminants by analyzing dated sediment cores and blue mussel (*Mytilus edulis*) tissue (NBEP, 2017). The sediment cores were evaluated for levels of copper, lead, cadmium and chromium and the effects range median (ERM – threshold where detected levels of a contaminant above the ERM likely or always result in observed effects) were compared to levels of the contaminants in the 1770s. The analysis showed that the levels for all contaminants spiked during the Industrial Revolution and then dramatically reduced with the introduction of environmental regulations (i.e., Clean Water Act and Clean Air Act). Additional analysis showed that all analyzed contaminants within the sediment cores dropped below the ERM after 1990. Similarly, data on metals and PCBs from tissue from blue mussels showed a trend in declining levels of contaminants from 1976 to 2012 (NBEP, 2017).

Emerging contaminants, or "chemical contaminants of emerging concern ("CECs") refers to chemicals with unknown ecological effects and no associated regulatory standards" (NBEP, 2017). Sources of CECs include pharmaceuticals, personal care products, and industrial chemicals, and information on them within the Bay is limited (NBEP, 2017). Due to the lack of sufficient data, the extent and magnitude of CECs within the Bay are not available.

Turbidity

There are limited data available on turbidity within Narragansett Bay. The NBC measures turbidity using a Secchi disk. A Secchi disk measures water clarity by lowering a black and white disk into the water column until it is no longer visible; the depth at which the disk is last visible is then recorded. Table 3.2-6 was adapted from available data from NBC for Bullock Reach and Conimicut Point, which are the two monitoring locations that are closest to the mouth of Narragansett Bay. Several readings were taken every month and the data below represents the annual average for depth visibility. All depths are in meters (NBC, 2019).

Table 3.2-6 2017-2019 Water Clarity Depths Measured by NBC at Bullock Reach and Conimicut Point Monitoring Stations using a Secchi Disk

Sample Location and Year	Greatest Depth (m) (Date)	Shallowest Depth (m) (Date)	Annual Average Depth of Visibility (m)
Bullock's Reach – 2017	3.9 (11/29/2017)	0.8 (8/23/2017)	1.7
Bullock's Reach – 2018	3.9 (10/17/2018)	1.3 (5/24/2018, 7/25/2018, 8/1/2018, 8/8/2018)	2.1
Bullock's Reach – 2019	3.9 (3/13/2019)	0.9 (5/30/2019	1.7

Sample Location and Year	Greatest Depth (m) (Date)	Shallowest Depth (m) (Date)	Annual Average Depth of Visibility (m)
Conimicut Point – 2017	4.2 (10/18/2017)	1.1 (7/6/2017)	1.8
Conimicut Point – 2018	5.4 (3/28/2018)	1.3 (8/8/2018)	1.7
Conimicut Point – 2019	3.6 (1/3/2019)	0.9 (5/30/2019)	2.3

Anthropogenic Activities

The watersheds of Narragansett Bay have experienced development and population growth since the 1700s and continued residential, commercial, and industrial development. These factors have shaped the area and introduced nutrients, pathogens and pollutants into streams, rivers and the Bay. Both point and non-point sources of pollution are present, and the effects of those sources as well as others are discussed above.

3.2.2.3 Potential Project Impacts

Construction and Decommissioning

The primary concern to surface water quality is sediment suspension and deposition during installation of the RWEC-RI. To assess these impacts, Revolution Wind prepared a sediment transport modeling analysis to support this Category B Assent application, as well as permitting with RIDEM for the WQC pursuant to the Water Quality Regulations (250- RICR-150-05-1.1 et seq.) and RIDEM and RI CRMC for a dredge permit pursuant to the Rules and Regulations for Dredging and the Management of Dredged Materials (250-RICR-150-05-2.1 et seq.).

RPS's Hydrodynamic and Sediment Transport Modeling Report – Rhode Island State Waters (Appendix O) assessed and characterized the modeled sediment suspension and deposition associated with seabed preparation activities and installation of the RWEC-RI. For deposition impacts, refer to the discussion in Section 3.2.1.2 above.

The volume of resuspended sediment (i.e., total suspended solid [TSS]) into the water column was predicted to be 103,875.3 cy (79,418.4 m^3), 103,163.2 cy (78,873.9 m^3), 103,875.3 cy (79,418.4 m^3), 46,287.1 cy (35,388.9 m^3), and 3,097.8 cy (2,368.4 m^3) for CFE, TSHD split bottom, TSDH continuous overflow, jet plow, and HDD, respectively. The modeling also showed that TSS plumes are limited to the bottom of the water column for seabed preparation and cable installation using CFE and were more widely distributed throughout the entire water column for TSHD.

The maximum amount of time a plume of greater than 100 mg/L is predicted to remain suspended for the various activities and installation methods was:

- For seabed preparation, no greater than 2.3 hours, 13.5 hours, and 13.8 hours for CFE, TSHD split bottom, and TSDH continuous overflow;
- For jet plow installation, no greater than 4.5 hours; and
- For HDD at the landfall location, no greater than 70.2 hours.

The Rhode Island Water Use Classification for the HDD work area (Waterbody ID RI0007027E-03D) is SB.[9] Two temporary exit pits will be excavated offshore and a casing pipe will be installed to receive the boring head and collect boring fluids. The sediments excavated from the exit pits will be stored on a barge and will ultimately be used to backfill the exit pits (see Section 2.2.3.2 under Landfall Construction for detailed description of HDD process). To minimize the potential risks for an inadvertent drilling fluid release, an HDD Contingency Plan will be developed and BMPs will be implemented during construction.

A pre-application meeting was held with the CRMC and RIDEM on June 18, 2020 to discuss environmental sampling in accordance with the Rules and Regulations for Dredging and the Management of Dredged Materials (250-RICR-150-05-2). Revolution Wind conducted sediment sampling at the exit pit locations in accordance with consultation with the two agencies.[10] Laboratory analytical results were returned from ESS Laboratories on January 4, 2021. Key findings include the following:

- Total petroleum hydrocarbons, Semi-Volatile Organic Compounds and PCBs were not detected in any of the sediment samples
- Metals were not detected in concentrations exceeding the RIDEM Residential or Industrial/Commercial Direct Exposure Criteria or the CAD Cap Criteria
- Percent fines (silt/clay) exceeding 10% was detected in all samples

Based on these results, the dredge/excavations for the HDD pits will be suitable for disposal in any of the potential disposal locations except beach disposal (nourishment). That said, the Project does not propose disposal of dredged material. Dredge material at the HDD exit pits will be re-used for backfill. Sediments disturbed during cable installation will naturally backfill or fallback into the cable trench.

Vessels will be used during construction and decommissioning of the RWEC-RI and will comply with regulatory requirements for management of onboard fluids and fuels, including prevention and control of discharges and accidental spills. Revolution Wind will meet applicable regulations and standards, as set by the IMO MARPOL, the USCG, and the State of Rhode Island, for treatment and disposal of solid and liquid wastes generated during all phases of the Project. Revolution Wind will also implement an ERP/OSRP (see Appendix G). Overall, installation of the RWEC-RI will not result in significant impacts to water quality from sediment suspension and deposition and is not expected to impact DO, chlorophyll a, or nutrient balance in the region. Due to proper handling and disposal of solid and liquid waste generated by the vessels, no impacts to surface water quality are expected from vessels.

Based on RPS's simulation and the implementation of the avoidance, minimization and mitigation measures discussed in 3.2.2.4 below, impacts to water quality from seabed disturbance would be temporary and would not impact DO, chlorophyll a, or nutrient balance in the region.

9 These waters are designated for primary and secondary contact recreational activities; shellfish harvesting for controlled relay and depuration; and fish and wildlife habitat. They shall be suitable for aquacultural uses (other than shellfish for direct human consumption), navigation, and industrial cooling. These waters shall have good aesthetic value.

10 Reference sediment sampling Plan approval dated July 3, 2020.

Operations and Maintenance

There are no anticipated impacts to water quality during O&M of the RWEC-RI unless a cable repair is required. Repair or replacement of cables or cable protection associated with the RWEC-RI during operations are considered non-routine maintenance activities potentially resulting in the same or lesser impacts as construction.

3.2.2.4 Proposed Avoidance, Minimization, and Mitigation

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to water quality:

- To the extent feasible, installation of the RWEC-RI will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
- Revolution Wind will require all construction and operations vessels to comply with regulatory requirements related to the prevention and control of spills and discharges.
- Accidental spill or release of oils or other hazardous materials offshore will be managed through the OSRP (see Appendix G).
- All vessels will comply with USCG and EPA regulations that require operators to develop waste management plans, post informational placards, manifest trash sent to shore, and use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Vessels will also comply with BOEM lease stipulations that require adherence to NTL 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process.
- HDD drilling fluids will be managed within a contained system following punch out of the pilot drilling to be collected for reuse as necessary. An HDD Contingency Plan will be prepared and implemented to minimize the potential risks associated with release of drilling fluids.
- A SESC Plan, including erosion and sedimentation control measures, will be implemented to minimize potential water quality impacts during construction and operation of the onshore Project components.

3.2.3 Benthic and Shellfish Resources

3.2.3.1 Affected Environment

Benthic and shellfish resources in the RWEC-RI Project Area were evaluated by reviewing public data sources and conducting Project-specific studies. Sources reviewed included state and federal agency-published papers and databases (McMullen et al., 2009; RI CRMC, 2010; LaFrance et al., 2010; Poppe et al., 2014a; Collie and King, 2016; Siemann and Smolowitz, 2017 ; Shumchenia and King 2019; LaFrance et al. 2019), published journal articles (McMaster, 1960), online data portals and mapping databases (Northeast Ocean Data, 2019; USGS, 2017), an academic thesis (Malek, 2015), studies conducted for the planned South

Fork Wind Farm ("SFWF") (Deepwater Wind South Fork, 2019), and correspondence and consultation with federal and state agencies.

Benthic and shellfish resources are described in the following subsections in terms of benthic habitat types and commonly associated taxa, including SAV, macroalgal assemblages, and micro- and macrobenthic communities.

Broadly, the habitats within the RWEC-RI Project Area are low in environmental complexity, consisting mainly of sand and mud habitats (Appendix P). The exceptions are habitats located in the central portions of the West Passage and at the entrance to Narragansett Bay. Six primary benthic habitat types were mapped within the RWEC-RI: Glacial Moraine B, Glacial Moraine A, Coarse Sediment, Sand and Muddy Sand, Mud and Sandy Mud, and Bedrock. The majority of the RWEC-RI in Rhode Island Sound was mapped as Sand and Muddy Sand – Mobile, whereas Mud and Sandy Mud comprised the majority of primary habitat types mapped within Narragansett Bay. While six primary benthic habitat types were mapped, when modifiers are added 17 distinct habitats are present. Not all types are present in each portion of the RWEC-RI corridor. In addition, a few anthropogenic features (dredged material, demolition debris, revetment walls) were also mapped within Narragansett Bay. Habitats with modifiers (e.g., Mobile, Shell Substrate, Low Density Boulder Field, SAV), provide a greater level of detail in describing these benthic environments and highlight the spatial variation in diversity found on the seafloor within the RWEC-RI Project Area.

The habitats mapped in Rhode Island Sound are primarily dynamic sands and muds typical of offshore environments in Southern New England. These habitats provide a mix of mobile sands and depositional muddy environments that support a combination of small and large tube-building and burrowing infauna, as well as mobile epifauna (mollusks and crustaceans) (Appendix P).

The benthic habitats mapped within Narragansett Bay, from the West Passage to Quonset Point, were primarily depositional muds and sandy mud. These habitats support a combination of small and large tube-building and burrowing infauna, as well as mobile epifauna (mollusks and crustaceans). Where these habitats are modified by shell substrate, additional taxa are supported, such as blue mussels and sessile gastropods (i.e., Crepidula), that provide important filtration ecosystem services. In shallow nearshore water, mud and sandy mud habitats may support SAV beds. These habitats also provide important ecosystem services related to water clarity and nutrient cycling, and provide critical habitat for invertebrates and demersal fish, particular juveniles. Outcroppings of Bedrock, Glacial Moraine B, and Glacial Moraine A habitats were mapped within the RWEC-RI Project Area near Conanicut and Dutch Islands within the West Passage of Narragansett Bay. These habitats, as well as nearby Low or Medium Density Boulder Fields coincident with sand and mud habitats, provide structure that supports attached fauna such as sponges and, in shallower photic waters, flora such as benthic macroalgae, as well as demersal fish, such as black sea bass and tautog, that utilize hard bottom substrates and structure.

These findings are consistent with recent surveys in the area (Shumchenia and King, 2019) and expected fauna based on historical studies (Hale et al. 2018).

No sensitive taxa or species of concern were observed within the RWEC-RI Project Area. However, SAV beds consisting primarily of eelgrass (*Zostera marina*), with additional presence of widgeon grass (*Ruppia maritima*), occur in Narragansett Bay. SAV beds are found in shallow coastal areas, including along the western shores of Conanicut and Dutch Islands, at the mouth of Wickford Harbor adjacent to Cornelius Island, and on the west side of Compass Rose Beach (Appendix P). During Revolution Wind's SAV video survey in September 2020, a total of 52 transect lines of a variety of distances and orientations were mapped in nearshore regions of the RWEC-RI Project Area, around the landfall location where SAV was expected at a higher probability. SAV, specifically eelgrass (*Zostera marina*), was observed along the shoreline at the west side of Compass Rose Beach, approximately 845 feet (257 m) east of the proposed HDD exit pits.

3.2.3.2 Potential Project Impacts

Construction and Decommissioning

During construction and decommissioning of the RWEC-RI, benthic resources and shellfish are expected to experience impacts from sediment suspension and deposition and habitat alteration from vessel anchoring and cable installation. Most marine species have some degree of tolerance to higher concentrations of suspended sediment because storms, currents, and other natural processes regularly result in increases in turbidity (MMS 2009). However, eggs and larval organisms are especially susceptible to smothering through sedimentation; for example, winter flounder generally spawn in shallow coastal waters between late November and early December and their eggs are known to be susceptible to adverse effects related to sediment deposition. In areas of sediment disturbance, benthic habitat recovery and benthic infaunal and epifaunal species abundances may take up to 1 to 3 years to recover to pre-impact levels, based on the results of a number of studies on benthic recovery (e.g., AKRF, Inc. et al. 2012; Germano et al. 1994; Hirsch et al. 1978; Kenny and Rees 1994).

Benthic species may also experience localized, long-term impacts caused by the conversion of soft-bottom habitat to hard-bottom habitat associated with cable protection along portions of the RWEC-RI route. None of the impacts are expected to result in population-level effects on benthic species, due to the limited scale and intensity of the RWEC-RI activities, and the availability of similar habitat in the surrounding area.

The benthic habitats mapped within the RWEC-RI corridor that are currently subject to CRMC regulations include Glacial Moraine B, Glacial Moraine A, and Mud and Sandy Mud with SAV. All three of these habitats were limited in their distribution within the mapped RWEC-RI corridor and were mostly located on the periphery of the corridor. Collectively, Glacial Moraine A and B habitats comprised 0.3% (5 acres) of the habitats mapped within the portion of the RWEC-RI Project Area in Rhode Island Sound and 3% (132 acres) of the habitats mapped within the RWEC-RI Project Area in Narragansett Bay. Mud and Sandy Mud with SAV habitats totaled 0.004% (0.2 acres) of the habitats mapped within the RWEC-RI corridor in Narragansett Bay.

As described further in Section 5.2.2 of this Category B Assent application, Revolution Wind anticipates avoidance of Glacial Moraine A and B with siting of the RWEC-RI. Glacial Moraine is defined by CRMC as an Area of Particular Concern (per Section 11.10.2 of the Ocean SAMP) given its importance to fish and other marine plants and animals. Should complete avoidance of Glacial Moraine A and B habitats not be possible due to other, currently unknown, constraints (e.g., unexploded ordnance), Revolution Wind will take all feasible efforts to avoid any damage to the glacial moraine benthic habitats.

The nearest SAV bed to the indicative RWEC-RI route within the West Passage is approximately 1,150 ft (350 m) from the route, on the western side of Dutch Island. At this distance, SAV habitat near the cable corridor is 35 m beyond the projected impact distance for deposition and is within the projected impact distance for elevated turbidity (RPS 2021). The SAV bed mapped at the landfall location during the 2020 video survey is 32 m beyond the projected impact distance for deposition and is within the projected impact distance for elevated turbidity (RPS 2021). Revolution Wind will utilize HDD to avoid documented SAV near the Project's landfall location. In addition, Revolution Wind will avoid construction during the peak SAV growing season (i.e., July to September), which will minimize potential effects due to increased turbidity and sediment deposition associated with cable installation and excavation of the HDD exit pits.

Operations and Maintenance

There are no anticipated impacts during O&M of the RWEC-RI unless a cable repair is required. Repair or replacement of cables or cable protection associated with the RWEC-RI during operations are considered non-routine maintenance activities potentially resulting in the same or lesser impacts as construction.

Revolution Wind evaluated EMF associated with operation of the RWEC-RI and the calculated magnetic-field and induced electric-field levels for the Project cables are not expected to affect populations of marine organisms in the area (Exponent, 2020). This conclusion is based on comparisons of the reported EMF sensitivity of select, local marine species to the levels of EMF produced by the submarine cables. As part of the evaluation process, Exponent calculated the magnetic-field levels and induced electric-field levels associated with the Project cables. These calculations show that for the offshore segment of the RWEC and the RWEC Landfall Cables the highest magnetic field at 3.3 feet (1 m) above the seabed will be 6.3 milligauss ("mG") or less at average loading and less than 8.4 mG at peak loading. These maximum calculated field levels were then compared to magnetic-field levels reported in the scientific literature as causing behavioral responses in species groups expected to inhabit the Project Area, including marine invertebrates, fish, and elasmobranchs. This conservative evaluation resulted in the following conclusions (Exponent, 2020b), which are consistent with those of a 2019 BOEM report (Snyder et al., 2019):

- Data from field surveys conducted at 60-hertz ("Hz") alternating current ("AC") submarine cable sites demonstrate that behavior and distribution of large crustaceans are unaffected by these magnetic fields.
- Observations of cephalopod distributions at the same 60-Hz AC cable sites also indicated that these species are not affected by the presence of AC EMF.

- Magnetic-field levels calculated for cables are below thresholds at which laboratory and field studies reported behavioral changes in magnetosensitive fish species.
- Elasmobranchs (sharks, rays and skates) are not expected to detect the magnetic fields generated by the 60-Hz AC submarine cables.
- Calculated electric fields associated with Project cables are below the published detection thresholds of electrosensitive fish and elasmobranchs.

In conclusion, the 60-Hz magnetic- and induced electric-field levels calculated from conservative models of the Project's cables during operation will be below the detection thresholds of magnetosensitive and electrosensitive marine organisms in the Project Area.

3.2.3.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to benthic and shellfish resources:

- The RWEC will be sited to avoid and minimize impacts to sensitive habitats (e.g., hard bottom habitats) to the extent practicable.
- A preconstruction SAV survey will be completed to identify any new or expanded SAV beds. The Project design will be refined to avoid impacts to SAV to the extent practicable.
- To the extent feasible, installation of the RWEC-RI will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
- DP vessels will be used for installation of the RWEC-RI to the extent possible.
- A plan for vessels will be developed prior to construction to identify no-anchorage areas to avoid documented sensitive resources.
- Revolution Wind will require all construction and operations vessels to comply with regulatory requirements related to the prevention and control of spills and discharges.
- Accidental spill or release of oils or other hazardous materials offshore will be managed through the Oil Spill Response Plan.

Finally, as described in Section 2.2.5.1, in general, offshore site preparation and installation north of the COLREGS line of demarcation will occur between the day after Labor Day and February 1 to avoid and minimize impacts to winter flounder (*Pseudopleuronectes americanus*) and shellfish.

3.2.4 Finfish and Essential Fish Habitat

3.2.4.1 Affected Environment

This section describes finfish and Essential Fish Habitat ("EFH") within the RWEC-RI Project Area. Finfish evaluated include pelagic, demersal, and anadromous species that inhabit the region. EFH, as regulated by NMFS, is defined in the Magnuson-Stevens Fishery Conservation and Management Act ("MSFCMA") as those waters (e.g., aquatic areas and their associated physical, chemical, and biological properties used by fish) and substrate (e.g., sediment, hard bottom, underlying structures, and associated biological communities) necessary for the spawning, feeding, or growth to maturity of managed fish species. A 0.5 mi (800 m) wide corridor around the RWEC-RI Project Area was used for identifying species with EFH within the vicinity of the proposed cable corridor.

The regional waters off the coast of Rhode Island and Massachusetts are transitional waters that separate Narragansett Bay and Long Island Sound from the OCS (BOEM, 2013). These waters straddle the Mid-Atlantic and New England biogeographic regions and serve as the northern boundary for some Mid-Atlantic species and the southern boundary for some New England species. The species that may be found in the RWEC-RI reflect the transitional nature of this regional area.

Some demersal species are present year-round in the RWEC-RI Project Area; however, there are distinct seasonal variations in local populations because of seasonal migrations and inter-annual population dynamics (declines and increases) (Malek, 2015). Demersal species such as black sea bass (*Centropristis striata*), scup (*Stenotomus chrysops*), whiting (*Merlangius merlangus*), summer flounder (*Paralichthys dentatus*), winter flounder (*Pseudopleuronectes americanus*), yellowtail flounder (*Pleuronectes ferruginea*), and winter skate (*Leucoraja ocellata*) are important to both the stability and resiliency of the local marine community and have a large impact on commercial fisheries (RI CRMC, 2010).

Coastal pelagic species typically inhabit the photic zone over the continental shelf, in waters up to about 655 ft (200 m) deep (NOAA Fisheries, 2018). Example coastal pelagic species that may be found in the RWEC-RI Project Area include forage fish such as anchovy (*Anchoa mitchilli*), American shad (*Alosa sapidissima*), and Atlantic menhaden (*Brevoortia tyrannus*), as well as their predators. Certain pelagic species are considered highly migratory species; they travel long distances and often cross domestic and international boundaries. These include oceanic pelagic species such as many sharks. Many species of finfish that have pelagic life stages within the region are considered commercially or recreationally important. Some of these species (e.g., bluefish [*Pomatomus saltatrix*]) migrate seasonally to the RWEC-RI Project Area.

Anadromous species are those which migrate between the ocean and lower-salinity riverine environments for spawning. Demersal species of anadromous fish potentially present within the RWEC-RI Project Area include striped bass (*Morone saxatilis*) and Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), and potentially present pelagic species of anadromous fish include American shad, alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), Atlantic menhaden, and Atlantic sea herring (*Clupea harengus*) (BOEM, 2013; Scotti et al., 2010). The most common finfish prey species within the RWEC-RI Project Area include alewife, Atlantic menhaden, northern sand lance (*Ammodytes dubius*), and whiting.

The federally listed Atlantic sturgeon could occasionally occur within the RWEC-RI Project Area. The Atlantic sturgeon is an anadromous, subtropical species that can be found along the Atlantic coast from Labrador, Canada to Florida (Murdy et al., 1997; Atlantic States Marine Fisheries Commission ["ASMFC"], 2019b). There are five distinct population segments ("DPS") (i.e., the New York Bight, Gulf of Maine, Chesapeake Bay, Carolina, and South Atlantic DPS), which are grouped by ranges according to designations published by NOAA Fisheries (77 Federal Register 5880; 77 Federal Register 5914). The DPS most likely to be found in the vicinity of the Project Area is the New York Bight DPS. There are no known spawning locations or Critical Habitats in Rhode Island. Historically, Atlantic sturgeon spawned in the Taunton River in Massachusetts, however, their current status in this river is unknown (ASMFC, 2019b). Juvenile and adult Atlantic sturgeon have been captured in otter trawls and sink gill nets in the region and commercial bycatch data indicates the greatest occurrence of offshore Atlantic sturgeon in Massachusetts and Rhode Island waters to occur from November through May (Stein et al., 2004).

Within Narragansett Bay, the demersal fish community structure has been changing over the past six decades with some demersal species declining (e.g., winter flounder, whiting, and red hake (*Urophycis chuss*)), while others have increased (e.g., Atlantic butterfish (*Peprilus triacanthus*), scup, and squid) (Collie et al., 2008). These population changes are thought to be related to overfishing, fishery closures, changes in food sources, and changes in habitat (ASMFC, 2019a). The abundance of coastal anadromous finfish, such as striped bass, American shad, and river herring (alewife and blueback herring, collectively), has declined substantially in Narragansett Bay due to habitat loss and exploitation (NBEP, 2017). These species migrate between the ocean and lower-salinity riverine environments, typically undergoing their upstream spawning migration in the spring.

Within the 0.5 mi (800 m) corridor around the RWEC-RI centerline, 32 species of fish and invertebrates have designated EFH for various life stages. These species and their EFH are described in detail in Appendix Q.

3.2.4.2 Potential Project Impacts

Construction and Decommissioning

RWEC-RI construction and decommissioning impacts on EFH will vary for different species based on several factors including behavior and distribution in the water column diet, habitat preferences, the amount of suitable habitat present in the area, and life stage. Most of the potential impacts on EFH will be temporary and reversible as natural processes are expected to return the disturbed areas to pre-construction conditions apart from secondary cable protection. In addition, the spatial extent of anticipated habitat that is anticipated to be impacted is small relative to the amount of similar habitat in the region.

Species with a completely pelagic lifestyle are generally expected to be less negatively affected than demersal or benthic species from construction related impacts. Based on the results of a number of studies on benthic recovery (e.g., AKRF, Inc. et al., 2012; Germano et al., 1994; Hirsch et al., 1978; Kenny and Rees, 1994), the affected benthic communities in the disturbed area are expected to re-establish within 1 to 3 years as native assemblages recolonize the affected area or a new community develops as a result of immigration of organisms from nearby areas or from larval settlement. However, there are no expected population-level effects on EFH species due to the limited scale and intensity of the Project activities and the availability of similar habitat in the surrounding area. The species and associated life stages most likely to experience some level of negative impact are listed in Table 3.2-7 below.

Operations and Maintenance

There are no anticipated impacts during O&M of the RWEC-RI unless a cable repair is required. Repair or replacement of cables or cable protection associated with the RWEC-RI during operations are considered non-routine maintenance activities potentially resulting in the same or lesser impacts as construction.

Once the RWEC-RI becomes energized, the cables will produce a magnetic field, both perpendicularly and in a lateral direction around the cables. The cable will be shielded and, where feasible, buried beneath the seafloor and will otherwise be protected. Shielded electrical transmission cables do not directly emit electrical fields into surrounding areas but are surrounded by magnetic fields that can cause induced electrical fields in moving water (Gill et al., 2012). Based on EMF modeling performed for the Project (Exponent, 2020), behavioral effects and/or changes in finfish and EFH species abundance and distributions due to EMF are not expected. These conclusions are consistent with the findings of a previous comprehensive review of the ecological impacts of marine renewable energy projects, where it was determined that there has been no evidence demonstrating that EMF at the levels expected from marine renewable energy projects will cause an effect (negative or positive) on any species (Copping et al., 2016). Moreover, a 2019 BOEM report that assessed the potential for AC EMF from offshore wind facilities to affect marine populations concluded that, for the southern New England area, no negative effects are expected for populations of key commercial and recreational fish species (Snyder et al., 2019). Based on this information, it is not expected that finfish and EFH will be measurably affected by EMF from the cables.

Cable protection associated with the RWEC-RI also has the potential to have beneficial effects on species with life stages with a preference for hard-bottom habitats (e.g., gravel, rock, boulders, artificial reefs), depending on the quality of the newly-created hard-bottom habitat, and the composition of the colonizing benthic community. The species and life stages that may experience beneficial effect are listed in Table 3.2-8.

Note that some species could experience both negative and beneficial impacts at different phases of the Project. Thus, the same species and life stages may appear in both Table 3.2-7 and Table 3.2-8.

Table 3.2-7 EFH Species Most Likely to Experience Negative Impacts

Species	Egg	Larvae	Neonate	Juvenile	Adult
New England Finfish					
Atlantic cod (*Gadus morhua*)				●	●
Haddock (*Melanogrammus aeglefinus*)				●	
Monkfish (*Lophius americanus*)				●	●
Ocean pout (*Zoarces americanus*)	●			●	●
Red hake (*Urophycis chuss*)				●	●
Silver hake (*Merluccius bilinearis*)				●	●
White hake (*Urophycis tenuis*)				●	

Species	Egg	Larvae	Neonate	Juvenile	Adult
Windowpane flounder (*Scophthalmus aquosus*)				●	●
Winter flounder (*Pseudopleuronectes americanus*)	●	●			●
Yellowtail flounder (*Limanda ferruginea*)				●	●
Mid-Atlantic Finfish					
Black sea bass (*Centropristis striata*)				●	●
Scup (*Stenotomus chrysops*)				●	●
Summer flounder (*Paralichthys dentatus*)				●	●
Invertebrates					
Atlantic sea scallop (*Placopecten magellanicus*)	●	●		●	●
Atlantic surfclam (*Spisula solidissima*)				●	●
Longfin inshore squid (*Doryteuthis pealeii*)	●				
Ocean quahog (*Arctica islandica*)				●	●
Skates					
Little skate (*Leucoraja erinacea*)				●	●
Winter skate (*Leucoraja ocellata*)				●	●
Sharks					
Spiny dogfish (*Squalus acanthias*)				●[1]	●

1 Includes sub-adult males and sub-adult females

Table 3.2-8 EFH Species That May Experience Beneficial Effects

Species	Egg	Larvae	Neonate	Juvenile	Adult
New England Finfish					
Atlantic cod (*Gadus morhua*)				●	●
Haddock (*Melanogrammus aeglefinus*)				●	
Monkfish (*Lophius americanus*)				●	●
Ocean pout (*Zoarces americanus*)	●			●	●
Pollock (*Pollachius virens*)				●	
Red hake (*Urophycis chuss*)				●	●
Silver hake (*Merluccius bilinearis*)					●
Winter flounder (*Pseudopleuronectes americanus*)				●	●

Species	Egg	Larvae	Neonate	Juvenile	Adult
Yellowtail flounder (*Limanda ferruginea*)					●
Mid-Atlantic Finfish					
Black sea bass (*Centropristis striata*)				●	●
Scup (*Stenotomus chrysops*)					●
Invertebrates					
Atlantic sea scallop (*Placopecten magellanicus*)	●	●		●	●
Longfin inshore squid (*Doryteuthis pealeii*)	●				
Skates					
Little skate (*Leucoraja erinacea*)				●	●
Winter skate (*Leucoraja ocellata*)				●	●

3.2.4.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to finfish and EFH:

- To the extent feasible, installation of the RWEC-RI will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
- To the extent feasible, the RWEC-RI will typically target a burial depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment.
- DP vessels will be used for installation of the RWEC-RI to the extent practicable.
- A plan for vessels will be developed prior to construction to identify no-anchorage areas to avoid documented sensitive resources.
- Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region.
- Revolution Wind will require all construction and operations vessels to comply with regulatory requirements related to the prevention and control of spills and discharges.
- Accidental spill or release of oils or other hazardous materials offshore will be managed through the OSRP.

- A ramp-up or soft-start will be used at the beginning of each pile segment during impact pile driving and/or vibratory pile driving to provide additional protection to mobile species in the vicinity by allowing them to vacate the area prior to the commencement of pile driving activities.
- Construction and operational lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations.
- All vessels will comply with USCG and EPA regulations that require operators to develop waste management plans, post informational placards, manifest trash sent to shore, and use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Vessels will also comply with BOEM lease stipulations that require adherence to NTL 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process.

Finally, as described in Section 2.2.5.1, in general, offshore site preparation and installation north of the COLREGS line of demarcation will occur between the day after Labor Day and February 1 to avoid and minimize impacts to winter flounder (*Pseudopleuronectes americanus*) and shellfish.

3.2.5 Marine Mammals and Sea Turtles

3.2.5.1 Affected Environment

The description of the affected environment for marine mammals was developed by reviewing current public data sources related to marine mammals including: the NOAA Northeast Fisheries Science Center's ("NEFSC's") Atlantic Marine Assessment Program for Protected Species ("AMAPPS") (Palka et al., 2017), the Northeast Large Pelagic Survey Collaborative Aerial and Acoustic Surveys for Large Whales and Sea Turtles (Kraus et al., 2016), Remote Marine and Onshore Technology surveys for New York State Energy Research and Development Authority ("NYSERDA") (Normandeau Associates Inc. [Normandeau] and APEM, 2019); a technical report for the Ocean SAMP (Kenney and Vigness-Raposa, 2010); available marine mammal habitat density data available on the Northeast Ocean Data Portal (Curtice et al., 2019; Roberts et al., 2016, 2017, 2018; Roberts, 2018, 2020); NOAA stock assessment reports (Hayes et al., 2017, 2018, 2019, 2020); and relevant journal publications.

As summarized in Table 3.2-9 below, 36 species of marine mammals inhabit the regional waters of the western North Atlantic OCS. Of these, 5 species are not expected to occur within the RWEC-RI Project Area and 21 species are considered rare or uncommon in the RWEC-RI Project Area. See Appendix R for additional detail regarding marine mammals and sea turtles.

Information regarding distances from shore for marine mammal migratory routes are not available for all species. Surveys suggest that some cetacean species, notably the North Atlantic Right Whale (NARW) and humpback whale, can be found between 50 and 2,000 m from shore while migrating (Best et al., 1998; Hayes et al., 2020). Fin whales, humpback whales, NARWs, and minke whales have all been observed in the RWEC-RI Project Area and will be most abundant in the winter and spring (Kenney and Vigness-Raposa, 2010; Kraus et al., 2016). Sei whales and blue whales are not expected to occur within the RWEC-RI Project Area. Sperm whales in this area have been observed in Rhode Island state waters near Block Island following prey species and may therefore be encountered in the RWEC-RI Project Area during summer and fall (Cetacean and Turtle Assessment Program ["CETAP"], 1982; Kenney and Vigness-Raposa, 2010). Common bottlenose dolphin, common dolphins, and Atlantic white-sided dolphins are the only dolphin species expected to occur with regularity in the RWEC–RI Project Area (Kenney and Vigness-Raposa, 2010; Hayes et al., 2020). Harbor porpoises are known to prefer shallower waters closer to shore and are likely to occur in Rhode Island state waters as they travel between their winter habitat in the Mid-Atlantic to their summer habitat in the Gulf of Maine (Kenney and Vigness-Raposa, 2010). They are predominantly expected in the winter and spring. Historically, seals were rare in Rhode Island state waters, but since the passing of the MMPA in 1972 observations of harbor and gray seals have increased and they are most abundant in these waters from late fall until late spring (McLeish, 2016). Arctic species such as harp, hooded, and ringed seals have also been reported in Narragansett Bay, although sightings of these species are rare (Kenney and Vigness-Raposa, 2010). Harbor seals are the most frequently observed seal species throughout the coastal waters of Rhode Island and adjacent state waters (Kenney and Vigness-Raposa, 2010). Gray seals are less common in Rhode Island, but recovery of the Massachusetts and Canadian breeding populations has led to a recent increase in gray seal observations in New England waters (Kenney and Vigness-Raposa, 2010; Hayes et al., 2020). Both species are expected to occur in the RWEC–RI; harbor seals may be present year-round in lower densities, but peak presence of both species is likely to occur in late spring through early summer (Kenney and Vigness-Raposa, 2010).

The only species of marine mammal that can regularly be found onshore are seals. There have been six identified haul-out sites in Narragansett Bay, with the most observations at the Dumplings off Conanicut Island and Rome Point in North Kingstown (Kenney and Vigness-Raposa, 2010). The nearest haul-out site to the proposed landfall location at Quonset Point in North Kingstown, Rhode Island, is approximately 1.86 mi (3 km) away.

Table 3.2-9 Marine Mammals Potentially Occurring Within the Regional Western North Atlantic OCS Waters and the RWEC-RI Project Area

Common Name	Scientific Name	Stock	Current Population Status	Occurrence in the RWEC-RI Project Area	Best Abundance Estimate[1]
Fin whale	*Balaenoptera physalus*	Western North Atlantic	ESA Endangered MMPA Depleted and Strategic RI State Endangered	Common	7,418
Sei whale	*Balaenoptera borealis*	Nova Scotia	ESA Endangered MMPA Depleted and Strategic	Uncommon	6,292
Blue whale	*Balaenoptera musculus*	Western North Atlantic	ESA Endangered	Not Expected	402

Common Name	Scientific Name	Stock	Current Population Status	Occurrence in the RWEC-RI Project Area	Best Abundance Estimate[1]
			MMPA Depleted and Strategic		
North Atlantic right whale	*Eubalaena glacialis*	Western North Atlantic	ESA Endangered MMPA Depleted and Strategic RI State Endangered	Common	428
Minke whale	*Balaenoptera acutorostrata*	Canadian East Coast	MMPA Non-strategic	Common	24,202
Humpback whale	*Megaptera novaeangliae*	Gulf of Maine	MMPA Non-strategic RI State Endangered	Common	1,396
Sperm whale	*Physeter macrocephalus*	North Atlantic	ESA Endangered MMPA Depleted and Strategic	Regular	4,349
Pygmy sperm whale	*Kogia breviceps*	Western North Atlantic	MMPA Non-strategic	Rare	7,750
Dwarf sperm whale	*Kogia sima*	Western North Atlantic	MMPA Non-strategic	Rare	7,750
Northern bottlenose whale	*Hyperoodon ampullatus*	Western North Atlantic	MMPA Non-strategic	Not Expected	Unknown
Cuvier's beaked whale	*Ziphius cavirostris*	Western North Atlantic	MMPA Non-strategic	Rare	21,818
Mesoplodont beaked whales	*Mesoplodon* spp.	Western North Atlantic	MMPA Depleted	Rare	21,818
Killer whale	*Orcinus orca*	Western North Atlantic	MMPA Non-strategic	Rare	Unknown
False killer whale	*Pseudorca crassidens*	Western North Atlantic	MMPA Strategic	Rare	1,791
Pygmy killer whale	*Feresa attenuata*	Western North Atlantic	MMPA Non-strategic	Not Expected	Unknown
Short-finned pilot whale	*Globicephala macrorhynchus*	Western North Atlantic	MMPA Strategic	Rare	28,924
Long-finned pilot whale	*Globicephala melas*	Western North Atlantic	MMPA Strategic	Uncommon	39,215
Melon-headed whale	*Peponocephala electra*	Western North Atlantic	MMPA Non-strategic	Not Expected	Unknown
Risso's dolphin	*Grampus griseus*	Western North Atlantic	MMPA Non-strategic	Uncommon	35,493

Common Name	Scientific Name	Stock	Current Population Status	Occurrence in the RWEC-RI Project Area	Best Abundance Estimate[1]
Common dolphin	*Delphinus delphis*	Western North Atlantic	MMPA Non-strategic	Common	172,825
Fraser's dolphin	*Lagenodelphis hosei*	Western North Atlantic	MMPA Non-strategic	Rare	Unknown
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Western North Atlantic	MMPA Non-strategic	Common	93,233
White-beaked dolphin	*Lagenorhynchus albirostris*	Western North Atlantic	MMPA Non-strategic	Rare	536,016
Pantropical spotted dolphin	*Stenella attenuata*	Western North Atlantic	MMPA Non-strategic	Rare	6,593
Clymene dolphin	*Stenella clymene*	Western North Atlantic	MMPA Non-strategic	Not Expected	Unknown
Striped dolphin	*Stenella coeruleoalba*	Western North Atlantic	MMPA Non-strategic	Rare	67,036
Atlantic spotted dolphin	*Stenella frontalis*	Western North Atlantic	MMPA Non-strategic	Uncommon	39,921
Spinner dolphin	*Stenella longirostris*	Western North Atlantic	MMPA Non-strategic	Rare	4,102
Rough toothed dolphin	*Steno bredanensis*	Western North Atlantic	MMPA Non-strategic	Rare	136
Common bottlenose dolphin	*Tursiops truncatus*	Western North Atlantic, offshore	MMPA Non-strategic	Common	62,851
		Western North Atlantic, Northern migratory coastal	MMPA Depleted and Strategic	Rare	6,639
Harbor porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy	MMPA Non-strategic RI State SGCN	Common	95,543
Harbor seal	*Phoca vitulina*	Western North Atlantic	MMPA Non-strategic RI State SGCN	Regular	75,834
Gray seal	*Halichoerus grypus*	Western North Atlantic	MMPA Non-strategic	Regular	27,131
Harp seal	*Pagophilus groenlandica*	Western North Atlantic	MMPA Non-strategic	Rare	Unknown
Hooded seal	*Cystophora cristata*	Western North Atlantic	MMPA Non-strategic	Rare	Unknown

Common Name	Scientific Name	Stock	Current Population Status	Occurrence in the RWEC-RI Project Area	Best Abundance Estimate[1]
Florida manatee[2]	*Trichechus manatus latirostris*	-	ESA Threatened MMPA Depleted and Strategic	Rare	Unknown

1 Best abundance estimate from the Draft 2019 Marine Mammal Stock Assessment Report, published by NMFS on the Federal Register on 27 November 2019 (84 FR 65353).

2 Under management jurisdiction of United States Fish and Wildlife Service rather than National Marine Fisheries Service (USFWS, 2019).

Definitions: Common – Occurring consistently in moderate to large numbers; Regular – Occurring in low to moderate numbers on a regular basis or seasonally; Uncommon – Occurring in low numbers or on an irregular basis; Rare – Records for some years but limited; and Not expected – Range includes the Project Area but due to habitat preferences and distribution information species are not expected to occur in the Project Area although records may exist for adjacent waters.

Species densities will likely be lower in state waters for some groups relative to OCS waters, and a few of the more offshore species whose densities are already low, are unlikely to occur in state waters. Information regarding distances from shore for marine mammal migratory routes are not available for all species. Surveys suggest that some cetacean species, notably the NARW and humpback whale, can be found between 50 and 2,000 m from shore while migrating (Best et al., 1998; Hayes et al., 2020). Fin whales, humpback whales, NARWs, and minke whales have all been observed in the Rhode Island state waters associated with the RWEC and will be most abundant in the winter and spring (Kenney and Vigness-Raposa, 2010; Kraus et al., 2016). Sei whales and blue whales are not anticipated in state waters. Sperm whales have been observed in Rhode Island state waters near Block Island following prey species and may be encountered in the RWEC–RI area during summer and fall (CETAP, 1982; Kenney and Vigness-Raposa, 2010).

Common bottlenose dolphin, common dolphins, and Atlantic white-sided dolphins are the only dolphin species expected to occur with regularity in the RWEC–RI (Kenney and Vigness-Raposa, 2010; Hayes et al., 2020). Harbor porpoises are known to prefer shallower waters closer to shore and are likely to occur in Rhode Island state waters as they travel between their winter habitat in the Mid-Atlantic to their summer habitat in the Gulf of Maine (Kenney and Vigness-Raposa, 2010). They are predominantly expected in the winter and spring.

Historically, seals were rare in Rhode Island state waters, but since the passing of the MMPA in 1972 observations of harbor and gray seals have increased and they are most abundant in these waters from late fall until late spring (McLeish, 2016). Arctic species such as harp, hooded, and ringed seals have also been reported in Narragansett Bay, although sightings of these species are rare (Kenney and Vigness-Raposa, 2010). Harbor seals are the most frequently observed seal species throughout the coastal waters of Rhode Island and adjacent state waters (Kenney and Vigness-Raposa, 2010). Gray seals are less common in Rhode Island, but recovery of the Massachusetts and Canadian breeding populations has led to a recent increase in gray seal observations in New England waters (Kenney and Vigness-Raposa, 2010; Hayes et al., 2020). Both species are expected to occur in the RWEC–RI; harbor seals may be present year-round in lower densities, but peak presence of both species is likely to occur in late spring through early summer (Kenney and Vigness-Raposa, 2010).

The Northeastern United States coast, including waters off Rhode Island, contains a variety of marine habitats that are suitable for these sea turtles, such as the shallow enclosed waters of the Peconic Bay and other bays in Long Island, the deeper waters of Long Island Sound and the Atlantic Ocean (Burke et al., 1993). With Rhode Island state waters being located within three miles of shore, more suitable habitat for adult sea turtles would be available compared to areas farther offshore.

There are four sea turtle species commonly found throughout the western North Atlantic which may occur within the Study Area. Consequently, these four species are considered potentially affected species. These species include the green sea turtle (*Chelonia mydas*), Kemp’s ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*). A fifth species, hawksbill sea turtle (*Eretmochelys imbricata*), may potentially occur within the region, but was not considered further in the impact assessment due to its use of tropical waters and coral reef habitats. Since this habitat is not present within the North Atlantic region, the presence of the hawksbill sea turtle would be extremely rare (NOAA Greater Atlantic Region Fisheries Office [“GARFO”], 2017). The four turtle species discussed in this section are listed as Endangered or Threatened under the ESA and are also listed as Endangered by the state of Rhode Island (RIDEM, 2020). USFWS and NMFS share the responsibility for sea turtle recovery under the authority of the ESA.

3.2.5.2 Potential Project Impacts

Construction and Decommissioning

Seafloor disturbances associated with installation and removal of the RWEC-RI may impact marine mammals and sea turtles by disrupting and temporarily displacing potential benthic prey species in the immediate area around the cable route. Marine mammals and sea turtles occurring in the area would likely be transiting in search of prey species, which may occasionally be benthic species. As discussed within Section 3.2.3, benthic species are expected to recover within 1 to 3 years.

Underwater noise generated by construction activities (including use of a pneumatic hammer and/or vibratory hammer at the landfall location for installation of the casing pipe and “goal posts”) could result in potential physiological and behavioral impacts on marine mammals and sea turtles. However, some marine mammal species show a preference for deeper waters and are less likely to occur in shallower Rhode Island state waters of the RWEC–RI, which may reduce the risk for potential impacts from nearshore construction.

Seasonal increases in marine mammal presence within offshore areas may increase the risk of exposure to above-threshold noise. For those very few individuals that may perceive the non-impulsive noise from DP vessels, impacts may be considered consequential if behavioral disruptions, short-term disruptions in communication, or temporary displacement from the ensonified area were to occur as this could result in the interruption of biologically significant behaviors.

Pinnipeds that may be present along the RWEC–RI could also be susceptible to in-air noise disturbance at haul out sites or pupping grounds, and in-air thresholds have been established by NMFS. However, above water noise impacts to pinnipeds are not expected to occur because the nearest known haul site for seals is approximately 3 km (1.86 mi) from the proposed location of the onshore Project components, and activities at this location are anticipated to produce relatively low levels of in-air noise.

Vessel strikes are another potential impact to marine mammals and sea turtles. Vessel strikes happen when either the animal or the vessel fails to detect one another in time to avoid the collision. Variables that contribute to the likelihood of a collision include vessel speed, vessel size and type and barriers to vessel detection by an animal (e.g. acoustic masking, heavy traffic, biologically focused activity). Most reports of collisions involve large whales, but collisions with smaller species have been reported (Evans et al., 2011; Van Waerebeek et al., 2007). Construction vessel traffic will result in a relatively localized impact that will occur sporadically throughout the approximate 8-month construction period, temporarily increasing the volume and movement of vessels. In the unlikely event that a strike resulting in injury or mortality were to occur, impacts could result in removal of those individuals from the population. The impacts resulting from the removal of an individual from a population that is listed as Endangered is countered by their overall resilience to population-level impacts. Due to comparatively low species densities, and the implementation of the avoidance measures discussed in 3.2.5.3 below, there is a low risk of impacts to occur. However, increased vessel traffic poses a strike risk for marine mammals during RWEC-RI construction.

Artificial lighting during installation and removal of the RWEC-RI will be associated with navigational and deck lighting on vessels from dusk to dawn. Only a limited area would be associated with the artificial lighting used on vessels relative to the surrounding unlit areas and the linear installation of the RWEC-RI will cause the lit area to constantly move along the cable route. Because of the relatively short duration of installation activities, lighting impacts for marine mammals will not be significant.

Operations and Maintenance

There are no anticipated impacts during O&M of the RWEC-RI unless a cable repair is required. Repair or replacement of cables or cable protection associated with the RWEC-RI during operations are considered non-routine maintenance activities potentially resulting in the same or lesser impacts as construction.

3.2.5.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to marine mammals and sea turtles:

- To the extent feasible, installation of the RWEC-RI will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
- To the extent feasible, the RWEC-RI will typically target a burial depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment.
- DP vessels will be used for installation of the RWEC-RI to the extent practicable.

- A plan for vessels will be developed prior to construction to identify no-anchorage areas to avoid documented sensitive resources.
- Vessels will follow NOAA and BOEM guidelines for marine mammal and sea turtle strike avoidance measures, including vessel speed restrictions.
- All personnel working offshore will receive training on marine mammal and sea turtle awareness and marine debris awareness.
- Revolution Wind will require all construction and operations vessels to comply with regulatory requirements related to the prevention and control of spills and discharges.
- Accidental spill or release of oils or other hazardous materials offshore will be managed through the OSRP.
- A ramp-up or soft-start will be used at the beginning of each pile segment during impact pile driving and/or vibratory pile driving to provide additional protection to mobile species in the vicinity by allowing them to vacate the area prior to the commencement of pile driving activities.
- Construction and operational lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations.
- All vessels will comply with USCG and EPA regulations that require operators to develop waste management plans, post informational placards, manifest trash sent to shore, and use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Vessels will also comply with BOEM lease stipulations that require adherence to NTL 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process.

3.2.6 Coastal and Marine Birds

3.2.6.1 Affected Environment

Information summarized in this section was compiled by reviewing publications and public data sources. The primary sources used include, but are not limited to, the following: RIDEM RI WAP (RIDEM et al. 2015), The Natural Heritage Area data layer hosted on the RIDEM ERM (RIDEM 2021b), USFWS IPaC database (USFWS, 2019 and 2020), Ocean SAMP surveys (RI CRMC 2010/2013), Northwest Atlantic Seabird Catalog (managed by NOAA), and individual species tracking studies (diving birds [Spiegel et al. 2017]; sea ducks [multiple researchers]; falcons [DeSorbo et al. 2018b]; Red Knot [Loring et al. 2018]; Piping Plover [Loring et al. 2019]; Roseate Tern [Loring et al. 2019].

A broad group of avian species passes over the Rhode Island state waters and the offshore region in general, including migrants (such as raptors and songbirds), coastal birds (such as shorebirds, waterfowl, and waders), and marine birds (such as seabirds and sea ducks). Many marine birds make annual migrations up and down the eastern seaboard (e.g., gannets, loons, and sea ducks), taking them directly through state waters in spring and fall. This results in a complex ecosystem where the community composition shifts regularly, and temporal and geographic patterns are highly variable. The region supports large populations of birds in summer, some of which breed in the area, such as coastal gulls and terns. Other summer residents, such as shearwaters and storm-petrels, visit from the Southern Hemisphere (where they breed during the austral summer) occasionally entering state waters. In the fall, many of the summer residents leave the area and migrate south to warmer regions and are replaced by species that breed further north and winter in the region such as common eider (*Somateria mollissima*) and harlequin duck (*Histrionicus histrionicus*) which are known to winter in the West Passage.

As the RWEC–RI approaches the landfall at Quonset Point in North Kingstown, coastal marine birds will come to dominate the species assemblages. Coastal birds typically forage within sight of land, while offshore species feed out of sight of land. Truly pelagic species forage at the frontal zone along or beyond the continental shelf break (Furness and Monaghan 1987, Schrieber and Burger 2001, Gaston 2004), and thus will generally not use coastal waters and are unlikely to occur in the RWEC–RI Project Area. Shallower waters within the RWEC–RI Project Area will provide foraging opportunities for terns, particularly the Roseate Tern (which feeds on sand lance), as well as sea duck, loons, gulls, and cormorants. Terns, including Roseate Terns, and related species will forage over shallow waters and sand spits near shore in pursuit of small prey fish (Nisbet et al. 2017).

Three species listed under the federal ESA occur in the region: piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), and roseate tern (*Sterna dougallii*). The Atlantic population of piping plovers nests on beaches in the region and will also migrate (spring and fall) through the area to and from breeding sites. There is no suitable piping plover nesting habitat within the Landfall Work Area because it is a developed property and the shoreline consists of a revetment. In addition, based on communication with the USFWS, the closest known nesting location for piping plover is approximately 1.5 miles to the northeast of the Onshore Project Area. Red knots winter in southern states or in Central or South America and pass through the region during migration in transit to and from Arctic breeding sites. Roseate terns also fly through the area on their way to breeding sites in New England states and Atlantic Canada. One species proposed for listing under the ESA, the black-capped petrel, could potentially occur in the state waters, although they are generally associated with deeper waters and are usually observed beyond the shelf break.

3.2.6.2 Potential Project Impacts

Construction and Decommissioning

Construction and decommissioning activities for the RWEC-RI will result in short-term, localized increases in turbidity close to the seafloor and in the water column (see Section 3.2.2). For birds that forage over open water, this could reduce visibility and inhibit prey detection in the immediate vicinity of construction activities. In addition, as discussed in Section 3.2.3.2, the sediment suspension and deposition from construction activities could impact benthic and shellfish, which are food sources for certain species. Any changes to prey base composition for marine birds during construction may result in the temporary loss of foraging opportunities. However, the small footprint of disturbance relative to the large expanse of similar habitat available within and adjacent to the RWEC-RI corridor and in the broader region will allow birds to access comparable prey species outside the disturbance area. Although a small strip of mudflat immediately in front of the Landfall Work Area will be exposed at low tides, there are no anticipated impacts to species that forage within intertidal zones, such as piping plover and red knot, due to the highly developed and disturbed nature of the Landfall Work Area and installing the nearshore portion of the RWEC-RI via HDD will avoid these habitats.

Birds might also temporarily avoid the RWEC-RI corridor due to above and below water noise generated by cable installation; however, no permanent habitat loss or displacement is anticipated. Vessel traffic could also both attract some bird species and cause others to avoid the area; similar to noise, no permanent habitat loss or displacement is anticipated.

Operations and Maintenance

The potential temporary impacts described above are considered unlikely during routine O&M of the RWEC-RI, but maybe occur if a cable repair is required. Repair or replacement of cables or cable protection associated with the RWEC-RI during operations are considered non-routine maintenance activities potentially resulting in the same or lesser impacts as construction.

3.2.6.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to coastal and marine birds:

- To the extent feasible, installation of the RWEC-RI will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
- Revolution Wind is developing an Avian Post-Construction Monitoring Plan for the Project that will summarize the approach to monitoring; describe overarching monitoring goals and objectives; identify the key avian species, priority questions, and data gaps unique to the region and Project Area that will be addressed through monitoring; and describe methods and time frames for data collection, analysis, and reporting. Post-construction monitoring will assess impacts of the Project with the purpose of filling select information gaps and supporting validation of the Project's Avian Risk Assessment. Focus may be placed on improving knowledge of ESA-listed species occurrence and movements offshore, avian collision risk, species/species-group displacement, or similar topics. Where possible, monitoring conducted by Revolution Wind will build on and align with post-construction monitoring conducted by the other Orsted/Eversource offshore wind projects in the Northeast region. Revolution Wind will engage with federal and state agencies and environmental groups (eNGOs) to identify appropriate monitoring options and technologies, and to facilitate acceptance of the final plan.
- Revolution Wind will document any dead (or injured) birds/bats found incidentally on vessels and structures during construction and post-construction and provide an annual report to BOEM and USFWS.
- Revolution Wind will require all construction and operations vessels to comply with regulatory requirements related to the prevention and control of spills and discharges.

- Accidental spill or release of oils or other hazardous materials offshore will be managed through the OSRP.
- Construction and operational lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations.
- All vessels will comply with USCG and EPA regulations that require operators to develop waste management plans, post informational placards, manifest trash sent to shore, and use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Vessels will also comply with BOEM lease stipulations that require adherence to NTL 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process.
- Using HDD to install the nearshore portion of the RWEC-RI, which will avoid impacts to the intertidal zone.

3.2.7 Marine Archeological Resources

Consistent with BOEM's Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585 (BOEM, 2017), a Marine Archaeological Resources Assessment ("MARA") was completed for the Project by SEARCH, Inc. (SEARCH), who is serving as the Qualified Marine Archaeologists for Revolution Wind. The current version of the MARA is provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552) (Appendix N).

Archaeologists reviewed extant public and proprietary databases containing information on shipwrecks, downed aircraft, or other potentially significant marine archaeological resources within the Project and surrounding areas. Ecological, geological, and cultural contexts were also developed to assist in the identification of potential submerged pre-contact Native American cultural resources. Finally, SEARCH reviewed gradiometer, side-scan sonar, sub-bottom profiler, and multibeam echosounder datasets collected during the 2019/2020 survey campaign to assess the presence or absence of potential submerged cultural resources within the Area of Potential Effects ("APE") offshore. SEARCH developed a paleolandscape reconstruction, based upon background research, regional geology, and the results of the high-resolution geophysical survey and geotechnical campaigns, which includes analysis of vibracores targeting potential submerged landforms.

In accordance with BOEM's Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585, avoidance and mitigation actions for cultural resources will be developed through Section 106 consultation with BOEM as the lead federal agency, the RIHPHC and Native American Tribes.

3.2.8 Commercial and Recreational Fishing

3.2.8.1 Affected Environment

The regional waters off the coast of Rhode Island and Massachusetts are transitional waters that separate Narragansett Bay and Long Island Sound from the OCS (BOEM, 2013). These waters straddle the Mid-Atlantic and New England regions and serve as the northern boundary for some Mid-Atlantic species and the southern boundary for some New England species. The species that may be found in the RWEC-RI reflect the transitional nature of this regional area.

Several factors directly affect spatial and temporal patterns of fish species, including habitat. The coastal waters of New England have diverse habitats that are defined by their temperature, salinity, pH, nutrient concentrations, physical structure, biotic structure, depth, and currents. The unique combination of habitat characteristics shapes the community of fish and invertebrate species that inhabit the area. Habitat characteristics influence species composition, distribution, and predator/prey dynamics. Benthic communities have experienced increased water temperatures in the region in the past several decades, and average pH is expected to continue to decline as seawater becomes more saturated with carbon dioxide (Saba et al., 2016). Acidification of seawater poses a threat to the health and survival of organisms with calcareous shells (such as the Atlantic scallop, blue clam, and hard clam), but less is known about direct effects of acidification on cartilaginous and bony fishes.

The distributional ranges of several groundfish species in New England waters have shifted northward and into deeper waters in response to increasing water temperatures (Pinsky et al., 2013; Nye et al., 2009) and more species are predicted to follow (Selden et al., 2018; Kleisner et al., 2017). The black sea bass, identified as particularly sensitive to habitat alteration (Guida et al., 2017), has been increasing in abundance over the past several years, and is expected to continue its expansion in southern New England as water temperatures increase (Kuffner, 2018; McBride et al., 2018). Several pelagic forage species have been increasing in the region, including butterfish, scup, squid (Collie et al., 2008) and Atlantic mackerel (McManus et al., 2018). Distributions of other species are reported to be shifting southward, including spiny dogfish, little skate, and silver hake (Walsh et al., 2015). It has been suggested that the spiny dogfish may replace the Atlantic cod as a major predator in southern New England as the cod is driven north by warm waters that the spiny dogfish tolerates well (Selden et al., 2018). Detailed information on commercial and recreational fishing can be found in Appendix S.

Further temperature increases in southern New England are expected to exceed the global ocean average by at least a factor of two, and ocean circulation patterns are projected to change (Saba et al., 2016). Distributional shifts are occurring in both demersal and pelagic species, perhaps mediated by changes in spawning locations and dates (Walsh et al., 2015). Southern species, including some highly migratory species such as mahi mahi that prefer warmer waters, are expected to follow the warming trend and become more abundant in the area (Walsh et al., 2015; South Atlantic Fishery Management Council, 2003). Climate change may also influence the migration behavior of anadromous fish in the region. The herrings, shad, and sturgeon were identified as having high biological sensitivity to adverse effects of climate change (Hare et al., 2016). In addition to physiological effects of temperature and pH, anadromous fishes face a physical risk caused by flooding in their spawning rivers.

As summarized in BOEM's Revised Environmental Assessment (BOEM, 2013), finfish assemblages off the coast of Rhode Island include demersal, pelagic, and shark species. In addition, there are important shellfish and migratory pelagic finfish throughout the region. Demersal species including groundfish such as cod and haddock, as well as other commercially important species such as monkfish, black sea bass, and winter skate. Many of these demersal fish species are considered to be high-value and are sought by both commercial and recreational anglers. Pelagic fishes are generally schooling and occupy the mid- to upper water column as juveniles and adults and are distributed from the nearshore to the continental slope and beyond. Some species are highly migratory and are reported to be present in the near-coastal and shelf surface waters of Southern New England waters in the summer, taking advantage of the abundant prey in the warm surface waters. Coastal migratory pelagics include fast-swimming schooling fishes that range from shore to the continental shelf edge and are sought by both recreational and commercial anglers. These fish use the highly productive coastal waters of the more expansive Mid-Atlantic Bight during the summer months and migrate to deeper and/or distant waters during the remainder of the year (BOEM, 2013). Several shark species also occupy this region.

3.2.8.2 Potential Project Impacts

Construction and Decommissioning

Construction and decommissioning activities associated with the RWEC-RI are generally expected to have short-term, localized impacts on access to fishing grounds due to safety measures on entering the area. In Rhode Island state waters fishing activity primarily uses pots and traps, followed by fixed nets, and the top species landed are scup, channeled whelk and summer flounder (Atlantic Coastal Cooperative Statistics Program, 2019). According to available VMS data (Northeast Regional Ocean Council, 2020), vessel intensity for the Atlantic herring, pelagic species (herring, mackerel, squid), monkfish, and squid fisheries are medium-high to very high along portions of the RWEC-RI route; therefore these fisheries are most likely to be affected during installation of the RWEC-RI.

Operations and Maintenance

During O&M of the RWEC-RI, commercial and recreational fisheries are expected to experience no effect or limited effects because the cables will be buried beneath the seabed. The USCG's stated policy is that "in the United States vessels will have the freedom to navigate through [wind farms], including export cable routes." (See USCG Navigation and Vessel Inspection Circular 01-19 dated 1 August 2019.) Therefore, commercial fishermen will have the ability to continue to fish along the RWEC-RI corridor.

As discussed in Sections 3.2.3.2 and 3.2.4.2, based on EMF modeling performed for the Project (Exponent, 2020), behavioral effects and/or changes in abundance and distributions of marine organisms due to EMF are not expected.

3.2.8.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to commercial and recreational fishing:

- To the extent feasible, installation of the RWEC-RI will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
- Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region.
- Communications and outreach with the commercial and recreational fishing industries will be guided by the Project-specific Fisheries Communication and Outreach Plan (see Appendix DD of the Project's COP).
- RWEC was sited to avoid conflicts with DoD use areas and navigational areas identified by the USCG, as applicable.
- Revolution Wind will consult with USCG, NUWC-Newport RI, the Northeast Marine Pilots Association and regional ferry service operators to avoid or reduce use conflicts.
- Project construction and O&M activities will be coordinated with appropriate contacts at USCG, NUWC-Newport, RI, and the Northeast Marine Pilots.
- A comprehensive communication plan will be implemented during offshore construction to inform all mariners, including commercial and recreational fishermen, and recreational boaters of construction activities and vessel movements. Communication will be facilitated through a Fisheries Liaison, Project website, and public notices to mariners (in coordination with USCG).

3.2.9 Recreational Boating and Tourism

3.2.9.1 Affected Environment

The Ocean SAMP provides offshore recreational maps of the Rhode Island Sound based on stakeholder feedback, USCG event permits, and racing event instructions (RI CRMC, 2010). Specifically, these waters are used for a variety of boat-based activities such as recreational boating, offshore sailboat racing, offshore diving, and offshore wildlife viewing. Offshore wildlife viewing near the region includes whale watching (peak season in June and August) and bird watching (year-round but particularly after storm events). The Ocean SAMP also identified several offshore recreational dive sites within the SAMP study area.

Table 3.2-10 provides a characterization of the sailboat, distance, and buoy races that generally occur in the vicinity of the RWEC-RI. Most of the races occur from May to September and have under 100 participants. The largest event is the Newport to Bermuda Yacht Race, which occurs in June and can have over 250 participants. The Off Soundings Club Spring Race Series often hosts up to 150 participants at its event in June off Block Island (ICF, 2012). The New York Yacht Club hosts multiple large race events each year, including its Annual Regatta, Race Week, and an Annual Cruise.

Figure 3.2-4 depicts recreational boating routes, distance sailing races, and recreational SCUBA diving areas in the vicinity of the RWEC-RI.

Table 3.2-10 Sailboat, Distance, and Buoy Races in or Near RWEC-RI

Event	Organizer	Month	Frequency	Course Description	Avg. No. of Vessels	Avg. Vessel Length (feet/meters)
Block Island Race Week	Storm Trysail Club (odd years); Ted Zuse (even years)	June	Annual	Week of buoy races west of Block Island	100+	30-90 / 9-27
New York Yacht Club Annual Regatta	New York Yacht Club	June	Annual	Buoy races south of Brenton Point	110	30-90 / 9-27
New York Yacht Club Invitational Cup	New York Yacht Club	Sept.	Biennial	Buoy races south of Brenton Point	20	42 / 12.8
New York Yacht Club Race Week	New York Yacht Club	Sept.	Biennial	Buoy races south of Brenton Point	150	30-90 / 9-27
Swan 42 National Championship	New York Yacht Club	July	Annual	Buoy races south of Brenton Point	20	42 / 12.8
Sail Newport Coastal Living Newport Regatta	Sail Newport	July	Annual	Buoy races south of Brenton Point	Varies	Varies
World championship regattas (vary) [b]	Various	Sept.	Annual	Buoy races south of Brenton Point	Varies	Varies
Annapolis to Newport Race	Annapolis Yacht Club	June	Biennial	Annapolis, MD, to Newport	61	34+ / 10.3+
Bermuda One-Two	Goat Island Yacht Club and Newport Yacht Club	June	Biennial	Singlehanded (one crew member): Newport to Bermuda; Doublehanded (two crew members): Bermuda to Newport	38	28-60 / 8.5-18.2
Block Island Race	Storm Trysail Club	May	Annual	Stamford, CT, around Block Island and back to Stamford	60	30-75 / 9.1-22.8

Event	Organizer	Month	Frequency	Course Description	Avg. No. of Vessels	Avg. Vessel Length (feet/meters)
Corinthians Stonington to Boothbay Harbor Race	Corinthians Association, Stonington Harbor Yacht Club, and Boothbay Harbor Yacht Club	July	Biennial	Stonington, CT, to Boothbay, ME	14	N/A
Earl Mitchell Regatta	Newport Yacht Club	Oct.	Annual	Newport to Block Island	15	30-50 / 9.1-15.2
Ida Lewis Yacht Club Distance Race	Ida Lewis Yacht Club	August	Annual	Multi-legged course through Rhode Island Sound and adjacent offshore waters	40	30-90 / 9.1-27.4
Marion to Bermuda Cruising Yacht Race	Marion-Bermuda Cruising Yacht Race Association	June	Biennial	Marion, MA, to Bermuda	48	32-80 / 9.7-24.3
New England Solo-Twin Championships	Newport Yacht Club and Goat Island Yacht Club[b]	July	Annual	Multi-legged course through Rhode Island Sound and adjacent offshore waters; starts and ends in Newport	35	24-60 / 7.3-18.2
Newport Bucket Regatta	Bucket Regattas/ Newport Shipyard	July	Annual	Three multi-legged courses off Brenton Point	19	68-147 / 20.7-44.8
Newport to Bermuda Race	Cruising Club of America	June	Biennial	Newport to Bermuda	265	30-90 / 9.1-27.4
New York Yacht Club Annual Cruise	New York Yacht Club	August	Annual	Varies	100	30-90 / 9.1-27.4
Offshore 160 Single-Handed Challenge	Newport Yacht Club and Goat Island Yacht Club	July	Biennial	Multi-legged course through Rhode Island Sound and adjacent offshore waters; starts and ends in Newport	15	28-60 / 8.5-18.2
Off Soundings Club Spring Race Series	Off Soundings Club	June	Annual	Day 1: Watch Hill to Block Island Day 2: Around Block Island	120-150	23-62 / 7-18.8

Event	Organizer	Month	Frequency	Course Description	Avg. No. of Vessels	Avg. Vessel Length (feet/meters)
Owen Mitchell Regatta	Newport Yacht Club	May	Annual	Newport to Block Island	31	24-44 / 7.3-13
Stamford Vineyard Race	Stamford Yacht Club	Aug./Sept.	Annual	Stamford, CT, to entrance of Vineyard Sound and back to Stamford	77	30-90/ 9.1-27.4
Volvo Ocean Race	N/A	Oct. - June	Triennial	Alicante, Spain to Gothenburg, Sweden with a stopover in Newport	N/A	N/A
Whaler's Race	New Bedford Yacht Club	Sept.	Annual	City of New Bedford, around Block Island, to Noman's Island, and back to New Bedford	22	25+ / 7.6+

Recreational boating in the West Passage of Narragansett Bay from Quonset to Narragansett is prevalent but not as dense as the East Passage. Unlike the East Passage which is home to Newport Harbor (multiple marinas, mooring fields, and clubs), Naval Station Newport (with its own marina, mooring field, and club), Jamestown's main harbor (multiple marinas, mooring fields, and clubs), and federal anchorages, the West Passage has relatively few marinas, mooring fields, and clubs from Narragansett to North Kingstown/Quonset.

The main mooring/dockage areas in the West Passage (from Quonset to Narragansett) are:

- Allen's Harbor: home to Mill Creek Marina, Quonset Davisville Navy Yacht Club, Allen Harbor Marina (North Kingstown owned)/moorings/public boat launch, The Marina at RI Mooring Services
- Wickford Harbor: home to North Kingstown's main mooring field, Wickford Shipyard, Safe Harbor Wickford Cove, Wickford Marina, Wickford Yacht Club, Pleasant St. Wharf, and a public boat launch.
- Dutch Island Harbor: home to Dutch Harbor Boat Yard and mooring field

There are a few smaller mooring areas off North Kingstown/Saunderstown (Bissel Cove, Plum Point, Plum Beach), off of the Saunderstown Yacht Club and off of Bonnet Shores. On the Jamestown side, there are private moorings extending the length of the island. Many of these clubs host sailboat racing event in the West Passage throughout the sailing season. Data regarding specific racing events and vessel numbers/lengths varies and not well documented.

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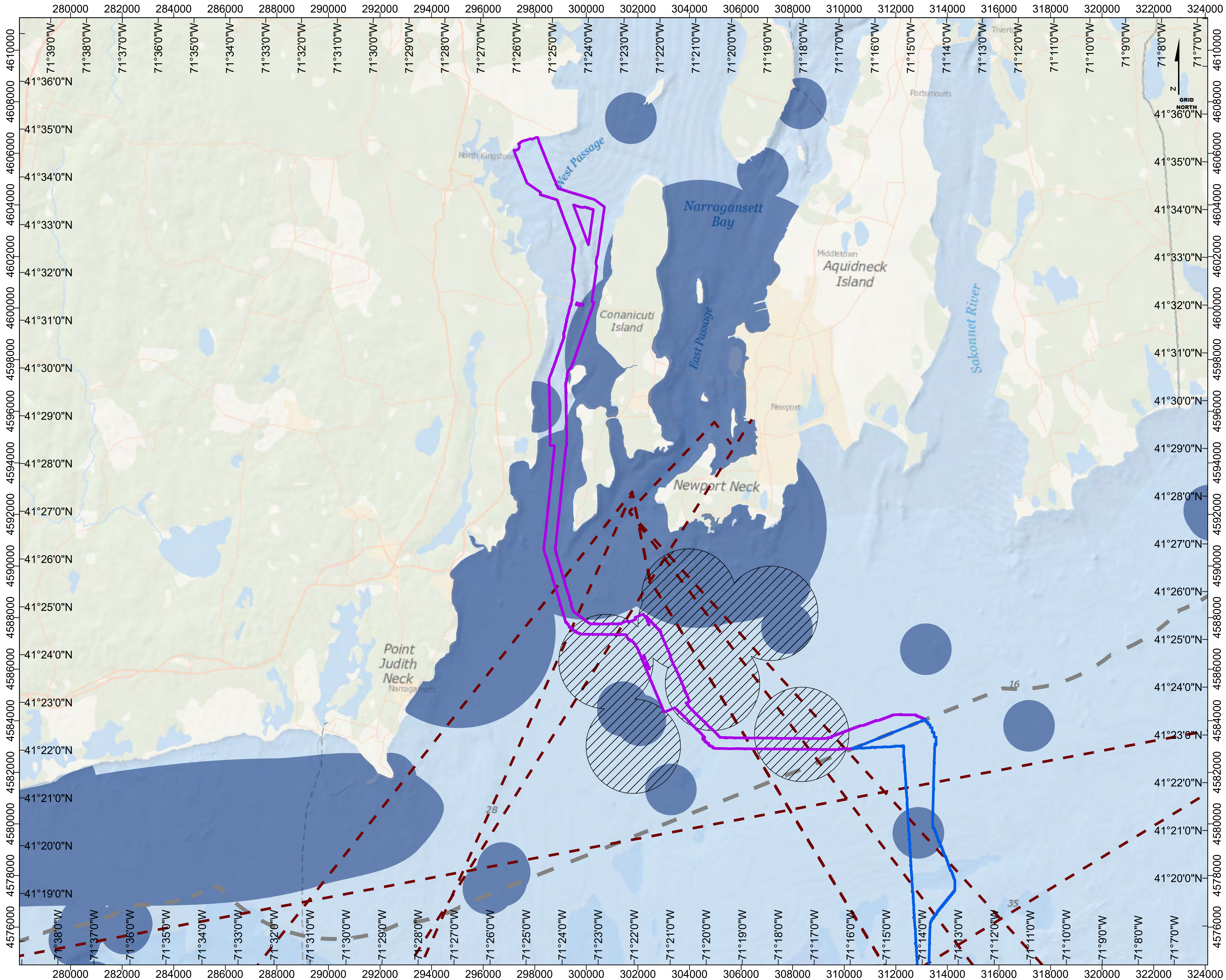
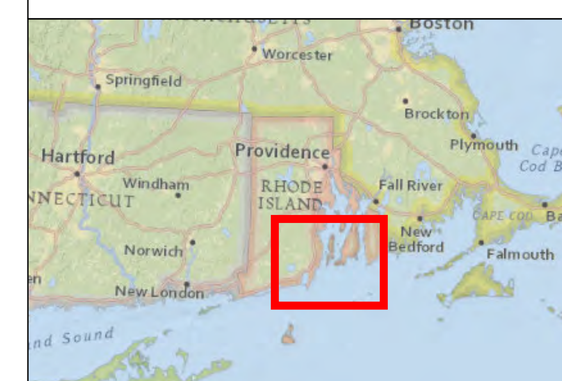
Figure 3.2-3
Offshore Recreation Features



Legend
- RWEC-OCS Project Area
- RWEC-RI Project Area
- 3-Nautical Mile State Water Boundary
- Distance Sailing Races
- Recreational Boating Areas of Particular Concern
- Recreational SCUBA Diving Areas

Service Layer Credits: World Ocean Reference: NOAA OCS, Esri, DeLorme National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
World_Ocean_Base: Esri, DeLorme, NaturalVue, OSAMP Figure 6



Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 1000 2000 3000 Meters

0 4,000 8,000 12,000 Feet

Date: 05/19/2020
Document no:

Created by: S. PELLETIER
Checked by: S. MOBERG
Approved by: STEPW

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3.2.9.2 Potential Project Impacts

Construction and Decommissioning

Impacts to recreational boating and tourism during construction and decommissioning of the RWEC-RI can occur from increased vessel traffic to construction locations. In addition, lighting of vessels during construction could also impact offshore recreational boating and tourism resources (e.g., altered fishing, scuba diving or sight-seeing conditions). Potential impacts to recreational boating from the RWEC-RI will generally be limited to construction and decommissioning and would be minimized by scheduling of most of the activity to avoid the peak tourist season.

Operations and Maintenance

During O&M of the RWEC-RI, recreational boating and tourism are expected to experience no effect or limited effects because the cables will be buried beneath the seabed. The RWEC-RI is not expected to have maintenance needs unless a cable repair is necessary. Therefore, impacts associated with increased vessel traffic and lighting within the RWEC-RI corridor are not expected during O&M unless repairs are needed. Such repairs are considered non-routine maintenance.

3.2.9.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to recreational boating and tourism:

- The onshore Project components construction schedule will be designed to minimize impacts to the local community during the summer tourist season, generally between Memorial Day and Labor Day.
- Communications and outreach with the commercial and recreational fishing industries will be guided by the Project-specific Fisheries Communication and Outreach Plan (see Appendix DD of the Project's COP).
- RWEC was sited to avoid conflicts with DoD use areas and navigational areas identified by the USCG, as applicable.
- Revolution Wind will consult with USCG, NUWC-Newport RI, the Northeast Marine Pilots Association and regional ferry service operators to avoid or reduce use conflicts.
- Project construction and O&M activities will be coordinated with appropriate contacts at USCG, NUWC-Newport, RI, and the Northeast Marine Pilots.
- A comprehensive communication plan will be implemented during offshore construction to inform all mariners, including commercial and recreational fishermen, and recreational boaters of construction activities and vessel movements. Communication will be facilitated through a Fisheries Liaison, Project website, and public notices to mariners (in coordination with USCG).

Finally, as described in Section 2.2.5.1, in general, offshore site preparation and installation north of the COLREGS line of demarcation will occur between the day after Labor Day and February 1 to avoid and minimize impacts to winter flounder (*Pseudopleuronectes* *americanus*) and shellfish. This schedule within state waters aligns with avoidance of the summer tourist season.

3.2.10 Commercial Shipping

3.2.10.1 Affected Environment

Commercial shipping within the region includes cargo vessels transiting to or from ports in the Narragansett Bay, Buzzards Bay, and Long Island Sound area. It also includes vessels transiting between a variety of other ports including the Port of New York and New Jersey, the Port of Boston, and other ports located on the east coast or abroad (RI CRMC, 2010).

A range of vessel types and activities characterize marine transportation in the Block Island and Rhode Island Sounds region. Commercial shipping involves the transport of goods (e.g., petroleum products, coal, and cars) through this area, while passenger ferries and cruise ships transport passengers between proximate coastal communities. Critical support to commercial vessel operations are provided by pilot boats, government enforcement vessels, and search and rescue vessels; they also facilitate safe navigation (RI CRMC, 2010).

There are two main traffic separation schemes located within the vicinity of the RWEC-RI corridor. These include the Narragansett Bay Traffic Separation Scheme (commercial traffic transiting north-south) and the Buzzards Bay Traffic Separation Scheme (commercial traffic transiting southwest-northeast). Traffic separation schemes are routing measures aimed at the separation of opposing streams of traffic by the establishment of shipping lanes, shipping zones, recommended routes, and precautionary areas (United States Department of Homeland Security, 2010).

Vessel traffic and navigation in the area may at times be impacted by restrictions. The RWEC-RI is primarily within the Narragansett Bay Special Operating Area ("OPAREA") Complex boundary, within which national defense training exercises are routinely conducted (NOAA, 2018); the OPAREA includes Block Island Sound and Rhode Island Sound, and extends seaward to the south.

Before it enters the Narragansett Bay along the West Passage, the RWEC-RI bisects the middle of the Buzzards Bay traffic separation zone and its associated inbound and outbound lanes. It then crosses the precautionary area at the northern end of the Narragansett Traffic Separation Scheme at the entrance of Narragansett Bay.

3.2.10.2 Potential Project Impacts

Construction and Decommissioning

Potential Project impacts of vessel traffic on marine navigation were evaluated in a detailed Navigation Safety Risk Assessment ("NSRA") prepared for the Project (Appendix T). Primary conclusions of the NSRA included that vessel traffic near the RWEC-RI is light and recreational/pleasure vessels represent the greatest proportion of vessel tracks in the study area. Project-related vessels will be navigated by trained, licensed vessel operators who will adhere to navigational rules and regulations. USCG-approved navigation lighting is required for all vessels during construction and O&M of the RWEC. All vessels operating between dusk and dawn are required to turn on navigation lights. Project construction activities will be carried out in close coordination with the Coast Guard.

Given the Project location relative to major commercial shipping lanes (not including commercial fishing), no significant disruption of the normal traffic patterns during the construction of the RWEC-RI is expected. The number of vessels that will operate during the construction phase is not expected to adversely impact normal traffic patterns. In addition, based on informal consultation with the Northeast Marine Pilots Association, no impacts or issues on navigation are anticipated as a result of the RWEC-RI.

Operations and Maintenance

During O&M of the RWEC-RI, commercial shipping is expected to experience no effect because the cables will be buried beneath the seabed. The RWEC-RI is not expected to have maintenance needs unless a cable repair is necessary. Therefore, impacts associated with increased vessel traffic within the RWEC-RI corridor are not expected during O&M unless repairs are needed. Such repairs are considered non-routine maintenance.

3.2.10.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to commercial shipping:

- RWEC was sited to avoid conflicts with DoD use areas and navigational areas identified by the USCG, as applicable.
- Revolution Wind will consult with USCG, the NUWC Newport RI, the Northeast Marine Pilots Association and regional ferry service operators to avoid or reduce use conflicts.
- Project construction and O&M activities will be coordinated with appropriate contacts at USCG, NUWC-Newport, RI, and the Northeast Marine Pilots.
- A comprehensive communication plan will be implemented during offshore construction to inform all mariners, including commercial and recreational fishermen, and recreational boaters of construction activities and vessel movements. Communication will be facilitated through a Fisheries Liaison, Project website, and public notices to mariners (in coordination with USCG).

3.2.11 Other Marine Uses

3.2.11.1 Affected Environment

This section describes the other marine uses, including military (United States Navy), in the general vicinity of the RWEC-RI. Military uses (United States Navy and other services, including Homeland Security [USCG]) occur within Rhode Island state waters and in proximity to the RWEC-RI. Such uses exist largely because of the proximity to Naval Station Newport, Newport Naval Undersea Warfare Center (Rhode Island), Naval Submarine Base New London, and USCG Academy (City of New London) (BOEM, 2013; RI CRMC, 2010). The United States Atlantic Fleet conducts training and testing exercises in the Narraganset Bay

OPAREA, as the Newport Naval Undersea Warfare Center routinely performs testing in the area (BOEM, 2013).

Other marine uses as presented in this section are defined below. Where present, these uses are shown on Figure 3.2.4.

Aids to Navigation

Aids to navigation ("ATON") are located in the vicinity of the RWEC-RI. ATONs are structures intended to assist a navigator in determining position or safe course, or to warn of dangers or obstructions to navigation. This data set includes lights, signals, buoys, day beacons, and other ATONs.

Anchorage Areas

Anchorage areas are located in the vicinity of the RWEC-RI, particularly within Narragansett Bay, including the West Passage. An anchorage area is a location at sea where vessels can lower their anchors and moor the vessel. The locations usually have conditions for safe anchorage, providing protection from poor weather conditions and other hazards. They can also be used as a mooring area for vessels waiting to enter a port or for the short-term staging area for barges containing construction materials.

Artificial Reefs

The artificial reefs within the region are generally created from obsolete materials, such as small steel boats and other marine vessels, surplus armored vehicles, tires, and concrete pipes, and are used to provide critical habitat for numerous species of fish in areas devoid of hard-bottom (BOEM, 2013).

Passenger Ferry Routes

Passenger ferries are commercial vessels used to carry passengers and their property from one shoreline to another. Such services in the region connect a variety of mainland (e.g., Newport, Point Judith) and island destinations (e.g., Block Island and Martha's Vineyard). The RWEC-RI crosses portions of the seasonal Newport-Block Island ferry and Quonset-Martha's Vineyard ferry routes.

Ocean Disposal Sites

As shown in Figure 4.6.8-1, there is one ocean disposal site in the vicinity of the RWEC-RI, which the EPA designates and manages under the Marine Protection, Research and Sanctuaries Act (MPRSA). Most of these designated sites are for the disposal of dredged materials.

Pilot Boarding Areas

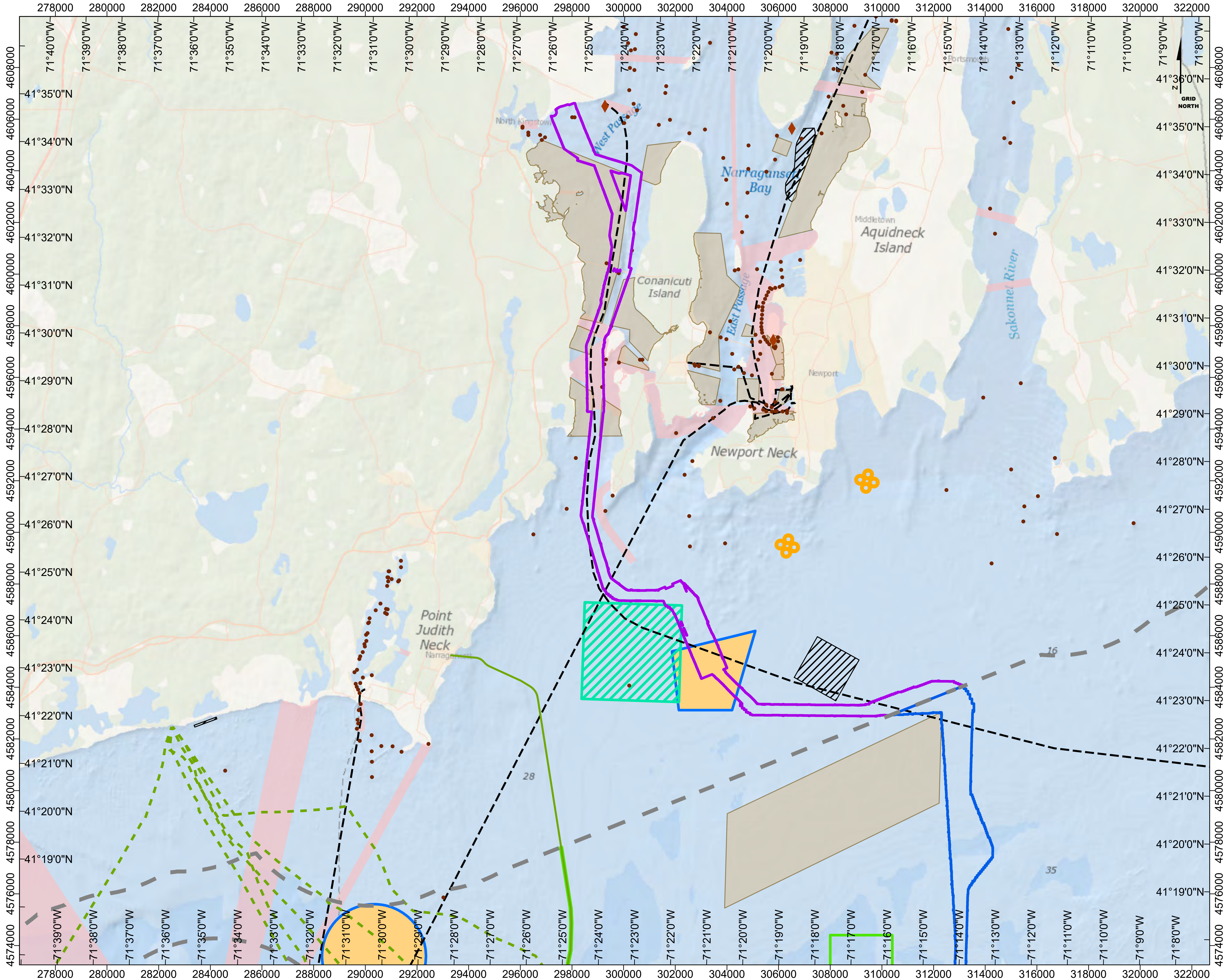
Pilot boarding areas are locations at sea where pilots who are familiar with local waters board incoming vessels to navigate their passage to a destination port. Pilotage is required by law for foreign vessels and United States vessels under register in foreign trade with specific draft characteristics. Pilot boarding areas are represented by a 0.5-nautical-mi (0.9-

km) radius around a coordinate point unless the coast pilot specifically designates a different radius or boarding area boundary. The RWEC-RI intersects one identified pilot boarding area – i.e., the Brenton Reef Pilot Station. Within the past two decades there are no documented cases of any vessel anchoring in the pilot boarding area, nor is there a recollection among the USCG or the Northeast Marine Pilots of any vessels anchoring there[11].

Submarine Cables and Cable Areas

There are existing submarine cables (i.e., electrical cables – communications or power - laid on the seafloor) that run through the RWEC-RI corridor. In addition, there are NOAA nautical chart cable and pipeline areas that denote where such infrastructure may be located. The existence of these areas does not necessarily mean that actual cables or pipeline are present (BOEM, 2013). As noted in Section 2.2.3.7, Revolution Wind has identified seven potential existing assets to-date along the RWEC-RI, some of which are in close proximity to each other (see Revolution Wind RWEC Design in Appendix A).

[11] Personal communication with Capt. P. Costabile, April 2020



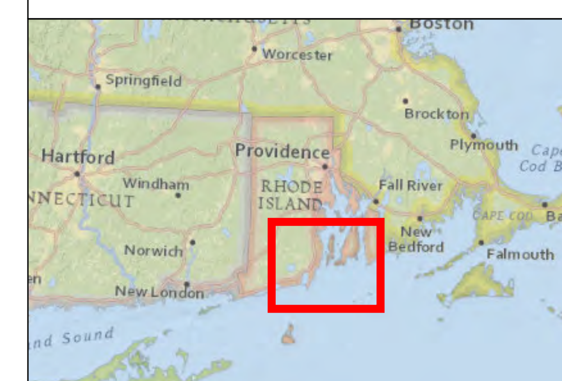
Revolution Wind

Figure 3.2-4
Other Marine Uses

Legend

- RWEC-OCS Project Area
- RWEC-RI Project Area
- Other Lease Areas
- 3-Nautical Mile State Water Boundary
- Submarine Cable
- Block Island Transmission Cables
- RI Ferry Route
- Bouy Location
- Aid To Navigation
- Artifical Reef
- Anchorage Areas
- Ocean Disposal Sites
- Restricted Area (Navy Operations)
- Pilot Boarding Areas
- Cable Area

Service Layer Credits: World Ocean Reference: NOAA OCS, Esri, DeLorme
National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
World_Ocean_Base: Esri, DeLorme, NaturalVue



Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 1000 2000 3000 Meters

0 5,000 10,000 15,000 Feet

Date: 05/19/2020
Document no:

Created by: S. PELLETIER
Checked by: S. MOBERG
Approved by: STEPW

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3.2.11.2 Potential Project Impacts

Construction and Decommissioning

Project-related vessel traffic impacts on commercial shipping were discussed in Section 3.2.10. Anticipated impacts to other marine uses, such as passenger ferry service or military operations, from RWEC-RI construction vessel traffic will not be significant. For instance, depending on the ports of origin (see Table 4.6-1) and destination, time of year, and time of day, vessel traffic may cross and/or impact passenger ferry service routes such as the Point Judith - Block Island Ferry. Although marine vessels and passenger ferry routes may overlap during construction and decommissioning, potential impacts to passenger ferries are anticipated to be the highest during the construction phase because Project-related vessel traffic will be the greatest during this period. Timely communication and notices will be issued to mariners informing them of construction activities and areas designated as off-limits.

Revolution Wind anticipates crossing seven existing submarine cable areas with installation of the RWEC-RI. Crossing of existing and operational cables poses the risk of damage to these existing facilities during RWEC-RI installation. However, Revolution Wind will coordinate with cable owners to identify methods to cross cables in agreement with the cable owners that will mitigate risk of damage.

Operations and Maintenance

There are no anticipated impacts during O&M of the RWEC-RI unless a cable repair is required. Repair or replacement of cables or cable protection associated with the RWEC-RI during operations are considered non-routine maintenance activities potentially resulting in the same or lesser impacts as construction.

3.2.11.3 Proposed Avoidance, Minimization, and Mitigation Measures

Environmental protective measures proposed by Revolution Wind are summarized in Section 2.2.5. Below is a list of measures applicable to other marine uses:

- To the extent feasible, the RWEC will typically target a burial depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment.
- To the extent feasible, installation of the RWEC will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
- RWEC was sited to avoid conflicts with DoD use areas and navigational areas identified by the USCG, as applicable.
- Revolution Wind will consult with USCG, the NUWC Newport RI, Northeast Marine Pilots Association and regional ferry service operators to avoid or reduce use conflicts.
- Project construction and O&M activities will be coordinated with appropriate contacts at USCG, the NUWC Newport, and the Northeast Marine Pilots.

- A comprehensive communication plan will be implemented during offshore construction to inform all mariners, including commercial and recreational fishermen, and recreational boaters of construction activities and vessel movements. Communication will be facilitated through a Fisheries Liaison, Project website, and public notices to mariners and vessel float plans (in coordination with USCG).

4

CRMP Regulatory Standards

The CRMP requires that the applicant provide sufficient information on the Project for CRMC to render a decision. Portions of the Project are subject to CRMC jurisdiction and the requirements of the CRMP (See Figure 1.1-1). In addition, the Landfall Work Area, Onshore Transmission Cables and OnSS are subject to the Shoreline Change (Beach) Special Area Management Plan (SAMP) which is incorporated into Part 1.1.6(I) of the CRMP. The Onshore Transmission Cables and OnSS are also subject to the Rules and Regulations Governing the Protection and Management of Freshwater Wetlands in the Vicinity of the Coast (650-RICR-20-00-2). Furthermore, the RWEC-RI from the mouth of Narragansett Bay to the three-nautical mile limit of state waters is subject to the policies and regulations of the Ocean SAMP, 650-RICR-20-05-11.

The following sections of the CRMP are addressed in this Chapter 4: Sections 1.1.5, 1.1.6(F), 1.1.6(I), 1.1.7, 1.1.8, 1.1.9, 1,1,10, 1.1.11, 1.2.1(E), 1.2.1(G), 1.2.2(A), 1.2.2(C), 1.2.2(F), 1.2.3, 1.3.1(B), 1.3.1(C), 1.3.1(F), 1.3.1(G), 1.3.1(H), 1.3.1(I), 1.3.1(J), 1.3.1(R), 1.3.3, 1.3.5, and 1.3.6.

Note, Section 1.3.1(A) of the CRMP (Category B Requirements) is addressed in Section 1.3.2 of this Category B Assent application; whereas Section 1.1.4(D) of the CRMP (Freshwater wetlands in the vicinity of the coast) is addressed in Appendix B of this application. For ease of review, Revolution Wind sets forth the applicable CRMP section and then provides its response. As demonstrated below, Revolution Wind meets all of the applicable standards.

4.1 CRMP Section 1.1.5 – Review Categories and Water Types

The RWEC-RI will pass through waters designated as Type 4 Multi-Purpose Waters within Narragansett Bay and Type 6 Industrial Waterfront and Commercial Navigation Channels in the nearshore area (See Figure 3.2-1). According to Table 1 in Section 1.1.5(A) of the CRMP, activities classified as "Energy-related Activities/Structures", "Dredging-Improvement", and "Filling in Tidal Waters" in Tidal Waters designated as Types 4 and 6 require a Category B Assent Application. Thus, Revolution Wind has submitted this application for Category B Assent. Similarly, activities listed in Table 2 in Section 1.1.5(B) of the CRMP specifically Energy related structures require a Category B Assent Application.

4.2 CRMP Section 1.1.6 – Applications for Category B Council Assents

Subparts A-E, G and H of Section 1.1.6 of the CRMP are noted and/or do not apply to the Project and are therefore not restated herein. Subparts F and I of Section 1.1.6 are applicable to the Project and addressed below.

4.2.1 CRMP Section 1.1.6(F) – Category B Applications

1. Applicants for activities and alterations listed as "B" in Tables 1, 2, or 3 in § 1.1.5 of this Part, in addition to adhering to the applicable policies, prerequisites, and standards, are required to address all Category B requirements as listed in applicable sections of the program and, where appropriate, other issues identified by the Council.

As demonstrated through responses to the applicable CRMP sections reviewed in this application, the Project will conform to the goals, policies, prerequisites, informational requirements, and standards of the CRMP.

2. Formal notice will be provided to all interested parties once completed forms for a Category B application have been filed with the Council. The notice shall set forth the nature of the application, any variances requested and the applicable sections of the CRMP from which a variance is requested. A public hearing will be scheduled if there are one or more substantive objections to the project, or at the consensus of four or more members of the Council.

Noted.

3. A Category B Assent shall be issued if the Council finds that the proposed alteration conforms to the goals, policies, prerequisites, informational requirements and standards of this Program.

See above response to §1.1.6(F)(1).

4.2.2 CRMP Section 1.1.6(I) – Coastal Hazard Analysis Application Requirements

1. The following new projects when subject to the jurisdiction of the CRMC must file a coastal hazard analysis with their CRMC application using the "CRMC Coastal Hazard Application Guidance" provided in Chapter 5 of the CRMC Shoreline Change Special Area Management Plan (Beach SAMP):

b. construction of new commercial and industrial structures as defined in § 1.1.2 of this Part;

d. Construction of any new private or public roadway, regardless of length;

e. construction of any new infrastructure project subject to §§ 1.3.1(F), (H), and (M) of this Part;

Revolution Wind will construct the above-referenced new structures. For this reason, a Coastal Hazard Analysis has been completed for the onshore Project components. (See Appendix C). Based on the Project Design Life of up to 35 years, a projected sea level rise of 5 ft (1.5 m) was used for the Hazard Assessment. A 5-ft (1.5-m) rise in sea levels

will not impact the onshore Project components which are located inland of the shore. The same 5-foot scenario does not expose the TJBs to future tidal inundation.

2. The following modifications to existing projects subject to the jurisdiction of the CRMC must file a coastal hazard analysis with their CRMC application using the "CRMC Coastal Hazard Application Guidance" provided in Chapter 5 of the CRMC Shoreline Change Special Area Management Plan (Beach SAMP): (list of modifications omitted)

Not applicable. Revolution Wind does not propose modification to existing projects referenced in this standard.

3. All projects meeting the analysis thresholds established in §§ 1.1.6(I)(1) and (2) of this Part above shall complete the CRMC coastal hazard application worksheet (http://www.crmc.ri.gov/coastalhazardapp.html) and provide the following information as part of the application: : (list of information omitted)

The information listed in this standard is included in the Coastal Hazard Analysis completed for the Project (see Appendix C).

4. All projects meeting the analysis thresholds established in §§ 1.1.6(I)(1) and (2) of this Part above shall provide site plans of the proposed project with the following overlays: (list of information omitted)

The required overlays are provided in Appendix C.

5. All projects meeting the analysis thresholds established in §§ 1.1.6(I)(1) and (2) of this Part above shall describe the proposed coastal adaptation techniques incorporated into the project design to overcome or accommodate any coastal hazard exposure risks resulting from the analyses required by § 1.1.6(I) of this Part.

The OnSS is sited in an area of the site that is higher than the surrounding ground. The elevation OnSS yard grade ranges between 18 and 20 feet NAVD88 and equipment within the OnSS is elevated above the 500-year coastal flood elevation of 23 feet NAVD88. This elevation is still higher than the modeled Stormtools Design Envelope (RICRMC, 2019) for the Project.

The TJBs will be located underground and located over 200 feet (61 m) from the shore. The TJBs are not predicted to be inundated by 5 feet (1.5 m) of SLR or Projected Erosion Rate for the Project. Buried transmission lines are often subject to groundwater inundation and the cables are designed to be resilient to inundation. The cable and joints are designed for water submersion. The conductor and XLPE insulation both contain outer layers of water swellable tapes. All manhole hardware and cable supports will be non-corrosive to ensure system can operate with corrosive water inside the manhole for extended periods.

4.2.3 CRMP Section 1.1.7 – Variances

A. Applicants desiring a variance from a standard shall make such request in writing and address the six criteria listed below in writing. Except as otherwise provided herein, the *application shall then be granted a variance only if the Council finds that the following six criteria are met.*

Not applicable. Revolution Wind does not anticipate requiring a variance from any standard in the CRMP.

4.2.4 CRMP Section 1.1.8 – Special Exceptions

The Project does not require a special exception. Specifically, Revolution Wind does not propose to conduct any of the prohibited activities listed under Section 1.1.5.A., Table 1, or any other prohibited activities in tidal or coastal pond waters, on shoreline features and their contiguous areas as listed in Sections 1.3.1.B. through 1.3.1.R.

4.2.5 CRMP Section 1.1.9 – Setbacks

Revolution Wind acknowledges the standards set forth in Section 1.1.9 and does not restate those standards herein. Revolution Wind notes that none of these standards is applicable to the Project. More specifically, Revolution Wind notes that at the landfall location at AP 185 Lot 008, the Coastal Feature is Coastal Beach backed by Manmade Shoreline. Based on the existing vegetated area within AP 185 Lot 008, it appears that the Coastal Buffer has been reduced to approximately 50 feet (15.24 m). The corresponding Setback from this Coastal Buffer is 75 feet (23 m).

The Landfall Work Area includes land within the 200-ft Contiguous Area of the Manmade Shoreline coastal feature, but installation of the RWEC-RI at the landfall will occur using HDD. The HDD entry pits will be approximately 200 ft (61 m) inland of the coastal feature such that no disturbance will occur within the existing 50-ft (15.24 m) vegetated Coastal Buffer or the corresponding 75 ft (22.86 m) Setback. Land disturbing activities are not proposed on AP 185 Lot 008; however, the existing parking lot within this property may be used for construction-related logistics such as parking, surveying equipment, and temporary staging of materials, if needed.

4.2.6 CRMP Section 1.1.10 – Climate Change and Sea Level Rise

Revolution Wind acknowledges policies in Section 1.1.10(A) and does not restate those herein. Revolution Wind has reviewed the 100-year storm event with 5 feet (1.5 m) of sea level rise (18 ft NAVD88) and has determined that this scenario would have no effect on Project infrastructure. The OnSS will be constructed with the substation equipment yard elevations ranging between 18 ft above NAVD88 on the east side and approximately 20 feet above NAVD88 on the west side. Critical electrical equipment within the yard will be elevated above the surrounding grade by 6 feet (1.8 m) which accommodates the 500-year coastal flood elevation at the OnSS site (23 ft NAVD88).

The Onshore Transmission Cable and TJBs will be installed underground within duct banks or concrete vaults. Based on a sea level rise assessment using Stormtools (RI CRMC, 2019), the Onshore Transmission Cable route will not be affected by sea level rise up to including 7 feet (2.1 m) of sea level rise. Regardless, buried transmission lines are often subject to groundwater inundation and the cables are designed to be resilient to inundation. The cable and joints are designed for water submersion. The conductor and XLPE insulation both contain outer layers of water swellable tapes. All manhole hardware and cable supports will be non-corrosive to ensure system can operate with corrosive water inside the manhole for extended periods.

The RWEC-RI will be installed at the landfall via HDD methodology, which will result in the export cables being buried approximately 65 feet (19.8 m) below ground, transitioning up to the entry and exit pits. The design of the RWEC-RI (including offshore and at the landfall location) anticipates that the cable will be submerged and incorporates watertight sheathing around the cable to protect the conductors. The design bears all inherent features of a marine cable meant to be fully immersed in water and installed and operated at high-sea depths under considerable water pressures.

4.2.7 CRMP Section 1.1.11 – Coastal Buffer Zones

Revolution Wind acknowledges the policies, prerequisites, prohibitions, and standards set forth in Section 1.1.11 and does not restate those herein. Revolution Wind acknowledges these policies and notes that the Project will not negatively affect the benefits of the Coastal Buffer Zones.

The Project's Landfall Work Area is proposed within existing developed properties (AP 185 Lots 001,004 and 008) adjacent to Type 6 Waters. The coastal feature in this location is Coastal Beach backed by Manmade Shoreline. Landward of the coastal feature within AP 185 Lot 008 an existing approximately 50-foot (15.24 m) wide vegetated Coastal Buffer Zone is present separating the existing commercial development from the coastal feature. The Coastal Buffer Zone is contained entirely with Lot 008 and doesn't extend to other portions of the Landfall Work Area. The Landfall Work Area does not lie within a RIDEM-mapped Natural Heritage and Endangered Species Program ("NHESP") Area (RIDEM, 2021b). Existing vegetation within the Coastal Buffer Zone is composed of native low shrubs, grasses, and herbs.

The existing development within AP 185 Lot 008 was permitted under CRMC Assents 2004-10-009 and 2014-04-089 which outline the Assent conditions that apply to the current property owner, including approved activities within the Coastal Buffer Zone. Revolution Wind has secured an easement with the property owner for the use of a portion of Lot 008 for the Project. Therefore, maintenance of the Coastal Buffer Zone and any authorized improvements such as such as shoreline access paths falls to the property owner and is not applicable to the Project.

The Onshore Transmission Cable within Circuit Drive crosses through a Coastal Buffer Zone extending north from Wetland 1. This area of Coastal Buffer Zone is developed and includes landscaped areas, access roads and parking lots associated with existing developments within AP 179, Lots 010, 013, 018 and 025, and AP 185 Lot 009; a stormwater detention basin within AP 179 Lot 021; and the Blue Beach parking lot and access path within AP 179 Lot 033 and 022, respectively. Constructing the Onshore Transmission Cable below Circuit Drive within this Coastal Buffer Zone will not alter the

character of the Buffer Zone nor affect the existing uses and benefits currently provided.

4.3 CRMP Section 1.2.1 – Tidal and Coastal Pond Waters

Subparts A-D and F of Section 1.2.1 of the CRMP are not applicable to the Project and are therefore not restated herein; however, Subparts E and G of Section 1.2.1 are applicable to the Project and addressed below.

E. Type 4 Multipurpose Waters

1. This category includes:

a. Large expanses of open water in Narragansett Bay and the Sounds which support a variety of commercial and recreational activities while maintaining good value as a fish and wildlife habitat; and

b. Open waters adjacent to shorelines that could support water dependent commercial, industrial, and/or high intensity recreational activities.

Approximately 0.5 mi of the RWEC-RI is located within Type 6 Waters at the landfall location. The remainder of the RWEC-RI (approximately 22.5 mi) is located in Type 4 Waters through the West Passage of Narragansett Bay to the three-nautical mile limit of state waters. The RWEC-RI is considered a water dependent activity.

2. Polices

a. The Council's goal is to maintain a balance among the diverse activities that must coexist in Type 4 waters. The changing characteristics of traditional activities and the development of new water dependent uses shall, where possible, be accommodated in keeping with the principle that the Council shall work to preserve and restore ecological systems.

Revolution Wind proposes to install two submarine export cables in state waters (i.e., the RWEC-RI) to a target burial depth of 4 to 6 feet (1.2 to 1.8 m) beneath Type 4 Waters for a distance of approximately 22.5 miles (36.2 km). The route for RWEC-RI was carefully selected through consultation with stakeholders to avoid conflicts with traditional activities and disturbance of sensitive ecosystems. The entire RWEC-RI in state waters is located within the recently proposed Narragansett Bay West Passage Renewable Energy Cable Corridor which was developed through collaboration with various stakeholders along with the collection of geophysical, geotechnical, and ecological studies within Narragansett Bay (RI CRMC, 2021).

b. The Council recognizes that large portions of Type 4 waters include important fishing grounds and fishery habitats, and shall protect such areas from alterations and activities that threaten the vitality of Rhode Island fisheries.

Refer to Sections 3.2.3, 3.2.4, and 3.2.8 of this Category B Assent application for a discussion of benthic and shellfish resources, finfish and EFH, and commercial and recreational fisheries, respectively. Potential impacts to these resources resulting from installation of the RWEC-RI are localized and short-term in nature and will occur

over a limited portion of the available fishing grounds; therefore, installation and operation of the RWEC-RI will not threaten the vitality of Rhode Island fisheries. In addition, the burial depth of the RWEC-RI will allow static and mobile gear fisheries to operate along the cable corridor following installation.

c. Aquaculture leases...

Not Applicable.

d. The Council shall work to promote the maintenance of good water quality within the Bay. While recognizing that stresses on water quality will always be present in urban areas such as the Providence River, the Council shall work to promote a diversification of activities within the upper Bay region through the water quality improvement process.

The Project is expected to result in short-term impacts to water quality within the Bay during installation of the RWEC-RI. Refer to Section 3.2.2.3 and Appendix O of this Category B Assent application for a discussion of these short-term impacts to water quality. Revolution Wind will apply for a Section 401 Water Quality Certificate with RIDEM.

G. Type 6 Industrial waterfronts and commercial navigation channels

1. These water areas are extensively altered in order to accommodate commercial and industrial water dependent and water enhanced activities. They include all or portions of the following areas:

...

c. Quonset Point and Davisville

...

Landfall of the RWEC-RI is proposed in the southwestern portion of Type 6 Waters at Quonset Point in North Kingstown.

2. Policies

a. The Council's goals for Type 6 waters and adjacent lands under Council jurisdiction are to encourage and support modernization and increased commercial activity related to shipping and commercial fisheries.

b. Highest priority uses of Type 6 waters and adjacent lands under Council jurisdiction are:

(1) berthing, loading and unloading, and servicing of commercial vessels;

(2) construction and maintenance of port facilities, navigation channels, and berths; and

(AA) The Council shall prohibit activities that substantially detract from or interfere with these priority uses.

The RWEC-RI approaches Quonset Point to make landfall approximately 0.6 mi west of Quonset Point Pier at the western boundary of the Type 6 Waters. Onshore, the RWEC and Onshore Transmission Cable cross under existing developed properties. At the landfall, AP 185 Lot 008 is developed as an office building. The RWEC-RI will not

interfere with any existing navigation channels, berthing, loading and unloading, and servicing of commercial vessels, or maintenance of port facilities, navigation channels, and berths.

c. The Council will encourage and support port development and modernization and increased economic activity in the marine industries by participating wherever possible in the joint long range planning and development activities with other state and local agencies, including the R.I. Port Authority, the Department of Environmental Management, and coastal cities and towns.

Noted. Overall, the Project will bring substantial benefits to Rhode Island, including the marine economic sector. Guidehouse evaluated the direct[12], indirect[13], and induced jobs[14]; labor earnings[15]; gross output[16]; and economic value added[17] expected from the Project (inclusive of the RWF, RWEC, and onshore Project components). Based on this evaluation, the Project would have beneficial effects for the national economy across both phases – construction and operation – with an expected gross output (i.e. the sum value of all goods and services at all stages of production resulting from the Project) of roughly $1,360.3 million and valued add (the best indicator of economic development benefits to the local economy) of roughly $737.9 million. For Rhode Island, the expected gross output and value add are $726.8 million and $390.6 million, respectively. This includes the generation of 3,059 direct, indirect, and induced jobs during the construction phase, and 233 direct, indirect, and induced annual jobs during the operations phase (Guidehouse, 2020).

d. Through its Special Area Management Plan for Providence Harbor, and other planning initiatives, the Council will identify and designate acceptable disposal solutions and sites adequate to meet the need for dredging, and provide the assurances required by industry that channel depths will be maintained, while minimizing environmental effects. …

Not applicable.

12 Direct jobs are on-site labor and professional services. On-site labor is given in job years, which are full-time equivalent (FTE) jobs multiplied by the number of construction years. Construction jobs are given as FTE job-years since they are spread over a multi-year construction period. Some construction jobs will last only a portion of a year while others may last the entire expected construction period of three years. Operations jobs are given as annual FTE jobs over the entire operating period.

13 Indirect jobs are driven by the increase in demand for goods and services from direct on-site spending from the Project.

14 Induced jobs are driven by the local expenditures of those receiving payments within the first two job categories or increased household spending by workers.

15 Labor earnings are the additional earnings (wages and employer paid benefits) associated with the additional local jobs.

16 Gross output is the sum value of all goods and services at all stages of production resulting from the Project.

17 Value added is the best indicator of economic development benefits to the local economy. The sum total of value added of all enterprises and self-employed in a given state comprises that state's gross domestic product. These values are the sum of earnings from capital and labor or the difference between total gross output and the cost of intermediate inputs. It is comprised of payments made to workers, proprietary income, other property type income, indirect business taxes, and taxes on production and imports less subsidies.

4.4 CRMP Section 1.2.2 – Shoreline Features

Subparts B, D, E and G of Section 1.2.2 are not applicable to the Project and are therefore not stated herein; however, Subparts A, C, and F of Section 1.2.2 are applicable to the Project and addressed below.

A. Coastal Beaches

1. Policies

a. The Council's goals are:

(1) to preserve the qualities of, and public access to those beaches which are an important recreational resource (adjacent to Type 1 and 2 waters);

Blue Beach, a Coastal Beach adjacent to Type 2 waters, is located west of the Project's landfall location. No work is proposed at Blue Beach. Access to Blue Beach may be temporarily disrupted during the installation of the Onshore Transmission Cable in the shoulder of Circuit Drive, but any disruption will be intermittent during the limited construction period. As referenced in Table 2.2-10, the construction schedule for onshore construction will be designed to minimize impacts to the local community during the summer tourist season, generally between Memorial Day and Labor Day, and Revolution Wind will coordinate with local authorities during construction to minimize local traffic impacts. Also, in state waters north of the COLREGS line of demarcation, RWEC-RI construction will occur between Labor Day and February 1 to avoid and minimize impacts to winter flounder and shellfish (see Section 2.2.5.1 of this Category B Assent application).

(2) to prevent activities that will significantly disrupt longshore and/or onshore offshore beach processes, thereby creating an erosion or flooding hazard; and,

The Project will not disrupt longshore and/or onshore-offshore beach processes. Utilizing an HDD methodology, the RWEC-RI will make landfall beneath the intertidal zone, Coastal Beach, Manmade Shoreline and Coastal Buffer Zone. The use of HDD will avoid activities that could temporarily or permanently affect longshore or onshore beach processes.

(3) to prevent construction in high hazard areas; and

High hazard areas associated with Project construction along the shoreline is limited to the FEMA-designated Coastal Velocity Zone (VE Elevation 21) and FEMA Coastal A Zone (AW Elevation 12) in other landward portions of the Landfall Work Area. The Project infrastructure will be entirely below ground within these flood zones and will not be affected by these hazard conditions. Furthermore, CRMC's Shoreline Change Mapping (RI CRMC, 2016) indicates that this section of shoreline has experienced little erosion and in fact have accreted at a rate of approximately 0.5 ft (0.15 m) per year during the study period (reference transects 1684 and 1685).

(4) to protect the scenic and ecologic value of beaches.

All Project infrastructure near Blue Beach (i.e., the RWEC-RI, TJBs, and Onshore Transmission Cable) will be installed below-ground and, therefore, will not affect the scenic value of the beach. Also, no work is proposed at Blue Beach and, therefore, the ecological value of the beach will not be affected.

Nearshore and onshore construction activities may temporarily affect the scenic value of Blue Beach. However, this will be limited to the limited construction duration (up to 18 months). As referenced in Table 2.2-9, the construction schedule for onshore construction will be designed to minimize impacts to the local community during the summer tourist season, generally between Memorial Day and Labor Day. Also, in state waters north of the COLREGS line of demarcation, RWEC-RI construction will occur between Labor Day and February 1 to avoid and minimize impacts to winter flounder and shellfish (see Section 2.2.5.1 of this Category B Assent application).

b. Alterations to beaches adjacent to Type 1 and Type 2 waters are prohibited except where the primary purpose of the project is to preserve or enhance the area as a natural habitat for native plants and wildlife. In no case shall structural shoreline protection facilities be used to preserve or enhance these areas as a natural habitat or to protect the shoreline feature.

Not applicable. The Project will not alter a Coastal Beach.

c. Alterations to beaches adjacent to Type 3, 4, 5, and 6 waters may be permitted if: (subparts omitted)

Not applicable. The Project will not alter a Coastal Beach.

d. Vehicular use of beaches where not otherwise prohibited or restricted by property owners or by private or public management programs is permitted only under the following conditions: (subparts omitted)

Not applicable. The Project does not propose vehicular use on a Coastal Beach.

2. Prohibitions

a. The construction of new structures other than access ways, walkover structures, and beach facilities, are prohibited in setback areas.

Not applicable. The Project will install the RWEC-RI below grade using an HDD methodology and will not construct new structures that interfere with the Council's goals for the Setback.

b. The use of plastic snow fencing is prohibited due to the hazards presented to fish, marine mammals, and other wildlife in the aftermath of a storm event.

Revolution Wind will comply.

c. Alterations to beaches adjacent to Type 1 and Type 2 waters are prohibited except where the primary purpose of the project is to preserve or enhance the area as a natural habitat for native plants and wildlife.

Not applicable. The Project will not alter a Coastal Beach.

C. Coastal Wetlands

Revolution Wind acknowledges the prerequisites, standards, and prohibitions set forth in Section 1.2.2(C) and does not restate those herein.

The Project will not alter Coastal Wetland. The Onshore Transmission Cable is located within 50 ft (15.2 m) of Coastal Wetland 1 (refer to Onshore Transmission Cable plans in Appendix A). However, construction and installation of the Onshore Transmission Cable near Coastal Wetland 1 will be confined to within the existing paved roadway; thus, there will be no impact to or effect on existing functions and values of this coastal wetland. In accordance with the Project's SESC Plan (refer to Revolution Wind Onshore Transmission Facilities SESC Plan in Appendix A) compost filter sock along the road shoulder and catch basin inlet protection along the entire Onshore Transmission Cable route will be installed during construction to prevent the discharge of sediments to sensitive coastal environments.

F. Manmade Shorelines

Revolution Wind acknowledges the prerequisites, standards, and prohibitions set forth in Section 1.2.2(F) and does not restate those herein.

The RWEC-RI landfall location includes Manmade Shoreline which currently consists of a cast-in-place concrete revetment fronted by riprap (refer to the HDD Landfall Design plans sheets 2, 3 and 4 in Appendix A).

Using an HDD method to install the RWEC-RI at the landfall location, the Project avoids alteration of the existing cast-in-place concrete revetment. Revolution Wind will have no ownership, repair, or maintenance interest in the existing Manmade Shoreline.

4.5 CRMP Section 1.2.3 – Areas of Historic and Archaeological Significance

A. Policies

1. The Council's goal is to, where possible, preserve and protect significant historic and archaeological properties in the coastal zone.

Revolution Wind has submitted to BOEM a Terrestrial Archaeological Resources Assessment. A copy of this report is provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552) (Appendix K).

Moreover, Revolution Wind has submitted to BOEM a Marine Archaeological Resources Assessment. A copy of this report is provided under confidential cover to Category B Assent application because it contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552) (Appendix N).

A VRA was prepared for the OnSS which assessed visibility of the OnSS from all areas within a 3-mile radius (VSA; 30.5 sq mi). VSRs and proximate residences within 150 ft were considered. The VRA concluded that proximate abutters may be temporarily

impacted during construction and decommissioning and limited visual impact during operation. Public resources in the VSA will experience negligible visual impacts (Refer to Section 3.1.8 and Appendix I of this application).

Revolution Wind will avoid adverse impacts to historic and archaeological resources to the extent practicable. BOEM is required to satisfy Section 106 of the NHPA, which requires consultation with State Historic Preservation Offices ("SHPOs"), Tribal Historic Preservation Offices ("THPOs"), and other interested parties, as well as assessment and mitigation of unavoidable adverse effects to historic properties.

2. Preservation of significant historic and archaeological properties is a high priority use of the coastal region. Activities which damage or destroy important properties shall be considered a low priority.

As noted above, Revolution Wind will avoid adverse impacts to historic and archaeological resources to the extent practicable. Any unavoidable adverse impacts will require mitigation, as determined through BOEM's Section 106 Consultation obligations.

3. The Council shall require modification of, or shall prohibit proposed actions subject to its jurisdiction where it finds a reasonable probability of adverse impacts on properties listed in the National Register of Historic Places. Adverse impacts are those which can reasonably be expected to diminish or destroy those qualities of the property which make it eligible for the National Register of Historic Places. The Council shall solicit the recommendations of the RI Historical Preservation and Heritage Commission regarding impacts on such properties.

BOEM is consulting with the RIHPHC in order to satisfy Section 106 of the NHPA. Revolution Wind has shared information and data with the RIHPHC to support their review of the Project under Section 106 of the NHPA.

4. Prior to permitting actions subject to its jurisdiction on or adjacent to properties eligible for inclusion (but not actually listed in the National Register of Historic Places), and/or areas designated as historically or archaeologically sensitive by the RI Historical Preservation and Heritage Commission as the result of their predictive model, the Council shall solicit the recommendations of the Commission regarding possible adverse impacts on these properties. The Council may, based on the Commission's recommendations and other evidence before it, including other priority uses of this Program, require modification of or may prohibit the proposed action where such adverse impacts are likely.

BOEM is consulting with the RIHPHC in order to satisfy Section 106 of the NHPA. Revolution Wind has shared information and data with the RIHPHC to support their review of the Project under Section 106 of the NHPA.

5. Structural shoreline protection facilities may be permitted in Type 1 Waters provided that the structure is necessary to protect a structure which is currently listed in the National Register of Historic Places.

Not applicable.

4.6 CRMP Section 1.3.1 – In Tidal and Coastal Pond Waters, On Shoreline Features And Their Contiguous Areas

Subpart A of Section 1.3.1 is reviewed in Section 1.3.2 of this Category B Assent application. Subparts B, C, F-J, and R of Section 1.3.1 of the CRMP are applicable the Project and addressed in the following subsections. Subparts A, D, E, and K-Q of Section 1.3.1 are not applicable to the Project and are therefore not restated herein.

4.6.1 CRMP Section 1.3.1(B) – Filling, removing, or grading of shoreline features

1. Policies

a. Established agricultural practices in areas contiguous to shoreline features are excluded from this section.

Not applicable.

b. All filling, removing or grading activities shall be done in accordance with the policies and standards of this section and the standards and specifications set forth in the most recent edition of the Rhode Island Soil Erosion and Sediment Control Handbook.

No filling or grading will occur on the shoreline feature. The HDD entry pits are about 290 ft (88.4 m) inland from the coastal feature (see HDD Landfall Design HDD Plan & Profile HDD East and HDD West in Appendix A). The Onshore Transmission Cable will follow Circuit Drive and enter the 200-foot Contiguous Area measured from Coastal Freshwater Wetland 1 (see Onshore Transmission Cable plans in Appendix A). Temporary excavation and backfill of the HDD entry pits in the Landfall Work Area and trenching for the Onshore Transmission Cable will be carried out with appropriate sediment and erosion controls in place that are consistent with the 2016 update to the RISESCH (see Onshore Transmission Facilities SESC Plan in Appendix A).

c. All new activities subject to §§ 1.3.1(C) (residential, commercial, and industrial structures), 1.3.1(M) and 1.3.3 of this Part, or those activities which disturb more than five thousand (5,000) square feet of land on a site shall prepare and implement an erosion and sediment control plan approved by the Council which references all necessary practices for erosion and sediment control. All erosion and sediment control plans shall be consistent with applicable policies and standards contained in the Rhode Island Coastal Resources Management Program and the standards and specifications set forth in the most recent edition of the Rhode Island Soil Erosion and Sediment Control Handbook. All erosion and sediment control plans shall be strictly adhered to.

Refer to Revolution Wind Onshore Transmission Facilities SESC Plan and Revolution Wind Proposed Onshore Substation SESC Plan (Appendices E and F, respectively) prepared for RIPDES authorization under the Construction General Permit. All erosion and sediment control plans are consistent with applicable policies and standards in the CRMP and the standards and specifications set forth in the most recent edition of the RISESCH.

d. The Council recognizes the most recent version of the Rhode Island Soil Erosion and Sediment Control Handbook, and its amendments, published jointly by the Rhode Island Department of Environmental Management and the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), as containing appropriate Best Management Practices (BMP) for use within the CRMC's jurisdiction. All erosion and sediment control plans shall be consistent with this manual. Applicants are also encouraged to consult the most recent version of the Rhode Island Stormwater Design and Installation Standards Manual during the preparation of their erosion and sediment control plan in order to ensure consistency with the Council's stormwater management requirements (see § 1.3.1(F) of this Part).

The SESC Plan prepared for the OnSS was developed following the template prepared by the RIPDES Program and construction BMPs were developed following guidance in the 2016 revision to the RISESCH. The long-term stormwater management practices incorporated into the OnSS design are consistent with the Stormwater Management, Design and Installation Rules (RIDEM, 2018b)and the latest edition of the Rhode Island Stormwater Design and Installation Standards Manual. Note, utility installation work in roadways does not trigger the Stormwater Management, Design and Installation Rules in accordance with Minimum Standard 6 A.4. *Pavement excavation and patching that is incidental to the primary project purpose, such as replacement of a collapsed storm drain, is not classified as redevelopment*.[18] In this instance, the primary project purpose is the installation of an underground transmission line.

e. Routine filling, removing, or grading of bulk materials (e.g. coal, salt, etc.) that occurs as part of the normal operations of an existing bulk transfer facility (e.g., the Port of Providence) which is adjacent to type 6 waters is excluded from the provisions of this section…

Not applicable.

f. Filling, removing, or grading activities shall be reviewed at the Category B level when:

(1) the filling or removing involves more than 10,000 cubic yards of material;

(2) the affected area is greater than two acres; or

(3) the affected area is a designated historic area or archaeologically sensitive site.

Construction of the onshore Project components will disturb more than 2 acres. Revolution Wind understands the Project is being reviewed at the Category B level.

2. Prohibitions (list omitted)

Not applicable. Revolution Wind does not propose any activities listed in this subpart

3. Standards

a. The following standards apply in all cases where filling, removal, or grading is undertaken:

(1) Fill slopes shall have a maximum grade of thirty percent (30%);

18 Personal communication with Nicholas Pisani PE on August 11, 2020.

Excavations associated with the Landfall Work Area and the Onshore Transmission Cable are temporary and will be backfilled and restored to pre-existing grades and conditions. Graded slopes associated with the OnSS are proposed to have a 3:1 slopes and a structural retaining wall will be installed to minimize graded slope lengths to meet existing grades. Refer to Onshore Substation plans at Appendix A. These plans are provided under confidential cover to this Category B Assent application because they contain confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552).

(2) All excess excavated materials, excess fill, excess construction materials, and debris shall be removed from the site and shall not be disposed in tidal waters or on a coastal feature;

Excess excavated materials, excess fill, excess construction materials, and debris will be collected, sorted for recycling or disposal, and re-interred within the construction footprint if appropriate or shipped offsite to an appropriately approved, licensed disposal facility. Waste storage and disposal will be conducted in accordance with applicable state and federal requirements.

(3) Disturbed uplands adjacent to a construction site shall be graded and re-vegetated or otherwise stabilized to prevent erosion during or immediately after construction. Nutrients shall be applied at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface waters;

The closest construction to the coast begins at the HDD entry pits within a previously developed site in Quonset Business Park, approximately 200 ft (61 m) from the Coastal Feature. The OnSS and Onshore Transmission Cable construction will be carried out following the Project-specific SESC Plan. All stabilization work will be undertaken in accordance to the time frames provided in the RIPDES Construction General Permit. .

(4) Removal or placement of sediments along jetties or groins may be permitted only as part of an approved dredging or beach nourishment project (see § 1.3.1(I) of this Part);

Not Applicable. Revolution Wind does not propose removal or placement of sediments along jetties or groins.

(5) All fill shall be clean and free of materials which may cause pollution of tidal waters;

Onshore Project components involving excavation and backfill (the HDD entry pits and Onshore Transmission Cable) will reuse suitable excavated materials for backfill. Where these excavated materials are not suitable for re-use, fill material will be imported to the site. In accordance with the RIDEM Remediation Regulations requirements, fill materials will be "certified clean fill" determined by laboratory analysis and visual assessment for debris and rubble. At the OnSS, structural fill meeting specific gradation requirements will similarly be certified clean fill.

(6) Cutting into rather than filling out over a coastal bank is the preferred method of changing upland slopes; and

Coastal Bank is not present in the Project Area. Coastal Features are Coastal Beach backed by Manmade Shoreline. The Project will not alter existing Coastal Features as the landfall will be made using HDD.

(7) Limit the application, generation, and migration of toxic substances and ensure that toxic substances are properly stored and disposed of onsite in accordance with all applicable federal, state, and local requirements.

The Project does not include application of toxic substances as part of the construction activities. Any oils or toxic materials that may be kept at the substation will be properly labeled and stored according to all applicable federal, state, and local requirements. Equipment will be mounted on concrete foundations with concrete secondary insulating fluid containment designed for 110 percent containment. A SPCC Plan will be developed for the Project to address potential for discharges and releases from onshore construction.

b. The following upland and shoreline earthwork standards shall be required in those cases where the Council determines that additional measures are warranted in order to protect the environment of the coastal region. Such requirements shall be listed on Assents as stipulations.

Noted, see responses below.

c. For earthwork on shoreline features:

(1) Prior to initiation of construction, the contractor may be required to meet on site with the CRMC staff to discuss and clarify the conditions of the permit;

Noted; however, earthwork is not proposed on a shoreline feature.

(2) A re-vegetation plan shall be submitted for review and approval when construction is undertaken on a barrier beach. This plan shall describe plant material, methods of planting, time of planting, soil amendments, and maintenance;

Not applicable. The Project does not include construction on a Barrier Beach.

(3) Construction materials and excavated soils shall not be placed or stored on any shoreline feature excepting developed barrier beaches and manmade shorelines;

Excavated material is not proposed to be stored on a Shoreline Feature; note, the Shoreline Feature present at the landfall location is Manmade Shoreline. The HDD entry pits are positioned approximately 290 ft landward of the coastal feature (See Revolution Wind Excavation Details in the HDD Landfall Design plan set).

(4) All disturbed soils shall be graded smooth to a maximum 3:1 slope and re-vegetated immediately after construction, or temporarily stabilized with mulch, jute matting, or similar means until seasonal conditions permit such re-vegetation;

No new slopes will be graded within the CRMC contiguous area. All excavations associated with the Landfall Work Area and the Onshore Transmission Cable will be backfilled and graded to restore pre-construction grades and conditions (e.g. level paved or landscaped areas). At the OnSS, slopes will be graded to 3:1 and stabilized with vegetation in accordance with the SESC Plans for this Project component (see

Appendix A). These plans are provided under confidential cover to this Category B Assent application because they contain confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552).

(5) In sensitive areas, work shall be carried out from areas above slope from coastal features. Machinery and construction equipment shall normally not be allowed to operate on a coastal wetland. For unavoidable work on a coastal wetland, a protective cover shall be deployed to minimize disturbance;

Equipment will not be operated on Coastal Features or in a Coastal Wetland.

(6) In instances where the CRMC permits temporary disturbance of a coastal feature, shoreline slope, buffer zone, or area of beach grass, the disturbed area shall be completely restored by the owner under the guidance of CRMC staff; and

Disturbance of Coastal Features or any vegetated area adjacent to the coast is not proposed. The Landfall Work Area is within an existing developed parcel and the HDD entry pits will be located within a paved area approximately 290 ft north of the Manmade Shoreline (See Revolution Wind Excavation Details in the HDD Landfall Design plan set). At the landfall location, the RWEC-RI will be installed using HDD and, therefore, will avoid the Coastal Feature and adjacent vegetated areas.

(7) Concrete structures which will come in contact with salt water shall be constructed with concrete which utilizes a Type II or Type V air entraining Portland cement or an equivalent that is resistant to sulfate attacks of seawater.

No onshore concrete structures are proposed within shoreline features that would contact saltwater.

d. For upland earthwork measures shall be taken to minimize erosion:

(1) A line of staked hay bales or other erosion preventing devices (including diversion ditches, check dams, holding ponds, filter barrier fabric, jute or straw mulch) shall be placed at the downslope perimeter of the proposed area of construction prior to any grading, filling, construction, or other earthwork. Hay bales shall be toed-in to a depth of 3 to 4 inches and maintained by replacing bales where necessary until permanent re-vegetation of the site is completed. No soils or other materials are authorized to pass beyond the bale line;

All perimeter soil erosion and sediment controls will be selected and installed consistent with the latest version of the RISESCH. Compost filled filter sock and straw wattles may be used with or without silt fence for perimeter erosion control. Refer to Revolution Wind Onshore Transmission Facilities SESC Plan and Revolution Wind Proposed Onshore Substation SESC Plan (Appendix A). *These plans are provided under confidential cover* to this Category B Assent application because they contain confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552).

(2) All slopes shall be returned to the original grade unless otherwise specified;

All excavations associated with the Landfall Work Area and the Onshore Transmission Cable will be backfilled and graded to restore pre-construction grades and conditions (e.g. level paved or landscaped areas). At the OnSS, slopes will be graded to 3:1 and stabilized with vegetation in accordance with the SESC Plans for this Project component (see Appendix A). These plans are provided under confidential cover to this Category B Assent application because they contain confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552).

(3) Where natural or manmade slopes are or have become susceptible to erosion, the slopes shall be graded to a suitable slope and re-vegetated with thick rooting brush vegetation. Mulch shall be applied as necessary to provide protection against erosion until the vegetation is established;

The Project SESC Plans specify proposed measures for avoiding and mitigating erosion. The measures will comply with the latest version of the RISESCH. Refer to Revolution Wind Onshore Transmission Facilities SESC Plan and Revolution Wind Proposed Onshore Substation SESC Plan (Appendix A). These plans are provided under confidential cover to this Category B Assent application because they contain confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552).

(4) Construction shall be timed to accommodate stream and/or runoff flow and not allow flows over exposed, un-stabilized soils, or into or through the excavation. Flows shall not be restricted in such a manner that flooding or inhibition or normal flushing occurs;

Not Applicable. The Project does not involve in-stream work.

(5) Any pumping of groundwater which may be necessary for de-watering shall be discharged into sediment traps consisting of a minimum of staked hay bale rings enclosing crushed stone or trap rock of a size sufficient to disperse inflow velocity. Hay bales shall be recessed 4 to 6 inches into the soil and maintained; and

Noted. All groundwater discharges will be governed by the limitations of the RIPDES General Permit for Construction Activity or the RIPDES Remediation General Permit, as appropriate.

(6) There shall be no discharge of sediment laden waters into storm drains. Storm drains shall be surrounded by staked hay bales to intercept sediment.

Storm drain inlet protection will be provided. Discharges will be directed to temporary sediment basins and/or vegetated areas away from sensitive receptors and storm drains.

e. For any disturbance of steep slopes (over 15 percent): (standards omitted)

Not applicable. Existing steep slopes over 15 percent will not be altered by the Project.

4.6.2 CRMP Section 1.3.1(C) – Residential, Commercial, Industrial, and Recreational Structures

Revolution Wind acknowledges the policies and prerequisites set forth in Section 1.3.1(C)(1) and (2) and does not restate those herein. Revolution Wind proposes a light industrial facility within AP 185, Lots 001, 004 and 008, along Burlingham Avenue and Circuit Drive, within AP 179 Lot 011, along Camp Avenue and within AP 179 Lots 001 and 030 in the Town of North Kingstown, Rhode Island. The Project is predominately within the Quonset Business Park, and within those areas is subject to the authority of the Quonset Development Corporation ("QDC"). Project components within Camp Avenue are subject to the authority of the Town of North Kingstown.

The Project does not require public water or sewer system connections, or on-site water withdrawal and/or sewage disposal. Revolution Wind proposes a light industrial facility that does not require transportation services. The OnSS will require a connection to backup electric, telephone and fiberoptic services. These services are available in the Project Area, and the connection will be made from the closest utility pole proximate to the OnSS and through consultation with TNEC.

Revolution Wind has filed an Application for Development Plan Review (QDC, 2018) with the QDC for the OnSS and will file an application for a utility easement for portions of the Onshore Transmission Cable to be located within QDC-managed roadways. Based upon consultation with QDC, Revolution Wind does not anticipate the need for a Zoning Permit, Variance or Special Use Permit. Because the Quonset Business Park is a state-managed development area, the State Building Commission has authority over the issuance of building permits. State Building Commission review includes review by the State Fire Marshall's office. Consultation with the State Building Commission has been initiated.[19] A Building Official Form signed by the State Building Commission Official is included with this application.

At the municipal level, street opening permits and/or easements for the portion of the Project in Camp Avenue will be obtained from the Town of North Kingstown prior to construction.

3. Prohibitions

Subparts 1.3.1(C)(3)(a-f) do not apply to the Project. Subpart 1.3.1(C)(3)(g) relates to activities proposed in the 200-foot Contiguous Area landward of the coastal feature. Revolution Wind provides the following responses:

- Filling, removal, and grading of shoreline features – See Section 4.6.1 of this application.
- Residential buildings – Not applicable.
- Commercial and industrial structures features – See Section 4.6.2 of this application.
- Recreational structures – Not applicable.

19 State Agency Project Plan Review File ID 37455.

- **Municipal sewage treatment facilities – Not applicable.**
- **Onsite wastewater treatment systems ("OWTS") – Not applicable.**
- **Point discharges – runoff – Not applicable. See Section 4.6.3 of this application.**
- **Point discharges – other – Not applicable. See Section 4.6.3 of this application.**
- **Structural shoreline protection – Not applicable.**
- **Non-structural shoreline protection – Not applicable.**
- **Upland dredged material disposal – Not applicable.**
- **Energy related structure – See Section 4.6.4 of the application.**
- **Mining – Not applicable.**
- **Construction of public roads, bridges, parking lots, railroad lines, and airports – Not applicable**
- **Associated residential structures – Not applicable.**

4. Standards

a. General:

(1) See standards given in "Filling, Removing, or Grading of Shoreline Features" in § 1.3.1(B) of this Part, as applicable.

Refer to Section 4.6.1 of this Category B Assent application.

(2) See standards given in "Sewage Treatment and Disposal" in § 1.3.1(F) of this Part, as applicable.

Refer to Section 4.6.3 of this Category B Assent application.

(3) Commercial and Industrial docks, wharves and piers shall be designed and certified by a registered professional engineer.

Not applicable.

(4) All commercial and industrial structures and operations in tidal waters shall have a defined structural perimeter for in-water facilities, which shall describe and limit that area in which repair or alteration activities may take place. Structural perimeters shall be defined on the basis of in-water facilities in place as of September 30, 1971, or subsequently assented structures. All new or modified structural perimeter limit lines shall be a maximum of ten (10) feet (3 m) outside of the structures. The structural perimeter limit (SPL) shall be designated on all plans with the corners designated by their State Plane Coordinates. However, in all cases the SPL shall be setback at least fifty (50) feet (15.24 m) from approved mooring fields. In addition the SPL shall be setback at least three times the authorized project depth from federal navigation projects (e.g. navigation channels and anchorage areas).

Revolution Wind proposes a water dependent, light industrial facility in Rhode Island state waters (i.e., the RWEC-RI). Revolution Wind will seek a license and/or commercial lease of submerged lands for renewable energy development rather than a structural perimeter limit, as appropriate, from CRMC pursuant to CRMC's Enabling Act, R.I. Gen. Laws Section 46-23-1 et seq, and applicable CRMC regulations. The RWEC-RI is a submarine facility buried below the sea floor and will not conflict with navigation or preclude other uses of Rhode Island state waters. The RWEC-RI was sited to avoid

conflicts with DoD use areas and navigational areas identified by the USCG, as applicable.

(5) It is permissible to have vessels berthed at a facility outside of the structural perimeter limit if, in the opinion of the Executive Director, there are no conflicts with other users, impacts to resources, or conflicts with the DEM Shellfish Program. All vessels shall be berthed parallel to piers and docks if outside of the structural perimeter limit.

Not applicable.

b. All new or existing commercial marine facilities (CMF) as defined in § 1.1.2 of this Part shall perform fitness of purpose inspections in accordance with the CRMC "Guidelines for Fitness of Purpose Investigations and Certifications." The addition of new structural components or systems on existing CMFs that are structurally independent of the existing components or systems shall be considered as "new." (subparts omitted)

Not applicable.

c. Residential, commercial, industrial, and recreational buildings:

(1) Excavation and grading shall be restricted to those activities and areas necessary for the construction of the building and/or appurtenant structures (see § 1.3.1(B) of this Part).

(2) Applicants shall be required to reduce the inflow of pollutants carried by surface runoff in accordance with the policies and standards contained in § 1.3.1(F) of this Part and as detailed in the most recent version of the Rhode Island Stormwater Design and Installation Standards Manual.

Revolution Wind will comply. Refer to Section 4.6.3 of this application for a description of compliance with the Rhode Island Stormwater Design and Installation Standards Manual.

6. Flood zone construction. In many instances lands under the jurisdiction of the CRMC are by virtue of their topographic position subject to flooding. The Federal Emergency Management Agency has evaluated the risk of flooding and has established one hundred (100) year return frequency elevations of the flood waters (i.e., the Base Flood Elevation, (BFE) for all of the State's coastal communities. The approximate limits of the flood zones and the associated Base Flood Elevations are shown on the FEMA Flood Insurance Rate Maps, which are commonly available at each communities building official's office. In recognition that structures located within Flood Hazard Zones must be designed to meet more severe conditions than those not, the Rhode Island State Building Code, (RISBC) contains specific requirements for flood zone construction.

A FEMA-designated Coastal Velocity Zone (VE Elevation 21) is mapped along the shoreline in the Landfall Work Area and a FEMA Coastal A Zone (AW Elevation 12) is mapped in other landward portions of the Landfall Work Area and Onshore Transmission Cable. The Project infrastructure will be entirely below ground within these flood zones and will not be affected by these hazard conditions. At the OnSS, a coastal flood zone is present with a base flood elevation of 13 ft NAVD88. The OnSS site is outside of the Limit of Moderate Wave Action associated with the coastal flood

zone. The OnSS will be constructed with the substation yard elevations ranging between 18 ft (5.5 m) above NAVD88 on the east side and approximately 20 ft (6.1 m) above NAVD88 on the west side. Critical electrical equipment within the yard will be elevated above the surrounding grade by 6 ft (1.8 m) which accommodates the 500-year coastal flood elevation at the OnSS site (23 ft NAVD88). Compliance with the Rhode Island State Building Code will be addressed through consultation with the State Building Commission and is demonstrated by the enclosed signed Building Official Form.

a. The CRMC requires all applicants proposing construction within flood hazard zones to demonstrate that all applicable portions of the RISBC are to be met. This demonstration shall be made by submitting to the CRMC at the time of application a building official's form properly completed and signed by the local building official.

The signed Building Official Form is provided with this application.

7. Construction in flood hazard zones. In addition to the requirements of the RISBC, the CRMC suggests that applicants incorporate the following items into their proposed designs:

a. For construction in wave velocity (V) zones as defined by FEMA Flood Insurance Rate Maps: (list omitted)

Not applicable. Revolution Wind does not propose above-grade structures within the FEMA velocity zone.

b. For construction in coastal (A) Flood Zones. (list omitted)

Portions of the Landfall Work Area and Onshore Transmission Cable are located within the FEMA-designated coastal A zone. These facilities will be entirely below grade and are not intended for habitation.

At the OnSS, a coastal A zone is present with a base flood elevation of 13 ft NAVD88. The OnSS site is outside of the Limit of Moderate Wave Action associated with the coastal flood zone. In order to minimize grading at the site and meet Eversource's design standards for construction in flood zones, the OnSS will be constructed at elevations ranging between 18 feet (5.5 m) above NAVD88 on the east side and approximately 20 feet (6.1 m) above NAVD88 on the west side. Critical electrical equipment within the yard will be elevated above the surrounding grade by 6 feet which accommodates the 500-year coastal flood elevation at the OnSS site (23 ft or 7 m NAVD88).

4.6.3 CRMP Section 1.3.1(F) – Treatment of Sewage and Stormwater

Revolution Wind acknowledges the policies and prerequisites set forth in Section 1.3.1(F) (1) and (2) and does not restate those herein.

A stormwater management plan has been developed which addresses storm water runoff treatment based on the Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8; Stormwater Rules) (see Appendix U) and emphasizes the use of Low Impact Development techniques. A long-term stormwater operation and

maintenance ("O&M") plan is provided in Appendix V. The O&M plan was developed to ensure the continued proper functioning of the stormwater system for this Project. A SESC Plan has been prepared for the Project that complies with the RISESCH (RI State Conservation Committee et al., 2016).

The OnSS will comply with the Stormwater Rules. The proposed stormwater management design employs qualifying pervious area ("QPA") to treat proposed compacted gravel roadways within the substation yard. Subdrains beneath the gravel surface of the substation yard will collect pre-treated stormwater and discharge to infiltration basins. Runoff from proposed building roofs within the yard and access driveways outside of the yard will be directed to infiltration basins. The proposed infiltration basin system has been designed to treat and infiltrate up to and including the 100-year storm event. The use of infiltration for stormwater management will mitigate any potential thermal or low dissolved oxygen impacts by avoiding point source discharges. Alterations to existing drainage patterns will be avoided by the proposed stormwater management design which matches or reduces existing peak discharge rates at the existing design points. Refer to Revolution Wind Proposed Onshore Substation Stormwater Management Report (Appendix U).

At the OnSS, the Project proposes to restore disturbed areas outside of the substation and related improvements with an assemblage of native planting selected from the Rhode Island Coastal Plant Guide. Refer to the Revolution Wind Proposed Onshore Substation plans sheets W1.01 and W2.01 at Appendix A. These plans are provided under confidential cover to this Category B Assent application because they contain confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552).

The Project does not propose any new or increased discharges and will not discharge to salt marshes, tidal channels, unconsolidated coastal banks or bluffs. The Project does not require public water or sewer system connections, or on-site water withdrawal and/or sewage disposal.

The Project requires authorization under the RIPDES Construction General Permit and requires a Section 401 Water Quality Certification from RIDEM.

3. Prohibitions
a. Point source discharges of sewage and/or stormwater runoff are prohibited on unconsolidated coastal banks and bluffs.

Not applicable. Revolution Wind will not have any such point source discharges.

b. New and enlarged stormwater discharges to the high salt marsh environment bordering Type 1 and Type 2 waters and within salt marshes designated for preservation which border Type 3, 4, 5, and 6 waters are prohibited. Stormwater discharges to existing well flushed tidal channels within high marshes shall not be subject to this prohibition. All such discharges, however, shall meet the applicable standards contained herein.

Not applicable. Revolution Wind will not have any new or enlarged discharges to salt marsh or tidal channels.

c. Point source discharges of sewage are prohibited in Type 1 waters.

Not applicable. Revolution Wind will not generate or discharge sewage.

4. Standards
a. For Onsite Wastewater Treatment Systems (OWTS):

Not applicable. Revolution Wind does not propose an OWTS.

b. The requirements of the RIDEM Stormwater Management, Design and Installation Rules (250-RICR-150-10-8) shall apply to all CRMC applications.

Revolution Wind complies with this standard. A stormwater management design was prepared in accordance with 250-RICR-150-10-8 (RIDEM, 2018b). Refer to Revolution Wind Proposed Onshore Substation Stormwater Management Report (Appendix U).

c. For stormwater management the Council requires, in accordance with the "Smart Development for a Cleaner Bay Act of 2007" (see R.I. Gen. Laws Chapter 45-61.2), that all applicable projects meet the following requirements:
(1) Maintain pre-development groundwater recharge and infiltration on site to the maximum extent practicable;
(2) Demonstrate that post-construction stormwater runoff is controlled, and that post-development peak discharge rates do not exceed pre-development peak discharge rates; and

Revolution Wind complies with this standard. The proposed stormwater management design meets or reduces existing peak discharge rates and infiltrates up to and including the 100-year storm event. Refer to Revolution Wind Proposed Onshore Substation Stormwater Management Report (Appendix U).

(3) Use low impact-design techniques as the primary method of stormwater control to the maximum extent practicable.

Revolution Wind complies with this standard. Stormwater management at the OnSS emphasizes the use of infiltration to manage up to and including the 100-year storm event. Refer to Stormwater Management Report (Appendix U).

d. Residential, commercial, industrial or public recreational structures as defined in § 1.3.1(C) of this Part shall provide treatment and management of stormwater runoff for all new structural footprint expansions, including building rooftops, greater than six (600) hundred square feet in size and any new impervious pavement, driveways, sidewalks, or parking areas, regardless of size. Applicable projects shall submit a stormwater management plan that demonstrates compliance with the eleven (11) minimum stormwater management standards and performance criteria as detailed in the most recent version of the RIDEM Rhode Island Stormwater Design and Installation Standards Manual. Single-family dwelling projects, however, may meet these provisions as detailed below in §§ 1.3.1(F)(3)(h) and (i) of this Part, below.

Revolution Wind complies with this standard. Stormwater management at the OnSS emphasizes the use of infiltration to manage up to and including the 100-year storm event. The stormwater design complies with 250-RICR-150-10-8. Refer to Stormwater Management Report (Appendix U).

e. Roadways, highways, bridges, and other projects subject to § 1.3.1(M) of this Part shall…. provide treatment and management of stormwater runoff for all new impervious surfaces. These projects shall submit a stormwater management plan that demonstrates compliance with the eleven (11) minimum stormwater management standards and performance criteria as detailed in the most recent version of the RIDEM Rhode Island Stormwater Design and Installation Standards Manual. Any improvement projects to existing roads, highways and bridges and other projects subject to § 1.3.1(M) of this Part that result in the creation of new impervious surfaces shall provide treatment and management of stormwater as above for all new impervious surfaces. Maintenance activities such as pavement resurfacing projects, replacement of existing drainage systems, minor roadway repairs, or emergency roadway and drainage repairs are excluded from these requirements provided the project does not result in an expansion of the existing impervious surface area, new or enlarged stormwater discharges, or the removal of roadway materials down to the erodible soil surface of ten thousand (10,000) square feet or more of existing impervious area.

The Project does not propose any new roadways but will conduct utility installation along public roads maintained by the QDC and the Town of North Kingstown. Appropriate soil erosion and sediment control measures incorporated into the SESC Plan will be implemented during construction such that the interests of this section are protected. Subsequent parts of this section are not applicable to this Project.

Because the Project does not propose any new Public roadways, bridges, parking lots, railroad lines, and airports subject to Section 1.3.1(M), the policies prohibitions and standards in 1.3.1(M) are not applicable to the Project.

f. Unless exempted as a maintenance activity herein, any redevelopment that disturbs ten thousand (10,000) square feet or more of existing impervious surface coverage shall comply with Minimum Stormwater Standard 6: Redevelopment and Infill Projects of the RIDEM Stormwater Management, Design and Installation Rules (250-RICR-150-10-8). Maintenance activities subject to § 1.3.1(N) of this Part are excluded from these requirements provided there is no expansion of the existing impervious surface area and no new or enlarged stormwater discharges resulting from the maintenance activity.

Not applicable. While the Onshore Transmission Cable and Landfall Work Area construction may temporarily disturb up to 2.2 acres (0.89 ha) of existing impervious surfaces, this work is exempt from Minimum Standard 6 as stipulated under Minimum Standard 6 A.4. *Pavement excavation and patching that is incidental to the primary project purpose, such as replacement of a collapsed storm drain, is not classified as redevelopment*[18] In this instance, the primary project purpose is the installation of an underground transmission line.

g. All stormwater management plans shall take into consideration potential impacts associated with the discharge of stormwater runoff into the coastal environment. Applicants shall address these potential impacts to include, but not limited to, the following:
(1) Impacts to coastal wetlands such as changes in species composition due to the introduction of freshwater to high marsh areas;
(2) Changes in the salinity of tidal receiving waters;
(3) Thermal impacts to receiving waters;
(4) Effects of introducing stormwater runoff to receiving waters that have low dissolved oxygen concentrations; and
(5) Other potential water quality impacts as may be identified by CRMC staff.

The stormwater management design for the Project emphasizes the use of infiltration practices which infiltrate up to and including the 100-year storm event which addresses (2) through (5) above. The Project will not discharge to salt marshes.

h. Applicants for single-family residential dwellings and accessory structures …

Not applicable. Revolution Wind does not propose any single-family dwellings.

i. Applicants for single-family dwellings and accessory structures located on CRMC-designated barriers shall manage stormwater runoff as follows: (list omitted)

Not applicable. Revolution Wind does not propose any single-family dwellings or accessory structures located on CRMC-designated barriers.

j. New or enlarged stormwater discharges to salt marshes and well flushed tidal channels within high marshes …

Not applicable. Revolution Wind does not propose any new or enlarged discharges to salt marsh or tidal channels.

k. Stormwater open drainage and pipe conveyance systems must be designed to provide adequate passage for flows leading to, from, and through stormwater management facilities for at least the ten (10) year, twenty-four (24) hour Type III storm event. Applicants may not be required to control post-development peak discharge rates at pre-development peak discharge rates provided the project design provides for non-erosive stormwater discharges to tidal waters.

The OnSS stormwater drainage and conveyance systems have been sized for the anticipated ten (10) year, twenty-four (24) hour Type III storm event and match or reduce peak discharge rates.

l. Applicants may be required to submit a pollutant loading analysis to demonstrate that a proposed project will not unduly contribute to, or cause, water resource degradation when such projects are located in sensitive coastal resource areas. When a pollutant loading analysis is required, the applicant shall use the method detailed in the RIDEM Stormwater Management, Design and Installation Rules (250-RICR-150-10-8). If the Council determines that any proposed stormwater discharge will result in an unacceptable discharge of pollutants to the tidal waters of Rhode Island, the Council shall require the applicant to mitigate the pollutant *loads to acceptable levels using the practices detailed in the stormwater rules. Frequently, this can be accomplished using these practices in series to achieve higher pollutant removal efficiencies.*

Revolution Wind complies with this standard. The proposed stormwater management design emphasizes the use of infiltrate practices at the OnSS. Specifically, the substation incorporates QPAs as a pretreatment mechanism prior to discharge of runoff from the substation yard into surface infiltration basins. Other impervious surfaces discharge directly to these infiltration basins. The stormwater management design will infiltrate up to and including the 100-year storm event. Refer to Revolution Wind Proposed Onshore Substation Stormwater Management Report (Appendix U).

m. The use of proprietary hydrodynamic (swirl) separator or filter devices …

Not applicable. Revolution Wind does not propose the use of any proprietary treatment devices.

n. For outfalls:
(1) Work on outfalls, drainage channels, etc., shall proceed from the shoreline toward the upland in order that no unfinished or un-stabilized lower channel portions be subjected to erosion-producing velocities from upstream. If this cannot be accomplished, all flow shall be diverted from the unfinished areas until stabilization is completed.

Not applicable. The Project does not propose work on outfalls, drainage channels, etc.

(2) Where possible, outfall pipe slopes shall be designed for an exit velocity of less than five (5) feet per second.

Revolution Wind complies with this standard. The outlet pipe from the OnSS infiltration system is designed with a 0.84 percent slope and a 4.0 cfs outlet velocity.

(3) Screens or grates shall be placed over the end of large outfalls to trap debris.

Not applicable. The Project does not include the construction of large outfalls. A 10" diameter outfall is proposed at the OnSS.

(4) Beaches or other coastal features in front of outfalls shall be returned to original grade.

Not applicable. Revolution Wind does not propose outfalls on beaches or other coastal features.

(5) Riprap placed on beaches shall not increase the grade of the beach higher than one foot in order to maintain lateral access below mean high water.

Not applicable. Revolution Wind does not propose riprap on beaches or other coastal features.

(6) Riprap shall be compact, hard, durable, angular stone, with an approximate unit weight of one hundred sixty-five (165) lbs/cubic foot.

Not applicable. Revolution Wind does not propose riprap on beaches or other coastal features.

(7) Riprap shall be placed with an adequate bedding of crushed rock or other suitable filtering material.

Riprap at the flared end section of the outlet pipe at the OnSS is proposed to have a bedding layer of 6 inches (15.24 cm) of 2-inch (5 cm) crushed stone.

o. Applicants with new or modified single-family dwelling projects subject to the stormwater management provisions herein shall submit the following information: (list omitted)

Not applicable. Revolution Wind does not propose any single-family dwellings.

p. Applicants for all other projects subject to the stormwater management provisions herein shall submit the following information:
(1) 8.5 x 11 inch site plan depicting the location of all structural stormwater (LID or otherwise) components;

Site plans depicting the location of all structural stormwater (LID or otherwise) components are provided at 24 in (61 cm) by 36 in (91.4 cm) size are in Appendix A. The Stormwater Management Report (Appendix U) is provided at 8.5 (21.6 cm) x 11inches (28 cm) within the exception of the subwatershed figures which are 11 in (28 cm) x17in (43.18 cm).

(2) Operation & Maintenance Plan that meets the specifications detailed in the most recent version of the RIDEM Rhode Island Stormwater Design and Installation Standards Manual; and

An O&M Plan is provided in Appendix V.

(3) Following completion of the approved project, a post-construction certification by a Rhode Island registered P.E. and Rhode Island registered Landscape Architect, where required, demonstrating that all stormwater structures, LID components, and requisite planting materials necessary for the function of the stormwater management system were installed in accordance with the approved permit, specifications and approved site plans.

Revolution Wind will comply.

4.6.4 CRMP Section 1.3.1(G) – Construction of Shoreline Protection Facilities

Not Applicable. The Project does not include construction of Shoreline Protection Facilities. Using an HDD methodology, the RWEC-RI will be installed beneath the existing cast-in place concrete revetment fronted by riprap; thus, the Project will not impact the existing Shoreline Protection Facility in the Project Area.

4.6.5 CRMP Section 1.3.1(H) – Energy-Related Activities and Structures

Please note, Revolution Wind understands CRMC is evaluating whether Section 1.3.1(H) applies to this Category B application. Revolution Wind has provided the following responses, which may be withdrawn if agreement is reached that these provisions are not applicable.

1. Planning for energy facilities

a. Planning policies

(1) For applicable policies and standards pertaining to offshore renewable energy facilities see Subchapter 05 of this Chapter (CRMC Rhode Island Ocean Special Area Management Plan).

Not Applicable. Offshore renewable energy facilities are referred to in Chapter 20 Subchapter 05 of the Ocean SAMP. The Ocean SAMP applies to all offshore renewable energy facilities that are proposed for or located within state waters of the Ocean SAMP area. Responses to Ocean SAMP requirements applicable to portions of the Project in state waters are provided in Section 5 of this Category B Assent application. There are no power generation facilities associated with the Project within state waters or state boundaries.

In addition, the offshore wind farm components of the Project on the Outer Continental Shelf will be reviewed under CRMC's enforceable policies during the federal consistency review under the Ocean SAMP.

2. Siting of energy facilities

a. Policies and regulations

(1) Facilities for the processing, transfer and storage of petroleum products and the production of electrical power provide services necessary to support and maintain the public welfare and the state's economy. Such facilities, whether sited in the coastal region or elsewhere, have a high probability of affecting coastal resources and land uses because of their large size, environmental and aesthetic impacts, and impacts on surrounding land uses and broad development patterns.

(2) In order to properly and effectively discharge legislatively delegated responsibilities related to the location, construction, alteration and/or operation of energy facilities, including facilities for the processing, transfer and storage of petroleum products and the production of electrical power, the Council finds a need to require in all instances a permit for such location, construction, alteration and/or operation within the State of Rhode Island where there is a reasonable probability of conflict with a Council plan or program, or damage to the coastal environment.

Noted. Revolution Wind complies with this standard through submission of this Category B Assent application for the portion of the Project within the State of Rhode Island.

(3) The siting, construction, alteration and/or operation of petroleum processing, transfer or storage facilities and power generating facilities within the State of Rhode Island shall require a Council permit when there is reasonable probability demonstrated by reliable and probative evidence that the proposal will:

(AA) Conflict with any Council management plan or program.

Revolution Wind complies with CRMC's management plans and programs as documented herein.

(BB) Make any area unsuitable for any uses or activities to which it is allocated by a Council Plan or Program, or

Revolution Wind complies with this policy. Project components located within areas that are allocated a designated use include the RWEC-RI, the Landfall Work Area and portions of the Onshore Transmission Cable. Temporary disruption of allocated uses and activities in these areas may occur during construction, maintenance and decommissioning of these Project components. However, given design of these Project components, operations will not interrupt any Council-designated uses and activities.

(CC) Significantly damage the environment of the coastal region.

As demonstrated in Section 3 of this application, Revolution Wind has undertaken an extensive analysis of environmental conditions in the Project Area. The Project will not result in significant damage to the environment. Where impacts are unavoidable, Revolution Wind has minimized the extent of the impact and proposed environmental protective measures to mitigate for these impacts. Refer to tables 2.2-8 and 2.2-9 of this application for a description of proposed environmental protective measures.

(4) Applicants for energy facilities must consider the projected impacts of climate change, including but not limited to projected storm surge, coastal erosion and sea level rise to these facilities.

Refer to Section 4.2.6 of this Category B Assent application.

(5) Applicants shall be further required to demonstrate by reliable and probative evidence that:

(AA) Alternative sites have been considered and rejected for environmental, economic and/or operational reasons.

Refer to Section 2.1 for a description of alternatives considered.

(BB) Construction and/or operation will be in conformance with all applicable environmental standards, guidelines and objectives.

In addition to the Category B Assent requested in this application, the Project requires a multitude of other local, state and federal permits and approvals which are summarized in Table 1.4-1. Revolution Wind has initiated consultation with all of the agencies having jurisdiction over the Project and will be required to meet the standards, guidelines and objectives of these agencies.

(CC) Siting will not cause secondary developments that are inconsistent with the State Guide Plan or approved municipal comprehensive plans.

As an industrial facility, principally buried underground, the Project will not induce secondary development.

(DD) Operation will not degrade aquifers or water bodies utilized for public water supply, and

Refer to Sections 3.1.3 and 3.1.4 of this application.

(EE) Adequate procedures for the safe transport and/or disposal of products, materials and/or wastes hazardous to man or the coastal environment will be taken, including emergency containment and cleanup.

Revolution Wind will comply. The Project will implement an ERP/OSRP for work in the offshore environment (Appendix G). Onshore, the Project will comply with the applicable state and federal regulations regarding solid waste and hazardous waste storage, transport and disposal; and oil pollution control.

(6) Where on the basis of such evidence and/or demonstrations the Council finds a reasonable probability of noncompliance with any applicable policy or regulation, including § 1.3.8(B) of this Part, it shall require appropriate modification of or shall deny the application in question.

Revolution Wind has carefully designed the Project to comply with applicable policies and regulations.

(7) Recipients of approved Council permits shall be required to maintain such records as may be necessary to monitor and ensure compliance of facility operations with all applicable Policies as set forth above.

Revolution Wind will comply.

(8) Offshore renewable energy projects shall comply with the policies and standards in Subchapter 05 of this Chapter (CRMC Rhode Island Ocean Special Area Management Plan).

Compliance with Ocean SAMP policies and standards is demonstrated in Section 5 of this application.

3. Certified verification agent (CVA) requirement for energy-related activities defined in § 1.1.2 of this Part for which the CRMC has jurisdiction or requires a permit in accordance with §§ 1.1.4 and 1.3.3 of this Part, and as required by the CRMC executive director to review projects that are outside the scope of CRMC staff expertise. (subparts omitted)

Revolution Wind has submitted a CVA nomination to BOEM. BOEM approved the CVA nomination on June 10, 2021. Revolution Wind anticipates filing a similar nomination with CRMC to satisfy this requirement of the Category B Assent application.

4. Prerequisites

a. Applicants must demonstrate that all relevant local zoning ordinances, building codes, flood hazard standards, and all state safety codes, fire codes, and environmental requirements have or will be met.

Refer to Section 4.6.2 of this application.

5. Prohibitions

a. Industrial operations and structures are prohibited in Type 1 and 2 waters or on shoreline features and their contiguous areas abutting these waters.

Not applicable. The Project does not propose industrial operations and structures in Type 1 or Type 2 waters.

6. Additional Category B requirements

a. Unless preempted under the regulations of the Federal Energy Regulatory Commission the following summary defines the scope of the topics that shall be addressed by applicants for power generating and petroleum processing and storage as they apply to construction, operation, decommissioning, and waste disposal:

(1) Environmental impacts,

Refer to Sections 3.1.1 through 3.1.6 and 3.2.1 through 3.2.6 of this Category B Assent application.

(2) Social impacts,

Refer to Sections 3.1.7, 3.1.8, and 3.2.7 through 3.2.11 of this Category B Assent application.

(3) Economic impacts,

Refer to Sections 1.3, 3.2.4 and 3.2.8 of this Category B Assent application.

Also, refer to response to Section 1.2.1(G)(2)(c) in Section 4.3 of this Category B Assent application for a summary of the economic benefits to Rhode Island associated with the Project.

(4) Alternative sites,

Refer to Section 2.1 of this Category B Assent application.

(5) Alternative means to fulfill the need for the facility,

Refer to Sections 1.3 and 2.1 of this Category B Assent application.

(6) Demonstration of need, and

Refer to Section 1.3 of this Category B Assent application.

(7) Consistency with state and national energy policies.

Refer to Section 1.3 of this Category B Assent application.

b. Shorefront sites shall demonstrate the need for access to navigable waters or cooling and/or process water.

Not applicable. The Project does not require access to navigable waters or cooling and/or process water.

c. The above requirements for energy facilities do not have to be addressed if the proposal is for an electrical generating facility of forty (40) megawatt capacity or less, or for a petroleum storage facility of less than two thousand four hundred (2,400) barrel capacity. Such small-scale facilities shall be considered commercial or residential structures (see § 1.3.1(C) of this Part).

Not applicable.

7. Standards

a. See standards given in "Filling, removing, or grading" in § 1.3.1(B) of this Part, as applicable.

Refer to Section 4.6.1 of this Category B Assent application.

b. See standards given in "Residential, commercial, industrial, and public recreational structures" in § 1.3.1(C) of this Part, as applicable.

Refer to Section 4.6.3 of this Category B Assent application.

c. See standards given in "Treatment of sewage and stormwater" in § 1.3.1(F) of this Part, as applicable.

Refer to Section 4.6.3 of this Category B Assent application.

8. Transfer of petroleum products (list omitted)

Not applicable. Revolution Wind does not propose the transfer of petroleum products.

4.6.6 CRMP Section 1.3.1(I) – Dredging and Dredged Material Disposal

1. Policies

a. The Council shall support necessary maintenance dredging activities in Type 2, 3, 4, 5, and 6 waters, provided environmentally sound disposal locations and procedures are identified.

Not applicable. The Project is not a maintenance dredging activity.

b. Where beneficial re-use options as set forth in R.I. Gen. Laws § 46-6.1-3 are not practical, the Council favors offshore open-water disposal for large volumes of dredged materials, providing that environmental impacts are minimized.

The Project does not propose disposal of dredged material. Dredge material at the HDD exit pits will be re-used for backfill of the pits. Sediments disturbed during cable installation will naturally backfill or fallback into the cable trench.

c. The Council encourages the use of innovative nearshore methods of dredged materials disposal, particularly when small volumes of material must be disposed. These options include but are not limited to the creation of wetlands, shellfish habitat, and beach nourishment in suitable areas.

As noted above, the Project will re-use excavated material at the HDD exit pits for backfill. This method will minimize impacts to benthic resources in the disturbance area. Also, sediments disturbed during RWEC-RI installation beyond the HDD exit pits will naturally backfill or fallback with use of cable installation methods described in Section 2.2.3 of this Category B Assent application.

d. For disposal of dredged material resulting from maintenance dredging operations, a Category A Review may be permitted provided the Executive Director determines that the disposal is conducted consistent with the RIDEM's dredging regulations and that the disposal is at an approved disposal facility, or at an approved federal disposal facility. Category A reviews may also be permitted when: (list omitted)

Not applicable. The Project is not a maintenance dredging operation.

e. For beach replenishment, a Category A review may be permitted for the placement of clean sands provided the Executive Director determines that the placement of the materials shall be for beach replenishment only, and the proposal meets the standards of §§ 1.1.4(E) and 1.3.1(I) of this Part as applicable.

Not applicable. The Project does not involve beach replenishment.

f. The Council utilizes and follows the prescribed processes outlined in the army corps regulations and manuals for both upland and in-water dredged material disposal.

Not applicable. The Project does not propose upland or in-water disposal of dredge material.

g. The Council may require performance assurance bonds for projects that utilize in-water disposal or transit federal channels with loaded scows.

Not applicable. The Project does not propose in-water disposal of dredge material or transit federal channels with loaded scows.

2. Prerequisites: R.I. Gen. Laws § 46-6.1-7 specifies that approvals for dredging and dredged material disposal require Council and DEM approval. Further, the Council, as the lead agency for dredging, shall be the initial point of contact for application submittals. The Council and DEM have developed protocols that set out how proposed dredging activities shall be coordinated for review. A pre-application consultation request with the Council and DEM (and other agencies as appropriate) is an element of these protocols and is strongly encouraged for all applicants.

For ease of reference, Revolution Wind acknowledges the standards set forth in Section 1.3.1(I)(2)(a-g) and does not restate those standards herein. See Section 3.2.2.3 for a discussion regarding analytical sediment sampling results. A pre-application meeting was held with the CRMC and RIDEM on June 18, 2020 to discuss environmental sampling in accordance with Rules and Regulations for Dredging and the Management of Dredged Materials (250-RICR-150-05-2).

The Project will submit a Dredge Permit application to CRMC and RIDEM pursuant to the Rules and Regulations for Dredging and the Management of Dredged Materials (250-RICR-150-05-2.1 et seq.) for temporary excavation and backfill of HDD exit pits.

3. Prohibitions

a. The disposal of dredged materials on or adjacent to coastal wetlands…

Not applicable. The Project does not propose disposal of dredge material on coastal features or coastal wetlands.

b. No dredging for navigational purposes is permitted in Type 1 waters…

Not applicable. The Project does not propose dredging for navigational purposes, or in Type 1 or Type 2 waters.

c. It is prohibited to utilize any mechanical system to remove, relocate, wash or otherwise alter the seabed in any Rhode Island waters…

Revolution Wind is seeking a Council Assent for the Project through this application. The Project proposes a temporary excavation of sediments at the HDD exit pits for the purposes of the HDD installation.

4. Additional Category B requirements

a. Applicants for all dredging projects shall provide accurate soundings in the area of the proposed dredging operation.

Plans for the RWEC-RI and HDD Landfall are provided at Appendix A. These plans provide accurate bathymetric contours based on information collected during Project-specific surveys.

b. Applicants shall describe any temporary or permanent disturbance to a coastal feature…

Not applicable. Disturbances of coastal features are avoided through the use of HDD installation techniques.

c. When fine-grained sediments are to be removed, the applicant shall employ proper turbidity controls as necessary to control the transport of materials placed in suspension by dredging unless the applicant demonstrates to the Council on the basis of competent professional analysis that such transport will not be significant or will be controlled by other measures.

Sediment samples collected within the proposed exit pit vicinity contained fine grained sediments throughout the profile (0-15 feet or 4.6 m below grade) (see Section 3.2.2.3). Revolution Wind does not propose side casting material and excavated material will be stored on a support barge during excavation of sediments at the HDD exit pits.

d. The applicant shall limit dredging and disposal to specific times of the year…

Revolution Wind will adhere to TOY restrictions, as determined through coordination with RIDEM and NOAA NMFS (see Section 2.2.4.1 of this Category B Assent application).

e. Applicants for improvement dredging projects…

Not applicable. Revolution Wind does not propose an improvement dredging project.

f. When dredged materials are removed from a marine to an upland environment for disposal…

Not applicable. Revolution Wind does not propose upland disposal of sediments.

g. Applicants proposing dredging operations associated with residential boating facilities…

Not applicable. Revolution Wind does not propose dredging associated with a residential boating facility.

5. Standards: All applications submitted to the Council for dredging and disposal shall demonstrate that they have met all applicable sections of the CRMC/DEM dredging application checklist.

a. All materials to be dredged for either open water disposal or upland disposal must be classified by the Department of Environmental Management (DEM). Applicants for dredging or open water disposal of dredged materials shall also be required to obtain a dredging permit (which contains the Section 401 Clean Water Act Water Quality Certification) from the DEM.

Revolution Wind will comply. An application for dredging will be submitted to the CRMC and RIDEM. A Section 401 Water Quality Certification will also be requested from RIDEM. The Project does not propose dredged materials disposal.

b. For dredging:

(1) Bottoms of dredged areas shall slope downward into the waterway so as to maximize tidal flushing.

Revolution Wind does not propose a permanent excavation of sediments therefore maximizing of tidal flushing is not proposed nor is it optimal given the temporary nature of the excavations.

(2) Bottom slopes at the edges of dredged areas shall have a maximum slope of fifty percent (50%) percent.

Revolution Wind does not propose a permanent excavation of sediments therefore the slopes of the excavations will be determined based on the engineering parameters of the HDD exit pits.

(3) Dredging shall be planned so as to avoid undermining adjacent shoreline protection facilities and/or coastal features.

The proposed HDD exit pit excavation is approximately 1,000 ft (305 m) from the closest shoreline protection feature.

(4) Shellfish dredged from waters classified SB or lower shall not be made available for human consumption or bait.

Not applicable. Shellfish dredging is not proposed.

(5) All dredging at any marina shall be bounded to the footprint of the Marina Perimeter Limit (MPL). Side slopes associated with such dredging shall be allowed to extend beyond the MPL and then only when all adjacent structures are not impacted.

Not applicable. Dredging at a marina is not proposed.

c. For dredged materials disposal in open water: (list omitted)

Not applicable. Revolution Wind does not propose dredged materials disposal. Dredge material at the HDD exit pits will be re-used for backfill of the pits.

4.6.7 CRMP Section 1.3.1(J) – Filling in Tidal Waters

1. Policies

a. *It is the Council's policy to discourage and minimize the filling of coastal waters.*

Revolution Wind proposes to install two submarine export cables (RWEC-RI) in coastal waters of Narragansett Bay and Rhode Island Sound to bring offshore renewable energy into the regional transmission grid which serves Rhode Island and Connecticut. Burial of the RWEC-RI will typically target a depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth for the RWEC will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment. Where burial cannot occur, sufficient burial depth cannot be achieved, or protection is required due to cables crossing other cables or pipelines, additional cable protection methods may be used. It is estimated that approximately 22 acres (8.9 ha) of seafloor will be filled for cable protection. Refer to Sections 2.2.3.4 and 2.2.3.6 of this Category B Assent application for additional detail regarding cable burial and secondary cable protection, respectively. In addition, concrete mattresses or equivalent protection will be used to protect the HDPE conduit at the HDD exit pits.

b. Filling which is determined by the Council to be incidental to activities conducted in accordance with § 1.3.1(G) of this Part is not "filling in tidal waters" and is addressed by the policies, prerequisites, prohibitions, requirements, and standards contained in § 1.3.1(G) of this Part.

Not Applicable. The Project does not involve the construction or maintenance of a Shoreline Protection Facility.

c. In considering the merits of any given proposal to fill tidal waters, the Council shall weigh the public benefit to be served by the proposal against the loss or degradation of the affected public resource(s).

Refer to Section 1.2 for a description of the purpose and need of the Project.

d. Filling may be permitted where necessary for an approved erosion control or bulkheading project, but only when it has been demonstrated that the amount of filling has been minimized in accordance with the requirements of § 1.3.1(G) of this Part.

The Project does not propose bulkheading or coastal erosion control.

e. It is the Council's policy to require a public access plan, in accordance with § 1.3.6 of this Part, as part of any application for filling of tidal waters. A variance from this policy may be granted if an applicant can meet the variance requirements set forth in § 1.1.7 of this Part and demonstrate that no significant public access impacts will occur as a result of the proposed project.

Not applicable. The Project will not result in a significant impact to public access to the shoreline. The Project occurs within the Quonset Business Park which has existing dedicated public access points (QDC, 2015). Construction of the Onshore Transmission Cable will temporarily restrict access to the Blue Beach public access point during

active construction phases. However, access will not be blocked and any impact resulting from construction traffic would be limited in duration and intermittent.

f. In accordance with R.I. Gen. Laws §§ 46-23-6(4)(iii) and 46-23-16, the Council is authorized to grant, modify, or deny licenses, permits, and easements for the use of coastal resources which are held in trust by the state for all its citizens, and impose fees for private use of these resources. Licenses, permits and easements issued by the Council for the use of public trust resources remain subject to the public trust, convey no title, are valid only with the conditions and stipulations with which they are granted, and imply no guarantee of renewal.

Through this application, the Project will seek a license and/or commercial lease of submerged lands for renewable energy development, as appropriate, from CRMC pursuant to CRMC's Enabling Act, R.I. Gen. Laws Section 46-23-1 et seq, and applicable CRMC regulations. All other real estate licenses, permits, and easements have been or will be negotiated by the Project with the state local or private entity having authority over the subject real estate (Refer to Proof of Ownership documentation provided with this application).

g. Filling which is determined by the Council to be incidental to activities conducted in accordance with § 1.3.1(G) of this Part is not "filling in tidal waters" and is addressed by the policies, prerequisites, prohibitions, requirements, and standards contained in § 1.3.1(G) of this Part.

Refer to response to § 1.3.1(G) above.

2. Prerequisites

a. Except for federal consistency reviews, applicants for projects requiring filling in tidal waters shall be required to obtain a Section 401 (Clean Water Act 33 U.S.C. §§ 1251–1387) Water Quality Certification…

The Project will file an application with the RIDEM for a Section 401 Water Quality Certificate.

b. Permits for projects requiring filling in tidal waters must be obtained concurrently from the Army Corps of Engineers and the Council.…

The Project will file an Individual Permit application with the USACE for activities subject to the jurisdiction of Section 404 of the CWA and Section 10 of the Rivers and Harbors Appropriation Act of 1899.

3. Prohibitions

a. Filling in Type 1 and 2 waters is prohibited.

Not applicable. The Project is located in Type 4 and Type 6 waters.

b. Regulations governing the filling and other disturbances to wetlands are set forth in § 1.2.2(D) of this Part.

Not applicable. The Project avoids filling and disturbance of coastal wetlands.

c. Filling in Type 3, 4, 5, and 6 waters is prohibited unless:

(1) The filling is made to accommodate a designated priority use for that water area;

(2) The applicant has examined all reasonable alternatives and the Council has determined that the selected alternative is the most reasonable; and

(3) The filling is the minimum necessary to support the priority use.

Refer to response to Section 1.3.1(J)(1)(a) above.

4. Fees

Not applicable. The Project does not propose to create land by the filling of tidal waters or the dead storage of vessels.

4.6.8 CRMP Section 1.3.1(R) – Submerged Aquatic Vegetation and Aquatic Habitats of Particular Concern

1. Policies

a. The Council's goal is to preserve, protect and where possible, restore SAV habitat….

As summarized in Section 3.2.3 and detailed in Appendix P to this Category B Assent application, SAV was identified in the proximity of the landfall location during surveys performed for the Project in 2020. The Project is designed to avoid SAV and, therefore, will not result in permanent loss or significant alteration of SAV.

b. Activities under CRMC jurisdiction…shall avoid and minimize impacts to SAV habitat.

As noted above, the Project is designed to avoid SAV and, therefore, will not result in permanent loss or significant alteration of SAV.

The proposed HDD exit pits will be located approximately 845 feet (257.56 m) east of the identified SAV. As noted in Section 2.2.4.1 of this Category B Assent application, Revolution Wind will comply with TOY restrictions as determined through coordination with RIDEM and NOAA NMFS, which will result in avoidance of the peak SAV growing season (July to September). In addition, as noted in Table 2.2-8, Revolution Wind will perform a preconstruction SAV survey to identify any new or expanded SAV beds prior to construction; the Project design will be refined to avoid impacts to SAV to the extent practicable.

Impacts to any nearby SAV resulting from cable installation would be associated with sediment resuspension and subsequent deposition during cable burial and HDD exit pit excavation. Detailed sediment transport modeling has been performed to accurately predict the volume of sediment resuspension, concentration of sediments in the water column during construction activities, the extent of this sediment plume from the location of activity, and the spatial distribution of sediment deposition depths from the activity (Refer to Appendix O). The results of this model aid in assessing the potential impacts on SAV as a result of increased turbidity (sediment resuspension) and sediment deposition.

Installation of the RWEC will result in elevated total suspended solids in the water column (sediment suspension) and sediment deposition. Modeling indicates that sediment deposition exceeding 0.4 inches (1 cm) may be deposited up to 1,033 feet (315 m) from cable installation activities and up to 738 feet (225 m) from HDD exit pit excavation (Refer to Appendix O). Modeling results indicate that elevated turbidity exceeding 100 mg/L may extend up to 5,839 feet (1,780 m) from cable installation activities and to 1312 feet (400 m) from HDD exit pit excavation (RPS 2021).

Experimental results revealed *Z. marina* experienced 50% mortality following rapid burial of 1.57 inches (4 cm) (1/4 the shoot height) of sediment and 100% mortality following 4.72 inches (12 cm) (3/4 the shoot height) of rapid burial (Mills and Fonseca 2003). The modeled maximum sediment deposition resulting from installation activities is below these values (maximum threshold of 0.4 inches [1 cm] was modeled).

Increased total suspended solids in the water column has the potential to block photosynthetically active radiation ("PAR)" levels. However, Project induced turbidity levels are expected to be short-lived and not likely to have a direct effect on SAV photosynthesis or productivity.

c. The Council supports cooperative efforts to determine the current status and identify trends in the health and abundance of SAV species in Rhode Island using the best information as it becomes available.

Revolution Wind and their consultant, INSPIRE Environmental, have been in contact with several agencies and organizations involved with the management and documentation of SAV habitat distribution in Narragansett Bay including Save the Bay. The State will update its SAV data by conducting an aerial survey in 2021; data analysis will be conducted by the Environmental Data Center. Revolution Wind will coordinate with the State to ensure these data are integrated into its database and considered during final construction and monitoring planning.

d. Deep water habitats include subtidal waters bordering the immediate shoreline where a depth of three (3) or more meters is typically achieved within 100 to 200 feet seaward of the MLW mark. In these areas, eelgrass is typically limited to the shoreline fringe. This environmental setting is typical of the open waters of Narragansett Bay, Block Island and Rhode Island Sounds. Examples of these areas include the shorelines of Prudence Island, Jamestown and Block Island.

Deep water habitats occur along the majority of the RWEC-RI.

e. Shallow water habitats include subtidal waters where a depth of 3 meters is not attained within 100 – 200 feet of the shoreline and where the average waterbody depth is generally less than 3 meters. This situation is typical of the salt ponds and other shallow coastal embayments.

Shallow water habitats occur at the Project's landfall location at Quonset Point.

f. The Council shall assess the potential impacts to SAV and its habitat from proposed activities on a case-by-case basis. Such impacts may include, but shall not be limited to the *introduction of excess nutrients, sedimentation, shading, and/or disruption of SAV and SAV habitats.*

The RWEC-RI avoids SAV and, therefore, will not result in permanent loss or significant alteration of SAV. Impacts to any nearby SAV resulting from cable installation would be associated with sediment resuspension and subsequent deposition during cable burial and HDD exit pit excavation. These impacts are described above in response to Section 1.3.1(R)(1)(b).

g. All impacts to SAV and SAV habitat shall be avoided where possible and minimized to the extent practicable. Where the impacts are substantial or cannot be avoided or minimized, the Council may deny the application. The Council may exercise greater discretion if the proposed site is adjacent to or includes a restoration site and/or the site includes the sole source of SAV habitat.

As noted above, the RWEC-RI avoids known SAV habitat, although temporary impacts associated with sediment resuspension are possible. Refer to response to Section 1.3.1(R)(1)(b) above.

Revolution Wind sought information from Save the Bay regarding previous SAV restoration efforts located at Sauga Point, which is at the mouth of Wickford Harbor, southwest of the Project's landfall location. This restoration effort consisted of transplanting SAV shoots between 2003 and 2007. SAV beds in this vicinity were not documented in the RIGIS 2017 datasets. The Project will not impact the SAV restoration efforts at Sauga Point.

h. SAV habitats designated for preservation within the boundaries of the Narragansett Bay National Estuarine Reserve (NBNERR)…

Not applicable. No Project activities are in the vicinity of the NBNERR.

i. In tidal waters where applicants propose activities under §§ 1.3.1(C), (D), (F), (I), (J), (K), and (O) of this Part, and the Council's staff determines that SAV habitat is not present, an SAV survey will not be required. When such activities are proposed in areas of current or historic SAV habitat, an SAV survey shall be required (see § 1.3.1(R)(3) of this Part).

INSPIRE Environmental conducted a SAV survey over three days in September 2020 (Refer to Appendix P). More information regarding this survey effort is provided in responses to 3(a)-(d) below.

In addition, as noted in Table 2.2-8, Revolution Wind will perform a preconstruction SAV survey to identify any new or expanded SAV beds prior to construction; the Project design will be refined to avoid impacts to SAV to the extent practicable.

j. It is the policy of the Council that SAV surveys shall be completed during peak biomass. SAV surveys shall be completed in Narragansett Bay between July 1 and September 15….

Consistent with this policy, the 2020 SAV survey performed by Revolution Wind occurred on September 4, 5, and 14. The preconstruction SAV survey will be conducted between July 1 and September 15.

k. Aquaculture operations, which utilize floating racks and bottom culture techniques, can shade SAV….

Not applicable. The Project does not propose aquaculture.

2. Prohibitions (list omitted)

None of the prohibitions listed in this standard are applicable to the Project.

3. Standards

a. For activities under §§ 1.3.1(C), (D), (F), (I), (J), (K), and (O) of this Part, where the Council's staff is satisfied that SAV is not present within the limits of the proposed activity, an SAV survey will not be required.

Refer to response to 3(b) below. An SAV survey was performed for the Project in September 2020.

b. For activities under §§ 1.3.1(C), (D), (F), (I), (J), (K), and (O) of this Part, the Council shall require SAV surveys in tidal waters of the south shore salt ponds and other shallow water embayments, around Jamestown, Newport and in other areas when the Council's staff has evidence of SAV habitats. In areas where the Council's Staff lacks enough evidence to make a determination of SAV presence or absence, an SAV survey may be required.

A GIS analysis of available eelgrass mapping data for Narragansett Bay (RIGIS, 2017), was initially conducted to evaluate potential for SAV in the Project Area. This included data from 2009, 2012, and 2016 (RIGIS 2017). Based on this GIS analysis, a small section of eelgrass is present on the western side of Dutch Island, approximately 1,150 feet (350 m) from the proposed RWEC-RI. The next closest area of mapped eelgrass is on the western side of Conanicut Island, approximately 1,411 feet (430 m) from the RWEC-RI. In the vicinity of the Project's landfall location, known SAV locations in the general vicinity of the Project's landfall location include at the mouth of Wickford Harbor and adjacent to Cornelius Island (documented in 2016 and located approximately 5,000 ft (1,524 m) west of the landfall location) and on the west side of Compass Rose Beach (documented in 2012 and located approximately 2,430 ft (740.6 m) east of the landfall location).

Given these existing data and the potential for SAV habitat in the shallow waters near the landfall location, an SAV survey was conducted in subtidal shallow waters around the landfall location.

c. A survey that has been conducted three or more years prior to the date of the application will not satisfy the requirements of this section.

The September 2020 survey was performed within one year of this Category B Assent application. Also, as noted in Table 2.2-8, Revolution Wind will perform a preconstruction SAV survey to identify any new or expanded SAV beds and will refine Project design to avoid impacts to SAV to the extent practicable.

d. Where an SAV survey is required, the following standards are required. CRMC staff may require additional information: (list omitted)

The 2020 SAV survey was conducted onboard a 23-ft (7 m) Carolina Skiff using a towed underwater video sled to assess the presence/absence of SAV. The survey focused on the nearshore area off Quonset Point in the area between Blue Beach and the western edge of the Electric Boat property, out to a depth of approximately 15 ft (4.6 m). A total of 52 transect lines varying in length and orientation were performed. Video transect data were analyzed to identify the presence or absence of SAV in each video file. Additional parameters were analyzed where SAV was present including SAV bed extent (percent cover) and general sediment type, in accordance with federal and state agency protocols.

e. Standard design options for the construction of residential boating facilities in areas of SAV habitat.

This standard and its subparts are not applicable as the Project is not a residential boating facility.

f. In order to minimize impact upon SAV, all operations and docking of vessels shall be confined to the terminal portion of the facility. Docking and operation of motorized boats and/or other vessels elsewhere along the facility shall only be permitted over areas of no SAV habitat, as determined during staff review.

Not applicable.

4.6.9 CRMP Section 1.3.3 – Inland Activities and Alterations that are subject to Council Permitting

A. Policies

1. For consistency with state land development legislation, the Council hereby adopts the activities identified by R.I. Gen Laws. § 45-23-27 as applicable for review.

Not applicable. The Project does not propose activities subject to review under these provisions of the RIGL.

2. The Council shall review all proposals inland of the area contiguous to shoreline features which involve any of the above identified activities and alterations….

Revolution Wind acknowledges CRMC's authority to require an Assent for the Project as demonstrated by this application for Category B Assent.

3. Council Assents are also required for any other activity or alteration not listed in Table 1, Table 1A, or Table 1B, but which has a reasonable probability of conflicting with the Council's goals and its management plans or programs, and/or has the potential to damage the environment of the coastal region.

Revolution Wind acknowledges CRMC's authority to require an Assent for the Project as demonstrated by this application for Category B Assent.

4. Persons proposing subdivisions, cooperatives, and other multi ownership facilities, [of six (6) units or more] or activities generating more than 40,000 square feet (3,716 m^2) of impervious surface any portion of which extends onto a shoreline feature or its contiguous area, or within *critical coastal areas, or those areas as identified in R.I. Gen. Laws § 45-23-27 are required to apply for a Council Assent.*

Not Applicable. The Project does not propose a subdivision. Revolution Wind does not propose to generate 40,000 sf (3,716 m^2) of impervious surfaces on a shoreline feature or its 200-foot (61-m) Contiguous Area.

5. Applicants proposing any of these activities shall satisfy all requirements specified in the RICRMP and any applicable special area management plan. Applicants shall also submit the following with their applications:

a. A stormwater management plan as required in § 1.3.1(F) of this Part and as described in the most recent version of the DEM Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8).

A Stormwater Management Plan prepared for the OnSS is included with this application. The plan was prepared consistent with 250-RICR-150-10-8 (Refer to Appendix U).

b. A soils map of the property (suggested scale 1:200) with an accompanying analysis of the best use potential of the soils present; the soils maps and use potentials analysis prepared by the U.S.D.A. Natural Resources Conservation Service should be used as the basis for this analysis.

This mapping has been included in the Stormwater Management Plan (Appendix U).

c. An overlay map showing the principal vegetation types or any significant features identified by the R.I. Natural History Survey and the R.I. Historic Preservation and Heritage Commission on the property; the maps prepared by McConnell (1974) and Kupa and Whitman (1972) may be the basis for information on vegetation.

An overlay plan showing existing cover types has been prepared for the OnSS and is included in the Stormwater Management Plan (Appendix U).

d. An overlay showing the proposed subdivision layout, including buildings, roadways, parking areas, drainage systems, sewage treatment and disposal facilities, and undisturbed lands.

The Project does not propose a subdivision or to construct a sewage treatment system but plans which show the proposed development of the OnSS are provided.

e. A Site Plan as detailed in the most recent version of the Rhode Island Stormwater Design and Installation Standards Manual.

The Grading, Drainage, and Utility Plans (Drawing No. C-3.00) and SESC Plans (Drawing No. SESC-2) included in the Plan Set for the OnSS (Appendix A) provide the information required in the Rhode Island Stormwater Design and Installation Standards Manual. These plans are provided under confidential cover to this Category B Assent application because they contain confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552).

f. Prior to permitting, an archeological survey when recommended by the state Historical Preservation & Heritage Commission.

Revolution Wind has performed surveys to identify buried archaeological sites in areas of potential ground disturbance focusing on the Onshore Project Area. Revolution Wind is continuing to investigate the potential for impacts to terrestrial archaeological resources in consultation with RIHPHC and Native American Tribes. A copy of the Project's current Terrestrial Archaeological Resources Assessment is provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552)((Appendix K).

6. Applicants shall submit this information to the Council for review at the earliest stages of planning such projects and are required to utilize the Council's Preliminary Determination process in accordance with applicable requirements of the Land Development and Subdivision Review Enabling Act (R.I. Gen. Laws § 45-23-25 et seq.). Where so requested, all parties shall discuss their findings and recommendations at the municipality's pre-application conference, preliminary hearing, or similar proceeding. The findings and recommendations resulting from the coordinated, joint review shall be forwarded to the full Council. Where the Council finds a reasonable probability of conflict with this Program or with an adopted CRMC Special Area Management Plan, or finds there is a potential to damage the coastal environment, the Council shall require that suitable modification to the proposal be made or shall deny its Assent.

Revolution Wind has coordinated closely with CRMC leading up to submission of this Category B Assent application and a Preliminary Determination was filed with CRMC on February 8, 2021. See Appendix W Preliminary Determination Application Report of Findings.

7. In those cases where a subdivision has been approved by the Council, any person wishing to conduct an approved activity, in accordance with the stipulations of the Council Assent, need not apply for a separate Assent unless so required by a stipulation of the Assent.

Not Applicable. The Project does not propose a subdivision.

8. Applicants proposing the following projects are required to submit these projects for the Council's review:

a. Power generating plants over 40 megawatts;

Not Applicable. This application only involves portions of the Project that are in state waters or onshore which do not include power generation.

b. Chemical or petroleum processing, transfer or storage facilities (excluding storage facilities of less than 2,400 barrel capacity);

Not Applicable. The Project does not propose these petroleum facilities.

c. Freshwater wetlands in the vicinity of the coast;

The OnSS is proposed to be constructed in an area subject to this regulation. Review criteria provided in 650-RICR-20-00-2.10 are presented in this application at Appendix B.

d. Minerals extraction;

Not Applicable. The Project does not propose minerals extraction.

e. Sewage treatment and disposal facilities (excluding onsite wastewater treatment systems);

Not Applicable. The Project does not propose sewage treatment or disposal facilities.

f. Solid waste disposal facilities; and,

Not Applicable. The Project does not propose solid waste disposal facilities.

g. Desalination plants.

Not Applicable. The Project does not propose desalination plants.

9. Applicants proposing these activities shall demonstrate in writing that the Additional Category B requirements contained in § 1.3.1(A) of this Part have been satisfied. If the Council determines that there is a reasonable probability that the project may impact coastal resources, then it shall be required to obtain a Council Assent in accordance with all applicable requirements of this program.

Refer to Table 1.3-1 which demonstrates Revolution Wind's compliance with requirements listed in Section 1.3.1(A) of the CRMP.

B. Prerequisites

1. Solid waste disposal: permits from the Department of Environmental Management are required pursuant to the Solid Waste Management Act; and Air Quality Permit will have to be obtained from DEM if disposal practices include incineration. Disposal of hazardous wastes requires DEM permits pursuant to the R.I. Hazardous Waste Management Program as well as EPA permits.

Not applicable. The Project disposal practices do not include incineration of hazardous waste. Solid waste generated during construction, operation and decommissioning of the Project will be disposed of at an appropriately licensed facility.

2. Minerals extraction….

Not applicable. The Project does not include any mineral extraction activities.

3. Chemical processing, transfer, and storage….

Not applicable. The Project does not include chemical processing, transfer, or storage.

4. Power generation: persons proposing a hydroelectric plant are required by DEM to obtain a Wetlands Permit, Dam Safety Certificate, and a Section 401 Water Quality Certification; a Preliminary Permit will also have to be obtained from the Federal Energy Regulatory Commission (FERC). Other power generating facilities may require a DEM Air Quality

Certificate, Section 401 Water Quality Certification, and Spill Contingency Plan. An NPDES permit may have to be obtained from EPA Region 1.

Not applicable. The Project does not include a hydroelectric plant. Revolution Wind will file an application for a 401 Water Quality Certification and a RIPDES Authorization under the Construction General Permit.

5. *Petroleum processing, transfer, and storage….*

Not applicable. The Project does not include chemical processing, transfer, or storage.

6. *Sewage treatment and disposal….*

Not applicable. The Project does not include sewage treatment or disposal. The Project uses surface infiltration to treat stormwater at the OnSS and will not need a Underground Injection Control (UIC) permit.

4.6.10 CRMP Section 1.3.5 – Policies for the Protection and Enhancement of the Scenic Value of the Coastal Region

A. Policies

1. The primary goal of all Council efforts to preserve, protect, and, where possible, restore the scenic value of the coastal region is to retain the visual diversity and often unique visual character of the Rhode Island coast as it is seen by hundreds of thousands of residents and tourists each year from boats, bridges, and such public vantage points as roadways, public parks, and public beaches.

The Onshore Transmission Cable will be installed underground, and the RWEC-RI is a submarine cable. Thus, these Project components will not be visible once constructed.

At a maximum height of 65 ft (20 m) above grade and set back over 400 ft (122 m) from the road, the proposed OnSS will not be out of scale or character with the existing types of development currently present in the vicinity, such as the existing Davisville Substation, or the structures at nearby Quonset Business Park. As such, it is anticipated that the Project will result in negligible visual impacts to the public resources present in the VSA. Some Camp Avenue residences are likely to experience limited visual impacts as a result of the vegetative clearing associated with the OnSS and the OnSS access driveway. While these impacts are expected to alter the existing views experienced by the residents directly adjacent to the Project, they are generally localized and can be minimized through implementing site specific measures, such as visual screening (refer to Section 3.1.8 and Appendix I).

2. Every effort should be made to safeguard from obstruction significant views to and across the water from highways, scenic overlooks, public parks, and other vantage points enjoyed by the public.

The OnSS will be located inland and will not obstruct views to and across the water. The Onshore Transmission Cable will be below ground and will not cause any visual effects. The RWEC-RI will be buried in the seafloor and will not affect visual aesthetics.

3. The importance of the skyline as seen from tidal waters in determining the character of a view site must be recognized; it should, where possible, not be disrupted by visually intrusive structures.

The OnSS will not alter the character of the skyline as seen from tidal waters. The OnSS will be approximately 0.3 miles (0.48 km) north of the Fishing Cove estuary and obscured by terrain and vegetation.

4. On sites in or adjacent to historic features and districts, new structures should be designed to provide continuity with the existing scenic and historic character. Within historic districts, applicants shall consult with the Historic Preservation Commission to identify means for minimizing disruption and, where possible, enhancing the historic value of the area.

The OnSS is not within a Historic District and will not be out of scale or character with the existing types of development currently present in the vicinity, such as the existing Davisville Substation, or the structures at nearby Quonset Business Park.

5. Excellent guidance for preserving the visual character and quality of coastal landscapes in Rhode Island are contained in "Building at the Shore: A Handbook for Residential Development on the Rhode Island Coast." Review copies are available at the Council's office in Wakefield.

Noted.

B. In and Adjacent to Type 1, 2, and 4 Water

1. Structures along the water's edge should be screened by vegetation, preferably with native species typical to the area rather than exotic.

2. Trees that form the first line of visual definition as one looks landward from the water should be preserved.

3. In new developments, trees should be planted in the drifts that generally follow land contours and parallel the water's edge rather than in lines that cut across landscape contours.

4. Disruptions of natural landform and vegetation should be minimized.

5. New developments should not compete visually with such significant shoreline features as coves, peninsulas, cliffs, and bluffs; they should be set back and screened.

The RWEC-RI will be installed within Type 4 Waters; however, as a submarine cable, this Project component will not be visible once constructed. No above-ground features are proposed by the Project adjacent to Type 1 or Type 2 waters, or along the water's edge.

C. In and Adjacent to Type 3, 5, and 6 Waters

1. In all areas adjacent to Type 3 and 5 waters and, where appropriate, adjacent to Type 6 waters, the public should, where possible, be provided a sense of the water from within the townscape. Views to and across the water through yards, between houses, and from roadways should be preserved and, where possible, created.

The Project's landfall location is in Type 6 waters. Installation of the RWEC-RI at the landfall location will be completed using HDD and no above-ground features are proposed adjacent to Type 3, 5, or 6 waters.

2. When new structures are proposed adjacent to Type 3 and 5 waters….

Not applicable. The Project is proposed in Type 4 and Type 6 waters.

2. When new structures are proposed adjacent to Type 3 and 5 waters….

Not Applicable. The Project is proposed in Type 4 and Type 6 waters.

4.6.11 CRMP Section 1.3.6 – Protection and Enhancement of Public Access to the Shore

A. Policies

1. As trustee of Rhode Island's coastal resources and in accordance with state and federal statutory mandates, the Council has a responsibility to ensure that public access to the shore is protected, maintained and, where possible, enhanced for the benefit of all.

Noted.

2. It is the Council's policy to protect, maintain and, where possible, enhance public access to and along the shore for the benefit of all Rhode Islanders.

The Project will not prevent public access to the shore. Blue Beach is the nearest public access point to the shore, approximately 0.2 miles (0.32 km) west of the Project's landfall location. Access to the Blue Beach parking lot and trail may be temporarily impacted as a result of construction activity associated with the Onshore Transmission Cable. However, access will not be blocked and any impact resulting from traffic would be limited in duration and intermittent.

3. It is the Council's policy to require applicants to provide, where appropriate, on-site access of a similar type and level to that which is being impacted as the result of a proposed activity or development project.

Refer to response to 1.3.6.(A)(2) above.

4. Certain activities which require the private use of public trust resources to the exclusion of other public uses necessarily impact public access. Due to their likelihood of impacting public access and/or the public's use and enjoyment of Rhode Island's public trust resources, it is the Council's policy to require that applications for the following activities include a public access plan. (a-c omitted)

Refer to response to 1.3.6.(A)(2) above.

5. In accordance with § 1.1.7 of this Part, a variance from this policy may be granted if an applicant can demonstrate that no significant public access impacts will occur as a result of the proposed project.

Refer to response to 1.3.6.(A)(2) above. The Project does not require a variance from this policy.

6. Publicly funded beach nourishment projects shall contain a public access component.

Not applicable.

7. In accordance with R.I. Gen. Laws § 32-6-5(b), limited liability applies when the CRMC stipulates public access as a permit condition and when the Council designates a public right-of-way to the shore.

Noted.

B. General Policies

1. Any public access impacts associated with a proposed project should be avoided and minimized to the maximum extent possible.

Refer to response to 1.3.6.(A)(2) above.

2. Any public access created to compensate for proposed project impacts should be of a type and level similar to that which will be impacted.

Not applicable. The Project will not prevent public access to the shore in a manner that requires compensation.

3. In cases where access cannot practically be provided onsite, due to safety, security, environmental or other considerations, the Council may permit access be provided offsite.

Not applicable. Refer to response to 1.3.6.(A)(2) above..

4. All structural shoreline protection facilities should be designed and constructed in a manner which does not reasonably interfere with the public's right to pass and re-pass along the shore.

Not applicable. The Project does not propose new shoreline protection facilities.

C. Policies for the development of public access plans

Not Applicable.

5

Ocean SAMP Regulatory Compliance

For the purposes of this Category B Assent Application and as discussed within Section 1.3.4, the portion of the RWEC-RI from the mouth of Narragansett Bay to the three-nautical mile limit of state waters is subject to the policies and regulations of the Ocean SAMP (650-RICR-20-05-11) (See Figure 1.1-1). For Project components beyond the three-nautical mile state waters boundary, the CRMC will review the Project components under its enforceable policies of CRMC's federally approved coastal resources management program. The CZMA federal consistency regulations. Applicable sections from these enforceable policies and regulations in the Ocean SAMP are referenced below followed by the applicant's responses.

5.1 Ocean SAMP §11.9 General Policies

A. Ocean SAMP policies and regulatory standards represent actions the CRMC must take to uphold its regulatory responsibilities mandated to them by the Rhode Island General Assembly and the CZMA to achieve the Ocean SAMP goals and principles described in the Introduction Chapter. ... However, for state permitting purposes, offshore developments proposed to be sited in state waters are bound by both the General Policies (§ 11.9 of this Part) and regulatory standards (§ 11.10 of this Part) listed herein, The Policies of the Ocean SAMP. ...

Revolution Wind acknowledges the portion of the RWEC-RI within the Ocean SAMP area is subject to both the General Policies (Section 11.9 of the Ocean SAMP) and regulatory standards (Section 11.10 of the Ocean SAMP). The applicable policies and standards are addressed herein.

B. § 11.9 of this Part presents all Ocean SAMP general policies, while § 11.10 of this Part integrates the regulatory standards into a regulatory process that ensures the Council's ability to uphold its mandatory requirements.

Revolution Wind acknowledges the portion of the RWEC-RI within the Ocean SAMP area is subject to both the General Policies (Section 11.9 of the Ocean SAMP) and regulatory standards (Section 11.10 of the Ocean SAMP). The applicable policies and standards area addressed herein.

C. Any assent holder of a CRMC-approved offshore development, as defined in § 11.10.1(A) of this Part, shall:

1. Design the project and conduct all activities in a manner that ensures safety and shall not cause undue harm or damage to natural resources, including their physical, chemical, and biological components to the extent practicable; and take measures to prevent unauthorized discharge of pollutants including marine trash and debris into the offshore environment.

Refer to Section 2.2.5 for a description of measures that will be implemented by Revolution Wind to avoid undue harm or damage to natural resources. In addition, refer to Appendices X and G for the Project's Safety Management System and Emergency Response Plan/Oil Spill Response Plan, which are provided under confidential cover to this application because they contain confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552).

2. Submit requests, applications, plans, notices, modifications, and supplemental information to the Council as required;

Revolution Wind will comply.

3. Acknowledge, in writing, any oral request or notification made by the Council, within three (3) business days and follow up in writing on such request or notification within a reasonable period of time as determined jointly by the assent holder and CRMC considering the circumstances;

Revolution Wind will comply.

4. Comply with the terms, conditions, and provisions of all reports and notices submitted to the Council, and of all plans, revisions, and other Council approvals, as provided in § 11.10.5 of this Part;

Revolution Wind will comply.

5. Make all applicable payments on time;

Revolution Wind will comply.

6. Conduct all activities authorized by the assent in a manner consistent with the provisions of this document, the Rhode Island Coastal Resources Management Program, and all relevant federal and state statutes and regulations;

The Project design is intended to be consistent with the provisions of the Ocean SAMP, the CRMP, and all relevant federal and state statutes and regulations, and Revolution Wind will comply with all relevant federal and state statutes and regulations in conducting activities authorized by the assent.

7. Compile, retain, and make available to the Council within the time specified by the Council any information related to the site assessment, design, and operations of a project; and

This information is provided within this application for a Category B Assent and the Project's COP. Revolution Wind will comply with this policy to the extent the Council requires additional information.

8. *Respond to requests from the Council in a timeframe specified by the Council.*

Revolution Wind will comply.

D. Administrative processing fee: For large-scale offshore developments, underwater cables, and other projects as determined by the Council, the CRMC may asses the applicant with an administrative processing fee to help defray costs to conduct the CZMA federal consistency review, including the mitigation negotiations. This fee shall be $20,000. The Council cannot issue a conditional concurrence or an objection for failure to pay the fee.

This fee is not applicable to this Category B Assent application; Revolution Wind is supplying the required application fee for this Category B Assent application.

5.1.1 Ocean SAMP §11.9.1 Ecology

A. The Council recognizes that the preservation and restoration of ecological systems shall be the primary guiding principle upon which environmental alteration of coastal resources will be measured. Proposed activities shall be designed to avoid impacts and, where unavoidable impacts may occur those impacts shall be minimized and mitigated.

Noted. The RWEC-RI is designed to avoid adverse impacts and, where unavoidable impacts may occur those impacts will be minimized and mitigated. All reasonable efforts have been made to avoid sensitive ecological and benthic resources with respect to the RWEC-RI cable corridor. Refer to Sections 3.2.3 through 3.2.6 for discussions regarding potential ecological impacts associated with the RWEC-RI and proposed avoidance, minimization, and mitigation measures.

B. As the Ocean SAMP is an extension and refinement of CRMC's policies for Type 4 multipurpose waters as described in § 00-1.2.1(E) of this Chapter, CRMC will encourage a balance among the diverse activities, both traditional and future water dependent uses, while preserving and restoring the ecological systems.

Noted. The RWEC-RI was sited, planned, and designed to avoid and minimize impacts and foster coexistence with other water-dependent uses. To the extent there are potential adverse impacts that cannot be avoided, these will be minimized and mitigated. Overall, the RWEC-RI is consistent with CRMC's policies for Type 4 multipurpose waters as it is a water dependent use and will not have any long-term adverse impacts to activities that coexist in Type 4 waters, such as commercial and recreational fishing. Refer to Sections 3.2.8 through 3.2.10 for discussions regarding potential impacts to other water-dependent uses associated with the RWEC-RI and proposed avoidance, minimization, and mitigation measures.

C. The Council recognizes that while all fish habitat is important, spawning and nursery areas are especially critical in providing shelter for these species during the most vulnerable stages of their life cycles. The Council will ensure that proposed activities shall be designed to avoid impacts to these sensitive habitats, and, where unavoidable impacts may occur, those impacts shall be minimized and mitigated. In addition, the Council will give consideration to habitat used by species of concern as defined by the NMFS Office of Protected Resources.

As discussed in Section 3.2.3, the RWEC-RI is designed to avoid and minimize any adverse impacts to sensitive habitats. Where impacts cannot be fully avoided, they will be minimized and mitigated. Revolution Wind is committed to adhering to TOY restrictions to avoid impact to sensitive taxa during critical times in their life cycles (e.g., winter flounder eggs) (see Section 2.2.5.1).

Revolution Wind is also committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the potential impacts associated with the Project on ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region.

D. Because the Ocean SAMP is located at the convergence of two eco-regions and therefore more susceptible to change, the Council will work with partner federal and state agencies, research institutions, and environmental organizations to carefully manage this area, especially as it relates to the projected effects of global climate change on this rich ecosystem.

Noted.

E. The Council shall appoint a standing Habitat Advisory Board (HAB) which shall provide advice to the Council on the ecological function, restoration and protection of the marine resources and habitats in the Ocean SAMP area and on the siting, construction, and operation of off shore development in the Ocean SAMP study area and in NOAA-approved geographic location descriptions (GLDs). …

Noted.

5.1.2 Ocean SAMP §11.9.2 Global Climate Change

A. The Council recognizes that the changes brought by climate change are likely to result in alteration of the marine ecology and human uses affecting the Ocean SAMP area. The Council encourages energy conservation, mitigation of greenhouse gasses and adaptation approaches for management. The Council, therefore, supports the policy of increasing offshore renewable energy production in Rhode Island as a means of mitigating the potential effects of global climate change.

As an offshore renewable energy project, the Project is consistent with this policy.

B. The Council shall incorporate climate change planning and adaptation into policy and standards in all areas of its jurisdiction of the Ocean SAMP and its associated land-based infrastructure to proactively plan for and adapt to climate change impacts such as increased storm intensity and temperature change, in addition to accelerated sea level rise. For example, when evaluating Ocean SAMP area projects and uses, the Council will carefully consider how climate change could affect their future feasibility, safety and effectiveness. When evaluating new or intensified existing uses within the Ocean SAMP area, the Council will consider predicted impacts of climate change especially upon sensitive habitats, most notably spawning and nursery grounds, of particular importance to targeted species of finfish, shellfish and crustaceans.

Noted. The Project will provide clean, reliable offshore wind energy that will significantly increase the renewable energy pool available to Rhode Island and Connecticut and reduce carbon emissions across the region, thereby contributing to the region's efforts to combat climate change. Therefore, the Project is consistent with CRMC's policy of increasing offshore renewable energy production in Rhode Island as a means of mitigating the potential effects of global climate change.

C. The Council will convene a panel of scientists, biannually, to advise on findings of current climate science for the region and the implications for Rhode Island's coastal and offshore regions, as well as the possible management ramifications….

Noted.

D. The Council will prohibit those land-based and offshore development projects which based on a sea level rise scenario analysis will threaten public safety or not perform as designed resulting in significant environmental impacts. The U.S. Army Corps of Engineers has developed and is implementing design and construction standards that consider impacts from sea level rise. These standards and other scenario analyses should be applied to determine sea level rise impacts.

The modeled 5 feet of SLR during the life of the Project is not expected to impact the onshore Project components in a manner that threatens public safety or impacts the environment. See attached Coastal Hazard Application Worksheets for the OnSS and TJB (see Appendix C).

E. The Council supports the application of enhanced building standards in the design phase of rebuilding coastal infrastructure associated with the Ocean SAMP area, including port facilities, docks, and bridges that ships must clear when passing underneath.

Not applicable. The Project does not involve rebuilding coastal infrastructure.

F. The Council supports the development of design standards for marine platforms that account for climate change projections on wind speed, storm intensity and frequency, and wave conditions and will work with the U.S. Bureau of Ocean Energy Management, Department of the Interior, Department of Energy, and the Army Corps of Engineers to develop *a set of standards that can then be applied in Rhode Island projects. The Council will re-assess coastal infrastructure and seaworthy marine structure building standards periodically not only for sea level rise, but also for other climate changes including more intense storms, increased wave action, and increased acidity in the sea.*

Not applicable. The offshore portion of the Project applicable to this Category B Assent application (i.e., the RWEC-RI) does not include marine platforms.

G. The Council supports public awareness and interpretation programs to increase public understanding of climate change and how it affects the ecology and uses of the Ocean SAMP area.

Noted.

5.1.3 Ocean SAMP §11.9.3 Cultural and Historic Resources

A. The Council recognizes the rich and historically significant history of human activity within and adjacent to the Ocean SAMP area. These numerous sites and properties, that are located both underwater and onshore, should be considered when evaluating future projects.

Revolution Wind has submitted to BOEM, the lead federal agency reviewing the Project, technical reports evaluating cultural and historic resources potentially affected by the Project. One shipwreck and two geomorphic features of archaeological interest were identified within the portion of the Ocean SAMP Area subject to this Category B Assent application during Project surveys (i.e., from the mouth of Narragansett Bay to the three nautical mile state water line). Revolution Wind has submitted to BOEM a Marine Archaeological Resources Assessment. A copy of this report is provided under confidential cover to Category B Assent application because it contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552) (Appendix N).

Revolution Wind also notes that BOEM is required to satisfy Section 106 of the NHPA, which requires consultation with SHPOs, THPOs, and other interested parties, as well as assessment and mitigation of any adverse effects to historic properties. BOEM initiated Section 106 consultation for the Project on April 2, 2021.[20]

B. The Council has a federal obligation as part of its responsibilities under the federal Coastal Zone Management Act to recognize the importance of cultural, historic, and tribal resources within the state's coastal zone, including Rhode Island state waters. It has a similar

20 The regulations at 36 CFR § 800.8 provide for use of the National Environmental Policy Act (NEPA) process to fulfill a Federal agency's National Historic Preservation Act (NHPA) Section 106 review obligations in lieu of the procedures set forth in 36 CFR § 800.3 through 800.6. This process is known as NEPA substitution for Section 106 and the Bureau of Ocean Energy Management (BOEM) is using this process for the Project.

https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/BOEM_NEPASubstitution_ConsultingPartyGuide_Final.pdf *responsibility under the Rhode Island Historic Preservation Act. The Council will not permit activities that will significantly impact the state's cultural, historic and tribal resources.*

Noted. As stated in response to Section 11.9.3(A) above BOEM, as the lead federal agency, is required to satisfy Section 106 of the NHPA which requires consultation with SHPOs, THPOs, and other interested parties, as well as assessment and mitigation of any adverse effects to historic properties.

C. The Council will engage federal and state agencies, and the Narragansett Indian Tribe's Tribal Historic Preservation Office (THPO), when evaluating the impacts of proposed development on cultural and historic resources. The Rhode Island Historic Preservation and Heritage Commission (RIHPHC) is the State Historic Preservation Office (SHPO) for the State of Rhode Island and is charged with developing historical property surveys for Rhode Island municipalities, reviewing projects that may impact cultural and historic resources, and regulating archaeological assessments on land and in state waters. For other tribes outside of Rhode Island that might be affected by a federal action it is the responsibility of the applicable federal agency to consult with affected tribes.

Noted. Revolution Wind has engaged with applicable federal and state agencies, SHPOs, and THPOs (including the Narragansett Indian Tribe's TPHO) as part of cultural resource investigations and assessments performed for the Project. BOEM is required to satisfy Section 106 of the NHPA, which requires consultation with SHPOs, THPOs, and other interested parties.

D. Project reviews will follow the policies outlined in §§ 00-1.2.3 (Areas of Historic and Archaeological Significance) and 00-1.3.5 of this Chapter (Guidelines for the Protection and Enhancement of the Scenic Value of the Coastal Region) of the State of Rhode Island Coastal Resources Management Program, as amended (Subchapter 00 Part 1 of this Chapter). The standards for the identification of cultural resources and the assessment of potential effects on cultural resources will be in accordance with the National Historic Preservation Act Section 106 regulations, 36 C.F.R. Part 800, Protection of Historic Properties.

Noted. Revolution Wind has engaged with applicable federal and state agencies, SHPOs, and Native American Tribes (including the Narragansett Indian Tribe's Tribal Historic Preservation Officer [THPO]) as part of cultural resource investigations and assessments performed for the Project. Identification and evaluation surveys conducted for the Project are implemented in accordance with the Advisory Council on Historic Preservation's 36 C.F.R. Part 800 federal regulations and the Rhode Island Historical Preservation and Heritage Commission's (RIHPHC's) Performance Standards and Guidelines for Archaeology in Rhode Island (as revised) and the RIHPHC's archaeological permitting policies.

E. Historic shipwrecks, archeological or historical sites located within Rhode Island's coastal zone are Areas of Particular Concern (APCs) for the Rhode Island coastal management program. Direct and indirect impacts to these resources must be avoided to the greatest extent possible. Other areas, not noted as APCs, may also have significant archeological sites that could be identified through the permit process. For example, the area at the south end of Block

Island waters within the 30 foot depth contour is known to have significant archeological resources. As a result, projects conducted in the Ocean SAMP area may have impacts to Rhode Island's underwater archaeological and historic resources.

As noted above, one shipwreck and two geomorphic features of archaeological interest were identified during Project surveys within the portion of the Ocean SAMP Area subject to this Category B Assent application. Revolution Wind will avoid the identified shipwreck and 164 ft (50 m) buffer from the outer extent of its magnetic signature during installation of the RWEC-RI to the greatest extent practicable. Additionally, installation of the RWEC-RI will avoid to the greatest extent practicable, the two geomorphic features of archaeological interest located within the Ocean SAMP area subject to this Category B Assent application. Mitigation of any unavoidable adverse impacts to historic properties will be addressed through the Section 106 process lead by BOEM.

F. Archaeological surveys shall be required as part of the permitting process for projects which may pose a threat to Rhode Island's archaeological and historic resources. During the filing phase for state assent, projects needing archaeological surveys will be identified through the joint review process. The survey requirements will be coordinated with the SHPO and, if tribal resources are involved, with the Narragansett THPO.

Revolution Wind has completed archaeological surveys within the portion of the RWEC-RI in the Ocean SAMP area consistent with state and federal guidelines and in consultation with SHPOs and THPOs.

G. Areas of Particular Concern may require a buffer or setback distance to ensure that development projects avoid or minimize impacts to known or potential historic or archaeological sites. The buffer or setback distance during the permitting process will be determined by the SHPO and if tribal resources are involved, the Narragansett THPO.

Noted. Revolution Wind's Qualified Marine Archaeologist ("QMA") has recommended avoidance buffers for resources identified within the RWEC-RI. Revolution Wind will avoid the identified buffers to the greatest extent practicable. Revolution Wind understands buffer distances may be adjusted through BOEM's consultation with SHPOs and THPOs per Section 106 of the NHPA.

H. In addition to general Area of Particular Concern buffer/setback distances around shipwrecks or other submerged cultural resources, the Council reserves the right, based upon recommendations from RIHPHC, to establish protected areas around all submerged cultural resources which meet the criteria for listing on the National Register of Historic Places.

Noted.

I. Projects conducted in the Ocean SAMP area may have impacts that could potentially affect onshore archaeological, historic, or cultural resources. Archaeological and historical surveys may be required of projects which are reviewed by the joint agency review process. During the filing phase for state assent, projects needing such surveys will be identified and the survey *requirement will be coordinated with the SHPO and if tribal resources are involved, with the Narragansett THPO.*

Revolution Wind has performed surveys to identify buried archaeological sites in areas of potential ground disturbance focusing on the Onshore Project Area. Revolution Wind is continuing to investigate the potential for impacts to terrestrial archaeological resources in consultation with RIHPHC and the Narragansett THPO. A copy of the Project's current Terrestrial Archaeological Resources Assessment is provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552) (see Appendix K).

J. Guidelines for onshore archaeological assessments in the Ocean SAMP area can be obtained through the RIHPHC in their document, "Performance Standards and Guidelines for Archaeological Projects: Standards for Archaeological Survey" (RIHPHC 2007), or the lead federal agency responsible for reviewing the proposed development. In addition, guidelines for landscape and visual impact assessment in the Ocean SAMP area can be obtained through the lead federal agency responsible for reviewing the proposed development.

Noted. Revolution Wind has performed onshore archaeological surveys consistent with state and federal guidelines and in consultation with SHPOs and THPOs. A visual impact assessment of Project components within the Ocean SAMP area subject to this Category B Assent application was not conducted because the RWEC-RI will not be visible.

5.1.4 Ocean SAMP §11.9.4 Commercial and Recreational Fisheries

A. The commercial and recreational fishing industries, and the habitats and biological resources of the ecosystem they are based on, are of vital economic, social, and cultural importance to Rhode Island's fishing ports and communities. Commercial and recreational fisheries are also of great importance to Rhode Island's economy and to the quality of life experienced by both residents and visitors. The Council finds that other uses of the Ocean SAMP area could potentially displace commercial or recreational fishing activities or have other adverse impacts on commercial and recreational fisheries.

Refer to Section 3.2.8 of this Category B Assent application for an evaluation of commercial and recreational fisheries within state waters and potential impacts associated with the RWEC-RI, which are expected to be temporary and localized during construction and decommissioning. During O&M, commercial and recreational fisheries are expected to experience no effect or limited effects from the presence of the RWEC-RI because it will be buried beneath the seabed. The USCG's stated policy is that "in the United States vessels will have the freedom to navigate through [wind farms], including export cable routes" (see Coast Guard Navigation and Vessel Inspection Circular 01-19 dated 1 August 2019). Therefore, commercial fishermen will have the ability to continue to fish along the RWEC-RI corridor.

B. The Council recognizes that finfish, shellfish, and crustacean resources and related fishing activities are managed by a host of different agencies and regulatory bodies which have jurisdiction over different species and/or different parts of the SAMP area. Entities involved in managing fish and fisheries within the SAMP area include, but are not limited to, the Atlantic States Marine Fisheries Commission, the R.I. Department of Environmental Management, the R.I. Marine Fisheries Council, the NOAA National Marine Fisheries Service, the New England Fishery Management Council, and the Mid-Atlantic Fishery Management Council. The Council recognizes the jurisdiction of these organizations in fishery management and will work with these entities to protect fisheries resources. The Council will also work in coordination with these entities to protect priority habitat areas.

Noted. Refer to Sections 3.2.3 and 3.2.4 of this Category B Assent application for an evaluation of shellfish and finfish resources within state waters and potential impacts associated with the RWEC-RI. Also refer to Appendix P of this Category B Assent for a description of benthic habitats present within state waters.

C. The Council's policy is to protect commercial and recreational fisheries within the Ocean SAMP area, and the 2011 and 2018 GLDs, from the adverse impacts of other uses, while supporting actions to make ongoing fishing practices more sustainable. The Council anticipates that over time there will be improved scientific knowledge of the impacts of fishing on habitats and fish populations. Improvements in more sustainable gear technology, fishing practices, and management tools may improve the state of fisheries resources. A general goal of the Council is to improve the health of the Ocean SAMP area ecosystem and the populations of fish and shellfish it provides. Cooperative research, using the unique skills and expertise of the fishing community, will be a cornerstone to this goal.

Refer to response to Section 11.9.4(A) above.

Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries and benthic monitoring studies are being planned to assess the potential impacts associated with the Project (including the RWEC-RI) on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region. Revolution Wind's Fisheries and Benthic Monitoring Plan was submitted to CRMC under separate cover on June 7, 2021.

D. Commercial and recreational fisheries activities are dynamic, taking place at different places at different times of the year due to seasonal species migrations and other factors. The Council recognizes that fisheries are dynamic, shaped by these seasonal migrations as well as other factors including shifts in the regulatory environment, market demand, and global climate change. The Council further recognizes that the entire Ocean SAMP area is used by commercial and recreational fishermen employing different fishing methods and gear types. Changes in existing uses, intensification of uses, and new uses within the area could cause adverse impacts to these fisheries. Accordingly, the Council shall:

1. In consultation with the Fishermen's Advisory Board, as defined in § 11.3(E) of this Part, identify and evaluate prime fishing areas on an ongoing basis through an adaptive framework.

2. Review any uses or activities that could disrupt commercial or recreational fisheries activities.

Noted. Refer to response to Section 11.9.4(A) above.

E. The Council shall work together with the U.S. Coast Guard, the U.S. Navy, the U.S. Army Corps of Engineers, NOAA, fishermen's organizations, marine pilots, recreational boating organizations, and other marine safety organizations to promote safe navigation, fishing, and recreational boating activity around and through offshore structures and developments, and along cable routes, during the construction, operation, and decommissioning phases of such projects. The Council will promote and support the education of all mariners regarding safe navigation around offshore structures and developments and along cable routes.

Revolution Wind has worked and continues to work regularly with all the agencies and entities listed above to promote safe navigation, fishing, and recreational boating during development, construction, and operation of the Project. Revolution Wind's Marine Affairs team posts twice-weekly Mariners Briefings to its website (https://us.orsted.com/wind-projects/mariners), which is also published in the USCG Local Notice To Mariners. The Marine Affairs team also briefs the greater southeastern New England maritime community at each of the USCG's quarterly Port Safety Forum. The Marine Affairs team has three Fisheries Liaisons for the northeast region who regularly attend local and regional fishing industry meetings (such as the New England Fishery Management Council) to provide project updates and seek mariner feedback, and also visit fishing docks in Rhode Island to ensure continuous contact with stakeholders. Throughout these engagements and as new potential conflicts are identified, Revolution Wind will continue to work with potentially affect parties to deconflict waterway usage and ensure there are no significant impacts to mariners.

F. Discussions with the U.S. Coast Guard, the U.S. Department of the Interior Bureau of Ocean Energy Management and the U.S. Army Corps of Engineers have indicated that no vessel access restrictions are planned for the waters around and through offshore structures and developments, or along cable routes, except for those necessary for navigational safety. Commercial and recreational fishing and boating access around and through offshore structures and developments and along cable routes is a critical means of mitigating the potential adverse impacts of offshore structures on commercial and recreational fisheries and recreational boating. The Council endorses this approach and shall work to ensure that the waters surrounding offshore structures, developments, and cable routes remain open to commercial and recreational fishing, marine transportation, and recreational boating, except for navigational safety restrictions. The Council requests that federal agencies notify the Council as soon as is practicable of any federal action that may affect vessel access around and through offshore structures and developments and along cable routes. The Council will continue to monitor changes to navigational activities around and through offshore developments and along cable routes. Any changes affecting existing navigational activities *may be subject to CZMA federal consistency review if the federal agency determines its activity will have reasonably foreseeable effects on the uses or resources of Rhode Island's coastal zone.*

Revolution Wind continues to work with the USCG on a safety zone plan that minimizes the implementation of vessel control measures to ensure navigation safety during construction of the Project. The USCG is expected to issue a Federal rulemaking proposal in 2022 which will describe the plan in detail. The public will be afforded an opportunity to comment on the proposal. Revolution Wind does not anticipate requesting the USCG to establish safety zones during operation of the Project.

G. The Council recognizes that commercial and recreational fishermen from other states, such as the neighboring states of Connecticut, New York, and Massachusetts, often fish in the Ocean SAMP area. The Council also recognizes that many fish species that are harvested in adjacent waters may rely on habitats and prey located within the Ocean SAMP area. Accordingly, the Council will work with neighboring states to ensure that offshore development and other uses of the Ocean SAMP area do not result in significant impacts to the fisheries resources or activities of other states.

Noted. Refer to response to Section 11.9.4(A) above.

H. The Council shall appoint a standing Fishermen's Advisory Board (FAB) which shall provide advice to the Council on the siting and construction of other uses in marine waters. …

Noted.

5.1.5 Ocean SAMP §11.9.5 Recreation and Tourism

A. The Council recognizes the economic, historic, and cultural value of marine recreation and tourism activities in the Ocean SAMP area to the state of Rhode Island. The Council's goal is to promote uses of the Ocean SAMP area that do not significantly interfere with marine recreation and tourism activities or values.

Refer to Section 3.2.9 of this Category B Assent application for an evaluation of recreation and tourism within state waters and potential impacts associated with the RWEC-RI. Installation of the RWEC-RI will not significantly interfere or detract from marine recreation and tourism uses. As discussed within Section 3.2.9.2, potential impacts to recreational boating, which includes fishing, diving, races, and wildlife viewing, will generally be limited to construction and decommissioning, and any potential impacts these phases will be minimized with Revolution Wind's compliance with TOY restrictions in state waters (e.g., offshore work generally occurring between Labor Day and February 1; see Section 2.2.5.1). As a submarine cable, the RWEC-RI will have no impact on recreation and tourism activities once installed.

B. When evaluating proposed offshore developments, the Council will carefully consider the potential impacts of such activities on marine recreation and tourism uses. Where it is determined that there is a significant impact, the Council may modify or deny activities that significantly detract from these uses.

Refer to response to Section 11.9.5(A) above.

C. The Council will encourage and support uses of the Ocean SAMP area that enhance marine recreation and tourism activities.

Noted.

D. The Council recognizes that the waters south of Brenton Point and within the 3-nautical mile boundary surrounding Block Island are heavily-used recreational areas and are commonly used for organized sailboat races and other marine events. The Council encourages and supports the ongoing coordination of race and marine event organizers with the U.S. Coast Guard, the U.S. Navy, and the commercial shipping community to facilitate safe recreational boating in and adjacent to these areas, which include charted shipping lanes and Navy restricted areas (see Ocean SAMP Chapter 7, Marine Transportation, Navigation, and Infrastructure). The Council shall consider these heavily-used recreational areas when evaluating offshore developments in this area. Where it is determined that there is a significant impact, the Council may suitably modify or deny activities that significantly detract from these uses. The Council also recognizes that much of this organized recreational activity is concentrated within the circular sailboat racing areas as depicted in Figure 6 in § 11.10.2(I) of this Part, and accordingly has designated these areas as Areas of Particular Concern. See § 11.10.2 of this Part for requirements associated with Areas of Particular Concern.

Revolution Wind has and will continue to engage with the USCG and the organizers of major marine events in state waters to avoid any potential waterway conflicts with the installation of the RWEC-RI. During installation of the RWEC-RI, Revolution Wind will maintain regular contact with the USCG to avoid waterway conflicts to the extent feasible.

E. See § 11.9.4(E) of this Part for policy regarding safe navigation around and through offshore structures and developments and along cable routes.

Refer to response to Section 11.9.4(E) above in Section 5.1.4 of this Category B Assent application.

F. See § 11.9.4(F) of this Part for policy regarding vessel access around and through offshore structures and developments and along cable routes.

Refer to response to Section 11.9.4(F) above in Section 5.1.4 of this Category B Assent application.

G. The Council recognizes that offshore wildlife viewing activities are reliant on the presence and visibility of marine and avian species which rely on benthic habitat, the availability of food, and other environmental factors. The Council shall consider these environmental factors when evaluating proposed offshore developments in these areas. Where it is determined that there is a significant impact, the Council may modify or deny activities that significantly detract from these uses.

Refer to Section 3.2 of this Category B Assent application for an evaluation of biological and benthic resources, including marine and avian species, within state

waters and potential impacts associated with the RWEC-RI. As described in applicable subsections in Section 3.2 (i.e., benthic and shellfish resources, marine mammals and sea turtles, and coastal and marine birds), significant impacts to these resources are not anticipated in state waters given the limited scale and intensity of the RWEC-RI activities.

5.1.6 Ocean SAMP §11.9.6 Marine Transportation, Navigation, and Infrastructure

A. The Council recognizes the importance of designated navigation areas, which include shipping lanes, precautionary areas, recommended vessel routes, pilot boarding areas, anchorages, military testing areas, and submarine transit lanes to marine transportation and navigation activities in the Ocean SAMP area. The Council also recognizes that these and other waters within the Ocean SAMP area are heavily used by numerous existing users who have adapted to each other with regard to their uses of ocean space. Any changes in the spatial use patterns of any one of these users will result in potential impacts to the other users. The Council will carefully consider the potential impacts of such changes on the marine transportation network. Changes to existing designated navigational areas proposed by the U.S. Coast Guard, NOAA, the R.I. Port Safety and Security Forums, or other entities could similarly impact existing uses. The Council requests that they be notified by any of these parties if any such changes are to be made to the transportation network so that they may work with those entities to achieve a proper balance among existing uses.

Refer to Sections 3.2.10 and 3.2.11 of this Category B Assent application for an evaluation of commercial shipping and other marine uses (e.g., anchorage areas, ferry routes, pilot boarding areas, etc.), respectively, within state waters and potential impacts associated with the RWEC-RI.

Revolution Wind does not intend to request that the USCG modify any precautionary areas, recommended vessels routes, pilot boarding areas, etc. In conjunction with the RWEC-RI route through the West Passage of Narragansett Bay, the USCG may consider modifying some of the U.S. Navy anchorages north of the Jamestown Bridge, which the USCG considers to be obsolete.

B. The Council recognizes the economic, historic, and cultural value of marine transportation and navigation uses of the Ocean SAMP area to the state of Rhode Island. The Council's goal is to promote uses of the Ocean SAMP area that do not significantly interfere with marine transportation and safe navigation within designated navigation areas, which include shipping lanes, precautionary areas, recommended vessel routes, pilot boarding areas, anchorages, military testing areas, and submarine transit lanes. See § 11.10.2 of this Part for discussion of navigation areas which have been designated as Areas of Particular Concern.

Refer to response to Section 11.9.6(A) above. Refer to Section 5.2.2 of this Category B Assent application for discussion of Areas of Particular Concern.

C. The Council will encourage and support uses of the Ocean SAMP area that enhance marine transportation and safe navigation within designated navigation areas, which include shipping lanes, precautionary areas, recommended vessel routes, pilot boarding areas, anchorages, military testing areas, and submarine transit lanes.

Refer to response to Section 11.9.6(A) above.

D. See § 11.9.4(E) of this Part for policy regarding safe navigation around and through offshore structures and developments and along cable routes.

Refer to response to Section 11.9.4(E) above in Section 5.1.4 of this Category B Assent application.

E. See § 11.9.4(F) of this Part for policy regarding vessel access around and through offshore structures and developments and along cable routes.

Refer to response to Section 11.9.4(F) above in Section 5.1.4 of this Category B Assent application.

5.1.7 Ocean SAMP §11.9.7 Offshore Renewable Energy and Other Offshore Development

A. The Council supports offshore development in the Ocean SAMP area that is consistent with the Ocean SAMP goals, which are to:

1. Foster a properly functioning ecosystem that can be both ecologically effective and economically beneficial;

2. Promote and enhance existing uses; and

3. Encourage marine-based economic development that considers the aspirations of local communities and is consistent and complementary to the state's overall economic development needs and goals.

Revolution Wind developed the Project in direct response to the expressed needs of the States of Rhode Island and Connecticut to increase the renewable energy load serving each state. Refer to Section 1.3 of this Category B Assent application for further description of the Project's purpose and need. The RWEC-RI is a water dependent use proposed in Type 4 and Type 6 waters which will facilitate transfer of renewable energy generated by the Project to the States of Rhode Island and Connecticut. The RWEC-RI was sited, planned, and designed to avoid and minimize impacts to ecological resources. To the extent there are potential adverse impacts that cannot be avoided, these will be mitigated.

B. The Council supports the policy of increasing renewable energy production in Rhode Island. The Council also recognizes:

1. Offshore wind energy currently represents the greatest potential for utility-scale renewable energy generation in Rhode Island;

2. Offshore renewable energy development is a means of mitigating the potential effects of global climate change;

3. Offshore renewable energy development will diversify Rhode Island's energy portfolio;

4. Offshore renewable energy development will aid in meeting the goals set forth in Rhode Island's Renewable Energy Standard;

5. Marine renewable energy has the potential to assist in the redevelopment of urban waterfronts and ports.

As an offshore wind energy project, the Project is consistent with this policy of the Ocean SAMP. As noted in Section 1.3 of this Category B Assent application, the Project will contribute 400 MW of renewable energy toward Rhode Island's ambitious goal of converting Rhode Island to 100% renewable energy by 2030. The RWEC-RI is a water dependent use proposed in Type 4 and Type 6 waters which will facilitate transfer of renewable energy generated by the Project to the States of Rhode Island and Connecticut.

C. The Council's support of offshore renewable energy development shall not be construed to endorse or justify any particular developer or particular offshore renewable energy proposal.

Noted.

D. The Council may require the applicant to fund a program to mitigate the potential impacts of a proposed offshore development to natural resources and existing human uses. The mitigation program may be used to support restoration projects, additional monitoring, preservation, or research activities on the impacted resource or site.

The RWEC-RI avoids and minimizes impacts to natural resources and existing uses to the extent practicable. Refer to Section 3.2 for discussions of potential impacts associated with the RWEC-RI and proposed avoidance, minimization, and mitigation measures for resources in the Ocean SAMP Area subject to this Category B Assent application.

E. To the greatest extent possible, offshore development structures and projects shall be made available to researchers for the investigation into the effects of large-scale installations on the marine environment, and to the extent practicable, educators for the purposes of educating the public.

As described in Table 2.2-8 and -9, Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries and benthic monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region. Additionally, Revolution Wind will collaborate with independent researchers seeking to evaluate effects to the marine environment, and to educators seeking to better inform the public.

F. The Council shall work in coordination with the U.S. Department of the Interior Bureau of Ocean Energy Management to develop a seamless process for review and design approval of offshore wind energy facilities that is consistent across state and federal waters.

Revolution Wind supports this policy. The Project (including the RWEC) spans both state and federal waters and will benefit from a seamless, consistent review process.

G. The Council shall work together with the U.S. Coast Guard, the U.S. Navy, the U.S. Army Corps of Engineers, NOAA, fishermen's organizations, marine pilots, recreational boating organizations, and other marine safety organizations to promote safe navigation, fishing, and recreational boating activity around and through offshore structures and developments, and along cable routes, during the construction, operation, and decommissioning phases of such projects. The Council will promote and support the education of all mariners regarding safe navigation around offshore structures and developments and along cable routes.

Revolution Wind has worked and continues to regularly work with all the agencies and entities listed above to promote safe navigation, fishing, and recreational boating during development, construction, and operation of the project. Revolution Wind's Marine Affairs teams posts twice-weekly Mariners Briefings to our website (https://us.orsted.com/wind-projects/mariners), which is also published in the USCG Local Notice To Mariners. The Marine Affairs team also briefs the greater southeastern New England maritime community at each of the USCG's quarterly Port Safety Forums. The Marine Affairs team has three Fisheries Liaisons for the northeast region who regularly attend local and regional fishing industry meetings (such as the New England Fishery Management Council) to provide Project updates and seek mariner feedback, and also visit fishing docks in Rhode Island to ensure continuous contact with stakeholders. Throughout these engagements and as new potential conflicts are identified, Revolution Wind will continue to work with potentially affect parties to deconflict waterway usage and ensure there are no significant impacts to mariners.

H. To coordinate the review process for offshore wind energy developments, the Council shall adopt consistent information requirements similar to the requirements of the U.S. Department of the Interior's Bureau of Ocean Energy Management for offshore wind energy. All documentation required at the time of application shall be similar with the requirements followed by the U.S. Department of the Interior Bureau of Ocean Energy Management when issuing renewable energy leases on the Outer Continental Shelf. For further details on these regulations see 30 C.F.R. §§ 285 et seq. The Council shall continue to monitor the federal review process and information requirements for any changes and will make adjustments to the Ocean SAMP policies accordingly.

Revolution Wind supports this policy. Information presented in this Category B Assent application includes synthesis of information presented in the Project's COP, as published by BOEM on April 30, 2021. The Project's COP is available on BOEM's project website (https://www.boem.gov/Revolution-Wind).

I. To the maximum extent practicable, the Council shall coordinate with the appropriate federal and state agencies to establish project specific requirements that shall be followed by the *applicant during the pre-construction, construction, operation and decommissioning phases of an offshore development….*

Revolution Wind supports this policy. The Project (including the RWEC) spans both state and federal waters and will benefit from a seamless, consistent review process.

J. The Council identifies the following industry goals for offshore projects. These are not required standards at this time but are targets project proponents should try to meet where possible to alleviate potential adverse impacts:

1. A goal for the offshore wind farm applicant and operator is to have operational noise from wind turbines average less than or equal to 100 dB re 1 µPa2 in any 1/3 octave band at a range of 100 meters at full power production.

2. The applicant and manufacturer should endeavor to minimize the radiated airborne noise from the wind turbines.

3. A monitoring system including acoustical, optical and other sensors should be established near these facilities to quantify the effects.

Not applicable; the Project's wind turbines are located in federal waters and are not subject to this Category B Assent application.

5.1.8 Ocean SAMP §11.9.8 Application Requirements in State Waters

A. Applicants shall meet the site assessment plan (SAP) requirements in § 11.10.5 of this Part and the following: (text of subparts A.1-A.9 omitted)

Revolution Wind's SAP for Lease Area OCS-A-0486 was approved by BOEM in October 2017. CRMC issued concurrence in file #2017-09-034 on September 8, 2017. Therefore, Revolution Wind has complied with the SAP requirements in Section 11.9.8(A), including all reporting requirements of the approved SAP.

B. Applicants shall meet the construction and operation plan (COP) requirements in § 11.10.5 of this Part and the following: (B.1-B.7 omitted)

Revolution Wind's COP is consistent with the requirements in Section 11.10.5. On April 30, 2021, BOEM published a Noticed of Intent to Prepare an Environmental Impact Statement for the Project and published the Project's COP to their website (https://www.boem.gov/Revolution-Wind). The Project's ERP/OSRP and Safety Management System ("SMS") are provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552) (see Appendix G and Appendix X, respectively).

Refer to Appendix Y for a review of the Project's COP relative to the content requirements in Section 11.10.5 of this Part.

8. If the application and COP is approved, prior to construction the applicant shall submit to the Council for approval the documents listed below in §§ 11.9.8(B)(8)(a), (b), (c), (d) and (e) of this Part: (a-e omitted)

Revolution Wind will comply with this standard and submit a facility design report and fabrication and installation report to CRMC that complies with the requirements of this subpart.

Revolution Wind has submitted a CVA nomination to BOEM. BOEM approved the CVA nomination on June 10, 2021. Revolution Wind anticipates filing a similar nomination with CRMC to satisfy this requirement of the Category B Assent application.

9. Based on the Council's environmental and technical reviews, if approved, the Council may specify terms and conditions to be incorporated into any approval the Council may issue. The applicant shall submit a certification of compliance annually (or another frequency as determined by the Council) with certain terms and conditions which may include: (a-b omitted)

10. After the applicant's COP, facility design report, and fabrication and installation report is approved, and the Council has issued a permit and lease for the project site, construction shall begin by the date given in the construction schedule included as a part of the approved COP, unless the Council approves a deviation from the applicant's schedule.

11. The applicant shall seek approval from the Council in writing before conducting any activities not described in the applicant's approved COP. The application shall describe in detail the type of activities the applicant proposes to conduct. The Council shall determine whether the activities the applicant proposes are authorized by the applicant's existing COP or require a revision to the applicant's COP. The Council may request additional information from the applicant, if necessary, to make this determination.

12. The Council shall periodically review the activities conducted under an approved COP. The frequency and extent of the review shall be based on the significance of any changes in available information, and on onshore or offshore conditions affecting, or affected by, the activities conducted under the applicant's COP. If the review indicates that the COP should be revised, the Council may require the applicant to submit the needed revisions.

13. The applicant shall notify the Council, within 5 business days, any time the applicant ceases commercial operations, without an approved suspension, under the applicant's approved COP. If the applicant ceases commercial operations for an indefinite period which extends longer than 6 months, the Council may cancel the applicant's lease, and the applicant shall initiate the decommissioning process.

14. The applicant shall notify the Council in writing of the following events, within the time periods provided: (a-c omitted)

15. The applicant may commence commercial operations within thirty (30) days after the CVA has submitted to the Council the final fabrication and installation report.

16. The applicant shall submit a project modification and repair report to the Council, demonstrating that all major repairs and modifications to a project conform to accepted engineering practices. (a-d omitted)

Revolution Wind acknowledges requirements of Section 11.9.8(B)(9)-(16) and will comply. Refer to Appendix Y for the Contents of the Revolution Wind COP.

C. Design, fabrication and installation standards (1-21 omitted)

Revolution Wind acknowledges and will comply with requirements of Section 11.9.8(C)(1)-(21). Revolution Wind has submitted a CVA nomination to BOEM. BOEM approved the CVA nomination on June 10, 2021. Revolution Wind anticipates filing a similar nomination with CRMC to support this requirement of the Category B Assent application.

D. Pre-construction standards (1-3 omitted)

Revolution Wind acknowledges and will comply with requirements of Section 11.9.8(D)(1)-(3). Refer to Table 1.4-1 in Section 1.4 of this Category B Assent application for a summary of other state and federal approvals that Revolution Wind will obtain.

4. The Council shall consult with the U.S. Coast Guard, the U.S. Navy, marine pilots, the Fishermen's Advisory Board as defined in § 11.3(E) of this Part, fishermen's organizations, and recreational boating organizations when scheduling offshore marine construction or dredging activities. Where it is determined that there is a significant conflict with season-limited commercial or recreational fishing activities, recreational boating activities or scheduled events, or other navigation uses, the Council shall modify or deny activities to minimize conflict with these uses.

Revolution Wind has worked and continues to work regularly with all the agencies and entities listed above to promote safe navigation, fishing, and recreational boating during development, construction, and operation of the Project. Revolution Wind's Marine Affairs team posts twice-weekly Mariners Briefings to its website (https://us.orsted.com/wind-projects/mariners), which is also published in the USCG Local Notice To Mariners. The Marine Affairs team also briefs the greater southeastern New England maritime community at each of the USCG's quarterly Port Safety Forum. The Marine Affairs team has three Fisheries Liaisons for the northeast region who regularly attend local and regional fishing industry meetings (such as the New England Fishery Management Council) to provide project updates and seek mariner feedback, and also visit fishing docks in Rhode Island to ensure continuous contact with stakeholders. Throughout these engagements and as new potential conflicts are identified, Revolution Wind will continue to work with potentially affect parties to deconflict waterway usage and ensure there are no significant impacts to mariners.

5. The Council shall require the assent holder to provide for communication with commercial and recreational fishermen, mariners, and recreational boaters regarding offshore marine construction or dredging activities. Communication shall be facilitated through a project *website and shall complement standard U.S. Coast Guard procedures such as Notices to Mariners for notifying mariners of obstructions to navigation.*

Revolution Wind will comply. Refer to response above.

6. For all large-scale offshore developments, underwater cables, and other development projects as determined by the Council, the assent holder shall designate and fund a third-party fisheries liaison. The fisheries liaison must be knowledgeable about fisheries and shall facilitate direct communication between commercial and recreational fishermen and the project developer. Commercial and recreational fishermen shall have regular contact with and direct access to the fisheries liaison throughout all stages of an offshore development (pre-construction; construction; operation; and decommissioning).

Revolution Wind will comply. Revolution Wind has developed a Fisheries Communication and Outreach Plan which prescribes fisheries liaisons and fisheries representatives to serve as conduits for providing information to, and gathering feedback from, the fishing industry (see Appendix DD of the Project's COP).

7. Where possible, offshore developments should be designed in a configuration to minimize adverse impacts on other user groups, which include but are not limited to: recreational boaters and fishermen, commercial fishermen, commercial ship operators, or other vessel operators in the project area. Configurations which may minimize adverse impacts on vessel traffic include, but are not limited to, the incorporation of a traffic lane through a development to facilitate safe and direct navigation through, rather than around, an offshore development.

The RWEC-RI will be buried to sufficient depths (target burial of 4-6 feet [1.2-1.8 meters]) so as to minimize adverse impact on other user groups and not interfere with navigation.

8. Any assent holder of an approved offshore development shall work with the Council when designing the proposed facility to incorporate where possible mooring mechanisms to allow safe public use of the areas surrounding the installed turbine or other structure.

Revolution Wind will comply. Refer to Section 2.2.3.8 of this Category B Assent application for a description of temporary ADCPs that will be deployed during construction and for one-year post-construction.

9. The facility shall be designed in a manner that minimizes adverse impacts to navigation. As part of its application package, the project applicant shall submit a navigation risk assessment under the U.S. Coast Guard's Navigation and Vessel Inspection Circular 02-07, "Guidance on the Coast Guard's Roles and Responsibilities for Offshore Renewable Energy Installations."

A Navigation Safety Risk Assessment is included as Appendix T to this Category B Assent application. The RWEC-RI will be buried to sufficient depths (target burial of 4-6 ft [1.2-1.8 m]) so as to minimize adverse impact on other user groups and not interfere with navigation.

10. Applications for projects proposed to be sited in state waters pursuant to the Ocean SAMP shall not have a significant impact on marine transportation, navigation, and existing *infrastructure. Where the Council, in consultation with the U.S. Coast Guard, the U.S. Navy, NOAA, the U.S. Bureau of Ocean Energy Management, Regulation and Enforcement, the U.S. Army Corps of Engineers, marine pilots, the R.I. Port Safety and Security Forums, or other entities, as applicable, determines that such an impact on marine transportation, navigation, and existing infrastructure is unacceptable, the Council shall require that the applicant modify the proposal or the Council shall deny the proposal. For the purposes of marine transportation policies and standards as summarized in Ocean SAMP Chapter 7, impacts will be evaluated according to the same criteria used by the U.S. Coast Guard, as follows; these criteria shall not*

Refer to response to 11.9.8(D)(9) above.

11. Prior to construction, the Applicant shall provide a letter from the U.S. Coast Guard showing it meets all applicable U.S. Coast Guard standards.

Revolution will comply with all USCG permitting requirements and will provide CRMC documentation of such permits when obtained. Additionally, Revolution Wind has met with and will continue to meet regularly with USCG Sector Southeastern New England to discuss RWEC-RI operations to minimize impacts to the Marine Transportation System, and to secure USCG acceptance of Project plans.

E. Standards for construction activities

1. The assent holder shall use the best available technology and techniques to minimize impacts to the natural resources and existing human uses in the project area.

Refer to Section 2.2.3.4 for the cable installation tools that may be utilized during installation of the RWEC-RI within the Ocean SAMP Area. In order to determine the most appropriate cable installation methodology, Revolution Wind will complete a Cable Burial Risk Assessment in which the site conditions will be described in detail, identifying features such as boulder distribution and dimensions, sandwave height and mobility, soil strength and classification, seabed obstructions and UXO and MEC. Following this detailed information on the installation, final technique(s) will be selected and burial requirements will be included in the FDR and FIR, to be reviewed by the CVA. The RWEC-RI is designed to avoid adverse impacts and, where unavoidable impacts may occur those impacts will be minimized and mitigated.

2. The Council shall require the use of an environmental inspector to monitor construction activities. The environmental inspector shall be a private, third-party entity that is hired by the assent holder, but is approved and reports to the Council. The environmental inspector shall possess all appropriate qualifications as determined by the Council. This inspector service may be part of the CVA requirements.

Refer to Section 2.2.5.3 for Revolution Wind's commitments to compliance monitoring during construction. Revolution Wind will comply with this provision.

3. Installation techniques for all construction activities should be chosen to minimize sediment disturbance. Jet plowing and horizontal directional drilling in near-shore areas shall be required in the installation of underwater transmission cables. Other technologies may be used *provided the applicant can demonstrate they are as effective, or more effective, than these techniques in minimizing sediment disturbance.*

As described in Section 2.2.3.2, Revolution Wind is proposing the use of HDD at the landfall location, although the Project's landfall location is outside the Ocean SAMP Area. Also as described in Section 2.2.3.2, Revolution Wind is also considering the use of jet plowing for cable installation within the Ocean SAMP area. Refer to response to Section 11.9.8(E)(1) above regarding Revolution Wind's evaluation of cable installation methods.

4. All construction activities shall comply with the policies and standards outlined in the Rhode Island Coastal Resources Management Program (RICRMP), as well as the regulations of other relevant state and federal agencies.

Refer to Section 4 of this Category B Assent application for review of the Project's compliance with the CRMP. Also, refer to Table 1.4-1 in Section 1.4 of this Category B Assent application for a summary of other state and federal approvals that Revolution Wind will obtain.

5. The applicant shall conduct all activities on the applicant's permit under this part in a manner that conforms with the applicant's responsibilities in § 11.10.1(E) of this Part, and using:

a. Trained personnel; and

Revolution Wind will comply.

b. Technologies, precautions, and techniques that shall not cause undue harm or damage to natural resources, including their physical, atmospheric, chemical and biological components.

Revolution Wind is committed to minimizing potential effects on natural resources and existing human uses in the Project Area. Revolution Wind has proposed a suite of measures to avoid and minimize potential impacts resulting from construction and operation of the RWEC-RI, which are summarized in Tables 2.2-8 and 2.2-9 of this application.

6. The assent holder shall be required to use the best available technology and techniques to mitigate any associated adverse impacts of offshore renewable energy development.

a. As required, the applicant shall submit to the Council:

(1) Measures designed to avoid or minimize adverse effects and any potential incidental take of endangered or threatened species as well as all marine mammals;

(2) Measures designed to avoid likely adverse modification or destruction of designated critical habitat of such endangered or threatened species; and

(3) The applicant's agreement to monitor for the incidental take of the species and adverse effects on the critical habitat, and provide the results of the monitoring to the Council as required.

Revolution Wind will comply. Revolution Wind has proposed a suite of measures to avoid and minimize potential impacts resulting from construction and operation of the RWEC-RI, which are summarized in Tables 2.2-8 and 2.2-9 of this application. Revolution Wind will obtain an incidental take authorization for Project activities pursuant to the Marine Mammal Protection Act and Endangered Species Act (see Table 1.4-1). Revolution Wind anticipates such authorizations will specify specific conditions to avoid, minimize, and monitor potential adverse effects and incidental take of endangered and threatened species as well as marine mammals.

7. If the assent holder, the assent holder's subcontractors, or any agent acting on the assent holder's behalf discovers a potential archaeological resource while conducting construction activities or any other activity related to the Assent Holder's project, the applicant shall: (a-c omitted)

An Unanticipated Discoveries Plan is included as part of the Project's Marine Archaeological Resources Assessment, which is provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552) (Appendix N).

8. Post construction, the assent holder shall provide a side scan sonar survey of the entire construction site to verify that there is no post construction debris left at the project site. These side-scan sonar survey results shall be filed with the Council within ninety (90) days of the end of the construction period. The results of this side-scan survey shall be verified by a third-party reviewer, who shall be hired by the assent holder but who is pre-approved by and reports to the Council.

Refer to Section 2.2.5.3. Revolution Wind will conduct an as-built multi-beam survey along the entirety of the cable routes within state waters following installation and the placement of any secondary cable protection. Revolution Wind will comply with the stated reporting requirements in this standard.

9. All pile-driving or drilling activities shall comply with any mandatory best management practices established by the Council in coordination with the Joint Agency Working Group and which are incorporated into the RICRMP.

Not applicable. No piling driving will occur during installation of the RWEC-RI within the Ocean SAMP Area subject to this Category B Assent application.

10. The Council may require the assent holder to hire a CVA to perform periodic inspections of the structure(s) during the life of those structure(s). The CVA shall work for and be responsible to the council.

Revolution Wind has submitted a CVA nomination to BOEM. BOEM approved the CVA nomination on June 10, 2021. Revolution Wind anticipates filing a similar nomination with CRMC to support this requirement of the Category B Assent application.

F. When mitigation is required by the Council, the reasonable costs associated with mitigation negotiations, which may include data collection and analysis, technical and financial analysis, and legal costs, shall be borne by the applicant. The applicant shall establish and maintain either an escrow account to cover said costs of the negotiations or such other mechanism as set forth in the permit or approval condition pertaining to mitigation.

Noted. Revolution Wind will comply.

G. The CRMC shall convene a Wind Energy Industry-Fishery Coordination Board that will be composed of invited representatives of wind energy developers with projects located within state waters and the Rhode Island 2011 and 2018 GLDs, fishery representatives of the major sectors from the states of Rhode Island and Massachusetts, and state fishery and coastal management representatives from each state, including any other representatives of state or federal agencies deemed necessary. The Board will meet semi-annually to discuss and resolve fishery and wind industry interactions during and after the construction phase of each wind energy project.

Noted.

5.1.9 Ocean SAMP §11.9.9 Baseline Assessment Requirements and Standards in State Waters

A. The Council in coordination with the Joint Agency Working Group, as described in § 11.9.7(I) of this Part, shall determine requirements for the development of baseline assessments prior to, during, and post construction for all offshore projects. Monitoring of offshore projects is essential to determine whether construction and operation activities may have an adverse impact on the physical and biological components of offshore waters. In particular, establishment of pre-construction baseline assessments of commercial and recreational fishery resource conditions (i.e., community structure, biodiversity, and species biomass, abundance, size distribution) is necessary for evaluation of any potential coastal effects. Assessments and monitoring are essential to determine whether there are any potential coastal effects and potential cumulative impacts resulting from the construction and operation of multiple wind energy projects. Specific assessment and monitoring requirements shall be determined on a project-by-project basis and may include but are not limited to the assessment and monitoring of: (list omitted)

Revolution Wind has undertaken detailed analyses of the topics listed in this policy as part of its COP and has summarized these analyses, as they related to the RWEC-RI, in this Category B Assent application (see Section 3.2).

B. The Council shall require where appropriate that project developers perform systematic observations of recreational boating intensity at the project area at least three times: pre-construction; during construction; and post-construction. Observations may be made while conducting other field work or aerial surveys and may include either visual surveys or analysis of aerial photography or video photography. The Council shall require where appropriate that observations capture both weekdays and weekends and reflect high-activity periods including, *but not limited to, the July 4th holiday weekend, the week in June when the Block Island Race Week typically takes place, and other recreational boating events within Narragansett Bay, and Rhode Island and Block Island Sounds. The quantitative results of such observations, including raw boat counts and average number of vessels per day, will be provided to the Council.*

Noted. Revolution Wind will comply if required by the Council.

C. The items listed below shall be required for all offshore developments:

1. A biological assessment of commercially and recreationally targeted fishery species shall be required within the project area for all offshore developments for the periods specified in § 11.9.9(E) of this Part. This assessment shall assess the relative abundance, distribution, and different life stages of these species at all four seasons of the year. This assessment shall comprise a series of surveys, using survey equipment and methods that are appropriate for sampling finfish, shellfish, and crustacean species at the project's proposed location. This assessment may include evaluation of survey data collected through an existing survey program, if data are available for the proposed site.

Refer to response to Section 11.9.9(E) below.

2. An assessment of commercial and recreational fisheries effort, landings, and landings value shall be required for all proposed offshore developments. The assessment shall focus on the proposed project area and any alternatives. This assessment shall evaluate commercial and recreational fishing effort, landings, and landings value at three different stages: pre-construction (to assess baseline conditions); during construction; and during operation, as specified in § 11.9.9(E) of this Part. At each stage, all four seasons of the year must be evaluated. Assessment may use existing fisheries monitoring data but shall be supplemented by interviews with commercial and recreational fishermen. Assessment shall address whether fishing effort, landings, and landings value has changed in comparison to baseline (pre-construction) conditions.

Revolution Wind will comply with this requirement and will submit an economic assessment of fisheries values within the Project area at the three stages specified above.

D. The Council in coordination with the Joint Agency Working Group may also require facility and infrastructure monitoring requirements that may include but are not limited to:

1. Post construction monitoring including regular visual inspection of inner array cables and the primary export cable to ensure proper burial, foundation and substructure inspection.

Noted. Revolution Wind will comply.

E. Assessment standards—applicants shall provide the following biological assessments necessary to establish the baseline conditions of the fishery resource conditions during the project phases detailed below so that an analysis of comparison between project phases can be completed to assess whether project construction, installation and operation has resulted in significant adverse impacts to the commercial and recreational fishery resources.

1. Pre-construction baseline biological assessments of commercial and recreational targeted fishery species as specified in § 11.9.9(C) of this Part for a minimum of two (2) complete years before offshore construction and installation activities begin;

2. During construction biological assessments of commercial and recreational targeted fishery species as specified in § 11.9.9(C) for each year (if construction extends beyond a single year) of construction and installation; and

3. Post-construction biological assessments of commercial and recreational targeted fishery species as specified in § 11.9.9(C) of this Part for three (3) complete years following completion of construction and installation activities and during the operational phase of the project.

Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries and benthic monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region. The Project's Fisheries and Benthic Monitoring Plan was submitted to CRMC under separate cover on June 7, 2021.

F. The Council shall require post-construction assessments of commercial and recreational targeted fishery species at five (5) year intervals following the post-construction monitoring required in § 11.9.9(E)(3) of this Part. The assessments shall be conducted during the four seasons of a year as specified in § 11.9.9(C) of this Part. If the analysis of post-construction assessments demonstrate adverse impacts to fishery species as compared to the baseline assessments required in § 11.9.9(E) (1) of this Part that are attributable to the construction or operation of a wind energy project, then the Council may require mitigation measures consistent with §§ 11.10.1(E) and (F) of this Part.

Refer to response above.

5.2 Ocean SAMP §11.10 Regulatory Standards

This section contains regulatory standards outlined in the Ocean SAMP. Pursuant to the Ocean SAMP, Revolution Wind is addressing the following standards in this Category B Assent application:

- §11.10.1 Overall Regulatory Standards
- §11.10.2 Areas of Particular Concern
- §11.10.4 Other Areas
- §11.10.5 Application Requirements
- §11.10.6 Monitoring Requirements

Section 11.10.3, Prohibition and Areas Designated for Preservation, is not applicable to this Category B Assent application because, as an underwater cable, the RWEC-RI is exempt from this standard.

5.2.1 Ocean SAMP §11.10.1 Overall Regulatory Standards

A. All offshore developments regardless of size, including energy projects, which are proposed for or located within state waters of the Ocean SAMP area, are subject to the policies and standards outlined in §§ 11.9 and 11.10 of this Part (except, as noted above, § 11.9 of this Part shall not be used for CRMC concurrence or objection for CZMA federal consistency reviews). For the purposes of the Ocean SAMP, offshore developments are defined as: (1-7 omitted)

The RWEC-RI is an underwater cable and, therefore, Revolution Wind understands is subject to the policies and standards outlined in Section 11.9 and 11.10 of the Ocean SAMP.

B. In assessing the natural resources and existing human uses present in state waters of the Ocean SAMP area, the Council finds that the most suitable area for offshore renewable energy development in the state waters of the Ocean SAMP area is the renewable energy zone depicted in Figure 1 in § 11.10.1(R) of this Part, below. The Council designates this area as Type 4E waters. In the Rhode Island Coastal Resources Management Program (Subchapter 00 Part 1 of this Chapter) these waters were previously designated as Type 4 (multipurpose) but are hereby modified to show that this is the preferred site for large scale renewable energy projects in state waters. The Council may approve offshore renewable energy development elsewhere in the Ocean SAMP area, within state waters, where it is determined to have no significant adverse impact on the natural resources or human uses of the Ocean SAMP area. Large-scale offshore developments shall avoid areas designated as Areas of Particular Concern consistent with § 11.10.2 of this Part. No large-scale offshore renewable energy development shall be allowed in Areas Designated for Preservation consistent with § 11.10.3 of this Part.

Based on the figure provided in § 11.10.1.P, Figure 1: Renewable energy zone, the RWEC-RI is not within the renewable energy zone around Block Island. However, Revolution Wind does not propose a large-scale project within state waters. The wind farm portion of the Project is proposed in federal waters beyond the three-nautical mile limit of Rhode Island state waters and is therefore not considered a large-scale offshore project that is subject to this Category B Assent application process. The RWEC-RI is designed to avoid and minimize significant adverse impacts. Where impacts cannot be fully avoided, they will be minimized and mitigated.

C. Offshore developments shall not have a significant adverse impact on the natural resources or existing human uses of the Rhode Island coastal zone, as described in the Ocean SAMP. In making the evaluation of the effect on human uses, the Council will determine, for example, if there is an overall net benefit to the Rhode Island marine economic sector from the development of the project or if there is an overall net loss. Where the Council determines that impacts on the natural resources or human uses of the Rhode Island coastal zone through the *pre-construction, construction, operation, or decommissioning phases of a project constitute significant adverse effects not previously evaluated, the Council shall, through its permitting and enforcement authorities in state waters and through any subsequent CZMA federal consistency reviews, require that the applicant modify the proposal to avoid and/or mitigate the impacts or the Council shall deny the proposal.*

As noted above and discussed throughout this application, The RWEC-RI is designed to avoid and minimize significant adverse impacts. Where impacts cannot be fully avoided, they will be minimized and mitigated.

As detailed in Section 1.3, Purpose and Need, the Project will provide clean, reliable offshore wind energy that will increase significantly the volume of renewable energy delivered to consumers in Rhode Island and Connecticut. In addition, overall, the Project will bring substantial benefits to Rhode Island, including the marine economic sector. Guidehouse evaluated the direct[21], indirect[22], and induced jobs[23]; labor earnings[24]; gross output[25]; and economic value added[26] expected from the Project (inclusive of the RWF, RWEC, and onshore Project components). Based on this evaluation, the Project would have beneficial effects for the national economy across both phases – construction and operation – with an expected gross output (i.e. the sum value of all goods and services at all stages of production resulting from the Project) of roughly $1,360.3 million and valued add (the best indicator of economic development benefits to the local economy) of roughly $737.9 million. For Rhode Island, the expected gross output and value add are $726.8 million and $390.6 million, respectively. This includes the generation of 3,059 direct, indirect, and induced jobs during the construction phase, and 233 direct, indirect, and induced annual jobs during the operations phase (Guidehouse, 2020).

D. Any large-scale offshore development, as defined in § 11.3(H) of this Part, shall require a meeting between the Fisherman's Advisory Board (FAB), the applicant, and the Council staff to discuss potential fishery-related impacts, such as, but not limited to, project location, wind turbine configuration and spacing, construction schedules, alternative locations, project minimization and identification of high fishing activity or habitat edges. For any state permit

21 Direct jobs are on-site labor and professional services. On-site labor is given in job years, which are full-time equivalent (FTE) jobs multiplied by the number of construction years. Construction jobs are given as FTE job-years since they are spread over a multi-year construction period. Some construction jobs will last only a portion of a year while others may last the entire expected construction period of three years. Operations jobs are given as annual FTE jobs over the entire operating period.

22 Indirect jobs are driven by the increase in demand for goods and services from direct on-site spending from the Project.

23 Induced jobs are driven by the local expenditures of those receiving payments within the first two job categories or increased household spending by workers.

24 Labor earnings are the additional earnings (wages and employer paid benefits) associated with the additional local jobs.

25 Gross output is the sum value of all goods and services at all stages of production resulting from the Project.

26 Value added is the best indicator of economic development benefits to the local economy. The sum total of value added of all enterprises and self-employed in a given state comprises that state's gross domestic product. These values are the sum of earnings from capital and labor or the difference between total gross output and the cost of intermediate inputs. It is comprised of payments made to workers, proprietary income, other property type income, indirect business taxes, and taxes on production and imports less subsidies.

process for a large-scale offshore development this meeting shall occur prior to submission of the state permit application. ….

1. For purposes of BOEM's renewable energy program under the Outer Continental Shelf Lands Act, the CZMA federal consistency process cannot begin until a construction and operations plan (COP) has been submitted for BOEM's review and approval. ….

The portion of the Project subject to this this Category B Assent application (i.e., the RWEC-RI) is not a large-scale offshore development and a meeting with the FAB is not required per this subpart. Revolution Wind understands that CRMC will schedule a meeting with the FAB to discuss the broader Project as part of the requirements under federal consistency review.

E. The Council shall prohibit any other uses or activities that would result in significant long-term negative impacts to Rhode Island's commercial or recreational fisheries. Long-term impacts are defined as those that affect more than one or two seasons.

Noted. Revolution Wind is committed to minimizing Project impacts on commercial and recreational fisheries and the RWEC-RI will not result in significant impacts to Rhode Island's commercial or recreational fisheries. Construction and decommissioning activities associated with the RWEC-RI are generally expected to have short-term, localized impacts on access to fishing grounds due to safety measures on entering the area. During O&M of the RWEC-RI, commercial and recreational fisheries are expected to experience no effect or limited effects because the cables will be buried beneath the seabed. Refer to Section 3.2.8 and Appendix S of this Category B Assent application for evaluation of fisheries in the RWEC-RI corridor. Finally, Revolution Wind has developed a Fisheries Communication and Outreach Plan in consultation with relevant stakeholders and remains committed to continuous dialogue with these stakeholders (see Appendix DD of the Project's COP).

F. The Council shall require that the potential adverse impacts of offshore developments and other uses on commercial or recreational fisheries be evaluated, considered and mitigated as described in § 11.10.1(G) of this Part.

Noted. See the response to § 11.10.1(E) above.

G. For the purposes of fisheries policies and standards as summarized in Ocean SAMP Chapter 5, Commercial and Recreational Fisheries, §§ 5.3.1 and 5.3.2 of this Subchapter, mitigation is defined as a process to make whole those fisheries user groups, including related shore-side seafood processing facilities, that are adversely affected by offshore development proposals or projects. Mitigation measures shall be consistent with the purposes of duly adopted fisheries management plans, programs, strategies and regulations of the agencies and regulatory bodies with jurisdiction over commercial and recreational fisheries , including but not limited to those set forth above in § 11.9.4(B) of this Part. Mitigation shall not be designed or implemented in a manner that substantially diminishes the effectiveness of duly adopted fisheries management programs. Mitigation measures may include, but are not limited to, compensation, effort reduction, habitat preservation, restoration and construction, marketing, *and infrastructure and commercial fishing fleet improvements. Where there are potential impacts associated with proposed projects, the need for mitigation shall be presumed (see § 11.10.1(F) of this Part). Mitigation shall be negotiated between the Council staff, the FAB, the project developer, and approved by the Council. The final mitigation will be the mitigation required by the CRMC and included in the CRMC's Assent for the project or, included within the CRMC's federal consistency decision for a project's federal permit application.*

Noted. See the response to § 11.10.1(E) above.

H. The Council recognizes that moraine edges, as illustrated in Figures 3 and 4 in § 11.10.2 of this Part, are important to commercial and recreational fishermen. In addition to these mapped areas, the FAB may identify other edge areas that are important to fisheries within a proposed project location. The Council shall consider the potential adverse impacts of future activities or projects on these areas to Rhode Island's commercial and recreational fisheries. Where it is determined that there is a significant adverse impact, the Council will modify or deny activities that would impact these areas. In addition, the Council will require assent holders for offshore developments to employ micro-siting techniques in order to minimize the potential impacts of such projects on these edge areas.

Noted. Refer to response to Section 11.10.2(C)(3) below.

I. The finfish, shellfish, and crustacean species that are targeted by commercial and recreational fishermen rely on appropriate habitat at all stages of their life cycles. While all fish habitat is important, spawning and nursery areas are especially important in providing shelter for these species during the most vulnerable stages of their life cycles. The Council shall protect sensitive habitat areas where they have been identified through the Site Assessment Plan or Construction and Operation Plan review processes for offshore developments as described in § 11.10.5(C) of this Part.

Noted. Refer to Section 11.10.2(C)(3) below and the response to § 11.10.1(E) above.

J. Any large-scale offshore development, as defined in this Part, shall require a meeting between the HAB, the applicant, and the Council staff to discuss potential marine resource and habitat-related issues such as, but not limited to, impacts to marine resource and habitats during construction and operation, project location, construction schedules, alternative locations, project minimization, measures to mitigate the potential impacts of proposed projects on habitats and marine resources, and the identification of important marine resource and habitat areas. For any state permit process for a large-scale offshore development, this meeting shall occur prior to submission of the state permit application. ….

1. For purposes of BOEM's renewable energy program under the Outer Continental Shelf Lands Act, the CZMA federal consistency process cannot begin until a construction and operations plan (COP) has been submitted for BOEM's review and approval. ….

The portion of the Project subject to this this Category B Assent application (i.e., the RWEC-RI) is not a large-scale offshore development and a meeting with the HAB is not required per this subpart. Revolution Wind understands that CRMC will schedule a

meeting with the HAB to discuss the broader Project as part of the requirements under federal consistency review.

K. The potential impacts of a proposed project on cultural and historic resources will be evaluated in accordance with the National Historic Preservation Act and Antiquities Act, and the Rhode Island Historical Preservation Act and Antiquities Act as applicable. Depending on the project and the lead federal agency, the projects that may impact marine historical or archaeological resources identified through the joint agency review process may require a marine archaeology assessment that documents actual or potential impacts the completed project will have on submerged cultural and historic resources.

BOEM is the lead federal agency reviewing the Project and is required to satisfy Section 106 of the NHPA, which requires consultation with SHPOs, THPOs, and other interested parties, as well as assessment and mitigation of any adverse effects to historic properties. BOEM initiated Section 106 consultation for the Project on April 2, 2021.[27] Revolution Wind has submitted to BOEM a Marine Archaeological Resources Assessment. A copy of this report is provided under confidential cover to Category B Assent application because it contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552) (Appendix N).

L. Guidelines for marine archaeology assessment in the Ocean SAMP area can be obtained through the RIHPHC in their document, "Performance Standards and Guidelines for Archaeological Projects: Standards for Archaeological Survey" (RIHPHC 2007), or the lead federal agency responsible for reviewing the proposed development.

Noted. Revolution Wind has completed marine archaeological surveys consistent with state and federal guidelines and in consultation with SHPOs and THPOs.

M. The potential non-physical impacts of a proposed project on cultural and historic resources shall be evaluated in accordance with 36 C.F.R. § 800.5, assessment of adverse effects, including the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features. Depending on the project and the lead federal agency, the Ocean SAMP Interagency Working Group may require that a project undergo a visual impact assessment that evaluates the visual impact a completed project will have on onshore cultural and historic resources.

N. A visual impact assessment may require the development of detailed visual simulations illustrating the completed project's visual relationship to onshore properties that are designated National Historic Landmarks, listed on the National Register of Historic Places, or determined to be eligible for listing on the National Register of Historic Places. Assessment of impacts to specific views from selected properties of interest may be required by relevant state

27 The regulations at 36 CFR § 800.8 provide for use of the National Environmental Policy Act (NEPA) process to fulfill a Federal agency's National Historic Preservation Act (NHPA) Section 106 review obligations in lieu of the procedures set forth in 36 CFR § 800.3 through 800.6. This process is known as NEPA substitution for Section 106 and the Bureau of Ocean Energy Management (BOEM) is using this process for the Project.

https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/BOEM_NEPASubstitution_ConsultingPartyGuide_Final.pdf *and federal agencies to properly evaluate the impacts and determination of adverse effect of the project on onshore cultural or historical resources.*

O. A visual impact assessment may require description and images illustrating the potential impacts of the proposed project.

As a submarine cable, the RWEC-RI will not result in visual impacts.

5.2.2 Ocean SAMP §11.10.2 Areas of Particular Concern

A. Areas of Particular Concern (APCs) have been designated in state waters through the Ocean SAMP process with the goal of protecting areas that have high conservation value, cultural and historic value, or human use value from large-scale offshore development. …

Noted. Refer to response to Section 11.10.2(C) regarding APCs applicable to the portion of the RWEC-RI in the Ocean SAMP area.

B. The Council has designated the areas listed below in § 11.10.2(C) of this Part in state waters as Areas of Particular Concern. All large-scale, small-scale, or other offshore development, or any portion of a proposed project, shall be presumptively excluded from APCs. This exclusion is rebuttable if the applicant can demonstrate by clear and convincing evidence that there are no practicable alternatives that are less damaging in areas outside of the APC, or that the proposed project will not result in a significant alteration to the values and resources of the APC. When evaluating a project proposal, the Council shall not consider cost as a factor when determining whether practicable alternatives exist. Applicants which successfully demonstrate that the presumptive exclusion does not apply to a proposed project because there are no practicable alternatives that are less damaging in areas outside of the APC must also demonstrate that all feasible efforts have been made to avoid damage to APC resources and values and that there will be no significant alteration of the APC resources or values. Applicants successfully demonstrating that the presumptive exclusion does not apply because the proposed project will not result in a significant alteration to the values and resources of the APC must also demonstrate that all feasible efforts have been made to avoid damage to the APC resources and values. The Council may require a successful applicant to provide a mitigation plan that protects the ecosystem. The Council will permit underwater cables, only in certain categories of Areas of Particular Concern, as determined by the Council in coordination with the Joint Agency Working Group. The maps listed below in § 11.10.2(C) of this Part depicting Areas of Particular Concern may be superseded by more detailed, site-specific maps created with finer resolution data.

Revolution Wind has sited the RWEC-RI to avoid APC to the extent practicable. To the extent any portion of the RWEC-RI subject to this Category B Assent application overlaps with APC, no practicable alternatives exist that are less damaging in areas outside of the APC, and the RWEC-RI will not result in a significant alteration to the values and resources of the APC. Revolution Wind will take all feasible efforts to avoid damage to APC resources and values, and there will be no significant alteration of APC resources or values as a result of the RWEC-RI. Refer to response to Section 11.10.2(C)

below regarding APCs applicable to the portion of the RWEC-RI in the Ocean SAMP area.

C. Areas of particular concern that have been identified in the Ocean SAMP area in state waters are described as follows:

1. Historic shipwrecks, archeological or historical sites and their buffers as described in Ocean SAMP Chapter 4, Cultural and Historic Resources, Sections 440.1.1 through 440.1.4, are Areas of Particular Concern. For the latest list of these sites and their locations please refer to the Rhode Island State Historic Preservation and Heritage Commission.

Revolution Wind understands shipwrecks are designated as APCs per the Ocean SAMP. Within the portion of the RWEC-RI corridor subject to the Ocean SAMP (i.e., from the mouth of the Narragansett Bay to the three nautical mile state water line), one shipwreck was identified during Project surveys and the Project's QMA has recommended a 50-meter avoidance buffer around this resource (see Appendix N). The RWEC-RI will avoid this shipwreck and associated buffer to the extent practicable. BOEM is required to satisfy Section 106 of the NHPA, which requires consultation with SHPOs, THPOs, and other interested parties, as well as assessment and mitigation of unavoidable adverse effects to historic properties.

2. Offshore dive sites within the Ocean SAMP area, as shown in Figure 2 in § 11.10.2 of this Part, are designated Areas of Particular Concern. The Council recognizes that offshore dive sites, most of which are shipwrecks, are valuable recreational and cultural ocean assets and are important to sustaining Rhode Island's recreation and tourism economy.

There are no dive sites located within the RWEC-RI corridor. The nearest dive site, as identified on Figure 2 of Section 11.10.2 is located approximately 115 feet (35 meters) from the western edge of the RWEC-RI corridor. The dive site is approximately 1,000 feet (305 meters) west of the RWEC-RI routing, as shown in Appendix A.

3. Glacial moraines are important habitat areas for a diversity of fish and other marine plants and animals because of their relative structural permanence and structural complexity. Glacial moraines create a unique bottom topography that allows for habitat diversity and complexity, which allows for species diversity in these areas and creates environments that exhibit some of the highest biodiversity within the entire Ocean SAMP area. The Council also recognizes that because glacial moraines contain valuable habitats for fish and other marine life, they are also important to commercial and recreational fishermen. Accordingly, the Council shall designate glacial moraines as identified in Figures 3 and 4 in § 11.10.2 of this Part as Areas of Particular Concern.

Three benthic habitat types which are direct remnants of glaciation were identified within the Ocean SAMP area subject to this Category B Assent application based on site-specific data collected during 2019/2020 site investigation surveys: Glacial Moraine A, Glacial Moraine B, and Bedrock (see Appendix P). Bedrock habitats consist of exposed outcroppings of bedrock, either present as solitary outcrops or in groupings of large bedrock outcrops. Glacial moraine habitats, on the other hand, are complex

habitat classification categories composed of consolidated and unconsolidated geologic debris directly deposited by glacial movement (rather than reworking from meltwaters or transgressive seas) and are limited in distribution along the outer continental shelf near New England. A distinction was made between Glacial Moraine A and Glacial Moraine B habitats to distinguish between areas of unconsolidated geological debris (Glacial Moraine A) and consolidated geological debris (Glacial Moraine B). The surface of Glacial Moraine B deposits appeared poorly sorted and dense with very high boulder densities resulting in greater structural complexity and permanence. By comparison, the surface of Glacial Moraine A units was reworked with sand and gravel deposits resulting in less structural complexity and permanence. Glacial Moraine A and B habitats comprised 0.3% (5 acres) of the habitats mapped within the RWEC-RI Project Area in the portion of the Ocean SAMP area subject to this Category B Assent application (i.e., from the mouth of Narragansett Bay to the three nautical mile state water line). The data included in Appendix P to this Category B Assent application represent more detailed, higher resolution data to supplement data depicted in Figures 3 and 4 of Section 11.10.2(C) of the Ocean SAMP.

As shown in Appendix A (Export Cable Plan Set), Revolution Wind anticipates avoidance of Glacial Moraine A and B with siting of the RWEC-RI. Should complete avoidance of Glacial Moraine A and B habitats not be possible due to other, currently unknown, constraints (e.g., unexploded ordnance – refer to Section 2.2.3.5 of this application), Revolution Wind will take all feasible efforts to avoid any damage to the glacial moraine benthic habitats.

4. Navigation, military, and infrastructure areas including: designated shipping lanes, precautionary areas, recommended vessel routes, ferry routes, dredge disposal sites, military testing areas, unexploded ordnance, pilot boarding areas, anchorages, and a coastal buffer of 1 km as depicted in Figure 5 in § 11.10.2 of this Part are designated as Areas of Particular Concern. The Council recognizes the importance of these areas to marine transportation, navigation and other activities in the Ocean SAMP area.

Through consultation with applicable agencies, the RWEC-RI was sited to avoid conflicts with DoD use areas and navigational areas identified by the USCG, as applicable. As noted in Section 3.2.11 of this Category B Assent application, while the RWEC-RI intersects the Brenton Reef Pilot Station, within the past two decades there are no documented cases of any vessel anchoring in the pilot boarding area, nor is there a recollection among the USCG or the Northeast Marine Pilots of any vessels anchoring there[28].

28 Personal communication with Capt. P. Costabile, April 2020

5. Areas of high fishing activity as identified during the pre-application process by the Fishermen's Advisory Board, as defined in § 11.3(E) of this Part, may be designated by the Council as Areas of Particular Concern.

Noted. Refer to Section 3.2.8 and Appendix S of this Category B Assent application for evaluation of fishing activity within, and in the vicinity of, the RWEC-RI Project Area.

6. Several heavily-used recreational boating and sailboat racing areas, as shown in Figure 6 in § 11.10.2 of this Part, are designated as Areas of Particular Concern. The Council recognizes that organized recreational boating and sailboat racing activities are concentrated in these particular areas, which are therefore important to sustaining Rhode Island's recreation and tourism economy.

Revolution Wind has assessed available data regarding recreational boating and sailboat racing areas (refer to Section 3.2.9). Revolution Wind has also reviewed the data depicted in Figure 6 of Section 11.10.2 of the Ocean SAMP and finds that the RWEC-RI corridor passes through the Recreational Boating APCs south of Brenton Point. Siting of the RWEC-RI in this location was determined through detailed G&G surveys within the proposed corridor and consultation with the DoD. The G&G surveys identified the presence of geological obstructions extending southwesterly from Brenton Point into Rhode Island Sound (Refer to Section 3.2.1). The presence of shallow bedrock prohibits cable burial throughout much of this area. The G&G surveys identified a gap in the bedrock formation where sufficient depth to bedrock below the sediment surface would allow for cable installation. Similarly, consultation with the DoD led Revolution Wind to avoid a restricted area south of the entrance to Narragansett Bay. Routing around these other constraints causes the RWEC-RI corridor to intersect with the Recreational Boating APCs south of Brenton Point.

Given Revolution Wind's commitment to complying with TOY restrictions, construction of the RWEC-RI will generally occur between Labor Day and February 1 and will avoid times of the year when a heavy concentration of recreational boating is occurring in the Recreational Boating APCs. Construction impacts will be limited in duration and will avoid significant impact to these areas of substantial recreational value. Once installed, the RWEC-RI will be buried below the seafloor and will not interfere with use of these Recreational Boating APCs. Consequently, the RWEC-RI will not result in a significant alteration of the values and resources of the Recreational Boating APCs and Revolution Wind has made all feasible efforts to avoid affecting the Recreational Boating APC resources and values.

7. Naval fleet submarine transit lanes, as described in Ocean SAMP Chapter 7, Marine Transportation, Navigation, and Infrastructure Section 720.7, are designated as Areas of Particular Concern.

Through consultation with applicable agencies, the RWEC-RI was sited to avoid conflicts with DoD use areas and navigational areas identified by the USCG, as applicable. Through additional consultation with the USCG and the U.S. Navy, the RWEC-RI was sited to avoid or minimize conflicts with any of their equities in RI state

waters (e.g. underwater sensor and weapons testing ranges, designated anchorages, aids-to-navigation, vessel routing measures, etc.). These agencies have reviewed the RWEC-RI installation plans and indicated there are no objections subject to regular updates on installation schedules and discussion of potential waterway conflicts and plans to avoid or minimize those conflicts.

8. Other Areas of Particular Concern may be identified during the preapplication review by state and federal agencies as areas of importance.

Noted.

D. Developers proposing projects for within the renewable energy zone as described in § 11.10.1(B) of this Part shall adhere to the requirements outlined in § 11.10.2 of this Part regarding Areas of Particular Concern in state waters, including any Areas of Particular Concern that overlap the renewable energy zone (see Figure 7 in § 11.10.2 of this Part).

The Project is not proposed in the renewable energy zone around Block Island.

5.2.3 Ocean SAMP §11.10.4 Other Areas

A. Large-scale projects or other development which is found to be a hazard to commercial navigation shall avoid areas of high intensity commercial marine traffic in state waters. Avoidance shall be the primary goal of these areas. Areas of high intensity commercial marine traffic are defined as having 50 or more vessel counts within a 1 km by 1 km grid, as shown in Figure 9 in § 11.10.4(B) of this Part.

The portion of the Project that is the subject of this application for Category B Assent (i.e., the RWEC-RI) does not constitute a large-scale development as defined by the Ocean SAMP. Revolution Wind has committed to achieving sufficient burial depth of the RWEC-RI such that it will not interfere with commercial navigation. Additionally, the West Passage of Narragansett Bay is typically not used by commercial vessels due to water depth limitations, air draft restrictions of the Jamestown Bridge (approximately 30 feet less than the Newport Bridge), lack of a clearly marked navigation channel, and the absence of marine pilots qualified to conn a ship within the West Passage. Consequently, the majority of commercial vessel traffic transits the East Passage of Narragansett Bay.

5.2.4 Ocean SAMP §11.10.5 Application Requirements

Revolution Wind acknowledges Sections 11.10.5(A) and (B) of this part and does not restate those herein.

C. Prior to construction, the following sections shall be considered necessary data and information:

1. Site assessment plan – A SAP is a pre-application plan that describes the activities and studies (e.g., installation of meteorological towers, meteorological buoys) the applicant plans to perform for the characterization of the project site. The SAP shall describe how the applicant *shall conduct the resource assessment (e.g., meteorological and oceanographic data collection) or technology testing activities. For projects in state waters the applicant shall receive the approval of the SAP by the Council (see § 11.9.8 of this Part). For projects within Type 4E waters (depicted in Figure 1 in § 11.10.1 of this Part), pre-construction data requirements may incorporate data generated by the Ocean SAMP provided the data was collected within 2 years of the date of application, or where the Ocean SAMP data is determined to be current enough to meet the requirements of the Council in coordination with the Joint Agency Working Group. The applicant shall reference information and data discussed in the Ocean SAMP (including appendices and technical reports) in their SAP. For a SAP required by BOEM under the Outer Continental Shelf Lands Act for projects in federal waters, if BOEM combines the SAP with the COP, then the SAP and COP would be filed at the same time. If BOEM does not require a SAP for a project in federal waters, then the SAP shall not be necessary data and information for federal consistency reviews. (a-h omitted)*

Revolution Wind has complied with SAP requirements. The SAP for Lease Area OCS-A-0486 was approved by BOEM in October 2017. The CRMC issued concurrence in file #2017-09-034 on September 8, 2017.

2. Construction and operations plan (COP) - The COP describes the applicant's construction, operations, and conceptual decommissioning plans for the proposed facility, including the applicant's project easement area. (a-g omitted)

Revolution Wind's COP is consistent with the requirements outlined in this subpart. On April 30, 2021, BOEM published a Noticed of Intent to Prepare an Environmental Impact Statement for the Project and published the Project's COP to their website (https://www.boem.gov/Revolution-Wind).

Refer to Appendix Y for a review of the Project's COP relative to the content requirements of this subpart.

5.2.5 Ocean SAMP §11.10.6 Monitoring Requirements

A. The Council in coordination with the Joint Agency Working Group, as described in § 11.9.7(I) of this Part, shall determine requirements for monitoring as specified in § 11.9.9 of this Part. For CZMA federal consistency purposes the Council must identify any baseline assessments and construction monitoring activities during its CZMA six-month review of the COP.

Revolution Wind is committed to conducting monitoring prior to, during, and post construction and will coordinate with the Council and other key stakeholders in the development of specific monitoring plans. Current monitoring commitments are outlined in Tables 2.2-9 and 2.2-10 and Section 2.2.5.3, and include onshore environmental compliance monitoring, bathymetry and cable burial surveys, fisheries and benthic habitat monitoring, marine mammal and sea turtle monitoring for pile driving activities, and a post-construction avian monitoring. See also the responses to Section 11.9.9 of this Part (Section 5.1.9 of this Category B Assent application).

6

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Appendix A: Site Plans

Project Plans

Issued for	Permitting
Date Issued	June 30, 2021
Latest Issue	June 30, 2021

Revolution Wind Proposed Onshore/Offshore Cable Transmission Route and Onshore Substation

North Kingstown, RI and Tidal Waters of the State of Rhode Island

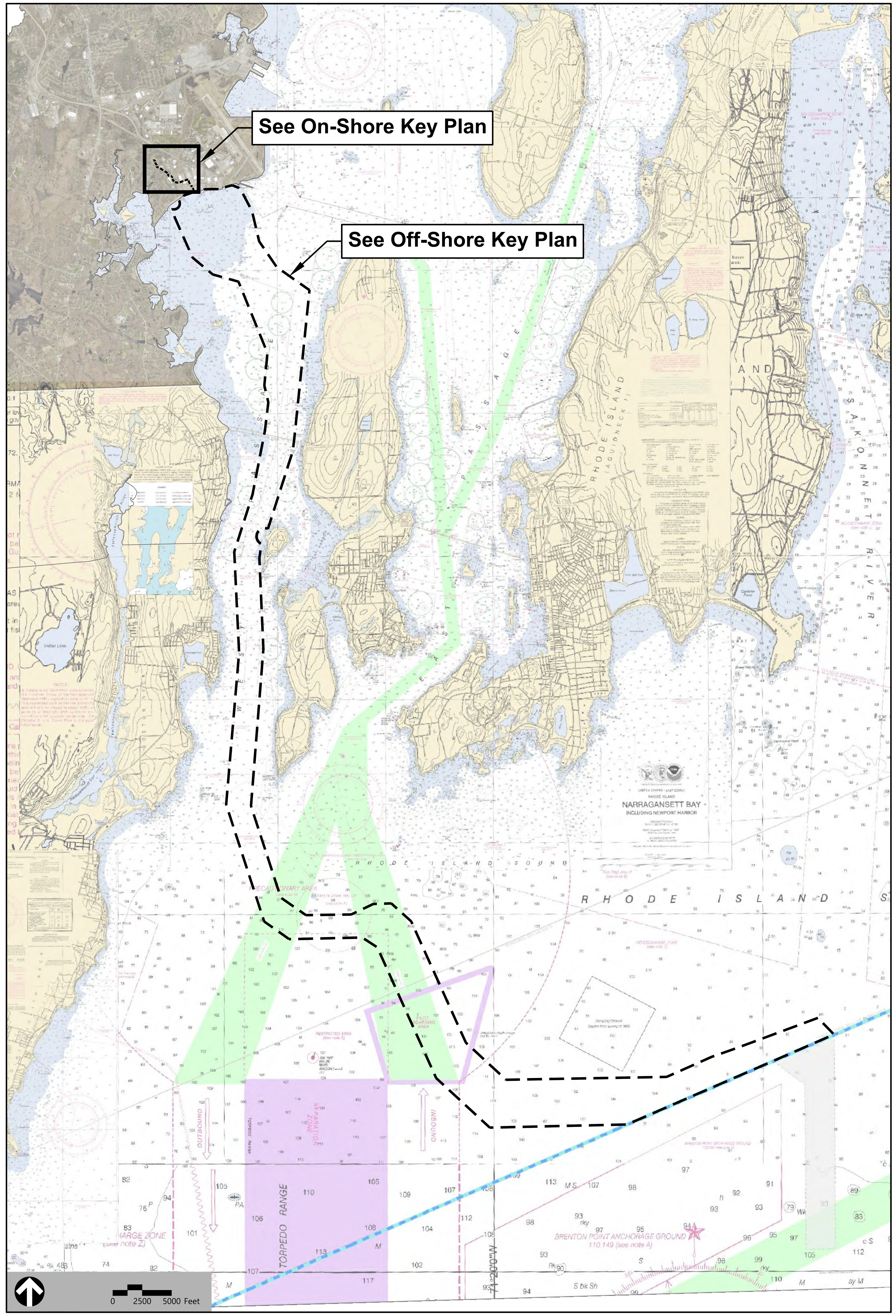
Owner/Applicant

Revolution Wind, LLC
c/o Kenneth Bowes
56 Exchange Terrace, Suite 300
Providence, Rhode Island 02903
(860) 883-5830
Kenneth.bowes@eversource.com

Assessor's Map: 179
Lots: 001, 011, 030

Assessor's Map: 185
Lots: 001, 004, 008

Camp Avenue and Circuit Drive
Tidal Waters of the State of Rhode Island



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Designers:

Revolution Wind Proposed Onshore Substation
Vanasse Hangen Brustlin, Inc.
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Revolution Wind 275-kV and 115-kV Transmission Line Onshore Cable Route Underground Transmission Line Construction Contract Drawings
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Revolution Wind Proposed Onshore Transmission Facilities Soil Erosion and Sediment Control Plan
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VHB Project : 73032.01 Revolution Wind Proposed Cable Route
Issued for : Permitting 06/30/2021

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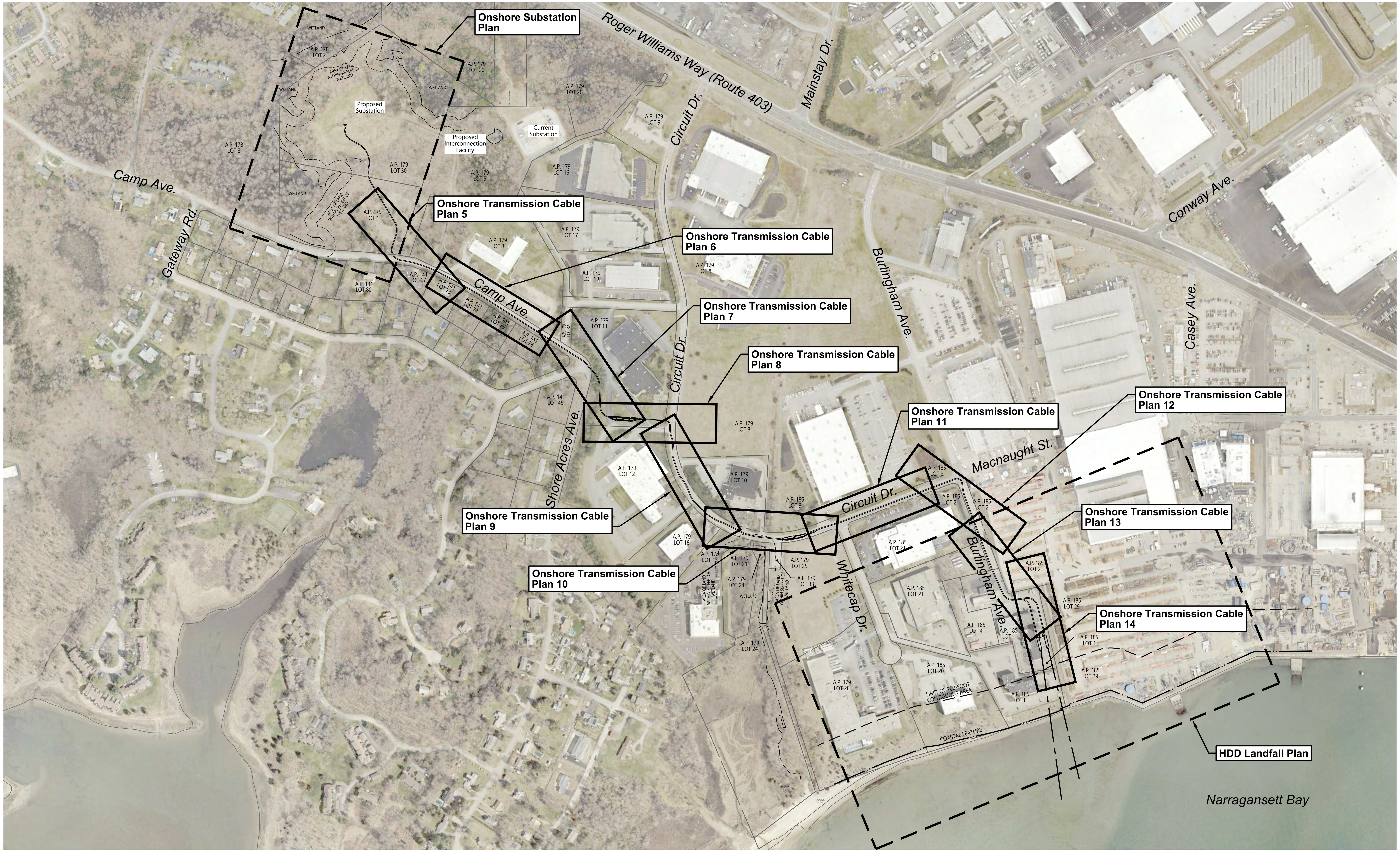

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NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE/OFFSHORE TRANSMISSION FACILITIES
ONSHORE KEY SHEET
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
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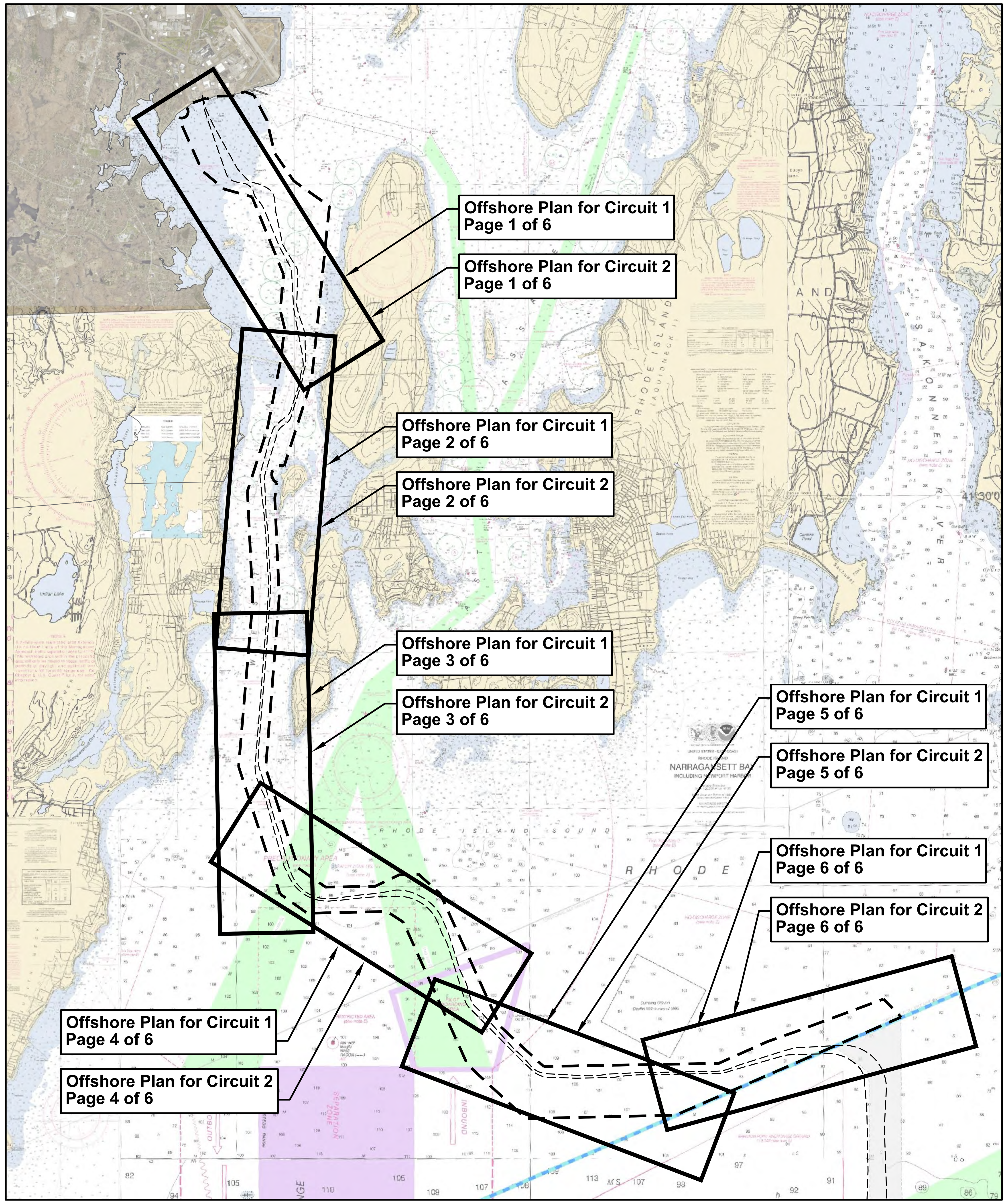
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. KEY-02	



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REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE/OFFSHORE TRANSMISSION FACILITIES
OFFSHORE KEY SHEET
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
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V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. KEY-03	

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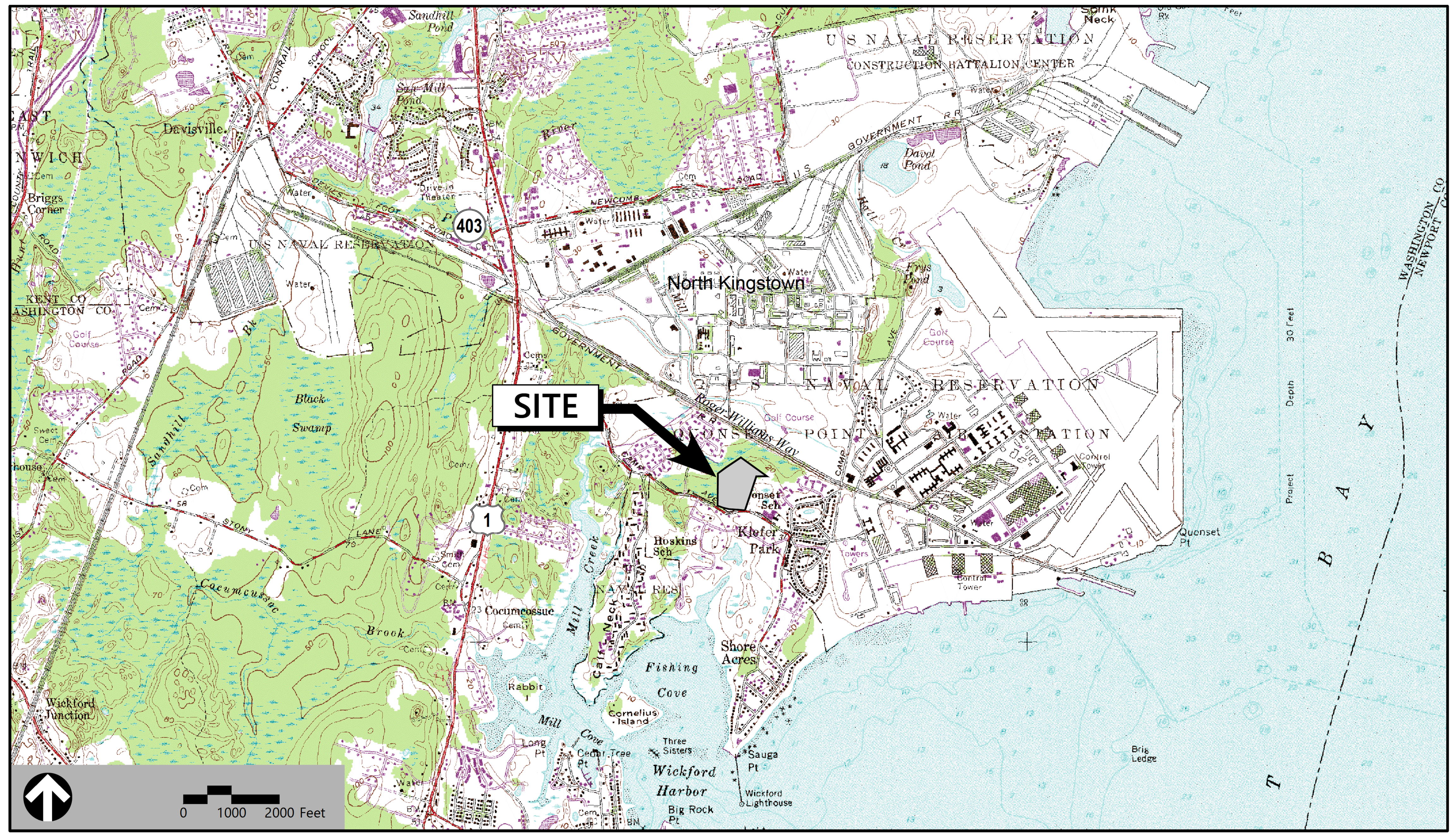
Site Plans

Issued for	Permits
Date Issued	May 5, 2021
Latest Issue	June 30, 2021

Revolution Wind Proposed Onshore Substation

Camp Avenue
North Kingstown, RI



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Owner

RI Commerce Corporation
95 Cripe Street
North Kingstown, RI 02852

Applicant

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Suite 300
Providence, RI 02903

Assessor's Map: 179
Lots: 001, 030

Sheet Index

No.	Drawing Title	Latest Issue
C1.00	Legend and General Notes	June 30, 2021
C2.00	Layout and Materials Plan	June 30, 2021
C3.00	Grading, Drainage, and Utility Plan	June 30, 2021
C4.00	Driveway Plan and Profile	June 30, 2021
C5.01	Site Details 1	June 30, 2021
C5.02	Site Details 2	June 30, 2021
W1.01	Wetland Restoration Plan	June 30, 2021
W2.01	Wetland Restoration Notes and Details	June 30, 2021
SESC-1	Soil Erosion and Sediment Control - General Notes & Details	June 30, 2021
SESC-2	Soil Erosion and Sediment Control - Site Plan	June 30, 2021

Reference Drawings

No.	Drawing Title	Latest Issue
Sv-1 & 2	Existing Conditions Plan of Land	July 13, 2020

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VHB Project: 73032.01 Revolution Wind Proposed Onshore Substation
Issued for: Permits 06/30/2021

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Legend

Exist. Prop.

- PROPERTY LINE
- PROJECT LIMIT LINE
- RIGHT-OF-WAY/PROPERTY LINE
- EASEMENT
- BUILDING SETBACK
- PARKING SETBACK
- BASELINE (10+00)
- CONSTRUCTION LAYOUT
- ZONING LINE
- TOWN LINE
- LIMIT OF DISTURBANCE
- WETLAND LINE WITH FLAG
- FLOODPLAIN
- AREA OF LAND WITHIN 50' FEET
- 100' FOOT RIVERBANK WETLAND
- BORDERING LAND SUBJECT TO FLOODING
- WETLAND BUFFER ZONE
- NO DISTURB ZONE
- 200' RIVERFRONT AREA
- GRAVEL ROAD
- EDGE OF PAVEMENT
- BITUMINOUS BERM
- BITUMINOUS CURB
- CONCRETE CURB
- CURB AND GUTTER
- EXTRUDED CONCRETE CURB
- MONOLITHIC CONCRETE CURB
- PRECAST CONC. CURB
- SLOPED GRAN. EDGING
- VERT. GRAN. CURB
- LIMIT OF CURB TYPE
- SAWCUT
- BUILDING
- BUILDING ENTRANCE
- LOADING DOCK
- BOLLARD
- SIGN
- DOUBLE SIGN
- STEEL GUARDRAIL
- WOOD GUARDRAIL
- PATH
- TREE LINE
- WIRE FENCE
- FENCE
- STOCKADE FENCE
- STONE WALL
- RETAINING WALL
- STREAM / POND / WATER COURSE
- DETENTION BASIN
- HAY BALES
- SILT FENCE
- SILT SOCK / STRAW WATTLE
- MINOR CONTOUR
- MAJOR CONTOUR

Exist. Prop.

- CONCRETE
- HEAVY DUTY PAVEMENT
- BUILDINGS
- RIPRAP
- CONSTRUCTION EXIT
- WASHED CRUSHED STONE YARD
- TOP OF CURB ELEVATION (27.35 TC×)
- BOTTOM OF CURB ELEVATION (26.85 BC×)
- SPOT ELEVATION (132.75 ×)
- TOP & BOTTOM OF WALL ELEVATION (45.0 TW / 38.5 BW)
- BORING LOCATION
- TEST PIT LOCATION
- MONITORING WELL
- UNDERDRAIN
- DRAIN
- ROOF DRAIN
- SEWER
- FORCE MAIN
- OVERHEAD WIRE
- WATER
- FIRE PROTECTION
- DOMESTIC WATER
- GAS
- ELECTRIC
- STEAM
- TELEPHONE
- FIRE ALARM
- CABLE TV
- CATCH BASIN CONCENTRIC
- CATCH BASIN ECCENTRIC
- DOUBLE CATCH BASIN CONCENTRIC
- DOUBLE CATCH BASIN ECCENTRIC
- GUTTER INLET
- DRAIN MANHOLE CONCENTRIC
- DRAIN MANHOLE ECCENTRIC
- TRENCH DRAIN
- PLUG OR CAP
- CLEANOUT
- FLARED END SECTION
- HEADWALL
- SEWER MANHOLE CONCENTRIC
- SEWER MANHOLE ECCENTRIC
- CURB STOP & BOX
- WATER VALVE & BOX
- TAPPING SLEEVE, VALVE & BOX
- SIAMESE CONNECTION
- FIRE HYDRANT
- WATER METER
- POST INDICATOR VALVE
- WATER WELL
- GAS GATE
- GAS METER
- ELECTRIC MANHOLE
- ELECTRIC METER
- LIGHT POLE
- TELEPHONE MANHOLE
- TRANSFORMER PAD
- UTILITY POLE
- GUY POLE
- GUY WIRE & ANCHOR
- HAND HOLE
- PULL BOX

Abbreviations

General

ABAN	ABANDON
ACR	ACCESSIBLE CURB RAMP
ADJ	ADJUST
APPROX	APPROXIMATE
BIT	BITUMINOUS
BS	BOTTOM OF SLOPE
BWLL	BROKEN WHITE LANE LINE
CONC	CONCRETE
DYCL	DOUBLE YELLOW CENTER LINE
EL	ELEVATION
ELEV	ELEVATION
EX	EXISTING
FDN	FOUNDATION
FFE	FIRST FLOOR ELEVATION
GRAN	GRANITE
GTD	GRADE TO DRAIN
LA	LANDSCAPE AREA
LOD	LIMIT OF DISTURBANCE
MAX	MAXIMUM
MIN	MINIMUM
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
PERF	PERFORATED
PROP	PROPOSED
REM	REMOVE
RET	RETAIN
R&D	REMOVE AND DISPOSE
R&R	REMOVE AND RESET
SWEL	SOLID WHITE EDGE LINE
SWLL	SOLID WHITE LANE LINE
TS	TOP OF SLOPE
TYP	TYPICAL

Utility

CB	CATCH BASIN
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
DCB	DOUBLE CATCH BASIN
DMH	DRAIN MANHOLE
CIP	CAST IRON PIPE
COND	CONDUIT
DIP	DUCTILE IRON PIPE
FES	FLARED END SECTION
FM	FORCE MAIN
F&G	FRAME AND GRATE
F&C	FRAME AND COVER
GI	GUTTER INLET
GT	GREASE TRAP
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HH	HANDHOLE
HW	HEADWALL
HYD	HYDRANT
INV	INVERT ELEVATION
I=	INVERT ELEVATION
LP	LIGHT POLE
MES	METAL END SECTION
PIV	POST INDICATOR VALVE
PWW	PAVED WATER WAY
PVC	POLYVINYLCHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
R=	RIM ELEVATION
RIM=	RIM ELEVATION
SMH	SEWER MANHOLE
TSV	TAPPING SLEEVE, VALVE AND BOX
UG	UNDERGROUND
UP	UTILITY POLE

Notes

General

1. CONTRACTOR SHALL NOTIFY "DIG-SAFE" (1-888-344-7233) AT LEAST 72 HOURS BEFORE EXCAVATING.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SECURITY AND JOB SAFETY. CONSTRUCTION ACTIVITIES SHALL BE IN ACCORDANCE WITH OSHA STANDARDS AND LOCAL REQUIREMENTS.
3. AREAS DISTURBED DURING CONSTRUCTION AND NOT RESTORED WITH IMPERVIOUS SURFACES (BUILDINGS, PAVEMENTS, WALKS, ETC.) SHALL RECEIVE 6 INCHES LOAM AND SEED.
4. WORK WITHIN THE LOCAL RIGHTS-OF-WAY SHALL CONFORM TO LOCAL MUNICIPAL STANDARDS. WORK WITHIN STATE RIGHTS-OF-WAY SHALL CONFORM TO THE LATEST EDITION OF THE STATE HIGHWAY DEPARTMENTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES.
5. UPON AWARD OF CONTRACT, CONTRACTOR SHALL MAKE NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN NECESSARY PERMITS, PAY FEES, AND POST BONDS ASSOCIATED WITH THE WORK INDICATED ON THE DRAWINGS, IN THE SPECIFICATIONS, AND IN THE CONTRACT DOCUMENTS. DO NOT CLOSE OR OBSTRUCT ROADWAYS, SIDEWALKS, AND FIRE HYDRANTS, WITHOUT APPROPRIATE PERMITS.
6. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
7. IN THE EVENT THAT SUSPECTED CONTAMINATED SOIL, GROUNDWATER, AND OTHER MEDIA ARE ENCOUNTERED DURING EXCAVATION AND CONSTRUCTION ACTIVITIES BASED ON VISUAL, OLFACTORY, OR OTHER EVIDENCE, THE CONTRACTOR SHALL STOP WORK IN THE VICINITY OF THE SUSPECT MATERIAL TO AVOID FURTHER SPREADING OF THE MATERIAL, AND SHALL NOTIFY THE OWNER IMMEDIATELY SO THAT THE APPROPRIATE TESTING AND SUBSEQUENT ACTION CAN BE TAKEN.
8. CONTRACTOR SHALL PREVENT DUST, SEDIMENT, AND DEBRIS FROM EXITING THE SITE AND SHALL BE RESPONSIBLE FOR CLEANUP, REPAIRS AND CORRECTIVE ACTION IF SUCH OCCURS.
9. DAMAGE RESULTING FROM CONSTRUCTION LOADS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO OWNER.
10. CONTRACTOR SHALL CONTROL STORMWATER RUNOFF DURING CONSTRUCTION TO PREVENT ADVERSE IMPACTS TO OFF SITE AREAS, AND SHALL BE RESPONSIBLE TO REPAIR RESULTING DAMAGES, IF ANY, AT NO COST TO OWNER.
11. THIS PROJECT DISTURBS MORE THAN ONE ACRE OF LAND AND FALLS WITHIN THE RIPDES CONSTRUCTION GENERAL PERMIT (CGP) PROGRAM AND RIDEM JURISDICTION. PRIOR TO THE START OF CONSTRUCTION CONTRACTOR IS TO FILE A NOTICE OF INTENT WITH THE RIDEM IN ACCORDANCE WITH THE RIPDES REGULATIONS.
12. EXISTING SOIL HAS BEEN DOCUMENTED TO CONTAIN CONTAMINANTS IN CONCENTRATIONS THAT EXCEED RIDEM REGULATORY CRITERIA. THE CONTRACTOR SHALL BE AWARE OF THE SOIL MANAGEMENT PLAN (SMP), AND THE ENVIRONMENTAL LAND USE RESTRICTION (ELUR) FOR THE PROPERTY WHICH DEFINES SPECIFIC PROCEDURES TO BE FOLLOWED TO MINIMIZE THE POTENTIAL OF EXPOSURE.

Utilities

1. THE LOCATIONS, SIZES, AND TYPES OF EXISTING UTILITIES ARE SHOWN AS AN APPROXIMATE REPRESENTATION ONLY. THE OWNER OR ITS REPRESENTATIVE(S) HAVE NOT INDEPENDENTLY VERIFIED THIS INFORMATION AS SHOWN ON THE PLANS. THE UTILITY INFORMATION SHOWN DOES NOT GUARANTEE THE ACTUAL EXISTENCE, SERVICEABILITY, OR OTHER DATA CONCERNING THE UTILITIES, NOR DOES IT GUARANTEE AGAINST THE POSSIBILITY THAT ADDITIONAL UTILITIES MAY BE PRESENT THAT ARE NOT SHOWN ON THE PLANS. PRIOR TO ORDERING MATERIALS AND BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL VERIFY AND DETERMINE THE EXACT LOCATIONS, SIZES, AND ELEVATIONS OF THE POINTS OF CONNECTIONS TO EXISTING UTILITIES AND, SHALL CONFIRM THAT THERE ARE NO INTERFERENCES WITH EXISTING UTILITIES AND THE PROPOSED UTILITY ROUTES, INCLUDING ROUTES WITHIN THE PUBLIC RIGHTS OF WAY.
2. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, OR EXISTING CONDITIONS DIFFER FROM THOSE SHOWN SUCH THAT THE WORK CANNOT BE COMPLETED AS INTENDED, THE LOCATION, ELEVATION, AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED IN WRITING TO THE OWNER'S REPRESENTATIVE FOR THE RESOLUTION OF THE CONFLICT AND CONTRACTOR'S FAILURE TO NOTIFY PRIOR TO PERFORMING ADDITIONAL WORK RELEASES OWNER FROM OBLIGATIONS FOR ADDITIONAL PAYMENTS WHICH OTHERWISE MAY BE WARRANTED TO RESOLVE THE CONFLICT.
3. SET CATCH BASIN RIMS, AND INVERTS OF SEWERS, DRAINS, AND DITCHES IN ACCORDANCE WITH ELEVATIONS ON THE GRADING AND UTILITY PLANS.
4. RIM ELEVATIONS FOR DRAIN AND SEWER MANHOLES, WATER VALVE COVERS, GAS GATES, ELECTRIC AND TELEPHONE PULL BOXES, AND MANHOLES, AND OTHER SUCH ITEMS, ARE APPROXIMATE AND SHALL BE SET/RESET AS FOLLOWS:
   - A. PAVEMENTS AND CONCRETE SURFACES: FLUSH
   - B. ALL SURFACES ALONG ACCESSIBLE ROUTES: FLUSH
   - C. LANDSCAPE, LOAM AND SEED, AND OTHER EARTH SURFACE AREAS: ONE INCH ABOVE SURROUNDING AREA AND TAPER EARTH TO THE RIM ELEVATION.
5. THE LOCATION, SIZE, DEPTH, AND SPECIFICATIONS FOR CONSTRUCTION OF PROPOSED PRIVATE UTILITY SERVICES SHALL BE INSTALLED ACCORDING TO THE REQUIREMENTS PROVIDED BY, AND APPROVED BY, THE RESPECTIVE UTILITY COMPANY (GAS, TELEPHONE, ELECTRIC, FIRE ALARM, ETC.). FINAL DESIGN LOADS AND LOCATIONS TO BE COORDINATED WITH OWNER AND ARCHITECT.
6. CONTRACTOR SHALL MAKE ARRANGEMENTS FOR AND SHALL BE RESPONSIBLE FOR PAYING FEES FOR POLE RELOCATION AND FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE, FIRE ALARM, AND ANY OTHER PRIVATE UTILITIES, WHETHER WORK IS PERFORMED BY CONTRACTOR OR BY THE UTILITIES COMPANY.
7. UTILITY PIPE MATERIALS SHALL BE AS FOLLOWS, UNLESS OTHERWISE NOTED ON THE PLAN:
   - A. STORM DRAINAGE PIPES SHALL BE HDPE.
   - D. PIPE INSTALLATION AND MATERIALS SHALL COMPLY WITH THE STATE PLUMBING CODE WHERE APPLICABLE. CONTRACTOR SHALL COORDINATE WITH LOCAL PLUMBING INSPECTOR PRIOR TO BEGINNING WORK.
8. CONTRACTOR SHALL COORDINATE WITH ELECTRICAL CONTRACTOR AND SHALL FURNISH EXCAVATION, INSTALLATION, AND BACKFILL OF ELECTRICAL FURNISHED SITEWORK RELATED ITEMS SUCH AS PULL BOXES, CONDUITS, DUCT BANKS, LIGHT POLE BASES, AND CONCRETE PADS. SITE CONTRACTOR SHALL FURNISH CONCRETE ENCASEMENT OF DUCT BANKS IF REQUIRED BY THE UTILITY COMPANY AND AS INDICATED ON THE DRAWINGS.

Layout and Materials

1. DIMENSIONS ARE FROM THE FACE OF CURB, FACE OF BUILDING, FACE OF WALL, AND CENTER LINE OF PAVEMENT MARKINGS, UNLESS OTHERWISE NOTED.
2. SEE ARCHITECTURAL DRAWINGS FOR EXACT BUILDING DIMENSIONS AND DETAILS CONTIGUOUS TO THE BUILDING, INCLUDING SIDEWALKS, RAMPS, BUILDING ENTRANCES, STAIRWAYS, UTILITY PENETRATIONS, CONCRETE DOOR PADS, COMPACTOR PAD, LOADING DOCKS, BOLLARDS, ETC.
3. PROPOSED BOUNDS AND ANY EXISTING PROPERTY LINE MONUMENTATION DISTURBED DURING CONSTRUCTION SHALL BE SET OR RESET BY A PROFESSIONAL LAND SURVEYOR.
4. PRIOR TO START OF CONSTRUCTION, CONTRACTOR SHALL VERIFY EXISTING PAVEMENT ELEVATIONS AT INTERFACE WITH PROPOSED PAVEMENTS, AND EXISTING GROUND ELEVATIONS ADJACENT TO DRAINAGE OUTLETS TO ASSURE PROPER TRANSITIONS BETWEEN EXISTING AND PROPOSED FACILITIES.

Demolition

1. CONTRACTOR SHALL REMOVE AND DISPOSE OF EXISTING MANMADE SURFACE FEATURES WITHIN THE LIMIT OF WORK INCLUDING BUILDINGS, STRUCTURES, PAVEMENTS, SLABS, CURBING, FENCES, UTILITY POLES, SIGNS, ETC. UNLESS INDICATED OTHERWISE ON THE DRAWINGS. REMOVE AND DISPOSE OF EXISTING UTILITIES, FOUNDATIONS AND UNSUITABLE MATERIAL BENEATH AND FOR A DISTANCE OF 10 FEET BEYOND THE PROPOSED BUILDING FOOTPRINT INCLUDING EXTERIOR COLUMNS.
2. EXISTING UTILITIES SHALL BE TERMINATED, UNLESS OTHERWISE NOTED, IN CONFORMANCE WITH LOCAL, STATE AND INDIVIDUAL UTILITY COMPANY STANDARD SPECIFICATIONS AND DETAILS. THE CONTRACTOR SHALL COORDINATE UTILITY SERVICE DISCONNECTS WITH THE UTILITY REPRESENTATIVES.
3. CONTRACTOR SHALL DISPOSE OF DEMOLITION DEBRIS IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS, ORDINANCES AND STATUTES.
4. THE DEMOLITION LIMITS DEPICTED IN THE PLANS IS INTENDED TO AID THE CONTRACTOR DURING THE BIDDING AND CONSTRUCTION PROCESS AND IS NOT INTENDED TO DEPICT EACH AND EVERY ELEMENT OF DEMOLITION. THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING THE DETAILED SCOPE OF DEMOLITION BEFORE SUBMITTING ITS BID/PROPOSAL TO PERFORM THE WORK AND SHALL MAKE NO CLAIMS AND SEEK NO ADDITIONAL COMPENSATION FOR CHANGED CONDITIONS OR UNFORESEEN OR LATENT SITE CONDITIONS RELATED TO ANY CONDITIONS DISCOVERED DURING EXECUTION OF THE WORK.
5. UNLESS OTHERWISE SPECIFICALLY PROVIDED ON THE PLANS OR IN THE SPECIFICATIONS, THE ENGINEER HAS NOT PREPARED DESIGNS FOR AND SHALL HAVE NO RESPONSIBILITY FOR THE PRESENCE, DISCOVERY, REMOVAL, ABATEMENT OR DISPOSAL OF HAZARDOUS MATERIALS, TOXIC WASTES OR POLLUTANTS AT THE PROJECT SITE. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR ANY CLAIMS OF LOSS, DAMAGE, EXPENSE, DELAY, INJURY OR DEATH ARISING FROM THE PRESENCE OF HAZARDOUS MATERIAL AND CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE ENGINEER FROM ANY CLAIMS MADE IN CONNECTION THEREWITH. MOREOVER, THE ENGINEER SHALL HAVE NO ADMINISTRATIVE OBLIGATIONS OF ANY TYPE WITH REGARD TO ANY CONTRACTOR AMENDMENT INVOLVING THE ISSUES OF PRESENCE, DISCOVERY, REMOVAL, ABATEMENT OR DISPOSAL OF ASBESTOS OR OTHER HAZARDOUS MATERIALS.
6. ANY MATERIAL REMOVED FROM THE SITE IS TO BE DISPOSED OF ON QUONSET DEVELOPMENT CORP. (QDC) PROPERTY. CONTRACTOR SHALL COORDINATE THE DISPOSAL WITH QDC IN ACCORDANCE WITH THE APPROVED RIDEM SOIL MANAGEMENT PLAN (SMP).

Erosion Control

1. PRIOR TO STARTING ANY OTHER WORK ON THE SITE, THE CONTRACTOR SHALL NOTIFY APPROPRIATE AGENCIES AND SHALL INSTALL EROSION CONTROL MEASURES AS SHOWN ON THE PLANS AND AS IDENTIFIED IN FEDERAL, STATE, AND LOCAL APPROVAL DOCUMENTS PERTAINING TO THIS PROJECT.
2. REFER TO THE SOIL EROSION AND SEDIMENT CONTROL PLANS, DETAILS AND REPORT FOR MINIMUM REQUIREMENTS.

Existing Conditions Information

1. BASE PLAN: THE PROPERTY LINES SHOWN WERE DETERMINED BY AN ACTUAL FIELD SURVEY CONDUCTED BY VHB,INC. THE TOPOGRAPHY AND PHYSICAL FEATURES ARE FROM AERIAL MAPPING COMPILED BY WSP FROM IMAGERY ACQUIRED IN 2010 AND SUPPLEMENTED BY A FIELD SURVEY CONDUCTED BY VHB, INC. BETWEEN OCTOBER, 2019 AND MAY 2020.
   - A. DELINEATION OF THE WETLANDS AND PLACEMENT OF THE FLAGS WAS PERFORMED BY: VHB.
   - B. FLAGS MARKING THE WETLANDS WERE LOCATED BY: VHB, SURVEY.
2. TOPOGRAPHY: ELEVATIONS ARE BASED ON NAVD 88.

Document Use

2. THESE PLANS AND CORRESPONDING CADD DOCUMENTS ARE INSTRUMENTS OF PROFESSIONAL SERVICE, AND SHALL NOT BE USED, IN WHOLE OR IN PART, FOR ANY PURPOSE OTHER THAN FOR WHICH IT WAS CREATED WITHOUT THE EXPRESSED, WRITTEN CONSENT OF VHB. ANY UNAUTHORIZED USE, REUSE, MODIFICATION OR ALTERATION, INCLUDING AUTOMATED CONVERSION OF THIS DOCUMENT SHALL BE AT THE USER'S SOLE RISK WITHOUT LIABILITY OR LEGAL EXPOSURE TO VHB.
3. CONTRACTOR SHALL NOT RELY SOLELY ON ELECTRONIC VERSIONS OF PLANS, SPECIFICATIONS, AND DATA FILES THAT ARE OBTAINED FROM THE DESIGNERS, BUT SHALL VERIFY LOCATION OF PROJECT FEATURES IN ACCORDANCE WITH THE PAPER COPIES OF THE PLANS AND SPECIFICATIONS THAT ARE SUPPLIED AS PART OF THE CONTRACT DOCUMENTS.
4. SYMBOLS AND LEGENDS OF PROJECT FEATURES ARE GRAPHIC REPRESENTATIONS AND ARE NOT NECESSARILY SCALED TO THEIR ACTUAL DIMENSIONS OR LOCATIONS ON THE DRAWINGS. THE CONTRACTOR SHALL REFER TO THE DETAIL SHEET DIMENSIONS, MANUFACTURERS' LITERATURE, SHOP DRAWINGS AND FIELD MEASUREMENTS OF SUPPLIED PRODUCTS FOR LAYOUT OF THE PROJECT FEATURES.

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Revolution Wind Proposed Onshore Substation

Camp Avenue
North Kingstown, Rhode Island

No.	Revision	Date	Appvd.
1	Per QDC Comments	June 11, 2021	KC
2	CRMC Submission	June 30, 2021	KC

Designed by AEC — Checked by RLC

Issued for: Permits — Date: May 5, 2021

Not Approved for Construction

Legend and General Notes

RENEE L. CODEGA No. 6517 REGISTERED PROFESSIONAL ENGINEER (CIVIL) 6/30/2021

Drawing Number C-1.00

Sheet 1 of 6

Project Number 73032.01

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NOTES:
1. BASE FLOOD ELEVATION TAKEN FROM FEMA FLOOD INSURANCE RATE MAP PANELS 44009C0108J AND 44009CV001B EFFECTIVE DATE OCTOBER 16, 2013.
2. REFER TO WETLAND RESTORATION PLANS FOR VEGETATIVE COVER.

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0 20 40 80 Feet

Revolution Wind Proposed Onshore Substation

Camp Avenue
North Kingstown, Rhode Island

No.	Revision	Date	Appvd.
1	Per QDC Comments	June 11, 2021	KC
2	CRMC Submission	June 30, 2021	KC

Designed by AEC | Checked by RLC
Issued for: Permits | Date: May 5, 2021

Not Approved for Construction

Layout and Materials Plan

Drawing Number: C-2.00
Sheet 2 of 6
Project Number 73032.01

RENEE L. CODEGA No. 6517 REGISTERED PROFESSIONAL ENGINEER (CIVIL) 6/30/2021

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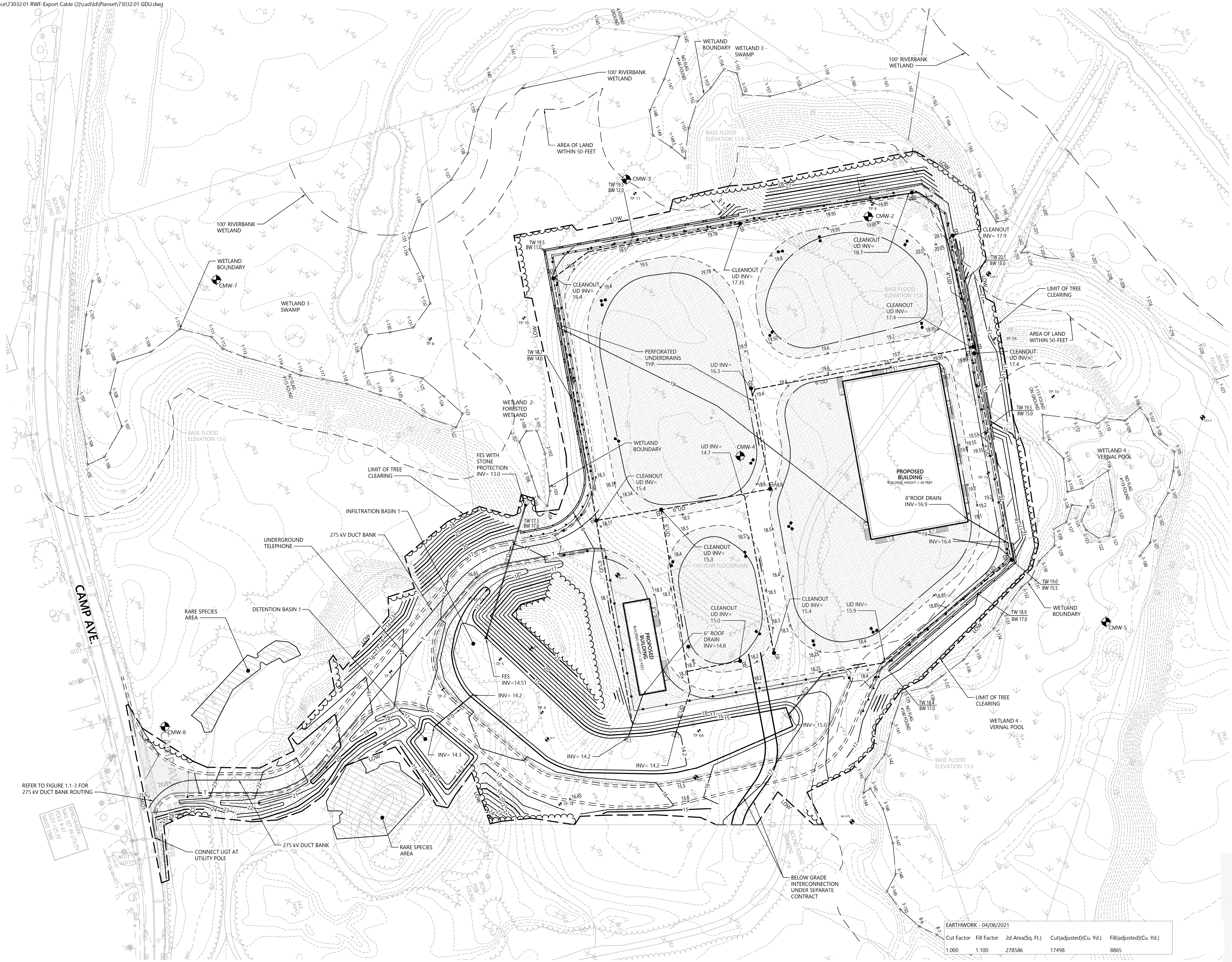

EARTHWORK - 04/08/2021				
Cut Factor	Fill Factor	2d Area(Sq. Ft.)	Cut(adjusted)(Cu. Yd.)	Fill(adjusted)(Cu. Yd.)
1.000	1.100	278586	17498	8865

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NOTES:
1. BASE FLOOD ELEVATION TAKEN FROM FEMA MAPFLOOD INSURANCE RATE MAP PANELS 44009C0108J AND 44009CV001B EFFECTIVE DATE OCTOBER 16, 2013.
2. ALL UNDERDRAIN (UD) OUTLETS SHALL BE PROTECTED WITH SCREEN CLAMPED TO END OF PIPE.
3. CMW MONITORING WELLS TO BE PROTECTED UNTIL ARMY CORP OF ENGINEERS DETERMINES REMOVAL IS ALLOWED.

0 20 40 80 Feet

Revolution Wind Proposed Onshore Substation

Camp Avenue
North Kingstown, Rhode Island

No.	Revision	Date	Appvd.
1	Per QDC Comments	June 11, 2021	KC
2	CRMC Submission	June 30, 2021	KC

Designed by AEC | Checked by RLC

Issued for: Permits | Date: May 5, 2021

Not Approved for Construction

Grading, Drainage, and Utility Plan

RENEE L. CODEGA No. 6517 REGISTERED PROFESSIONAL ENGINEER (CIVIL) 6/30/2021

Drawing Number C-3.00

Sheet 3 of 6

Project Number 73032.01

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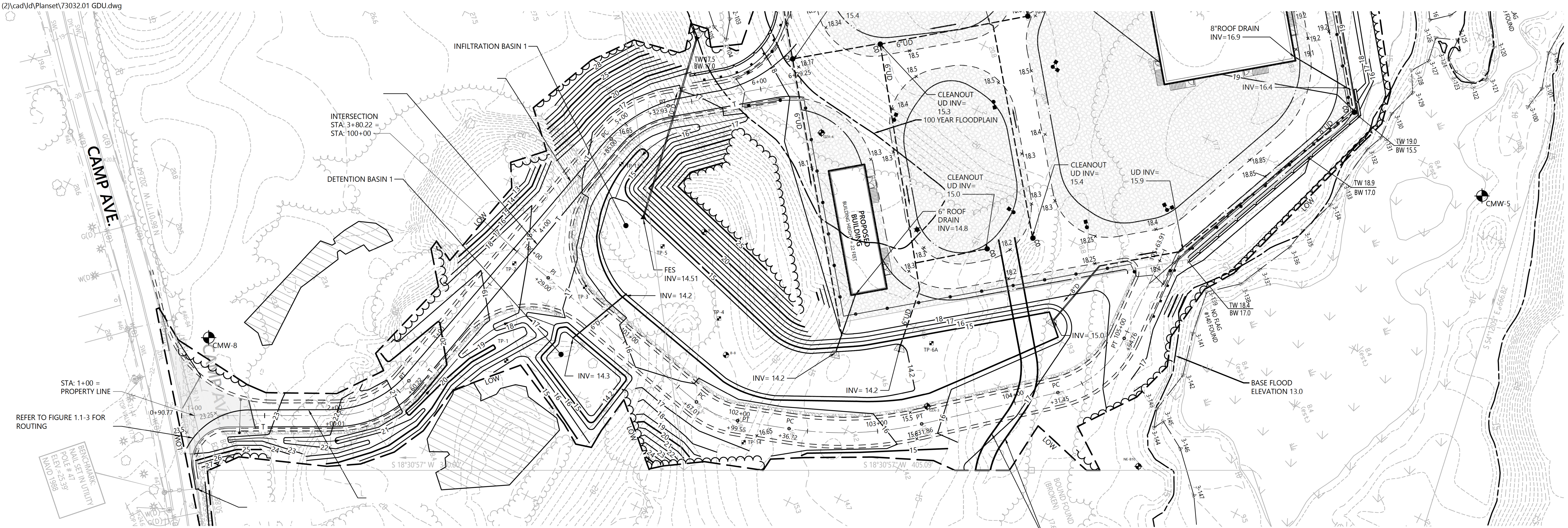
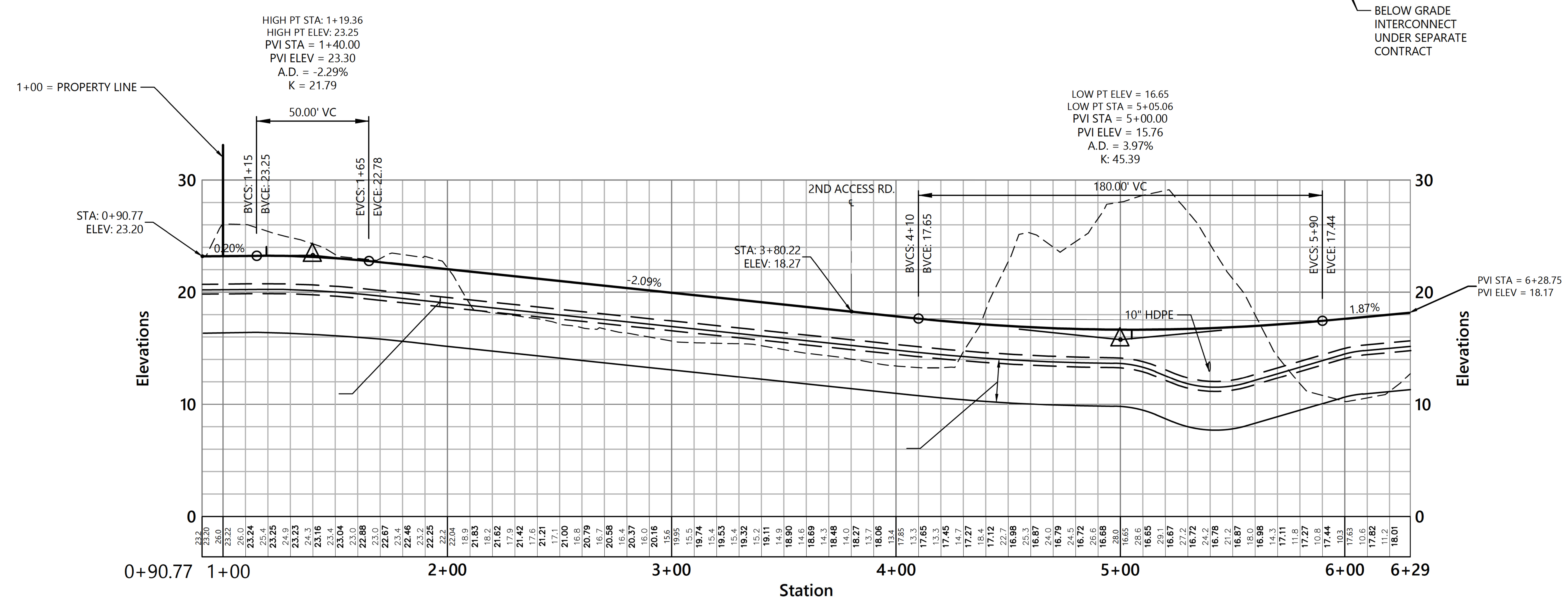
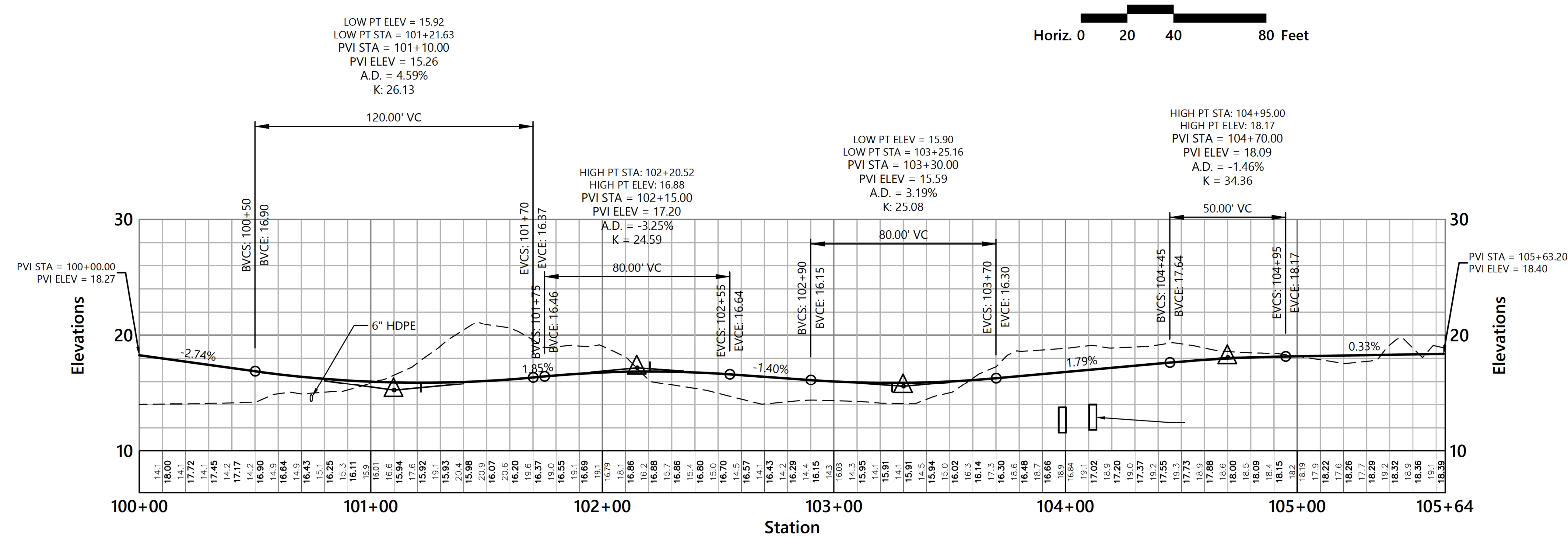




Alignment - Main Access

Vert. 0 4 8 16 Feet
Horiz. 0 20 40 80 Feet



Alignment - 2nd Access Rd.

Vert. 0 4 8 16 Feet
Horiz. 0 20 40 80 Feet

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0 20 40 80 Feet

Revolution Wind Proposed Onshore Substation

Camp Avenue
North Kingstown, Rhode Island

No.	Revision	Date	Appvd.
1	Per QDC Comments	June 11, 2021	KC
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Driveway Plan and Profile

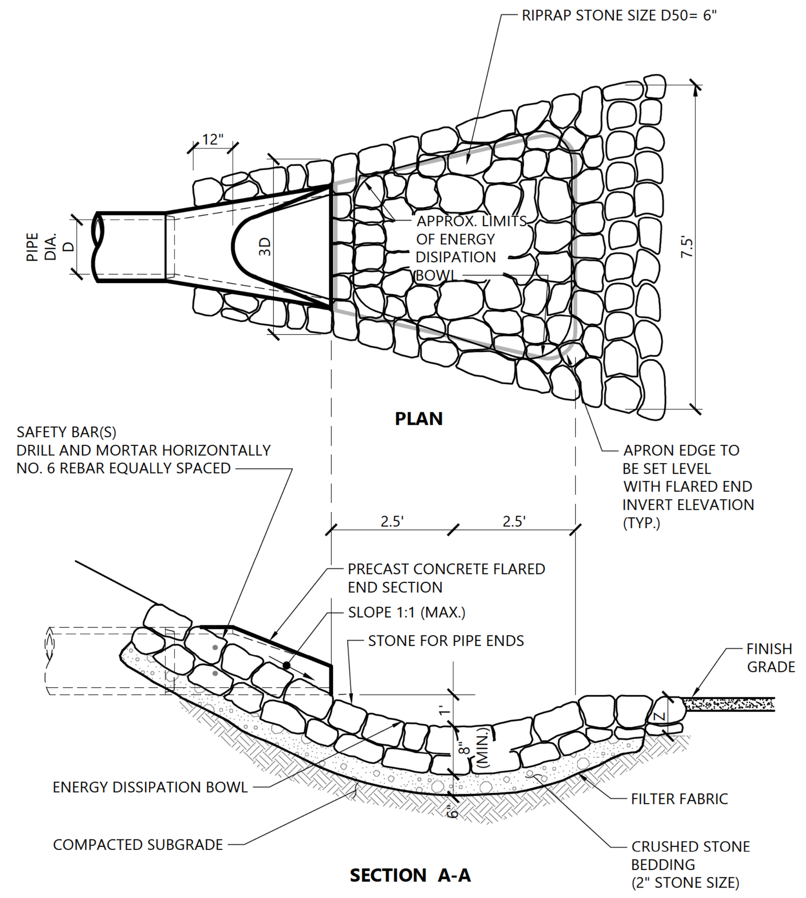
RENEE L. CODEGA No. 6517 REGISTERED PROFESSIONAL ENGINEER (CIVIL) 6/30/2021

Drawing Number: C-4.00

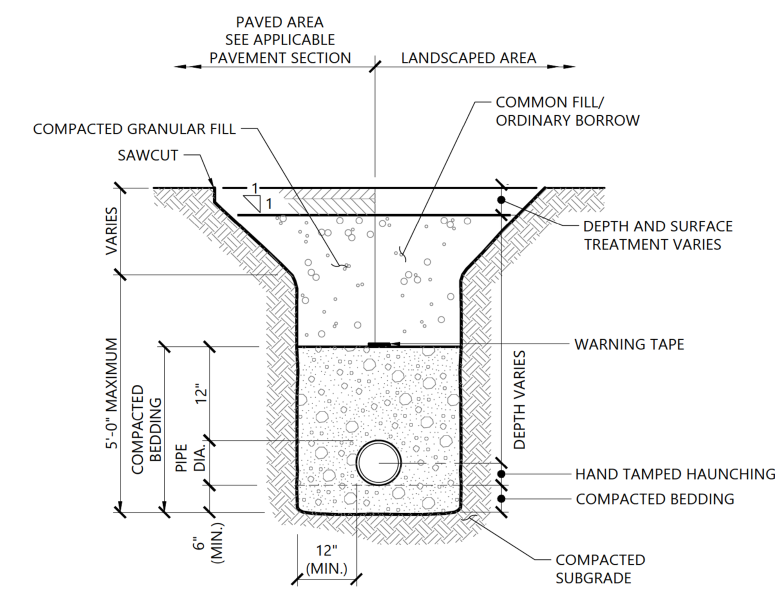
Sheet 4 of 6

Project Number 73032.01

Saved Tuesday, June 15, 2021 1:29:34 PM SPEREIRA Plotted Friday, June 25, 2021 8:39:53 AM Win Hagen



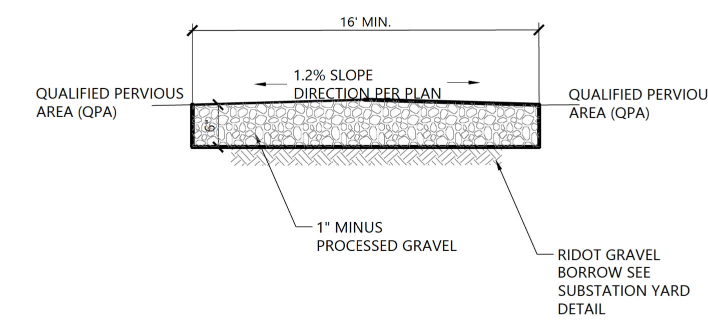
Flared End Section (FES) with Stone Protection 3/19
N.T.S. Source: VHB REV LD_134



NOTES

1. WHERE UTILITY TRENCHES ARE CONSTRUCTED THROUGH DETENTION BASIN BERMS OR OTHER SUCH SPECIAL SECTIONS, PLACE TRENCH BACKFILL WITH MATERIALS SIMILAR TO THE SPECIAL SECTION REQUIREMENTS.
2. USE METALLIC TRACING/WARNING TAPE OVER ALL PIPES.

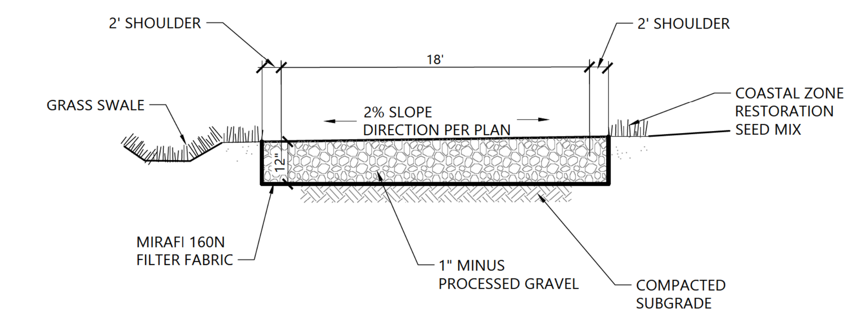
Utility Trench 1/16
N.T.S. Source: VHB LD_300



NOTES

1. PROCESSED GRAVEL STONE SHALL BE IN ACCORDANCE WITH THE CURRENT VERSION OF THE RHODE ISLAND DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.

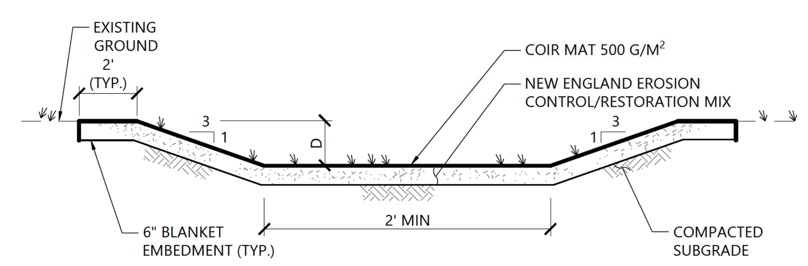
Gravel Drive Substation Yard
N.T.S. Source: VHB



NOTES

1. PROCESSED GRAVEL STONE SHALL BE IN ACCORDANCE WITH THE CURRENT VERSION OF THE RHODE ISLAND DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.

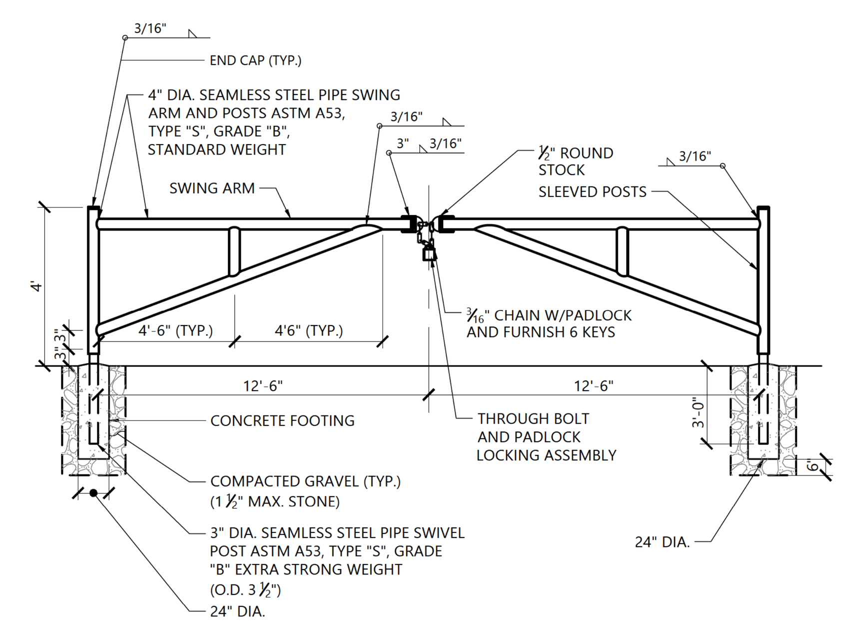
Gravel Drive
N.T.S. Source: VHB



SWALE TABLE

SWALE DESIGNATION	W	D
SWALE 1	2'-0"	1'-0"
SWALE 2	2'-0"	1'-0"

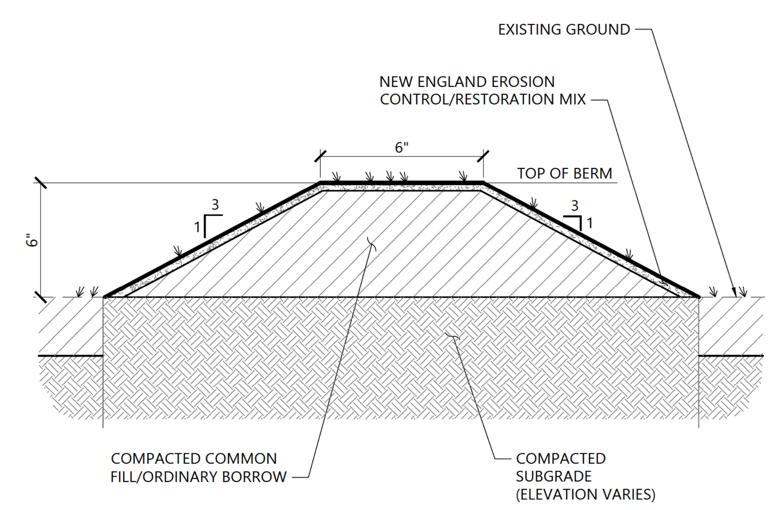
Grassed Swale 1/16
N.T.S. Source: VHB REV LD_171



NOTES

1. SHOP PRIME PAINT EXPOSED SURFACES FIELD PAINT EPOXY ENAMEL- YELLOW.
2. PROVIDE "MASTER" PADLOCK WITH 6 WORKING KEYS.
3. 3,000 PSI CONCRETE FOOTING

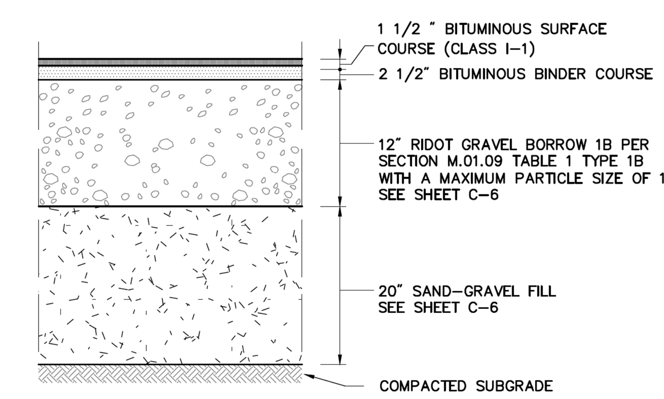
Emergency Gate (Double) 1/16
N.T.S. Source: VHB LD_486



NOTES

1. THE BERM SECTION IS SUBJECT TO CHANGE AND WILL BE BASED ON THE RESULTS OF FURTHER GEOTECHNICAL INVESTIGATIONS.

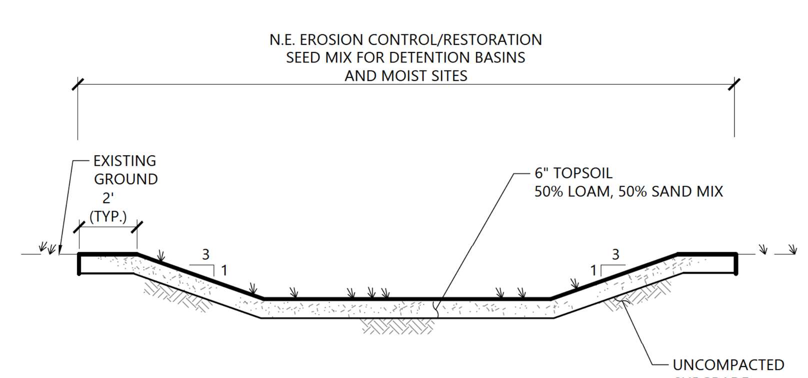
Earthen Berm Section
N.T.S. Source: VHB REV



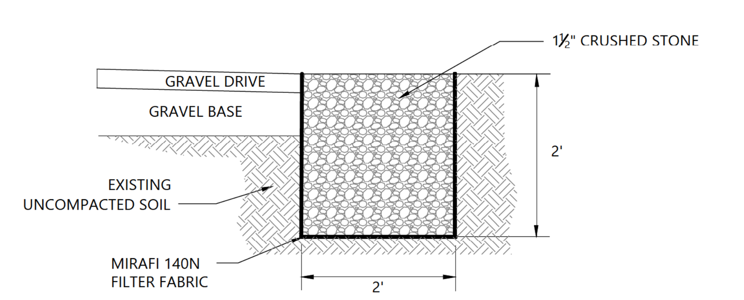
NOTES

BITUMINOUS MATERIALS AND INSTALLATION SHALL CONFORM TO RIDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION (LATEST EDITION) PART 400 BITUMINOUS PAVEMENTS.

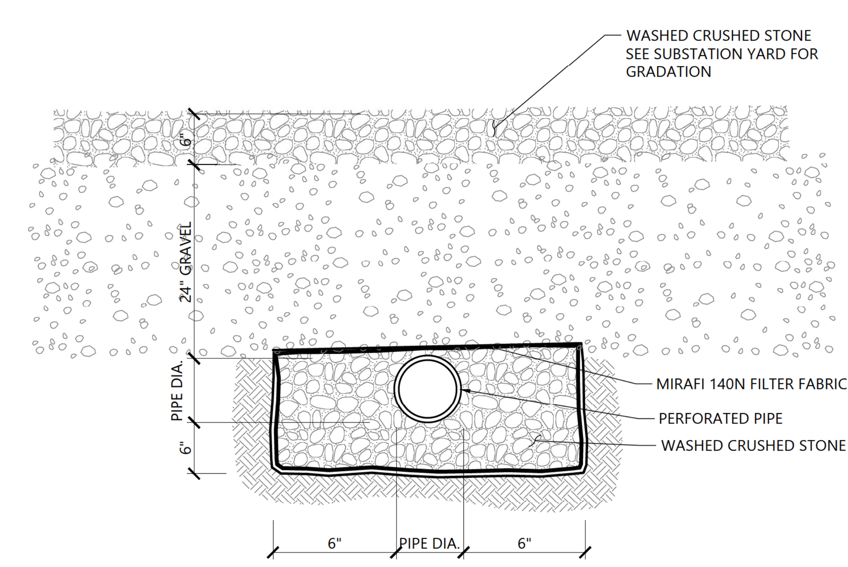
Bituminous Concrete Pavement (Paved Access Drive) 1/16
N.T.S. Source: VHB LD_430



Infiltration Basin 1/16
N.T.S. Source: VHB REV LD_171



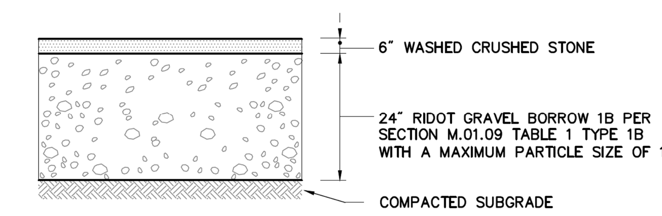
Stone Diaphragm
N.T.S. Source: VHB



NOTES

24" RIDOT GRAVEL BORROW 1B PER SECTION M.01.09 TABLE 1 TYPE 1B WITH A MAXIMUM PARTICLE SIZE OF 1.5"

Substation Yard With Underdrain 1/16
N.T.S. Source: VHB REV LD_184



NOTES

WASHED CRUSHED STONE

SIEVE DESIGNATION	% PASSING
1" INCH	100
3/4 INCH	90–100
1/2 INCH	20–55
3/8 INCH	0–15
NO. 4	0–5

Substation Yard 1
N.T.S. Source: VHB LD_4

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Revolution Wind Proposed Onshore Substation

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No.	Revision	Date	Appvd.
1	Per QDC Comments	June 11, 2021	KC
2	CRMC Submission	June 30, 2021	KC

Designed by AEC Checked by RLC
Issued for Permits Date May 5, 2021

Not Approved for Construction

Site Details 1

RENEE L. CODEGA No. 6517 REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

Drawing Number C-5.01
Sheet 5 of 6
Project Number 73032.01

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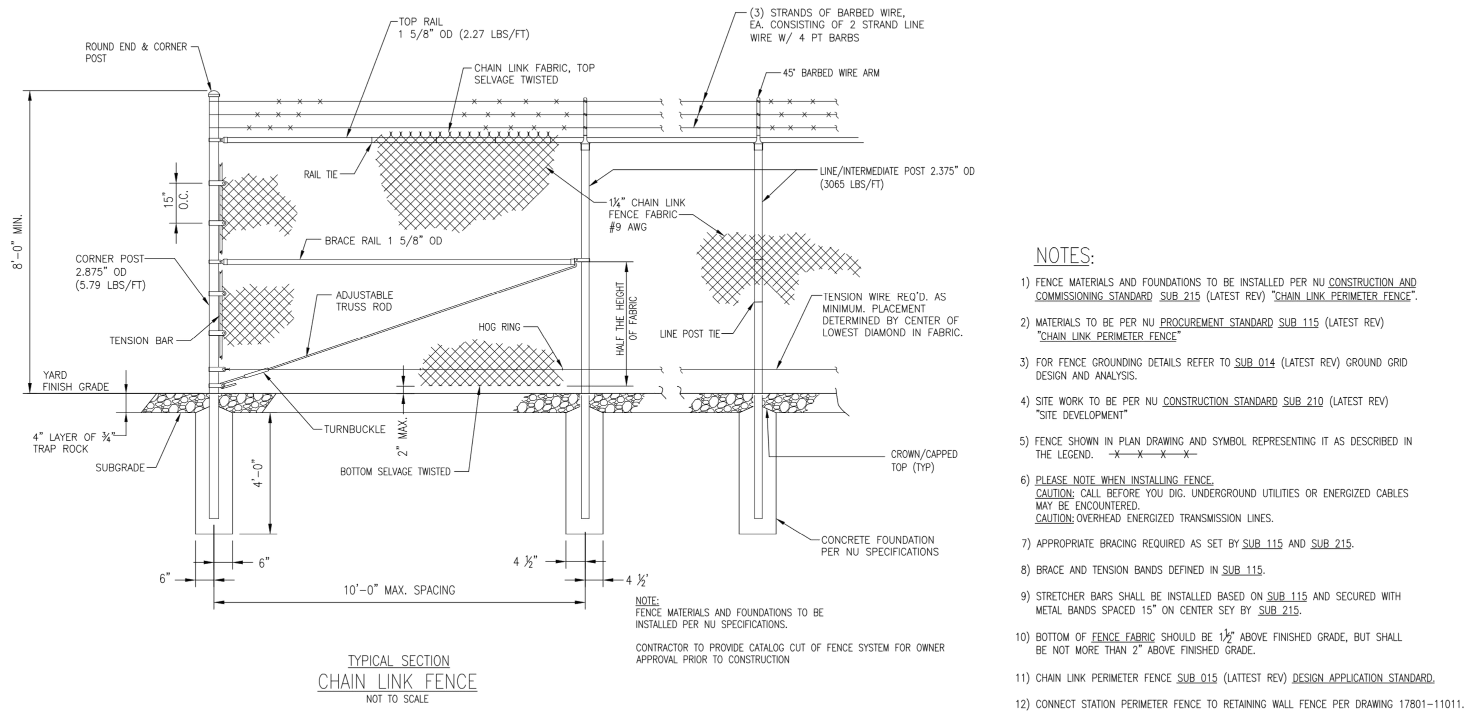
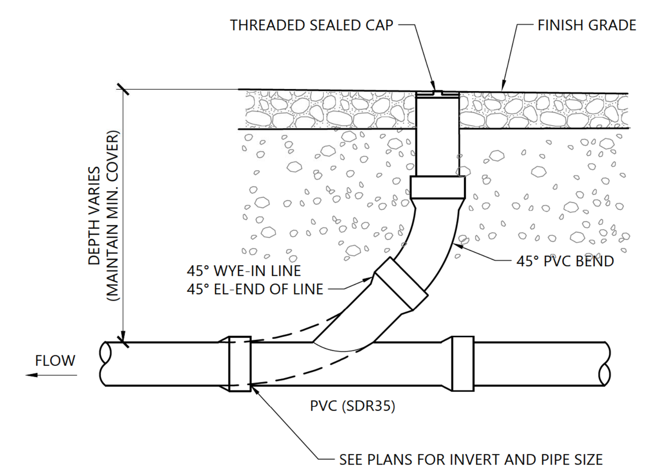


Chain Link Fence

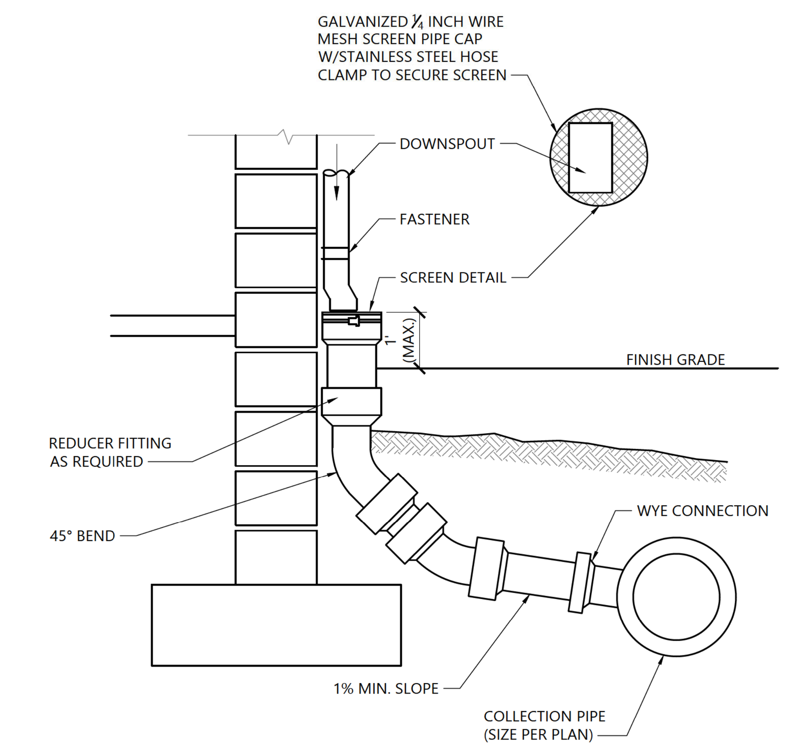
N.T.S. Source: VHB



Cleanout - Substation Yard

1/16

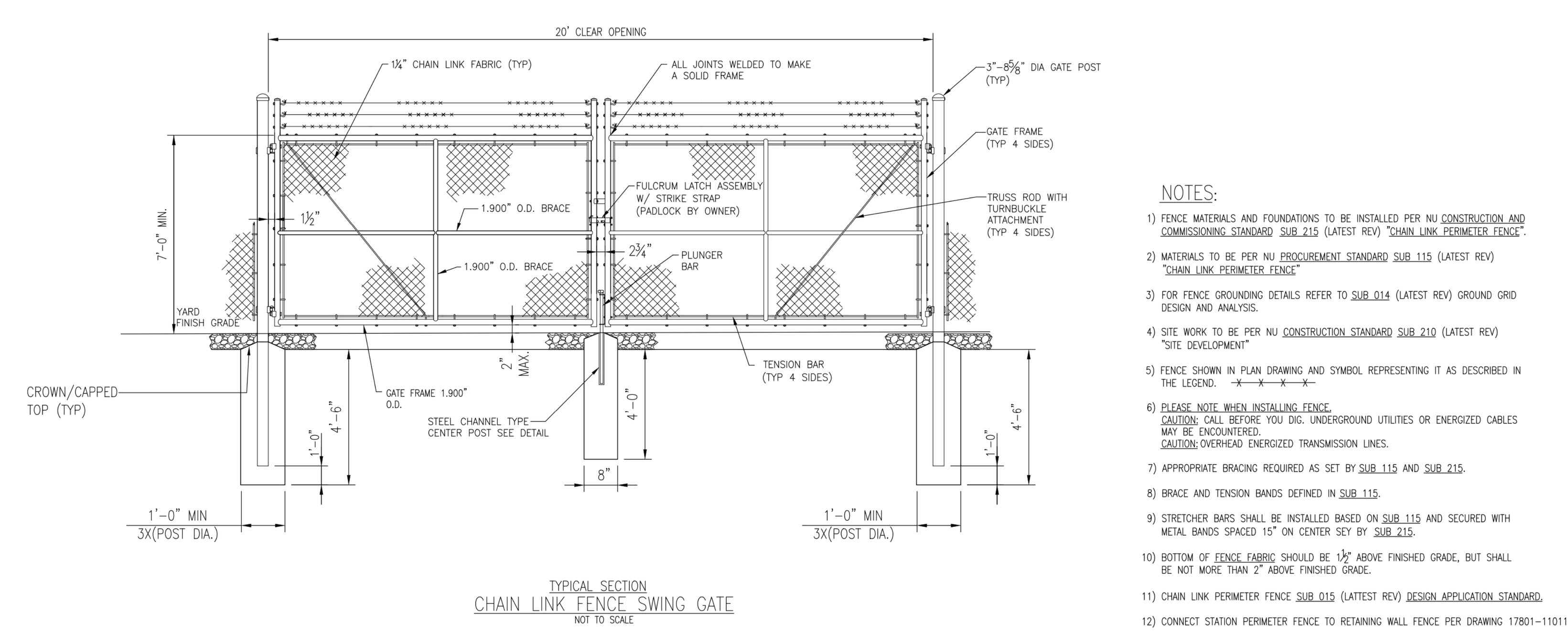
N.T.S. Source: VHB REV LD_302



Downspout Rain Leader

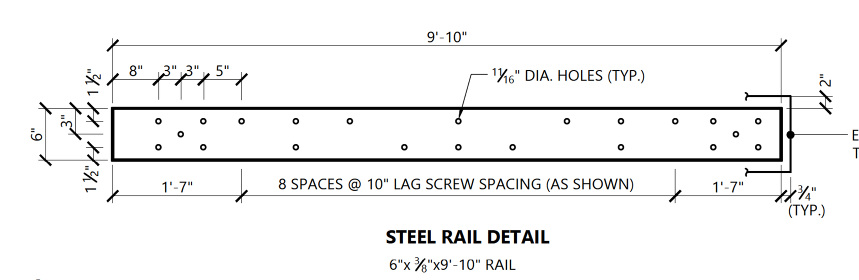
1/16

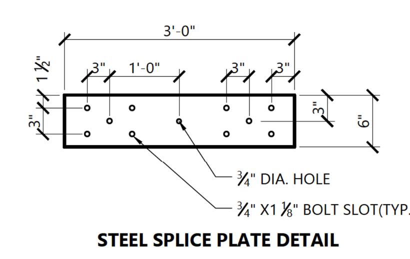
N.T.S. Source: VHB LD_195

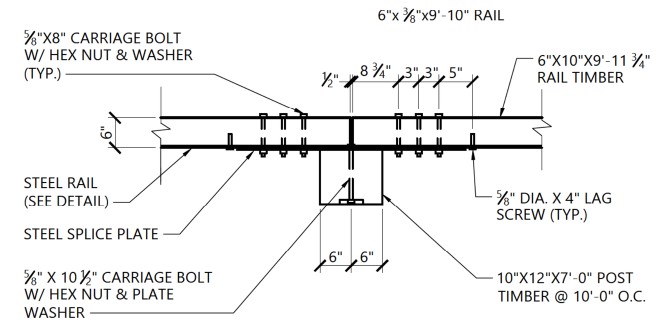


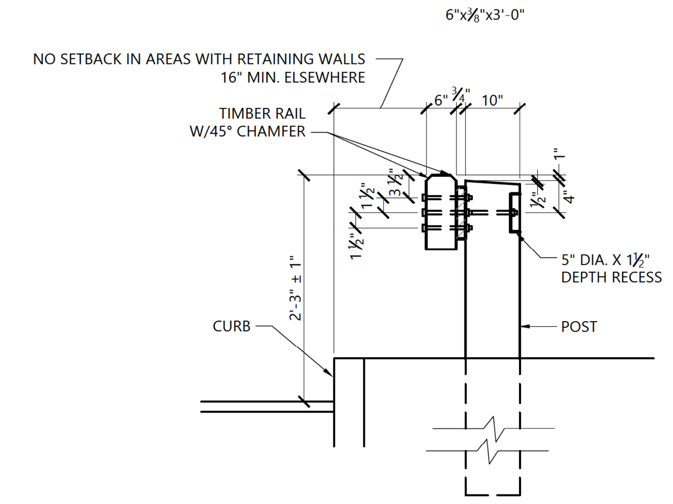
Chain Link Fence Swing Gate

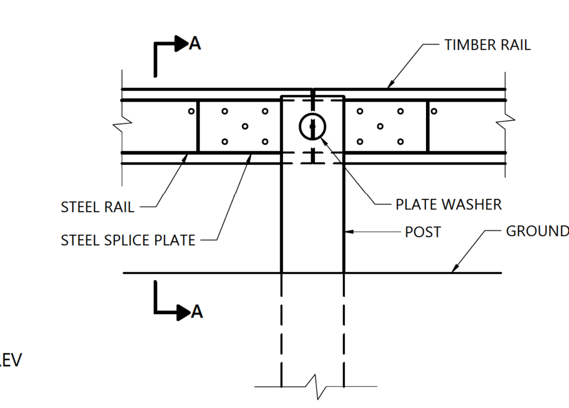
N.T.S. Source: VHB











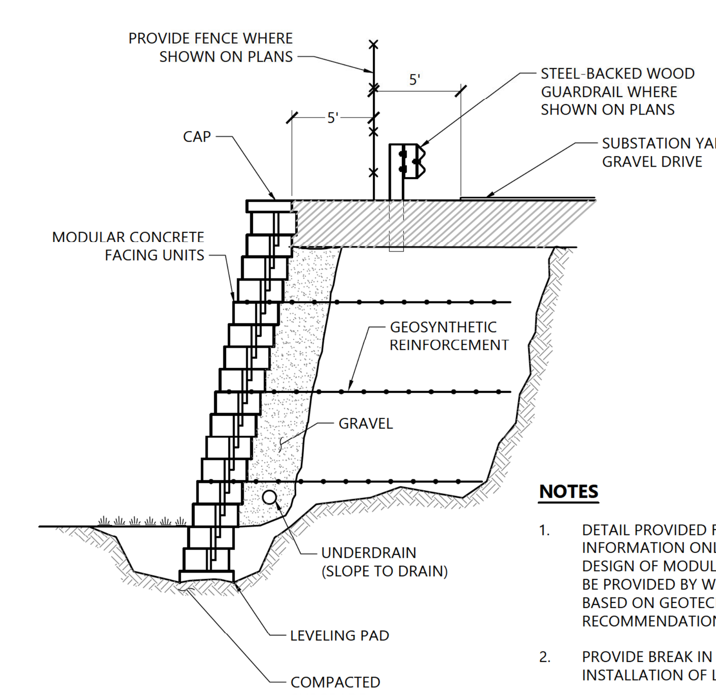
NOTES

1. TIMBER RAILS AND POSTS SHALL BE PLANED ON THE FACE AND TOP AND THEN PRESSURE TREATED.
2. STEEL RAILS, SPLICE PLATES, BOLTS. SCREWS, NUTS AND WASHERS SHALL BE GALVANIZED.
3. AT END POSTS, PROVIDE FULL COVERAGE OF POST FACE WITH TIMBER RAIL AND SPLICE PLATE.
4. STEEL BACKING REQUIRED AT GUARDRAILS ALONG DRIVE AISLES.
5. STEEL BACKING IS NOT REQUIRED AT GUARDRAILS LOCATED AT THE END OF PARKING SPACES.

Steel-Backed Wood Guardrail

1/16

N.T.S. Source: VHB REV LD_452



NOTES

1. DETAIL PROVIDED FOR GENERAL INFORMATION ONLY. STAMPED FI[...] DESIGN OF MODULAR WALL SYSTE[...] BE PROVIDED BY WALL MANUFACT[...] BASED ON GEOTECHNICAL ENGINE[...] RECOMMENDATIONS.
2. PROVIDE BREAK IN GUARDRAIL FOR INSTALLATION OF LIGHT POLE BASE[...]

Modular Retaining Wall

N.T.S. Source: VHB

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North Kingstown, Rhode Island

No.	Revision	Date	Appvd.
1	Per QDC Comments	June 11, 2021	KC
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Designed by AEC | Checked by RLC

Issued for **Permits** | Date May 5, 2021

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Site Details 2

RENEE L. CODEGA No. 6517 REGISTERED PROFESSIONAL ENGINEER (CIVIL) 6/30/2021

Drawing Number **C-5.02**

Sheet 6 of 6

Project Number 73032.01

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NOTES:

1. COASTAL ZONE MEADOW RESTORATION MIX SEED MIX
MODIFICATION OF A POPULAR RESTORATION MIX FOR THE COASTAL ZONE OF RHODE ISLAND, PARTICULARLY DRY AND RECENTLY DISTURBED SITES REQUIRING IMMEDIATE RE-VEGETATED FOR SOIL STABILIZATION. THE MIX MAY BE APPLIED BY HYDRO-SEEDING OR BY MECHANICAL SPREADER. AFTER APPLICATION LIGHTLY RAKE, OR ROLL TO ENSURE PROPER SOIL/SEED CONTACT. BEST RESULTS ARE OBTAINED WITH A SPRING OR LATE SUMMER SEEDING. LATE SPRING THROUGH MID-SUMMER SEEDING WILL BENEFIT FROM A LIGHT MULCHING OF WEED-FREE STRAW TO CONSERVE MOISTURE. IF CONDITIONS ARE DRIER THAN USUAL, WATERING WILL BE REQUIRED. FERTILIZATION IS NOT REQUIRED UNLESS THE SOILS ARE PARTICULARLY INFERTILE. PREPARATION OF A CLEAN WEED FREE SEED BED IS NECESSARY FOR OPTIMAL RESULTS.

APPLICATION RATE: 35 LBS/ACRE, 1,250 SF/LB

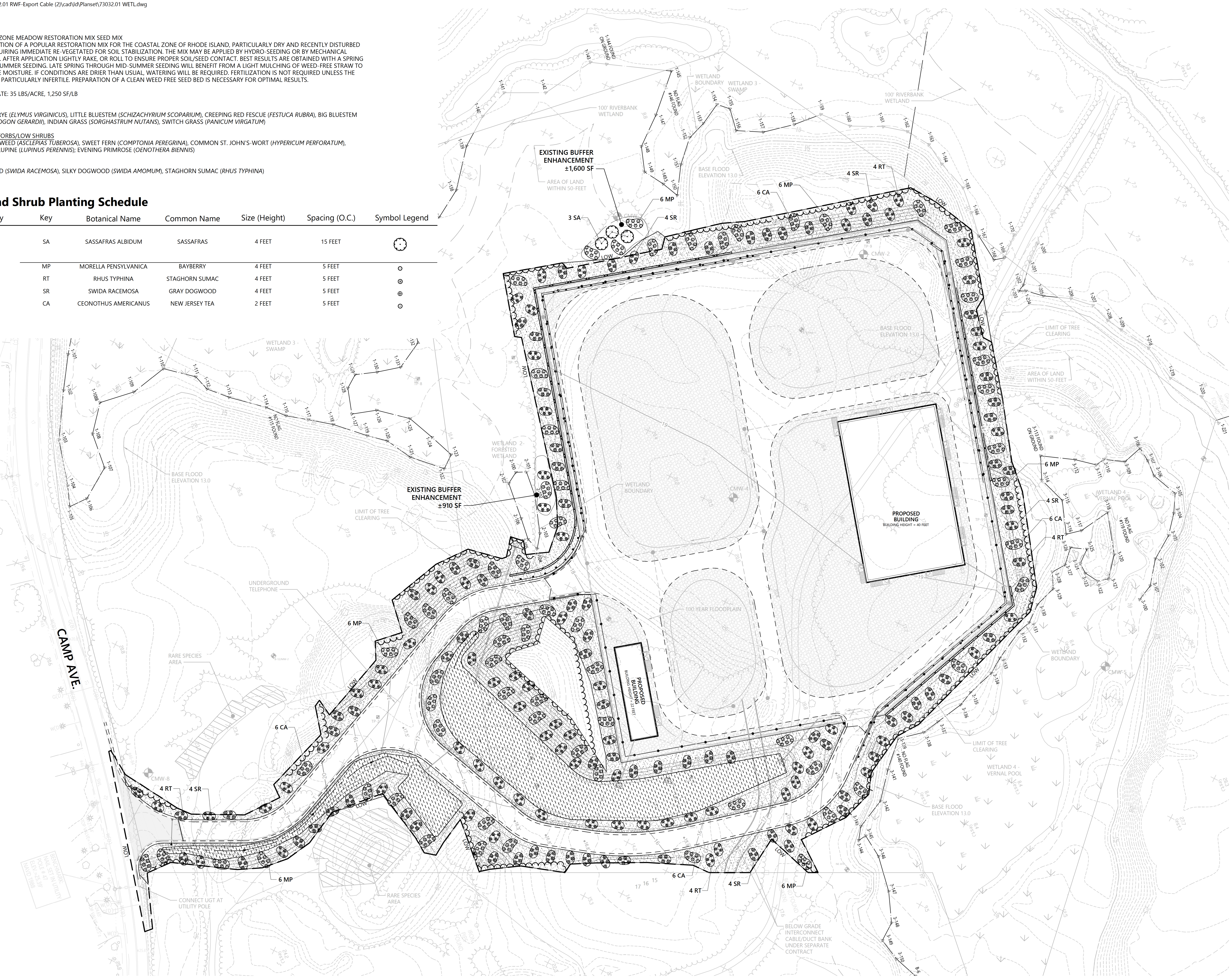
GRASSES
VIRGINIA WILD RYE (*ELYMUS VIRGINICUS*), LITTLE BLUESTEM (*SCHIZACHYRIUM SCOPARIUM*), CREEPING RED FESCUE (*FESTUCA RUBRA*), BIG BLUESTEM (*ANDROPOGON GERARDII*), INDIAN GRASS (*SORGHASTRUM NUTANS*), SWITCH GRASS (*PANICUM VIRGATUM*)

WILDFLOWERS/FORBS/LOW SHRUBS
BUTTERFLY MILKWEED (*ASCLEPIAS TUBEROSA*), SWEET FERN (*COMPTONIA PEREGRINA*), COMMON ST. JOHN'S-WORT (*HYPERICUM PERFORATUM*), SUNDIAL LUPINE (*LUPINUS PERENNIS*); EVENING PRIMROSE (*OENOTHERA BIENNIS*)

SHRUBS
GRAY DOGWOOD (*SWIDA RACEMOSA*), SILKY DOGWOOD (*SWIDA AMOMUM*), STAGHORN SUMAC (*RHUS TYPHINA*)

Tree And Shrub Planting Schedule

Quantity	Key	Botanical Name	Common Name	Size (Height)	Spacing (O.C.)	Symbol Legend
LOW TREE						
3	SA	SASSAFRAS ALBIDUM	SASSAFRAS	4 FEET	15 FEET	
SHRUBS						
234	MP	MORELLA PENSYLVANICA	BAYBERRY	4 FEET	5 FEET	
296	RT	RHUS TYPHINA	STAGHORN SUMAC	4 FEET	5 FEET	
332	SR	SWIDA RACEMOSA	GRAY DOGWOOD	4 FEET	5 FEET	
168	CA	CEONOTHUS AMERICANUS	NEW JERSEY TEA	2 FEET	5 FEET	



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= COASTAL ZONE MEADOW RESTORATION SEED MIX.

= NEW ENGLAND EROSION CONTROL/RESTORATION MIX FOR DETENTION BASINS AND MOIST SITES

APPLICATION RATE: 35 LBS/ACRE, 1,250 SF/LB

= STONE

0 20 40 80 Feet

Revolution Wind Proposed Onshore Substation

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Wetland Restoration Plan

REGISTERED STATE OF RHODE ISLAND HOPE ERIK J BEDNAREK No. 634 LANDSCAPE ARCHITECT
6/30/2021

Drawing Number **W1.01**

Sheet 1 of 2

Project Number 73032.01

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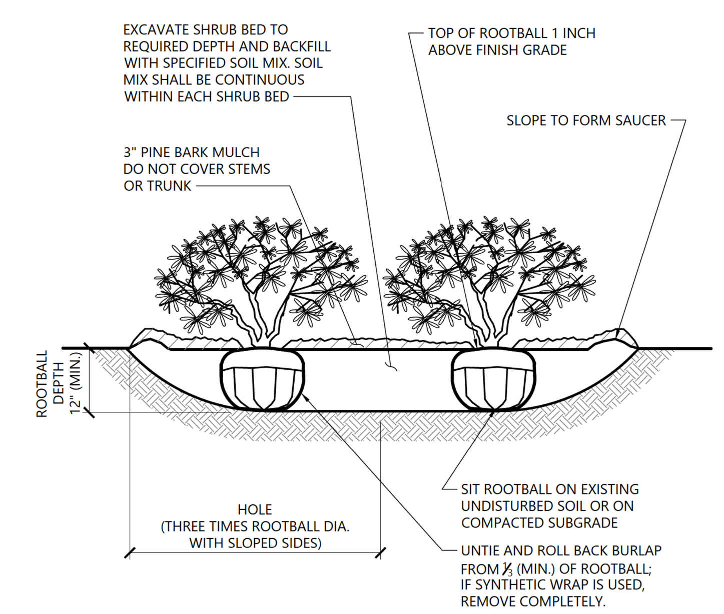
Planting Notes

1. ALL PROPOSED PLANTING LOCATIONS SHALL BE STAKED AS SHOWN ON THE PLANS FOR FIELD REVIEW AND APPROVAL BY THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
2. CONTRACTOR SHALL VERIFY LOCATIONS OF ALL BELOW GRADE AND ABOVE GROUND UTILITIES AND NOTIFY OWNERS REPRESENTATIVE OF CONFLICTS.
3. NO PLANT MATERIALS SHALL BE INSTALLED UNTIL ALL GRADING AND CONSTRUCTION HAS BEEN COMPLETED IN THE IMMEDIATE AREA. CONTRACTOR SHALL NOTIFY OWNER'S REPRESENTATIVE OF ANY CONFLICT.
4. A 3-INCH DEEP MULCH PER SPECIFICATION SHALL BE INSTALLED UNDER ALL TREES AND SHRUBS, AND IN ALL PLANTING BEDS, UNLESS OTHERWISE INDICATED ON THE PLANS, OR AS DIRECTED BY OWNER'S REPRESENTATIVE.
5. ALL TREES SHALL BE BALLED AND BURLAPPED, UNLESS OTHERWISE NOTED IN THE DRAWINGS OR SPECIFICATION, OR APPROVED BY THE OWNER'S REPRESENTATIVE.
6. FINAL QUANTITY FOR EACH PLANT TYPE SHALL BE AS GRAPHICALLY SHOWN ON THE PLAN. THIS NUMBER SHALL TAKE PRECEDENCE IN CASE OF ANY DISCREPANCY BETWEEN QUANTITIES SHOWN ON THE PLANT LIST AND ON THE PLAN. THE CONTRACTOR SHALL REPORT ANY DISCREPANCIES BETWEEN THE NUMBER OF PLANTS SHOWN ON THE PLANT LIST AND PLANT LABELS PRIOR TO BIDDING.
7. ANY PROPOSED PLANT SUBSTITUTIONS MUST BE REVIEWED BY LANDSCAPE ARCHITECT AND APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE.
8. ALL PLANT MATERIALS INSTALLED SHALL MEET THE SPECIFICATIONS OF THE "AMERICAN STANDARDS FOR NURSERY STOCK" BY THE AMERICAN ASSOCIATION OF NURSERYMEN AND CONTRACT DOCUMENTS.
9. ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE.
10. AREAS DESIGNATED "LOAM & SEED" SHALL RECEIVE MINIMUM 6" OF LOAM AND SPECIFIED SEED MIX. LAWNS OVER 2:1 SLOPE SHALL BE PROTECTED WITH EROSION CONTROL FABRIC.
11. ALL DISTURBED AREAS NOT OTHERWISE NOTED ON CONTRACT DOCUMENTS SHALL BE LOAM AND SEEDED OR MULCHED AS DIRECTED BY OWNER'S REPRESENTATIVE.
12. THIS PLAN IS INTENDED FOR PLANTING PURPOSES. REFER TO SITE / CIVIL DRAWINGS FOR ALL OTHER SITE CONSTRUCTION INFORMATION.

Plant Maintenance Notes

1. CONTRACTOR SHALL PROVIDE COMPLETE MAINTENANCE OF THE LAWNS AND PLANTINGS. NO IRRIGATION IS PROPOSED FOR THIS SITE. THE CONTRACTOR SHALL SUPPLY SUPPLEMENTAL WATERING FOR NEW LAWNS AND PLANTINGS DURING THE ONE YEAR PLANT GUARANTEE PERIOD.
2. CONTRACTOR SHALL PROVIDE ALL MATERIALS, LABOR, AND EQUIPMENT FOR THE COMPLETE LANDSCAPE MAINTENANCE WORK. WATER SHALL BE PROVIDED BY THE CONTRACTOR.
3. WATERING SHALL BE REQUIRED DURING THE GROWING SEASON, WHEN NATURAL RAINFALL IS BELOW ONE INCH PER WEEK.
4. WATER SHALL BE APPLIED IN SUFFICIENT QUANTITY TO THOROUGHLY SATURATE THE SOIL IN THE ROOT ZONE OF EACH PLANT.
5. CONTRACTOR SHALL REPLACE DEAD OR DYING PLANTS AT THE END OF THE ONE YEAR GUARANTEE PERIOD. CONTRACTOR SHALL TURN OVER MAINTENANCE TO THE FACILITY MAINTENANCE STAFF AT THAT TIME.

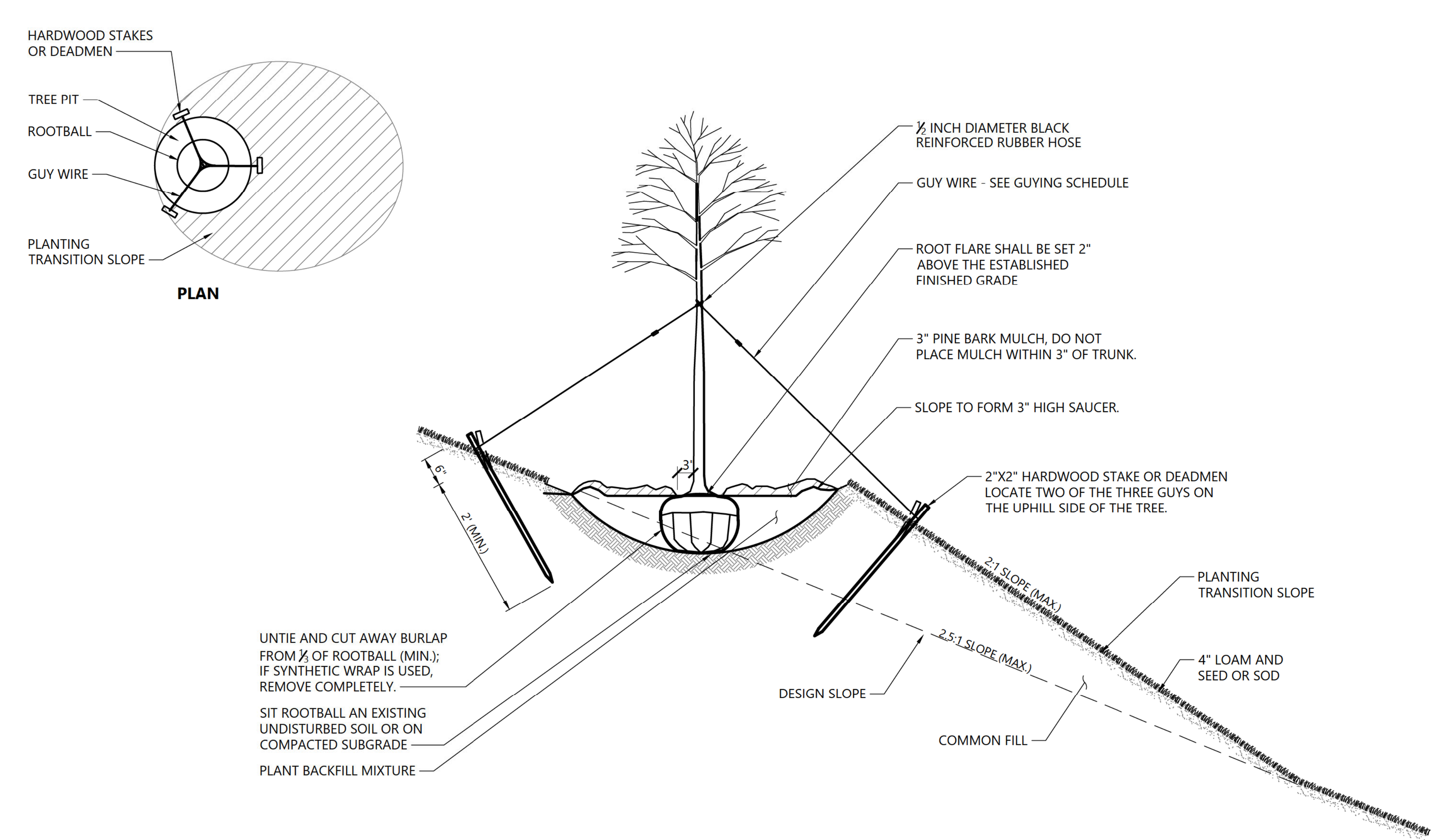


NOTES

1. LOOSEN ROOTS AT THE OUTER EDGE OF ROOTBALL OF CONTAINER GROWN SHRUBS.

Shrub Bed Planting 1/16

N.T.S. Source: VHB LD_601



Tree Planting on Slope 5/17

N.T.S. Source: VHB LD_605d

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Wetland Restoration Notes and Details

Drawing Number: W2.01

REGISTERED LANDSCAPE ARCHITECT — ERIK J BEDNAREK — 6/30/2021

Sheet 2 of 2

Project Number: 73032.01

General

1. CONTRACTOR SHALL NOTIFY "DIG-SAFE" (1-888-344-7233) AT LEAST 72 HOURS BEFORE EXCAVATING.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SECURITY AND JOB SAFETY. CONSTRUCTION ACTIVITIES SHALL BE IN ACCORDANCE WITH OSHA STANDARDS AND LOCAL REQUIREMENTS.
3. AREAS DISTURBED DURING CONSTRUCTION AND NOT RESTORED WITH IMPERVIOUS SURFACES (BUILDINGS, PAVEMENTS, WALKS, ETC.) SHALL RECEIVE 4 INCHES LOAM AND SEED.
4. UPON AWARD OF CONTRACT, CONTRACTOR SHALL MAKE NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN NECESSARY PERMITS, PAY FEES, AND POST BONDS ASSOCIATED WITH THE WORK INDICATED ON THE DRAWINGS, IN THE SPECIFICATIONS, AND IN THE CONTRACT DOCUMENTS. DO NOT CLOSE OR OBSTRUCT ROADWAYS, SIDEWALKS, AND FIRE HYDRANTS, WITHOUT APPROPRIATE PERMITS.
5. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
6. IN THE EVENT THAT SUSPECTED CONTAMINATED SOIL, GROUNDWATER, AND OTHER MEDIA ARE ENCOUNTERED DURING EXCAVATION AND CONSTRUCTION ACTIVITIES BASED ON VISUAL, OLFACTORY, OR OTHER EVIDENCE, THE CONTRACTOR SHALL STOP WORK IN THE VICINITY OF THE SUSPECT MATERIAL TO AVOID FURTHER SPREADING OF THE MATERIAL, AND SHALL NOTIFY THE OWNER IMMEDIATELY SO THAT THE APPROPRIATE TESTING AND SUBSEQUENT ACTION CAN BE TAKEN.
7. CONTRACTOR SHALL PREVENT DUST, SEDIMENT, AND DEBRIS FROM EXITING THE SITE AND SHALL BE RESPONSIBLE FOR CLEANUP, REPAIRS AND CORRECTIVE ACTION IF SUCH OCCURS.
8. CONTRACTOR SHALL CONTROL STORMWATER RUNOFF DURING CONSTRUCTION TO PREVENT ADVERSE IMPACTS TO OFF SITE AREAS, AND SHALL BE RESPONSIBLE TO REPAIR RESULTING DAMAGES, IF ANY, AT NO COST TO OWNER.
9. THIS PROJECT DISTURBS MORE THAN ONE ACRE OF LAND AND FALLS WITHIN THE RIPDES CONSTRUCTION GENERAL PERMIT (CGP) PROGRAM AND RIDEM JURISDICTION. PRIOR TO THE START OF CONSTRUCTION CONTRACTOR IS TO FILE A NOTICE OF INTENT WITH THE RIDEM AND PREPARE AND MAINTAIN A SOIL EROSION AND SEDIMENTATION PLAN IN ACCORDANCE WITH THE RIPDES REGULATIONS.
10. STAGING AND STOCKPILE AREAS SHALL NOT BE LOCATED WITHIN ANY WETLAND AND ABUTTING RESOURCE AREA AND SHALL BE LOCATED WITHIN THE LOD.
11. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND INSTALLING THE FOLLOWING ITEMS ON SITE AND REDLINING THE PLAN FOR RECORD KEEPING PURPOSES AS REQUIRED BY THE RIPDES PERMIT:
    a. BUILDING MATERIALS STAGING AREAS
    b. STOCKPILE AREAS. EROSION CONTROLS SHALL BE PLACED AT THE BASE OF ALL STOCKPILES
    c. DESIGNATED WASHOUT AND REFUELING AREAS.
    d. TEMPORARY SEDIMENT BASIN AREAS.
12. EXISTING SOIL HAS BEEN DOCUMENTED TO CONTAIN CONTAMINANTS IN CONCENTRATIONS THAT EXCEED RIDEM REGULATORY CRITERIA. THE CONTRACTOR SHALL BE AWARE OF THE SOIL MANAGEMENT PLAN (SMP) AND THE ENVIRONMENTAL LAND USE RESTRICTION (ELUR) FOR THE PROPERTY WHICH DEFINES SPECIFIC PROCEDURES TO BE FOLLOWED TO MINIMIZE THE POTENTIAL FOR EXPOSURE.

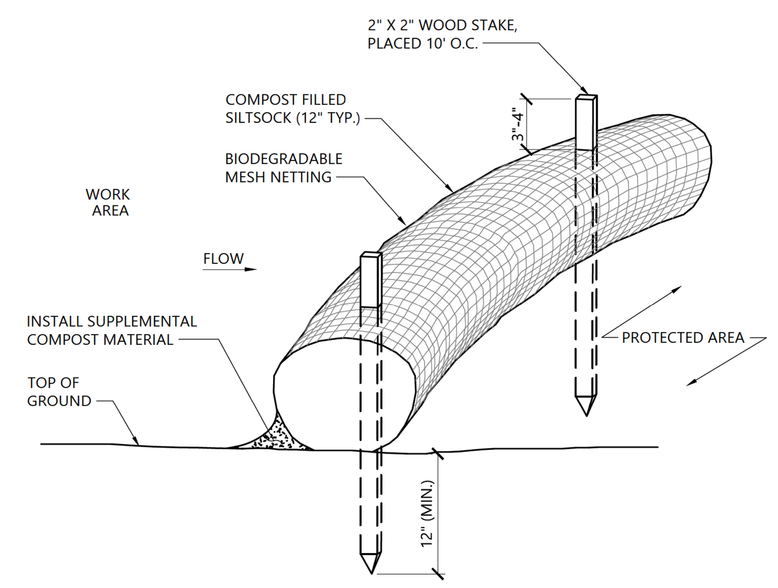
Erosion Control

1. PRIOR TO STARTING ANY OTHER WORK ON THE SITE, THE CONTRACTOR SHALL NOTIFY APPROPRIATE AGENCIES AND SHALL INSTALL EROSION CONTROL MEASURES AS SHOWN ON THE PLANS AND AS IDENTIFIED IN FEDERAL, STATE, AND LOCAL APPROVAL DOCUMENTS PERTAINING TO THIS PROJECT.
2. CONTRACTOR SHALL INSPECT AND MAINTAIN EROSION CONTROL MEASURES DAILY, AND REMOVE SEDIMENT THEREFROM ON A WEEKLY BASIS AND WITHIN TWELVE HOURS AFTER EACH STORM EVENT AND DISPOSE OF SEDIMENTS IN AN UPLAND AREA SUCH THAT THEY DO NOT ENCUMBER OTHER DRAINAGE STRUCTURES AND PROTECTED AREAS.
3. CONTRACTOR SHALL BE FULLY RESPONSIBLE TO CONTROL CONSTRUCTION SUCH THAT SEDIMENTATION SHALL NOT AFFECT REGULATORY PROTECTED AREAS, WHETHER SUCH SEDIMENTATION IS CAUSED BY WATER, WIND, OR DIRECT DEPOSIT.
4. CONTRACTOR SHALL PERFORM CONSTRUCTION SEQUENCING SUCH THAT EARTH MATERIALS ARE EXPOSED FOR A MINIMUM OF TIME BEFORE THEY ARE COVERED, SEEDED, OR OTHERWISE STABILIZED TO PREVENT EROSION.
5. UPON COMPLETION OF CONSTRUCTION AND ESTABLISHMENT OF PERMANENT GROUND COVER, CONTRACTOR SHALL REMOVE AND DISPOSE OF EROSION CONTROL MEASURES AND CLEAN SEDIMENT AND DEBRIS FROM ENTIRE DRAINAGE AND SEWER SYSTEMS.
6. A CROSS SLOPE SHALL BE PLACED ON THE STABILIZED CONSTRUCTION EXIT TO DIRECT RUNOFF TO AN ONSITE SETTLING AREA. IF DEEMED NECESSARY AFTER CONSTRUCTION BEGINS, A WASH PAD MAY BE INCLUDED TO WASH OFF VEHICLE WHEELS BEFORE LEAVING THE PROJECT SITE.
7. TEMPORARY SEDIMENT BASINS WILL BE DESIGNED EITHER AS EXCAVATIONS OR BERMED STORMWATER DETENTION STRUCTURES THAT WILL RETAIN RUNOFF FOR A SUFFICIENT PERIOD OF TIME TO ALLOW SUSPENDED SOIL PARTICLES TO SETTLE OUT PRIOR TO DISCHARGE. BASINS WILL BE LOCATED AS DETERMINED BY THE CONTRACTOR BASED ON CONSTRUCTION NEEDS. POINT OF DISCHARGE FROM SEDIMENT BASINS WILL BE STABILIZED TO MINIMIZE EROSION.
8. VEGETATIVE SLOPE STABILIZATION WILL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. VEGETATIVE SLOPE STABILIZATION WILL BE USED TO MINIMIZE EROSION ON SLOPES OF 3:1 OR STEEPER. ESTABLISHMENT OF TEMPORARY AND PERMANENT VEGETATIVE COVER MAY BE ESTABLISHED BY HYDRO-SEEDING OR SODDING. A SUITABLE TOPSOIL, GOOD SEEDBED PREPARATION, AND ADEQUATE LIME, FERTILIZER AND WATER WILL BE PROVIDED FOR EFFECTIVE ESTABLISHMENT OF THESE VEGETATIVE STABILIZATION METHODS. MULCH WILL ALSO BE USED AFTER PERMANENT SEEDING TO PROTECT SOIL FROM THE IMPACT OF FALLING RAIN AND TO INCREASE THE CAPACITY OF THE SOIL TO ABSORB WATER.
9. STABILIZATION OF DISTURBED AREAS MUST BE INITIATED IMMEDIATELY WHENEVER CLEARING, GRADING, EXCAVATION OR OTHER EARTH DISTURBANCE ACTIVITIES ARE PERMANENTLY CEASED ON ANY PORTION OF THE SITE, OR TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT BE RESUMED FOR A PERIOD EXCEEDING FOURTEEN (14) CALENDAR DAYS. STABILIZATION MUST BE COMPLETED USING VEGETATIVE STABILIZATION MEASURES WHERE POSSIBLE.
10. ALL DISTURBED SOILS EXPOSED PRIOR TO OCTOBER 15TH SHALL BE SEEDED BY THAT DATE. ANY SUCH AREAS WHICH DO NOT HAVE ADEQUATE VEGETATIVE STABILIZATION BY NOVEMBER 15TH MUST BE STABILIZED THROUGH THE USE OF NON-VEGETATIVE EROSION CONTROL MEASURES. IF WORK CONTINUES WITHIN ANY OF THESE AREAS DURING THE PERIOD FROM OCTOBER 15TH TO APRIL 15TH CARE MUST BE TAKEN TO ENSURE THAT ONLY THE AREA REQUIRED FOR THE DAY'S WORK IS EXPOSED, AND ALL ERODIBLE SOIL MUST BE STABILIZED WITHIN FIVE (5) WORKING DAYS.

Infiltration Basin Protection During Construction

FOR THE LONG-TERM FUNCTION OF THE INFILTRATION SYSTEM CARE MUST BE TAKEN IN THIS AREA DURING CONSTRUCTION. THE CONTRACTOR SHALL EMPLOY THE FOLLOWING MINIMUM BEST MANAGEMENT PRACTICES (BMPs):

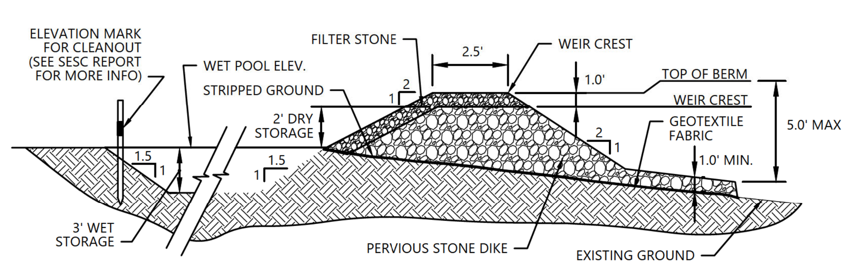
1. THESE AREAS SHALL NOT BE USED AS CONSTRUCTION SEDIMENTATION SYSTEMS.
2. INITIAL BASIN EXCAVATION SHOULD BE CARRIED TO WITHIN 1 FOOT OF THE FINAL ELEVATION OF THE BASIN FLOOR. FINAL EXCAVATION SHOULD BE DEFERRED UNTIL ALL DISTURBED AREAS CONTRIBUTING TO THE BASIN HAVE BEEN STABILIZED OR PROTECTED. PRIOR TO FINAL EXCAVATION, REMOVE ALL ACCUMULATED SEDIMENT.
3. CONSTRUCTION EQUIPMENT, VEHICULAR, AND STOCKPILING OF CONSTRUCTION AND EARTH MATERIALS SHALL BE OUTSIDE THE LIMITS OF THESE AREAS. THE SUBGRADE BENEATH SHALL NOT BE COMPACTED.
4. EXCAVATION FOR CONSTRUCTION OF THESE SYSTEMS SHALL BE PERFORMED MANUALLY OR BY LIGHT-TRACKED EQUIPMENT TO AVOID COMPACTION OF THE BASIN FLOOR.
5. THE CONTRACTOR SHALL INSTALL TEMPORARY CONSTRUCTION FENCING AROUND THE PERIMETER OF THE SYSTEMS TO PREVENT THE USE OF THESE AREAS FOR ALL ACTIVITIES THAT MIGHT DAMAGE THE INFILTRATION CAPABILITIES. THE FENCING MAY BE REMOVED FOR BACKFILLING AND FINAL CONSTRUCTION.

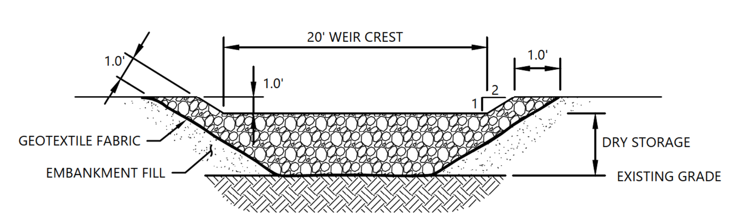


NOTES

1. SILTSOCK SHALL BE FILTREXX SILTSOXX, OR APPROVED EQUAL.
2. SILTSOCKS SHALL OVERLAP A MINIMUM OF 12 INCHES.
3. SILTSOCK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS, AND REPAIR OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.
4. COMPOST MATERIAL SHALL BE DISPERSED ON SITE, AS DETERMINED BY THE ENGINEER.
5. IF NON BIODEGRADABLE NETTING IS USED THE NETTING SHALL BE COLLECTED AND DISPOSED OF OFFSITE.

Siltsock - Erosion Control Barrier 1/16
N.T.S. Source: VHB LD_658





NOTES

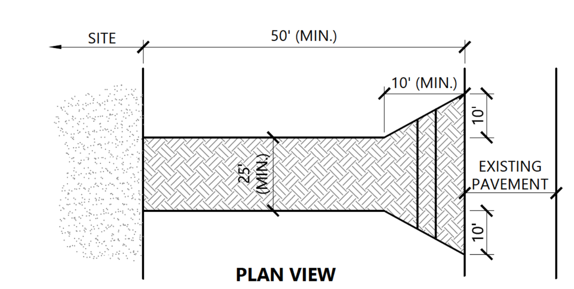
1. TEMPORARY SEDIMENT TRAP SHALL CONFORM TO THE REQUIREMENTS OF THE RHODE ISLAND SOIL EROSION AND SEDIMENT CONTROL HANDBOOK.
2. UNDER NO CIRCUMSTANCES SHALL THE GEOTEXTILE FABRIC OR ANY SEDIMENT DEPOSITED THEREON BE LEFT IN PLACE AFTER THE REMOVAL OF THE TEMPORARY SEDIMENT BASIN.

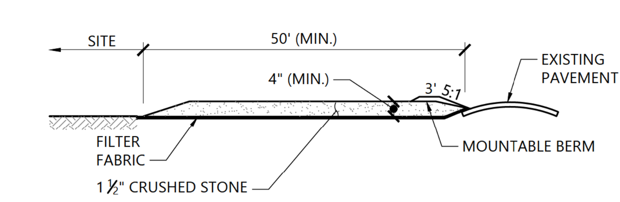
Temporary Sediment Trap
N.T.S.

Erosion Control Maintenance Requirements

SITE OWNERS AND OPERATORS MUST ENSURE THAT ALL EROSION, RUNOFF, SEDIMENT, AND POLLUTION PREVENTION CONTROLS REMAIN IN EFFECTIVE OPERATING CONDITION AND ARE PROTECTED FROM ACTIVITIES THAT WOULD REDUCE THEIR EFFECTIVENESS. SITE OWNERS AND OPERATORS MUST ALSO ENSURE THAT ALL EROSION, RUNOFF, SEDIMENT, AND POLLUTION PREVENTION CONTROLS ARE INSPECTED AT THE REQUIRED FREQUENCY REQUIREMENTS LISTED BELOW. IF THE DESIGNATED SITE INSPECTOR FINDS A PROBLEM (I.E. EROSION, RUNOFF, SEDIMENT OR POLLUTION PREVENTION CONTROLS REQUIRE REPLACEMENT, REPAIR, OR MAINTENANCE), THE OWNER AND OPERATOR MUST ENSURE THAT THE NECESSARY REPAIRS OR MODIFICATIONS ARE MADE IN ACCORDANCE WITH THE FOLLOWING:

1. INITIATE WORK TO FIX THE PROBLEM IMMEDIATELY AFTER DISCOVERING THE PROBLEM, AND COMPLETE SUCH WORK BY THE CLOSE OF THE NEXT WORK DAY, IF THE PROBLEM DOES NOT REQUIRE SIGNIFICANT REPAIR OR REPLACEMENT, OR IF THE PROBLEM CAN BE CORRECTED THROUGH ROUTINE MAINTENANCE.
2. WHEN INSTALLATION OF A NEW CONTROL OR A SIGNIFICANT REPAIR IS NEEDED, SITE OWNERS AND OPERATORS MUST ENSURE THAT THE NEW OR MODIFIED CONTROL PRACTICE IS INSTALLED AND MADE OPERATIONAL BY NO LATER THAN SEVEN (7) CALENDAR DAYS FROM THE TIME OF DISCOVERY WHERE FEASIBLE. IF IT IS INFEASIBLE TO COMPLETE THE INSTALLATION OR REPAIR WITHIN SEVEN (7) CALENDAR DAYS, THE REASONS WHY IT IS INFEASIBLE MUST BE DOCUMENTED IN THE SESC PLAN ALONG WITH THE SCHEDULE FOR INSTALLING THE STORMWATER CONTROL(S) AND MAKING IT OPERATIONAL AS SOON AS PRACTICABLE AFTER THE 7-DAY TIMEFRAME. WHERE THESE ACTIONS RESULT IN CHANGES TO ANY OF THE STORMWATER CONTROL MEASURES OUTLINED IN THE SESC PLAN, SITE OWNERS AND OPERATORS MUST MODIFY THE SESC PLAN ACCORDINGLY WITHIN SEVEN (7) CALENDAR DAYS OF COMPLETING THIS WORK IN ACCORDANCE WITH THE FOLLOWING:
    a. THE OWNER AND OPERATOR SHALL AMEND THE SESC PLAN WITHIN SEVEN (7) DAYS WHENEVER THERE IS A CHANGE IN DESIGN, CONSTRUCTION, OPERATION, MAINTENANCE OR OTHER PROCEDURE WHICH HAS A SIGNIFICANT EFFECT ON THE POTENTIAL FOR THE DISCHARGE OF POLLUTANTS, OR IF THE SESC PLAN PROVES TO BE INEFFECTIVE IN ACHIEVING ITS OBJECTIVES. IN ADDITION, THE SESC PLAN SHALL BE AMENDED TO IDENTIFY ANY NEW OPERATOR THAT WILL IMPLEMENT A COMPONENT OF THE SESC PLAN. THE AMENDED SESC PLAN MUST BE KEPT ON FILE AT THE CONSTRUCTION SITE AND ANY SESC PLAN MODIFICATIONS MUST BE DOCUMENTED. ANY AMENDMENTS TO CONTROL MEASURES WHICH INVOLVED THE PRACTICE OF ENGINEERING, MUST FIRST BE REVIEWED, SIGNED, AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF RHODE ISLAND.
3. IF CORRECTIVE ACTIONS ARE REQUIRED, THE SITE OWNER AND OPERATOR MUST ENSURE THAT ALL CORRECTIVE ACTIONS ARE DOCUMENTED ON THE INSPECTION REPORT IN WHICH THE PROBLEM WAS FIRST DISCOVERED. THESE CORRECTIVE ACTIONS MUST BE DOCUMENTED, SIGNED, AND DATED BY THE SITE OPERATOR ONCE ALL NECESSARY REPAIRS HAVE BEEN COMPLETED.
4. SOIL EROSION AND SEDIMENT CONTROL INSPECTION REQUIREMENTS
   MINIMUM FREQUENCY - EACH OF THE FOLLOWING AREAS MUST BE INSPECTED BY OR UNDER THE SUPERVISION OF THE OWNER AND OPERATOR AT LEAST ONCE EVERY SEVEN (7) CALENDAR DAYS AND WITHIN TWENTY FOUR (24) HOURS AFTER ANY STORM EVENT WHICH GENERATES AT LEAST 0.25 INCHES OF RAINFALL PER TWENTY-FOUR (24) HOUR PERIOD AND/OR AFTER A SIGNIFICANT AMOUNT OF RUNOFF:
    a. ALL AREAS THAT HAVE BEEN CLEARED, GRADED, OR EXCAVATED AND THAT HAVE NOT YET COMPLETED STABILIZATION;
    b. ALL STORMWATER EROSION, RUNOFF, AND SEDIMENT CONTROL MEASURES (INCLUDING POLLUTION PREVENTION PRACTICES) INSTALLED AT THE SITE TO COMPLY WITH THIS PERMIT;
    c. CONSTRUCTION MATERIAL, UNSTABILIZED SOIL STOCKPILES, WASTE, BORROW, OR EQUIPMENT STORAGE, AND MAINTENANCE AREAS THAT ARE COVERED BY THIS PERMIT AND ARE EXPOSED TO PRECIPITATION;
    d. ALL AREAS WHERE STORMWATER TYPICALLY FLOWS WITHIN THE SITE, INCLUDING TEMPORARY DRAINAGE WAYS DESIGNED TO DIVERT, CONVEY, AND/OR TREAT STORMWATER;
    e. ALL POINTS OF DISCHARGE FROM THE SITE;
    f. ALL LOCATIONS WHERE TEMPORARY OR PERMANENT SOIL STABILIZATION MEASURES HAVE BEEN IMPLEMENTED.
    g. ALL LOCATIONS WHERE VEHICLES ENTER OR EXIT THE SITE.

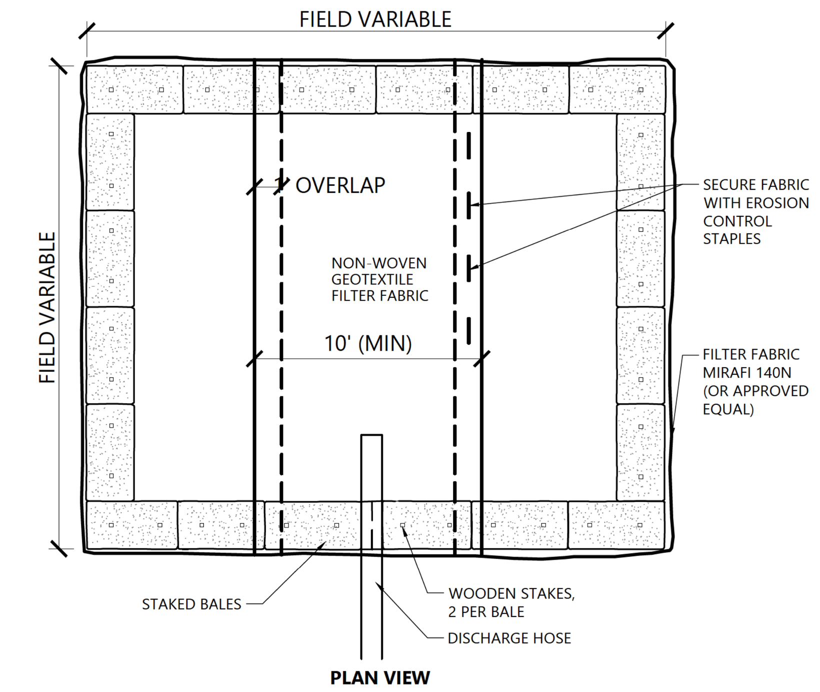


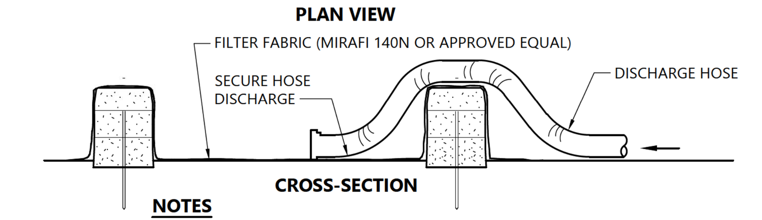


NOTES

1. EXIT WIDTH SHALL BE A TWENTY-FIVE (25) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
2. THE EXIT SHALL BE MAINTAINED IN A CONDITION WHICH SHALL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY. BERM SHALL BE PERMITTED. PERIODIC INSPECTION AND MAINTENANCE SHALL BE PROVIDED AS NEEDED.
3. STABILIZED CONSTRUCTION EXIT SHALL BE REMOVED PRIOR TO FINAL FINISH MATERIALS BEING INSTALLED.

Stabilized Construction Exit 1/16
N.T.S. Source: VHB LD_682

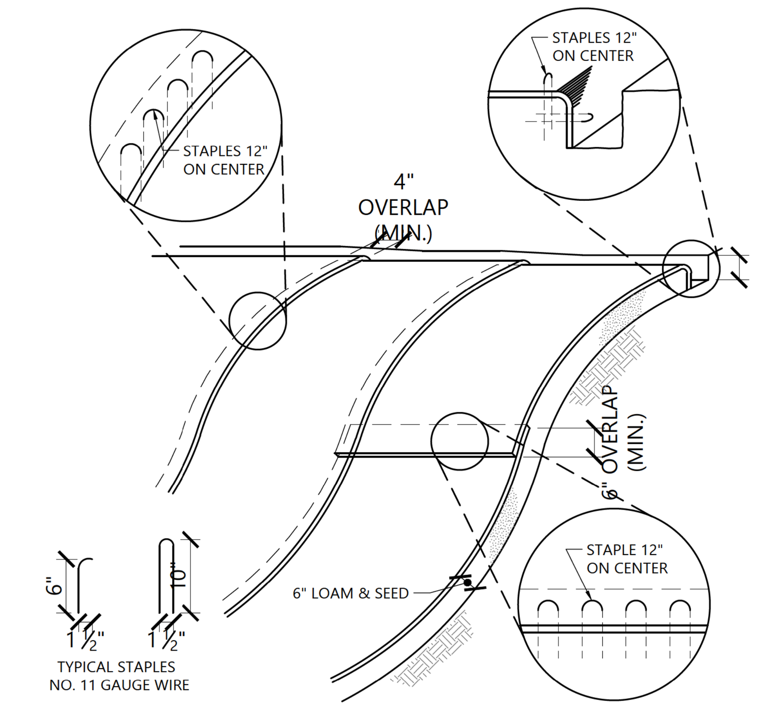




NOTES

1. NUMBER OF BALES MAY VARY DEPENDING ON SITE CONDITIONS.
2. THE BASIN TO BE SIZED TO PREVENT DISCHARGE WATER FROM OVERTOPPING BASIN.
3. CONTRACTOR SHALL LOCATE BASINS WITHIN THE LOW AT LOCATIONS NEEDED DURING CONSTRUCTION.

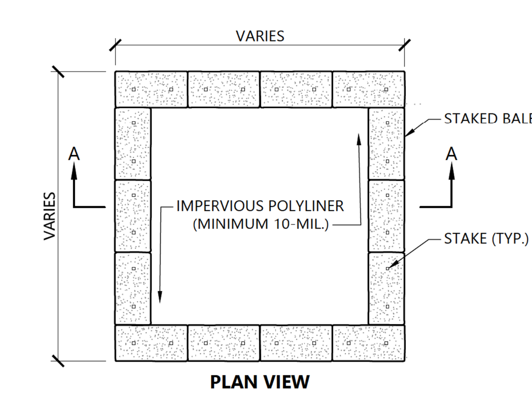
Dewatering Straw Bale Basin 1/16
N.T.S. Source: VHB REV LD_690

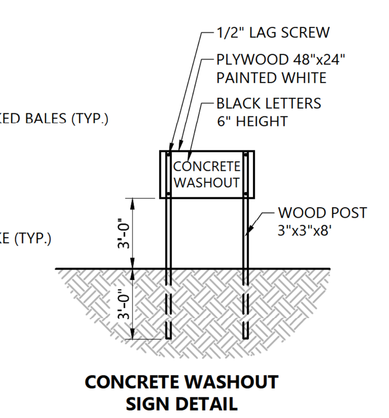


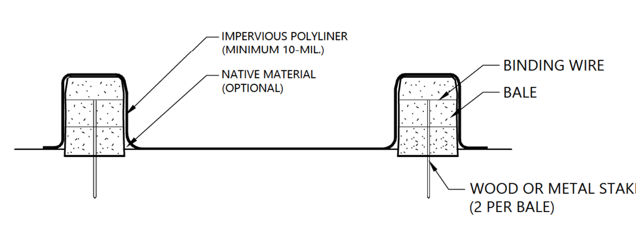
NOTES

1. BEGIN AT THE TOP OF BLANKET INSTALLATION AREA BY ANCHORING BLANKET IN A 6" DEEP TRENCH BACKFILL AND COMPACT TRENCH AFTER STAPLING.
2. ROLL THE BLANKET DOWN THE SWALE IN THE DIRECTION OF THE WATER FLOW.
3. THE EDGES OF BLANKETS MUST BE STAPLED WITH APPROX. 4 INCH OVERLAP WHERE 2 OR MORE STRIP WIDTHS ARE REQUIRED.
4. WHEN BLANKETS MUST BE SPLICED DOWN THE SWALE, PLACE UPPER BLANKET END OVER LOWER END WITH 6 INCH (MIN.) OVERLAP AND STAPLE BOTH TOGETHER.
5. METHOD OF INSTALLATION SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS.
6. EROSION CONTROL BLANKETS SHALL BE USED IN ALL AREAS WHERE SLOPES EQUAL OR EXCEED 3:1.

Erosion Control Blanket Slope Installation 1/16
N.T.S. Source: VHB REV LD_680







NOTES

1. FINAL LOCATION TO BE DETERMINED BY CONTRACTOR BASED ON SITE CONDITIONS.
2. KEEP AS FAR FROM DRAINAGE CHANNELS AND WETLAND AREAS AS PRACTICAL.
3. SUMPS TO BE CLEANED AND WASTE CONCRETE REMOVED AND PROPERLY DISPOSED OF UPON COMPLETION OF WORK.

Concrete Washout 12/17
N.T.S. Source: VHB

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1 Cedar Street
Suite 400
Providence, RI 02903
401.272.8100

Revolution Wind Proposed Onshore Substation

Camp Avenue
North Kingstown, Rhode Island

No.	Revision	Date	Appvd.
1	Per QDC Comments	June 11, 2021	KC
2	CRMC Submission	June 30, 2021	KC

Designed by AEC | Checked by RLC
Issued for **Permits** | Date **May 5, 2021**

Not Approved for Construction

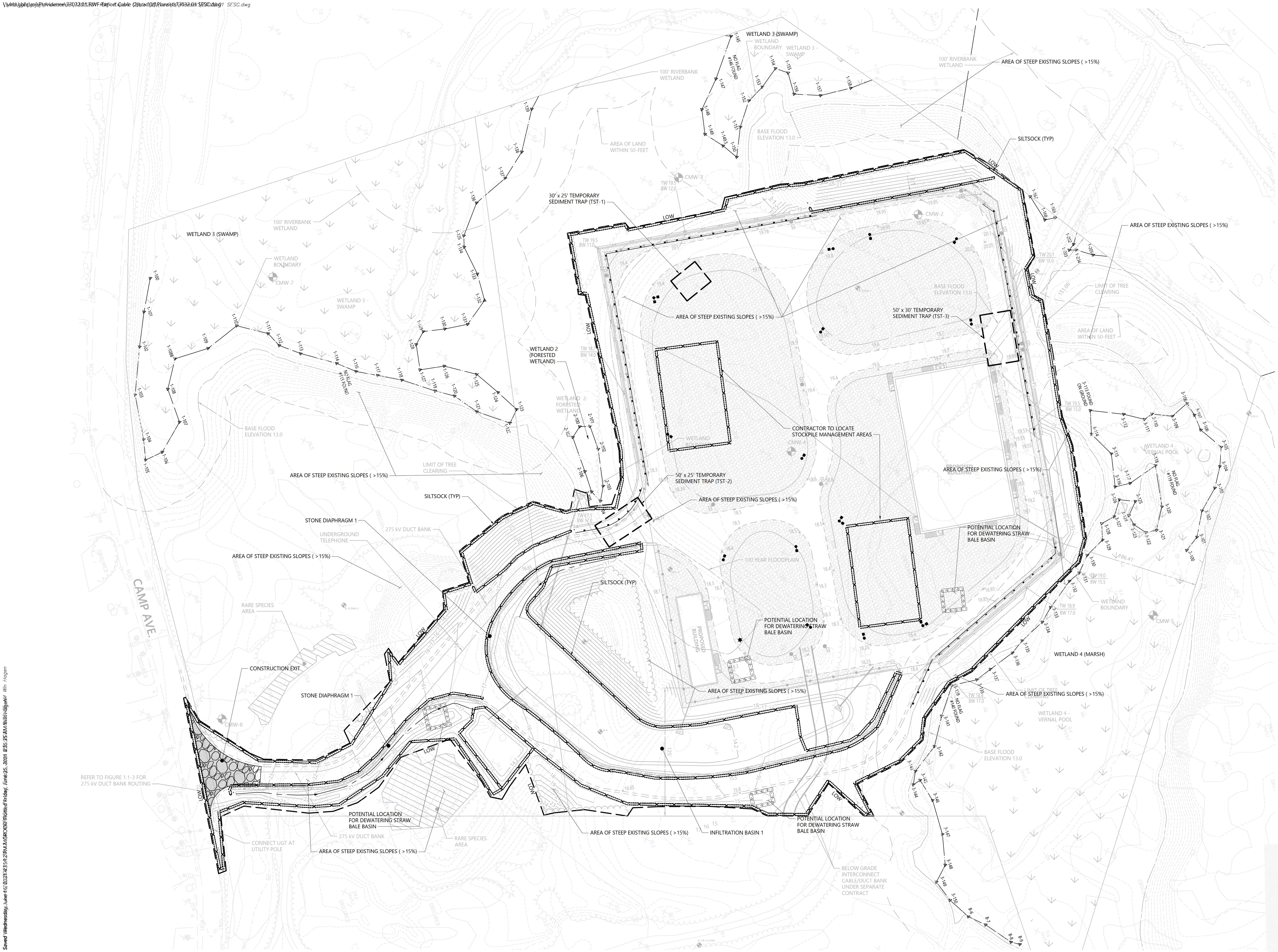
Soil Erosion and Sediment Control- General Notes & Details

Drawing Number **SESC-1**

Sheet 1 of 2

Project Number 73032.01

RENEE L. CODEGA No. 6517 REGISTERED PROFESSIONAL ENGINEER (CIVIL) 6/30/2021



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Notes:

1. REFER TO SOIL EROSION AND SEDIMENT CONTROL PLAN REPORT FOR ADDITIONAL INFORMATION AND GUIDELINES.
2. TOTAL SITE AREA = 15.7 ACRES. TOTAL SITE DISTURBANCE = 7.1 ACRES.
3. LOCATION OF RECEIVING WATERS: MILL CREEK TO WICKFORD HARBOR.
4. NO PORTION OF THE SITE FALLS WITHIN OR DIRECTLY DISCHARGES TO A NATURAL HERITAGE AREA (NHA), OR OTHERWISE IMPACTS THREATENED SPECIES OR HABITATS.
5. STOCKPILING MUST BE WITHIN PROJECT LIMIT OF WORK BUT OUTSIDE THE BMP AREAS SHOWN ON THE PLANS AND SUCH THAT CONSTRUCTION VEHICLES DO NOT DRIVE OVER THESE AREAS TO ACCESS THE STOCKPILES.
6. WASHOUT AND REFUELING AREAS MUST BE WITHIN PROJECT LIMITS BUT OUTSIDE THE BMP AREAS LISTED BELOW AND SHOWN ON THE PLANS.

Tree Clearing:

1. TREE CLEARING AREA IS DEFINED AS 30' OUTSIDE OF THE SUBSTATION YARD FENCE LINE. TREE CLEARING INCLUDES CUTTING OF TREES, NO STUMPING REQUIRED.

0 20 40 80 Feet

Revolution Wind Proposed Onshore Substation

Camp Avenue
North Kingstown, Rhode Island

No.	Revision	Date	Appvd.
1	Per QDC Comments	June 11, 2021	KC
2	CRMC Submission	June 30, 2021	KC

Designed by AEC | Checked by RLC

Issued for: Permits | Date: May 5, 2021

Not Approved for Construction

Soil Erosion and Sediment Control-Site Plan

Drawing Number: SESC-2

Sheet 2 of 2

Project Number 73032.01

RENEE L. CODEGA No. 6517 REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

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MATCH TO SHEET Sv-2

THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 9 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2015, AS FOLLOWS:

(A) TYPE OF BOUNDARY SURVEY: LIMITED CONTENT BOUNDARY SURVEY — MEASUREMENT SPECIFICATION: I

(B) OTHER TYPE OF SURVEY — DATA ACCUMULATION SURVEY: III — TOPOGRAPHIC SURVEY ACCURACY: T2/T3

(C) STATEMENT OF PURPOSE

THE PURPOSE FOR THE CONDUCT OF THE SURVEY AND FOR THE PREPARATION OF THE PLAN IS AS FOLLOWS: DESIGN OF ONSHORE SUBSTATION

BY 7/13/20

PATRICK W. McCOURT, P.L.S. #1964
VANASSE HANGEN BRUSTLIN, INC.
C.O.A. #A92

Saved Tuesday, March 23, 2021 3:46:26 PM PMCCOURT Plotted Wednesday, March 24, 2021 6:28:12 AM McCourt, Patrick

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1 Cedar Street
Suite 400
Providence, RI 02903
401.272.8100

Locus Map
(NOT TO SCALE)

N

RHODE ISLAND STATE PLANE
COORDINATE GRID NORTH

Revolution Wind Proposed Onshore Substation (ONSS)

Camp Avenue
North Kingstown, Rhode Island

No.	Revision	Date	Appvd.

Designed by | Checked by

Issued for: Permitting — Date: July 13, 2020

Drawing Title
Existing Conditions Plan of Land

Drawing Number
Sv-1

PATRICK W. McCOURT
No. 1964
PROFESSIONAL LAND SURVEYOR
7/13/20

Sheet 1 of 2

Project Number
73032.01

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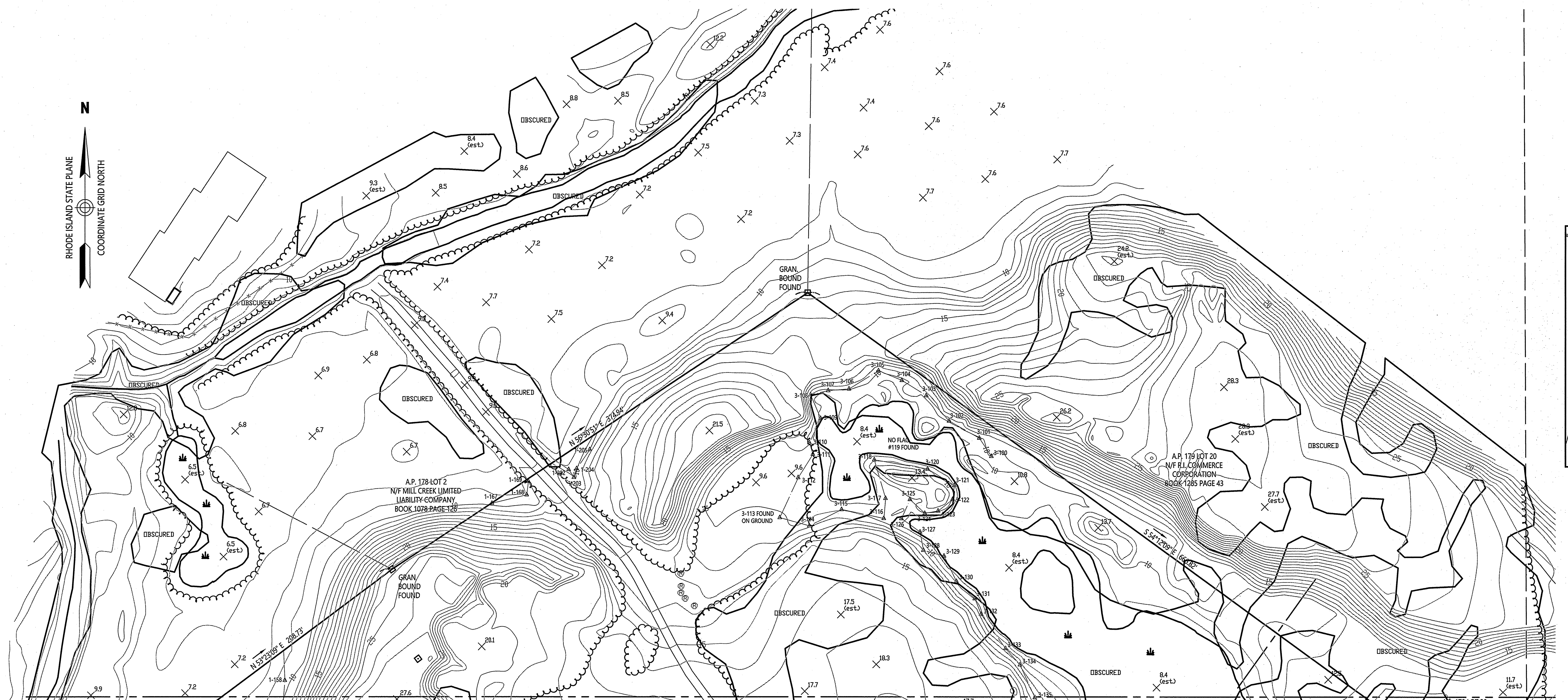


MATCH TO SHEET Sv-1

40 0 40 80
SCALE IN FEET

Legend

CATCH BASIN	CC CONCRETE CURB
CATCH BASIN	VGC VERTICAL GRANITE CURB
ROUND CATCH BASIN	BB BITUMINOUS BERM
FLARED END SECTION	BIT. BITUMINOUS PAVEMENT
DRAIN MANHOLE	CONC. CONCRETE
SEWER MANHOLE	UP UTILITY POLE
ELECTRIC MANHOLE	RCP REINFORCED CONCRETE PIPE
TELEPHONE MANHOLE	PVC POLYVINYLCHLORIDE PIPE
MANHOLE	CMP CORRUGATED METAL PIPE
SIGNAL MANHOLE	CPP CORRUGATED PLASTIC PIPE
WATER MANHOLE	VC VITRIFIED CLAY PIPE
WATER GATE	BWL BROKEN WHITE LINE
FIRE HYDRANT	BYL BROKEN YELLOW LINE
GAS GATE	DYL DOUBLE YELLOW LINE
STREET SIGN	SWL SINGLE WHITE LINE
LIGHT POLE	SYL SINGLE YELLOW LINE
UTILITY POLE	PIV POST INDICATOR VALVE
UTILITY POLE W/LIGHT	CLF CHAIN LINK FENCE
GUY WIRE	FES FLARED END SECTION
BOLLARD/POST	D DRAIN LINE
BORING	E ELECTRIC LINE
MW MONITORING WELL	FA FIRE ALARM
1–100 WETLAND FLAG	G GAS LINE
100.0 × SPOT ELEVATION	S SEWER LINE
ELECTRIC BOX	T TELEPHONE LINE
ELECTRIC METER	W WATER LINE
GAS METER	OHW OVERHEAD LINE
HAND HOLE	MW MONITORING WELL
WATER METER	TP TESTPIT
EDGE OF PAVEMENT	R= RIM ELEVATION
EDGE OF GRAVEL	I= INVERT ELEVATION
CURB	CL= CENTERLINE
STEEL GUARD RAIL	ELEV. ELEVATION
CHAIN LINK FENCE	F.F.E. FINISH FLOOR ELEVATION
D UNDERGROUND DRAINAGE LINE	TYP. TYPICAL
S UNDERGROUND SEWER LINE	ℙ PROPERTY LINE
OHW OVERHEAD WIRE	
E UNDERGROUND ELECTRIC LINE	CONCRETE PAD
G UNDERGROUND GAS LINE	
W UNDERGROUND WATER LINE	PARKING STRIPE
T UNDERGROUND TELEPHONE LINE	
FO UNDERGROUND FIBER OPTIC LINE	
STONE WALL	
TREE LINE	
WETLAND EDGE	
PROPERTY LINE	
EASEMENT LINE	
STATE HIGHWAY LINE	
CITY/TOWN LAYOUT LINE	
ZONING BOUNDARY LINE	
SHRUBS	
DECIDUOUS TREE	
EVERGREEN TREE	
MARSH AREA	

General Notes

1. ALL ELEVATIONS ARE BASED ON N.A.V.D. 1988.

2. THE EXISTING CONDITIONS SHOWN ON THIS PLAN ARE FROM AERIAL MAPPING COMPILED BY WSP FROM IMAGERY ACQUIRED IN 2010 AND SUPPLEMENTED BY A FIELD SURVEY, CONDUCTED BY VANASSE HANGEN BRUSTLIN, INC. BETWEEN OCTOBER, 2019 AND MAY 2020.

3. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT AND MAY BE SUBJECT TO INFORMATION DISCLOSED IN SUCH.

4. THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION EXISTING DRAWINGS AND SUBSURFACE UTILITY ENGINEERING MARKOUT BY KCI, INC.. THE SURVEYOR MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN-SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

5. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR IT'S REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 9 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2015, AS FOLLOWS:

(A) TYPE OF BOUNDARY SURVEY: MEASUREMENT SPECIFICATION:
LIMITED CONTENT BOUNDARY SURVEY I

(B) OTHER TYPE OF SURVEY
DATA ACCUMULATION SURVEY III
TOPOGRAPHIC SURVEY ACCURACY T2/T3

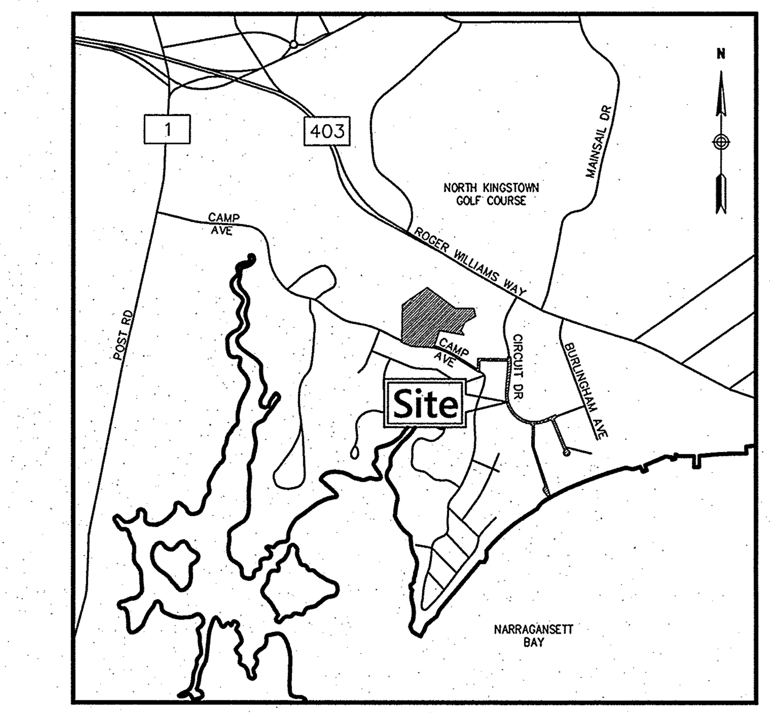
(C) STATEMENT OF PURPOSE

THE PURPOSE FOR THE CONDUCT OF THE SURVEY AND FOR THE PREPARATION OF THE PLAN IS AS FOLLOWS: DESIGN OF ONSHORE SUBSTATION

BY 7/13/20

PATRICK W. McCOURT, P.L.S. #1964
VANASSE HANGEN BRUSTLIN, INC.
C.O.A. #A92

vhb.com
vhb
1 Cedar Street
Suite 400
Providence, RI 02903
401.272.8100



Locus Map
(NOT TO SCALE)

Revolution Wind Proposed Onshore Substation (ONSS)

Camp Avenue
North Kingstown, Rhode Island

No.	Revision	Date	Appvd.

Designed by Checked by

Issued for: Permitting
Date: July 13, 2020

Drawing Title
Existing Conditions Plan of Land

Drawing Number
Sv-2

PATRICK W. McCOURT
No. 1964
PROFESSIONAL LAND SURVEYOR

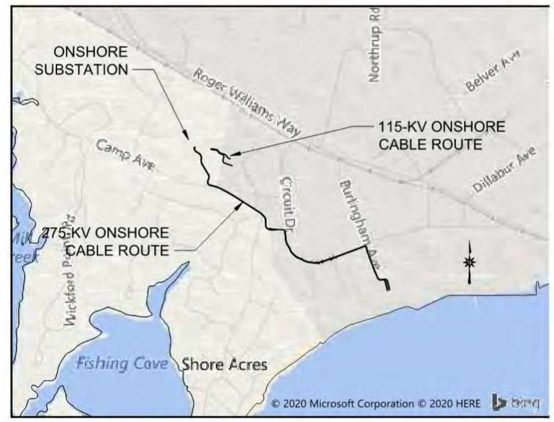
Sheet 2 of 2

Project Number
73032.01

Saved Tuesday, March 23, 2021 3:46:26 PM PMCCOURT Plotted Wednesday, March 24, 2021 6:28:49 AM McCourt, Patrick

Revolution Wind | Powered by Ørsted & Eversource

275-KV AND 115-KV TRANSMISSION LINE ONSHORE CABLE ROUTE



VICINITY MAP
N.T.S.

Underground Transmission Line Construction Contract Drawings

JUNE 21, 2021

126851

ROBBYN LYNN REED
No. 11127
REGISTERED PROFESSIONAL ENGINEER CIVIL

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NO.	DATE	BY	CKD	APP	DESCRIPTION
A	12/02/20	JCB	MD	NS	ISSUED FOR REVIEW-70%
B	06/21/21	JCB	MD	NS	ISSUED FOR PERMIT
C	06/30/21	JCB	MD	NS	ISSUED FOR PERMIT

BURNS & McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
LICENSEE NO. 000165

PRELIMINARY - NOT FOR CONSTRUCTION

ISSUED FOR PERMIT

DRAWING LIST TABLE	
DRAWING NUMBER	DRAWING TITLE
PG-01	COVER SHEET
PG-02	GENERAL NOTES
PG-03	KEY MAP
PG-04	275-kV ONSHORE CABLE DOUBLE CIRCUIT PLAN AND PROFILE
PG-05	275-kV ONSHORE CABLE DOUBLE CIRCUIT PLAN AND PROFILE
PG-06	275-kV ONSHORE CABLE DOUBLE CIRCUIT PLAN AND PROFILE
PG-07	275-kV ONSHORE CABLE DOUBLE CIRCUIT PLAN AND PROFILE
PG-08	275-kV ONSHORE CABLE DOUBLE CIRCUIT PLAN AND PROFILE
PG-09	275-kV ONSHORE CABLE DOUBLE CIRCUIT PLAN AND PROFILE
PG-10	275-kV ONSHORE CABLE DOUBLE CIRCUIT PLAN AND PROFILE
PG-11	275-kV ONSHORE CABLE DOUBLE CIRCUIT PLAN AND PROFILE
PG-12	275-kV ONSHORE CABLE DOUBLE CIRCUIT PLAN AND PROFILE
PG-13	275-kV ONSHORE CABLE DOUBLE CIRCUIT PLAN AND PROFILE
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PG-17	ONSHORE CABLE DUCT BANK CROSS SECTION DETAILS
PG-18	INTERCONNECT DUCT BANK CROSS SECTION DETAILS
PG-19	DUCT BANK SECTIONS
PG-20	SPLICE VAULT DETAILS
PG-21	SPLICE VAULT DETAILS
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CURVE TABLE

CURVE NO.	RADIUS	CURVE LENGTH	TANGENT LENGTH	DEFLECTION ANGLE	POINT OF INTERSECTION	POINT OF CURVATURE	POINT OF TANGENCY
C1	50'	47.12'	25.48'	S34° 09' 03.39"E	N 185,526.47, E 344,924.49	N 185,551.75, E 344,921.32	N 185,514.18, E 344,946.81
C2	100'	120.85'	69.04'	S26° 31' 47.92"E	N 185,459.80, E 345,045.52	N 185,493.11, E 344,985.05	N 185,391.45, E 345,035.81
C3	100'	68.50'	35.65'	S11° 31' 58.44"E	N 185,336.70, E 345,028.03	N 185,372.00, E 345,033.04	N 185,306.19, E 345,046.47
C4	75'	64.92'	34.65'	S06° 21' 34.04"E	N 185,093.88, E 345,174.83	N 185,123.53, E 345,156.90	N 185,061.01, E 345,163.87
C5	50'	86.00'	58.07'	S30° 50' 03.02"E	N 184,951.91, E 345,127.50	N 185,007.01, E 345,145.87	N 184,941.94, E 345,184.71
C6	600'	190.23'	95.92'	S71° 01' 23.28"E	N 184,922.95, E 345,293.57	N 184,939.43, E 345,199.08	N 184,877.83, E 345,378.21
C7	200'	7.81'	3.91'	S60° 49' 16.75"E	N 184,819.16, E 345,488.27	N 184,821.00, E 345,484.82	N 184,817.19, E 345,491.64
C8	200'	7.92'	3.96'	S58° 34' 01.95"E	N 184,770.26, E 345,571.96	N 184,772.26, E 345,568.54	N 184,768.13, E 345,575.30
C9	100'	43.30'	21.99'	S45° 01' 42.99"E	N 184,455.32, E 346,065.04	N 184,467.16, E 346,046.50	N 184,436.80, E 346,076.89
C10	50'	13.68'	6.88'	S40° 27' 44.57"E	N 184,427.92, E 346,082.57	N 184,433.72, E 346,078.86	N 184,423.34, E 346,087.71
C11	100'	80.62'	42.65'	S25° 12' 13.90"E	N 184,386.90, E 346,128.62	N 184,415.26, E 346,096.78	N 184,344.28, E 346,130.19
C12	50'	73.53'	45.23'	S44° 14' 21.26"E	N 184,199.39, E 346,135.52	N 184,244.59, E 346,133.86	N 184,196.53, E 346,180.66
C13	25'	37.69'	23.46'	S43° 11' 06.99"E	N 184,178.47, E 346,465.38	N 184,179.95, E 346,441.96	N 184,155.00, E 346,465.38
C14	100'	30.90'	15.57'	S08° 51' 03.12"E	N 184,123.62, E 346,465.38	N 184,139.19, E 346,465.38	N 184,108.79, E 346,470.11
C15	100'	39.33'	19.92'	S06° 26' 01.94"E	N 184,075.18, E 346,480.84	N 184,094.16, E 346,474.78	N 184,055.33, E 346,479.16
C16	50'	20.07'	10.17'	S06° 39' 57.05"E	N 184,016.37, E 346,475.86	N 184,026.50, E 346,476.72	N 184,006.70, E 346,479.03
C17	100'	36.32'	18.36'	S28° 34' 18.62"E	N 183,921.92, E 346,506.85	N 183,939.37, E 346,501.13	N 183,907.64, E 346,518.40
C18	200'	64.67'	32.62'	S29° 42' 50.50"E	N 183,879.62, E 346,541.08	N 183,904.98, E 346,520.56	N 183,849.05, E 346,552.48
C19	100'	45.54'	23.17'	S33° 29' 46.07"E	N 183,804.09, E 346,569.24	N 183,825.80, E 346,561.15	N 183,788.15, E 346,586.06
C20	100'	11.54'	5.78'	S43° 14' 09.93"E	N 183,753.12, E 346,623.03	N 183,757.09, E 346,618.84	N 183,748.69, E 346,626.74
C21	100'	33.15'	16.73'	S49° 25' 40.48"E	N 183,735.35, E 346,637.91	N 183,748.18, E 346,627.17	N 183,726.71, E 346,652.24
C22	100'	21.06'	10.57'	S64° 57' 31.76"E	N 183,704.33, E 346,689.38	N 183,709.79, E 346,680.33	N 183,700.89, E 346,699.37
C23	100'	14.68'	7.35'	S66° 47' 07.31"E	N 183,692.87, E 346,722.64	N 183,695.27, E 346,715.68	N 183,689.49, E 346,729.17
C24	100'	22.18'	11.14'	S68° 56' 01.55"E	N 183,642.14, E 346,820.42	N 183,647.27, E 346,810.54	N 183,639.31, E 346,831.19
C25	200'	30.02'	15.04'	S79° 35' 16.83"E	N 183,629.64, E 346,868.03	N 183,633.46, E 346,853.49	N 183,628.04, E 346,882.98
C26	100'	29.43'	14.82'	N87° 40' 51.57"E	N 183,617.48, E 346,981.54	N 183,619.06, E 346,966.80	N 183,620.25, E 346,996.11
C27	200'	32.42'	16.25'	N74° 36' 20.60"E	N 183,642.12, E 347,111.29	N 183,639.09, E 347,095.33	N 183,647.69, E 347,126.55
C28	200'	9.87'	4.94'	N71° 22' 32.72"E	N 183,670.02, E 347,187.78	N 183,668.33, E 347,183.15	N 183,671.48, E 347,192.50
C29	200'	11.97'	5.99'	N71° 04' 28.35"E	N 183,696.45, E 347,273.11	N 183,694.68, E 347,267.39	N 183,698.56, E 347,278.72

CURVE TABLE

CURVE NO.	RADIUS	CURVE LENGTH	TANGENT LENGTH	DEFLECTION ANGLE	POINT OF INTERSECTION	POINT OF CURVATURE	POINT OF TANGENCY
C30	25'	45.64'	32.34'	S58° 20' 46.48"E	N 183,913.70, E 347,849.88	N 183,902.30, E 347,819.61	N 183,881.55, E 347,853.29
C31	200'	50.41'	25.34'	S13° 16' 21.11"E	N 183,840.05, E 347,857.69	N 183,865.25, E 347,855.01	N 183,816.32, E 347,866.56
C32	200'	13.23'	6.62'	S22° 23' 14.47"E	N 183,477.52, E 347,993.18	N 183,483.71, E 347,990.87	N 183,471.49, E 347,995.90
C33	50'	64.51'	37.62'	S61° 14' 34.98"E	N 183,323.49, E 348,062.67	N 183,357.79, E 348,047.20	N 183,328.86, E 348,099.91
C34	50'	73.35'	45.07'	S56° 10' 32.16"E	N 183,343.35, E 348,200.42	N 183,336.92, E 348,155.82	N 183,299.65, E 348,211.44
C50	50'	39.95'	21.11'	S59° 00' 52.40"E	N 185,548.36, E 345,309.97	N 185,551.34, E 345,289.06	N 185,531.31, E 345,322.41
C51	50'	30.86'	15.94'	S53° 48' 14.90"E	N 185,495.58, E 345,348.49	N 185,508.46, E 345,339.09	N 185,490.52, E 345,363.60
C52	50'	30.19'	15.57'	S54° 11' 10.07"E	N 185,461.76, E 345,449.49	N 185,466.70, E 345,434.73	N 185,449.30, E 345,458.84
C53	50'	30.22'	15.59'	S54° 12' 02.82"E	N 185,402.85, E 345,493.70	N 185,415.31, E 345,484.35	N 185,397.91, E 345,508.48
C54	50'	39.88'	21.07'	S58° 58' 23.84"E	N 185,537.55, E 345,305.48	N 185,540.54, E 345,284.63	N 185,520.53, E 345,317.90
C55	50'	30.86'	15.94'	S53° 48' 14.90"E	N 185,487.11, E 345,342.29	N 185,499.99, E 345,332.89	N 185,482.05, E 345,357.40
C56	50'	79.01'	50.47'	S26° 12' 59.22"E	N 185,456.64, E 345,433.28	N 185,472.67, E 345,385.42	N 185,408.94, E 345,416.80
C57	50'	79.03'	50.50'	S26° 13' 51.98"E	N 185,332.47, E 345,390.40	N 185,380.20, E 345,406.88	N 185,316.46, E 345,438.29
C58	50'	73.62'	45.30'	S56° 01' 33.01"E	N 183,338.26, E 348,165.09	N 183,331.79, E 348,120.25	N 183,294.27, E 348,175.93

GENERAL NOTES:

1. ALL DUCT BANK VERTICAL RADII SHALL BE 200' UNLESS OTHERWISE NOTED. CONTRACTOR SHALL NOT DEVIATE FROM STATED HORIZONTAL OR VERTICAL RADII WITHOUT OWNER APPROVAL
2. DUCT BANK SHALL MAINTAIN A TYPICAL COVER DEPTH OF 3'-0" UNLESS OTHERWISE SHOWN ON DRAWINGS. MAINTAIN 2'-0" TYPICAL VERTICAL CLEARANCE OVER OR UNDER EXISTING UTILITIES AND MAINTAIN 2'-0" TYPICAL HORIZONTAL CLEARANCE FOR ADJACENT EXISTING UTILITIES SHOWN ON DRAWINGS UNLESS OTHERWISE NOTED.
3. STATIONING INDICATED IS AT CENTERLINE OF DUCT BANK SECTIONS.
4. CONTRACTOR SHALL PLUG CONDUIT SYSTEM WHEN WORK IS CEASED IN ACCORDANCE WITH SPECIFICATIONS.
5. CONTRACTOR SHALL PERFORM ALL RESTORATION WORK AS REQUIRED IN ACCORDANCE WITH SPECIFICATIONS.
6. ANY DEVIATIONS FROM THE PROPOSED DUCT BANK ALIGNMENT AS SHOWN ON THE DRAWINGS SHALL REQUIRE APPROVAL FROM ENGINEER.
7. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND CONSTRUCTION DRAWINGS. ALL WORK SHALL BE DONE IN ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND REQUIREMENTS.
8. THE UTILITIES AND NATURAL FEATURES SHOWN HEREON ARE BASED ON FIELD SURVEYS AND RECORD DOCUMENTS. OTHER FACILITIES MAY EXIST NOT DISCOVERED THROUGH THE RECORD CHECK. SUBCONTRACTOR SHALL VERIFY THE EXACT LOCATION, BOTH HORIZONTAL AND VERTICAL, OF ALL UTILITIES THROUGH THE APPROPRIATE UTILITY COMPANIES. CALL BEFORE YOU DIG.
9. SPLICE VAULT MINIMUM DEPTH OF COVER, AS MEASURED AT ANY POINT OF BURIED SPLICE VAULTS, SHALL BE 3'-0" UNLESS OTHERWISE SHOWN ON DRAWINGS.
10. VAULT LOCATIONS ARE SUBJECT TO ADJUSTMENT DUE TO UNFORESEEN CONDITIONS, AND WILL REQUIRE APPROVAL FROM ENGINEER.
11. NORTHING AND EASTING DESIGNATIONS FOR SPLICE VAULT LOCATIONS ARE REFERENCED TO OUTSIDE CORNERS OF SPLICE VAULT.
12. NORTHING AND EASTING DESIGNATIONS FOR HANDHOLE LOCATIONS ARE REFERENCED TO CENTER OF HANDHOLE.
13. ASSUMED DEPTH OF GRAVITY FACILITIES WHERE INVERT INFORMATION WAS NOT AVAILABLE IS 3'-6".
14. ASSUMED DEPTH OF NON-GRAVITY UTILITIES ARE:
    WATER: 4'-6"
    GAS: 3'-0"
    ELECTRIC: 3'-0"
    TELECOMMUNICATIONS: 3'-0"

811 Know what's below. Call before you dig.

Legend

- DRAIN MANHOLE
- CATCH BASIN
- SEWER MANHOLE
- ELECTRIC MANHOLE
- TELEPHONE MANHOLE
- MANHOLE
- HH HAND HOLE
- WATER GATE
- FIRE HYDRANT
- GAS GATE
- BOLLARD w/LIGHT
- STREET SIGN
- LIGHT POLE
- UTILITY POLE
- GUY POLE
- GUY WIRE
- MONITORING WELL
- FLOOD LIGHT
- WELL
- MARSH
- F.F.E.=45.27' FINISHED FLOOR ELEVATION
- CNO COULD NOT OPEN
- NPV NO PIPES VISIBLE
- DYL DOUBLE YELLOW LINE
- DWL DASHED WHITE LINE
- SYL SINGLE YELLOW LINE
- LSA LANDSCAPED AREA
- EOP EDGE OF PAVEMENT
- CC CONCRETE CURB
- VGC VERTICAL GRANITE CURB
- SGE SLOPED GRANITE EDGE
- BB BITUMINOUS BERM
- BC BITUMINOUS CURB
- GUARD RAIL
- CHAIN LINK FENCE
- DRAINAGE LINE
- SEWER LINE
- OHW OVERHEAD WIRE
- E UNDERGROUND ELECTRIC
- T TELEPHONE LINE
- G GAS LINE
- W WATER LINE
- STONE WALL
- TREE LINE

SURVEY NOTES:

1. THE EXISTING CONDITIONS DEPICTED ON THESE DRAWINGS ARE BASED UPON AN ACTUAL ON-THE-GROUND INSTRUMENT SURVEY PERFORMED BY VHB DURING 2019 AND 2020.
2. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES DEPICTED ON THESE DRAWINGS ARE BASED ON FIELD OBSERVATIONS AND INFORMATION OF RECORD. THEY ARE NOT WARRANTED TO BE EXACTLY LOCATED NOR IS IT WARRANTED THAT ALL UNDERGROUND UTILITIES OR OTHER STRUCTURES ARE DEPICTED ON THESE DRAWINGS.
3. THE HORIZONTAL AND VERTICAL VALUES DEPICTED ON THESE DRAWINGS ARE BASED ON NAD83 CONNECTICUT STATE PLANE ZONE AND NAVD 1988 DATUMS AND WERE DETERMINED USING RTN GPS SURVEY METHODS.

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ROBBYN LYNN REED
No. 11127
REGISTERED PROFESSIONAL ENGINEER CIVIL

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REVISIONS DURING CONSTRUCTION

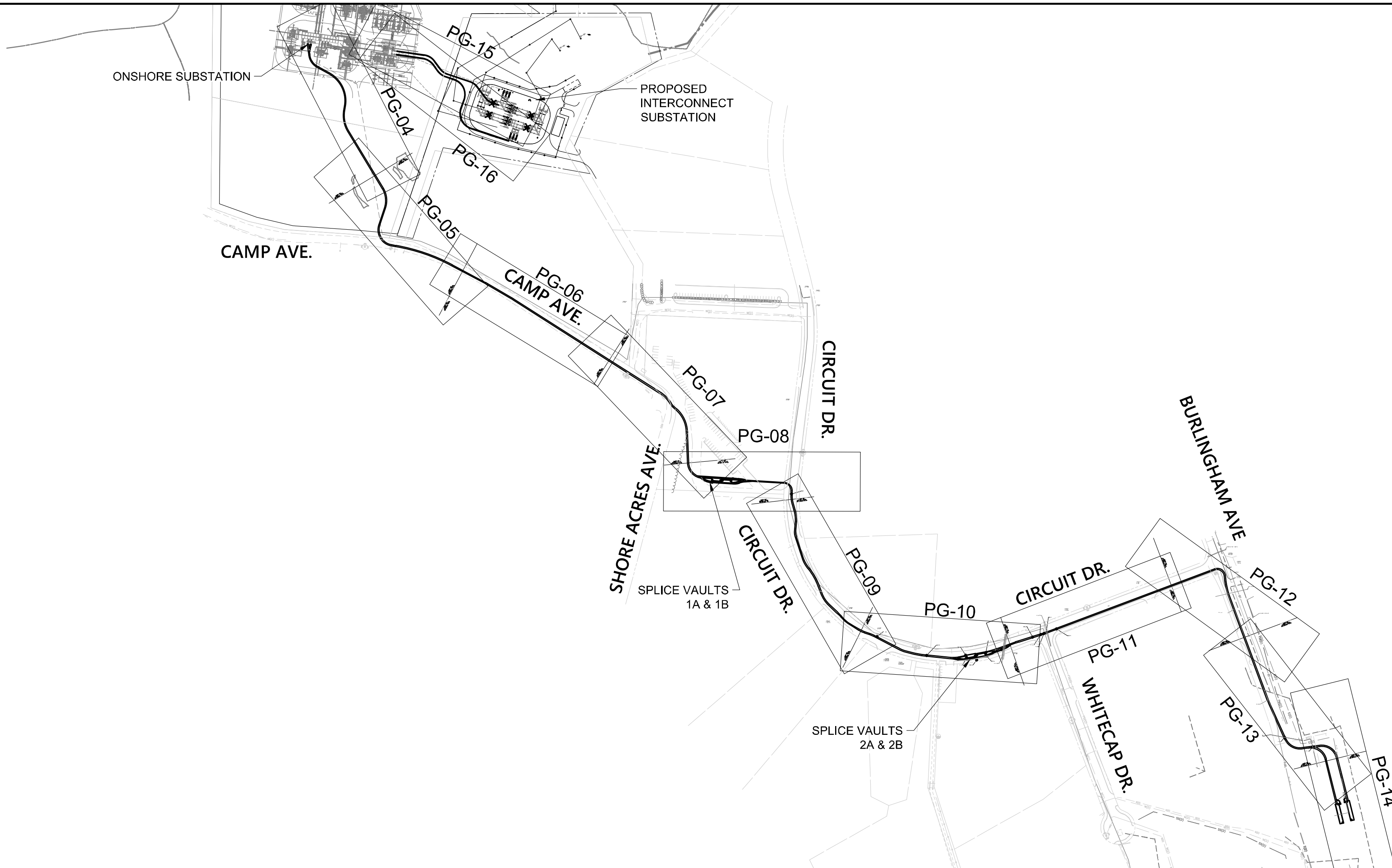
NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

Revolution Wind | Powered by Ørsted & Eversource

TITLE REVOLUTION WIND

GENERAL NOTES
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD	CHKD M. DAGENAIS–BMcD	APP N. SCOTT–BMcD	APP
DATE 09/30/20	DATE 09/30/20	DATE 09/30/20	DATE
H-SCALE N.T.S. / V-SCALE N.T.S.	SIZE ARCH D / V.S.	FIELD BOOK & PAGES / R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. PG-02	



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No. 11127
REGISTERED PROFESSIONAL ENGINEER CIVIL

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Jun 29 2021

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PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 150' 300'
SCALE IN FEET

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

Revolution Wind | Powered by Ørsted & Eversource

TITLE
REVOLUTION WIND
ONSHORE CABLE ROUTE KEY MAP
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD	CHKD M. DAGENAIS–BMcD	APP N. SCOTT–BMcD	APP
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20	DATE
H–SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V–SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. PG-03	

\\BMCD\DFS\CLIENTS\TND\NUSC\126851_REVWINDENG\DESIGN\UNDERGROUND\CADD\WORKING\03 KEY MAP.DWG 6/29/2021 9:51 AM JBARRINGER

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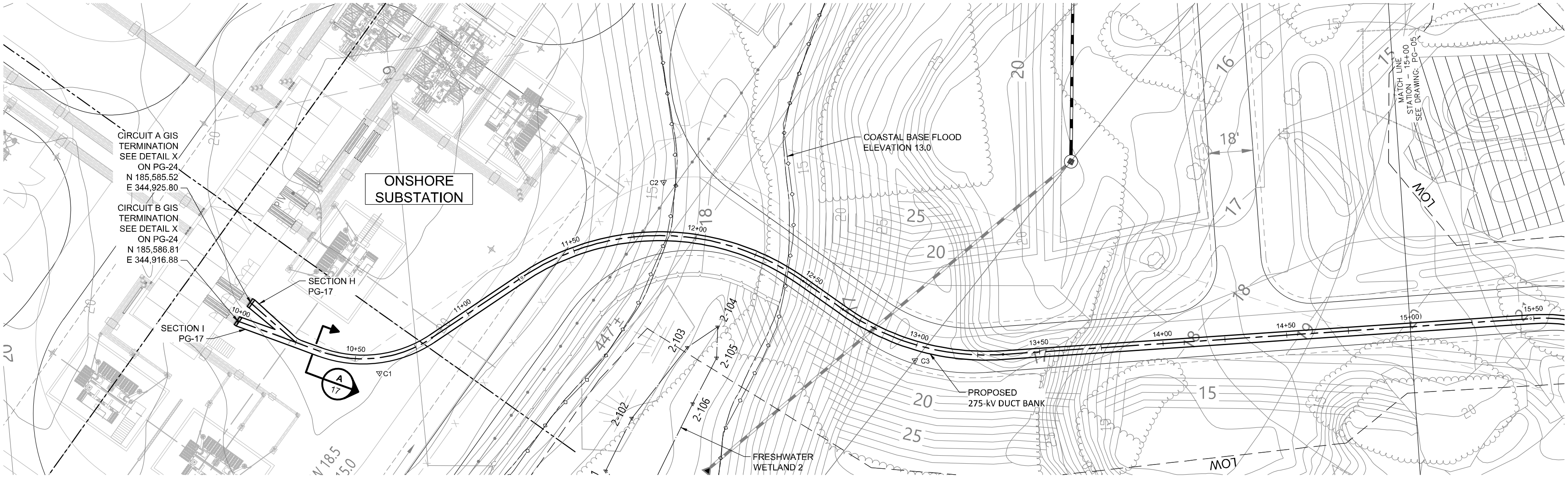
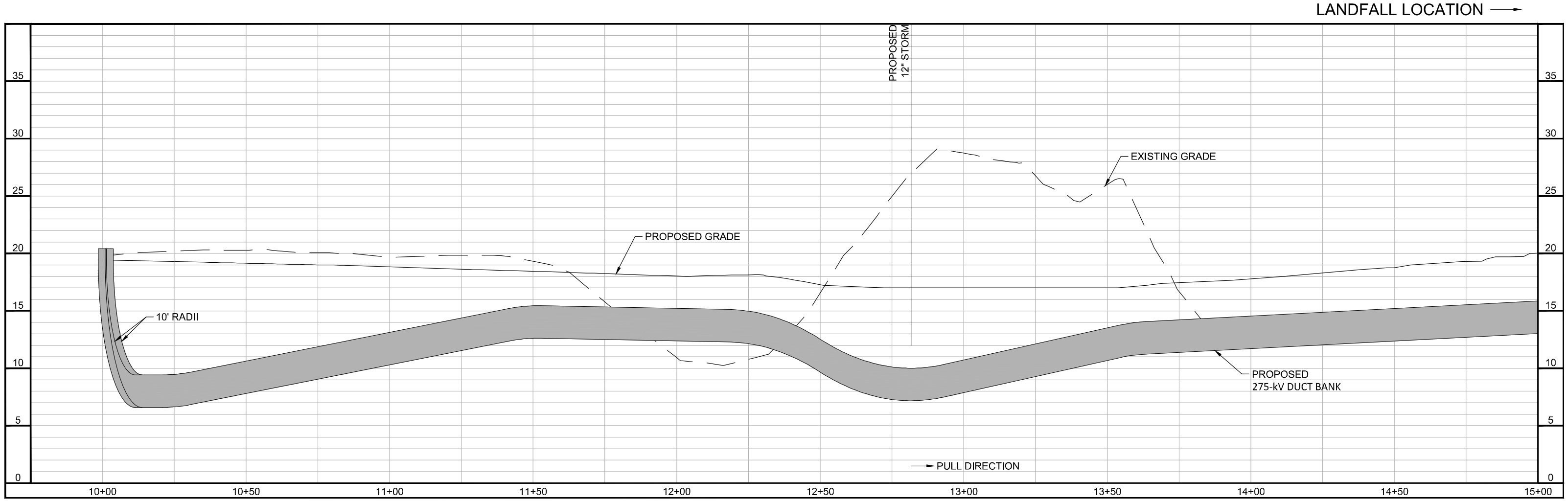


LANDFALL LOCATION →



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NORTH

VERTICAL SCALE IN FEET (0, 5', 10')

HORIZONTAL SCALE IN FEET (0, 10', 20', 40')

NOTES:

1. PROPOSED GRADE PER VHB GRADING PLAN DATED 11/02/2020

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

Revolution Wind — Powered by Ørsted & Eversource

REVOLUTION WIND
275-kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD	CHK M. DAGENAIS-BMcD	APP N. SCOTT-BMcD	APP
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20	DATE
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. PG-04	

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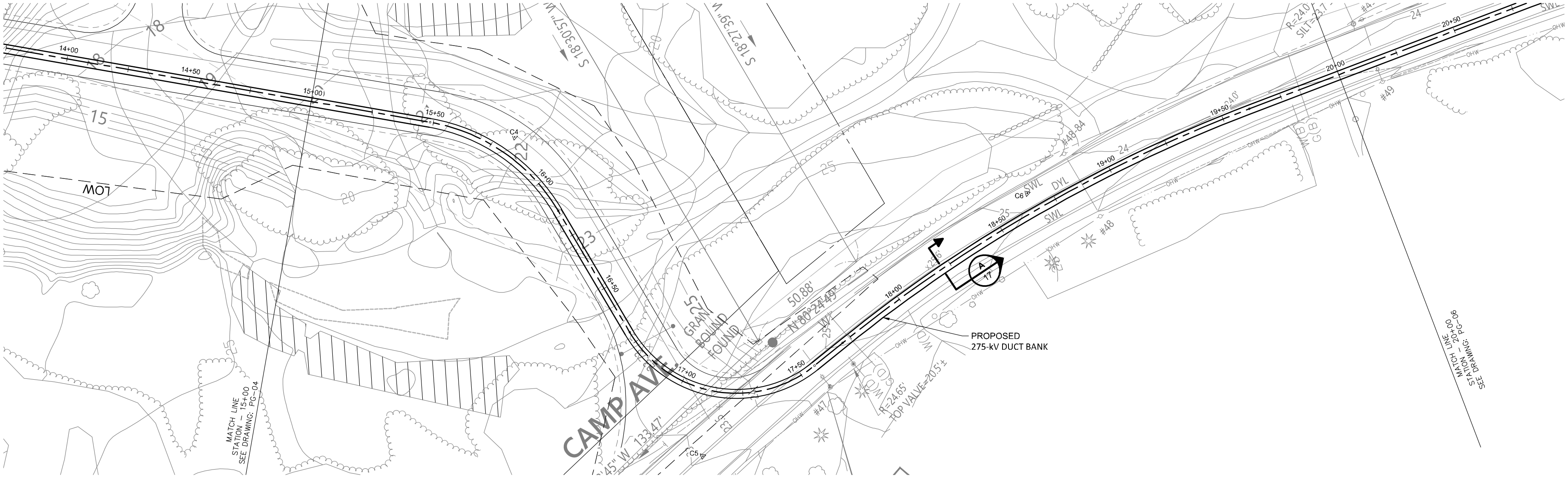

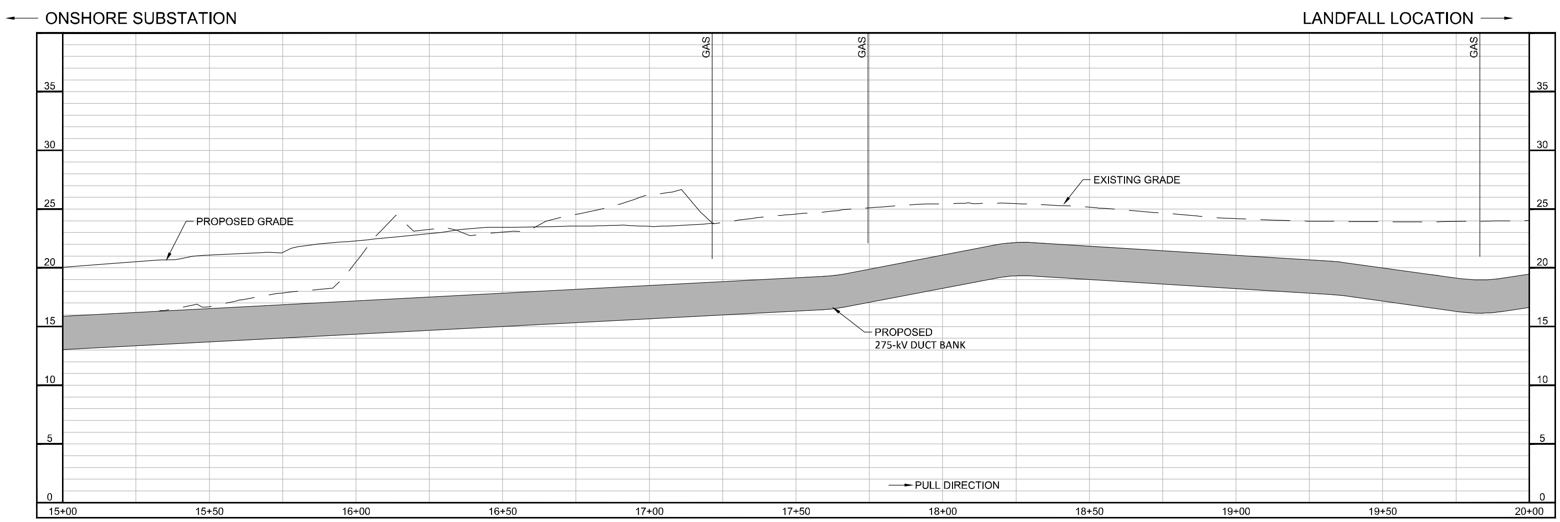

ROBBYN LYNN REED
No. 11127
REGISTERED
PROFESSIONAL ENGINEER
CIVIL

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Jun 29 2021

REVISIONS DURING CONSTRUCTION

ISSUED FOR PERMIT

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 5' 10'
VERTICAL SCALE IN FEET

0 10' 20' 40'
HORIZONTAL SCALE IN FEET

NOTES:

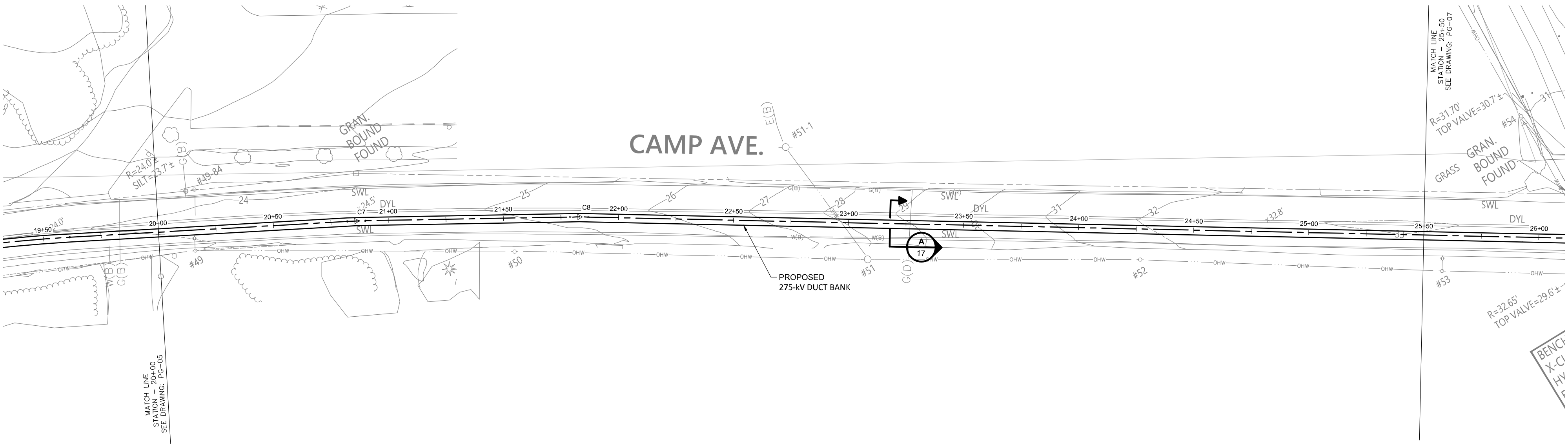
1. PROPOSED GRADE PER VHB GRADING PLAN DATED 11/02/2020

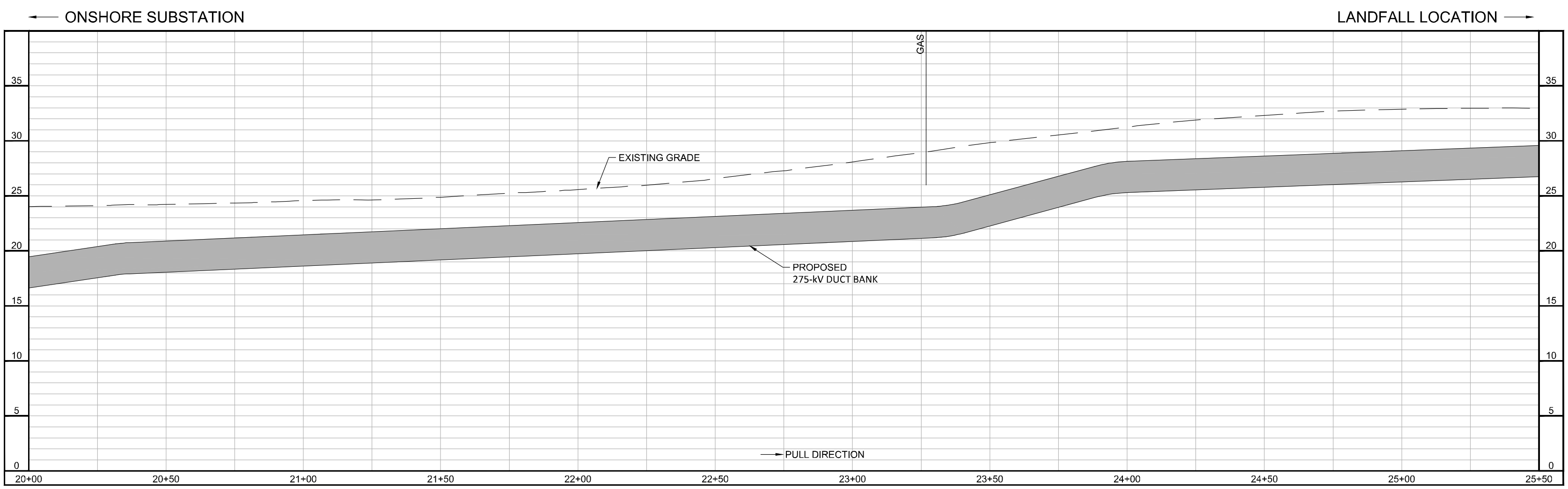
NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

Revolution Wind | Powered by Ørsted & Eversource

REVOLUTION WIND
275-kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD	CHK M. DAGENAIS-BMcD	APP N. SCOTT-BMcD	APP
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20	DATE
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	PG-05





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No. 11127
REGISTERED PROFESSIONAL ENGINEER CIVIL

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PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

VERTICAL SCALE IN FEET: 0, 5', 10'

HORIZONTAL SCALE IN FEET: 0, 10', 20', 40'

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW-70%	JCB	MD	NS	–

Revolution Wind — Powered by Ørsted & Eversource

REVOLUTION WIND
275-kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD, DATE 10/5/20; CHK M. DAGENAIS-BMcD, DATE 10/5/20; APP N. SCOTT-BMcD, DATE 10/5/20

H-SCALE N.T.S.; V-SCALE N.T.S.; SIZE ARCH D

DWG NO. PG-06

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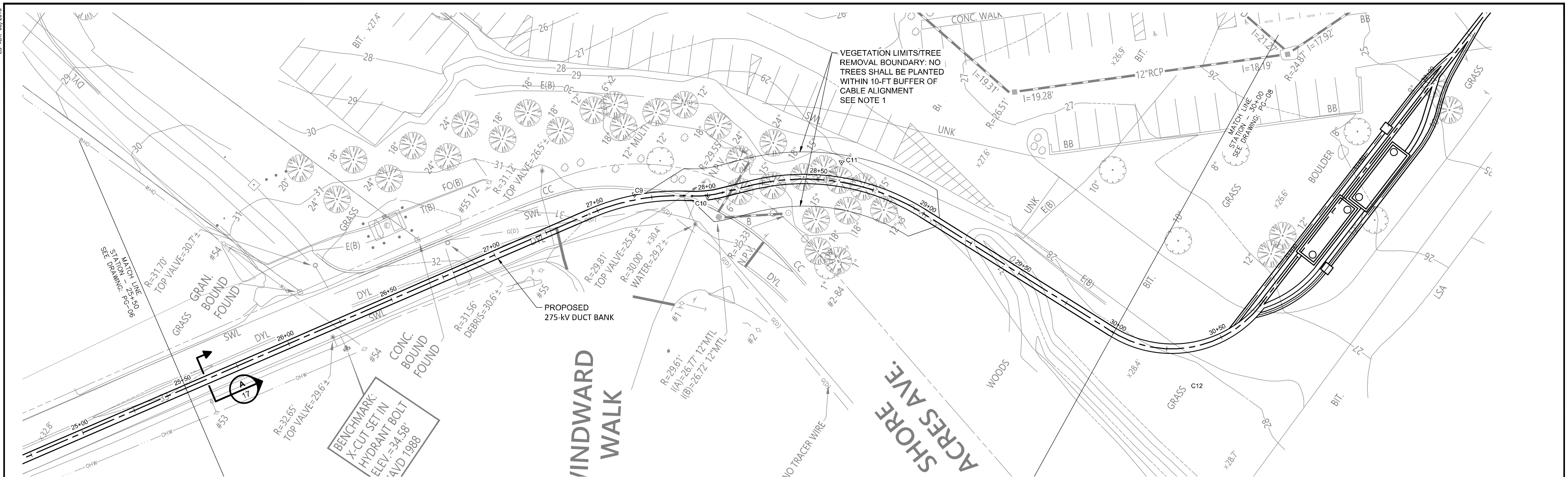

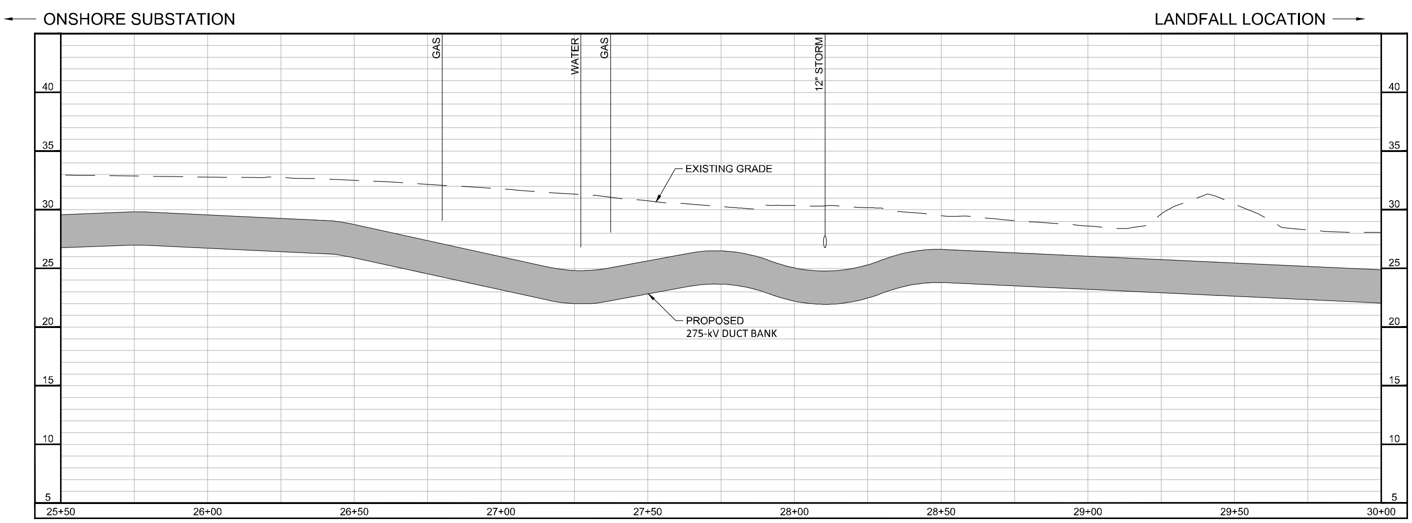

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No. 11127
REGISTERED PROFESSIONAL ENGINEER CIVIL

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PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

VERTICAL SCALE IN FEET (0, 5', 10')

HORIZONTAL SCALE IN FEET (0, 10', 20', 40')

NOTES:

1. CONTRACTOR TO CONFIRM TREE CLEARING EXTENTS WITH EVERSOURCE PRIOR TO CONSTRUCTION.

REVISIONS DURING CONSTRUCTION

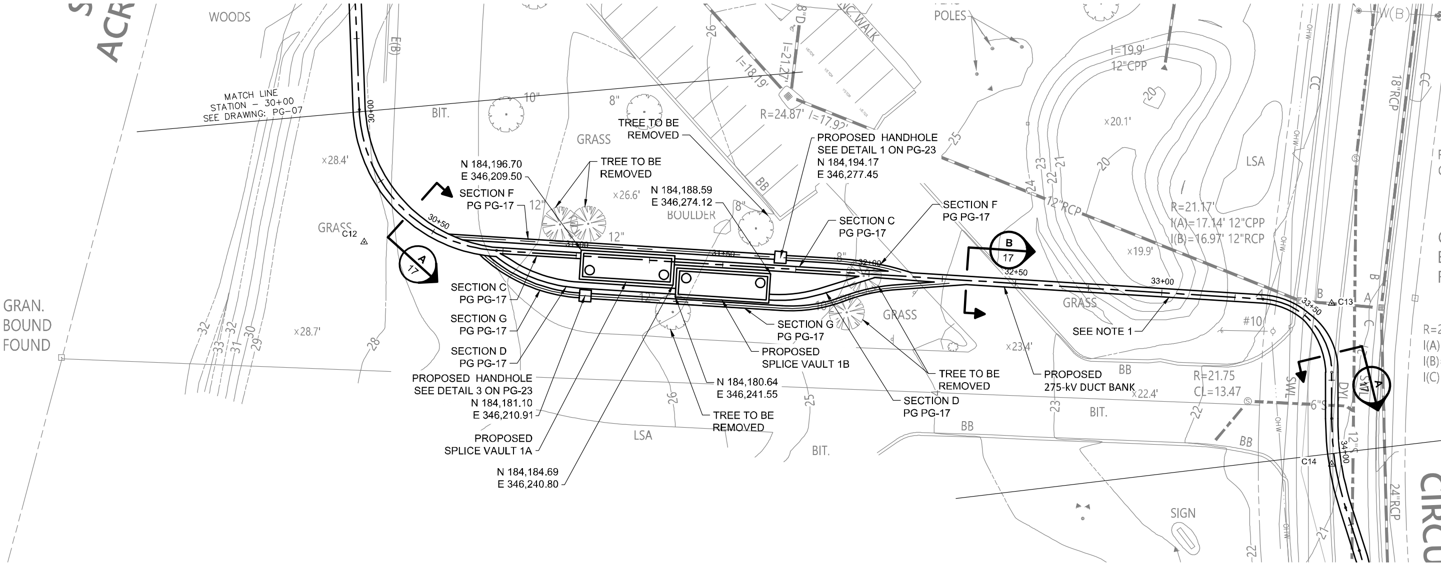
NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

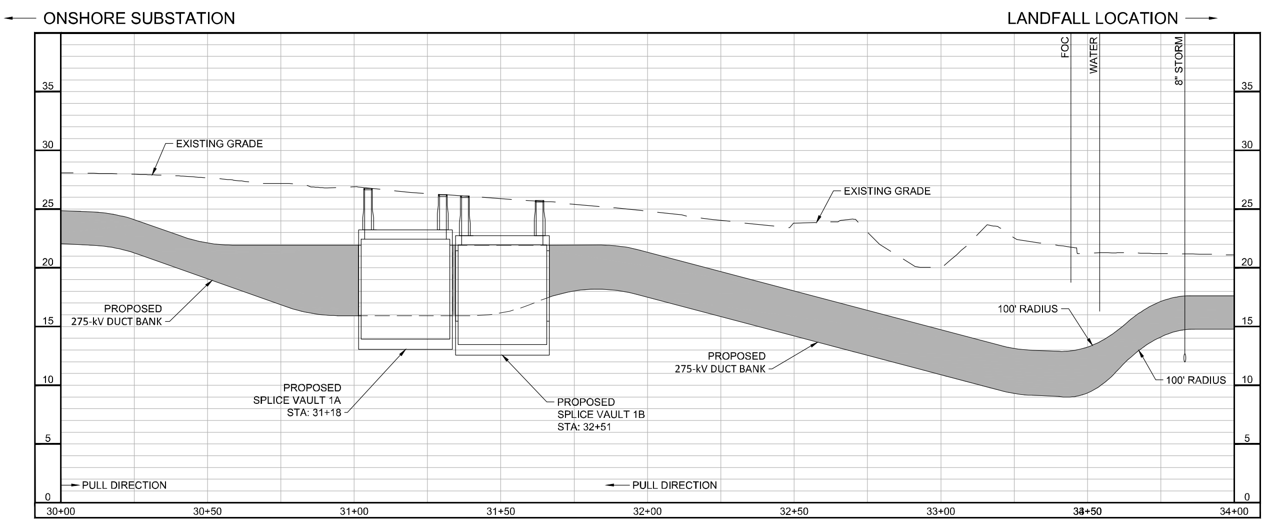
Revolution Wind | Powered by Ørsted & Eversource

REVOLUTION WIND
275-kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD	CHK M. DAGENAIS-BMcD	APP N. SCOTT-BMcD	APP
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20	DATE
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. PG-07	

ES VER: 05/2015





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REGISTERED PROFESSIONAL ENGINEER CIVIL

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NOTES:

1. CONTRACTOR SHALL RESTORE EXISTING INFILTRATION BASIN TO PRECONSTRUCTION CONDITION. REFER TO DETAIL 10 ON PG-28.

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PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

VERTICAL SCALE IN FEET: 0 5' 10'

HORIZONTAL SCALE IN FEET: 0 10' 20' 40'

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

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REVOLUTION WIND
275-kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD	CHK M. DAGENAIS-BMcD	APP N. SCOTT-BMcD
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES
V-SCALE N.T.S.		

DWG NO. PG-08

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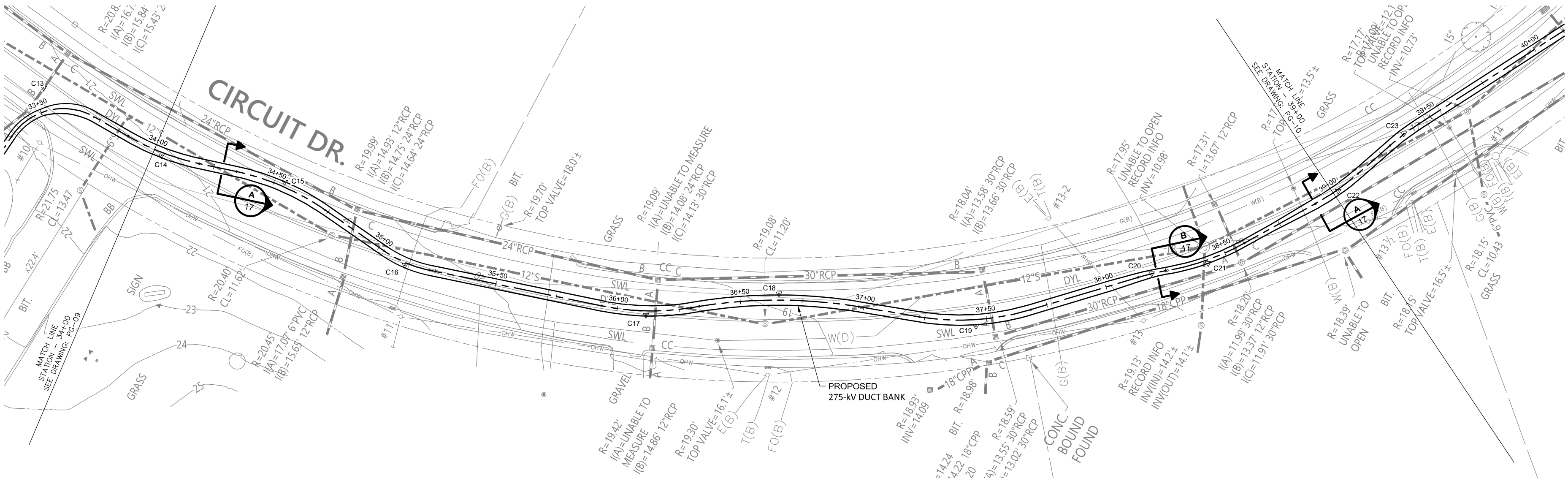

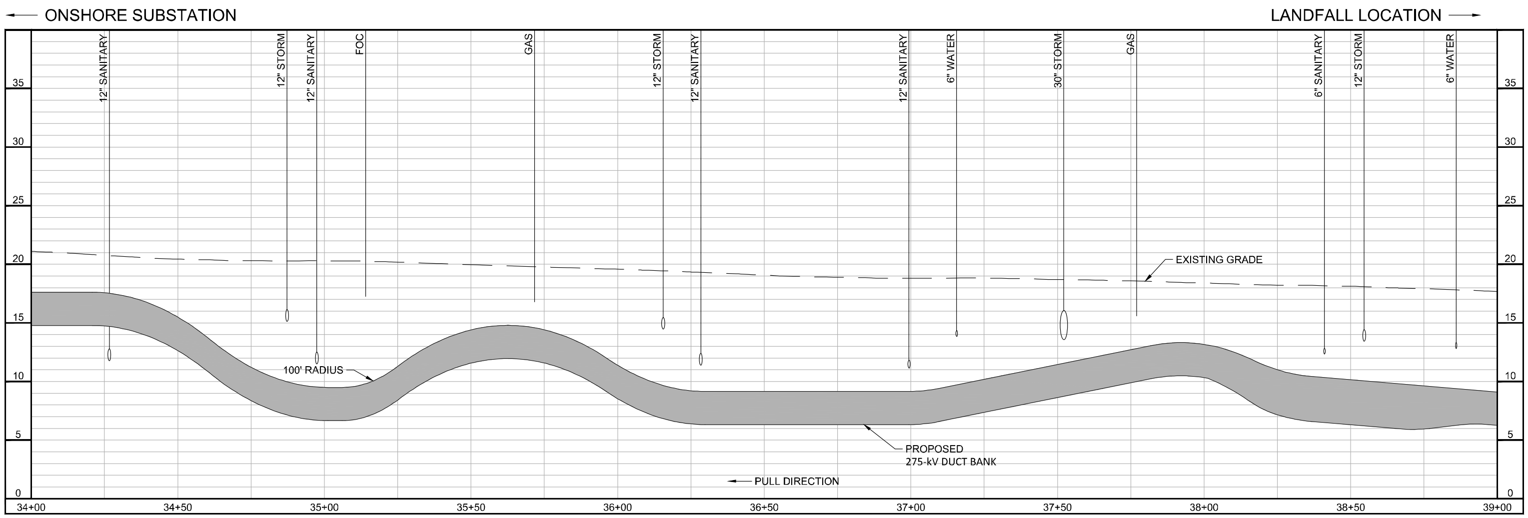

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PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

VERTICAL SCALE IN FEET (0, 5', 10')

HORIZONTAL SCALE IN FEET (0, 10', 20', 40')

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

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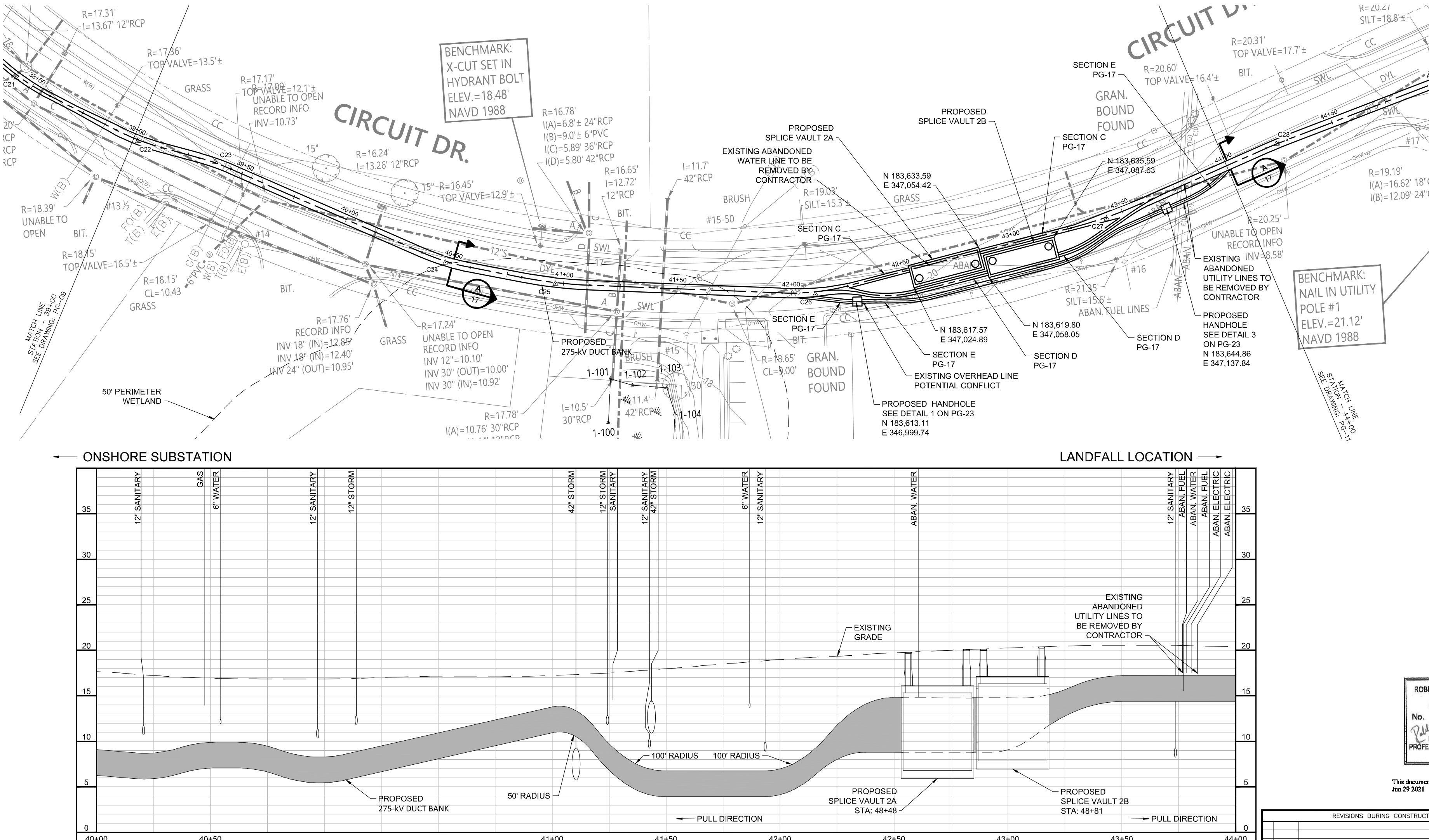
REVOLUTION WIND
275-kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD	CHK M. DAGENAIS-BMcD	APP N. SCOTT-BMcD	APP
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20	DATE
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	PG-09



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PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

VERTICAL SCALE IN FEET: 0, 5', 10'

HORIZONTAL SCALE IN FEET: 0, 10', 20', 40'

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

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REVOLUTION WIND
275–kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD, DATE 10/5/20; CHK M. DAGENAIS–BMcD, DATE 10/5/20; APP N. SCOTT–BMcD, DATE 10/5/20
H-SCALE N.T.S.; V-SCALE N.T.S.; SIZE ARCH D

PG-10

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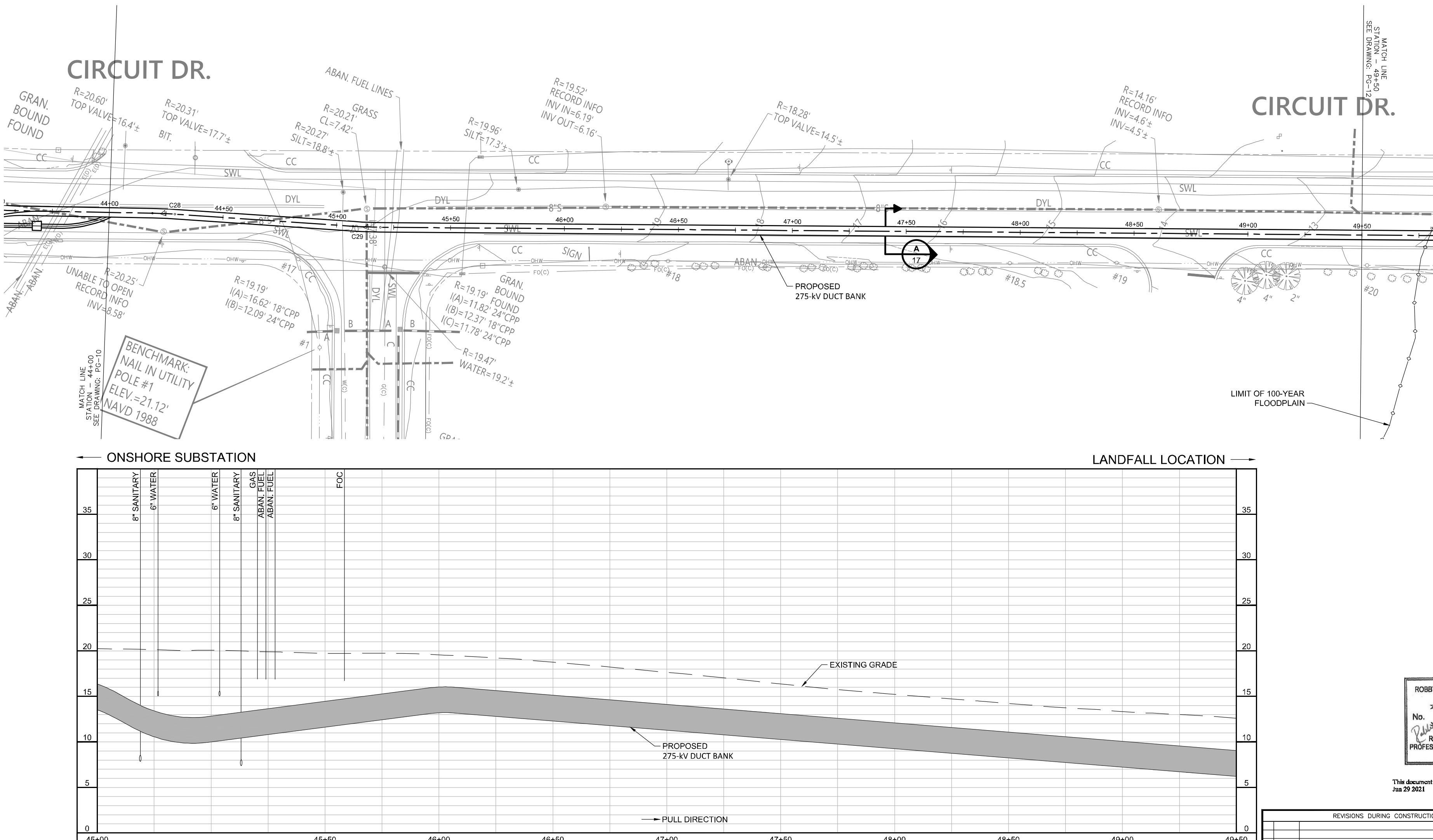
ES VER: 05/2015



ISSUED FOR PERMIT

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 5' 10'
VERTICAL SCALE IN FEET

0 10' 20' 40'
HORIZONTAL SCALE IN FEET

ROBBYN LYNN REED
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REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

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REVOLUTION WIND
275–kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD	CHK M. DAGENAIS–BMcD	APP N. SCOTT–BMcD	APP
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20	DATE
H–SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V–SCALE N.T.S.	V.S.	R.Z.DWG.	
W.E. PROJ. NUMBER		DWG NO.	PG-11

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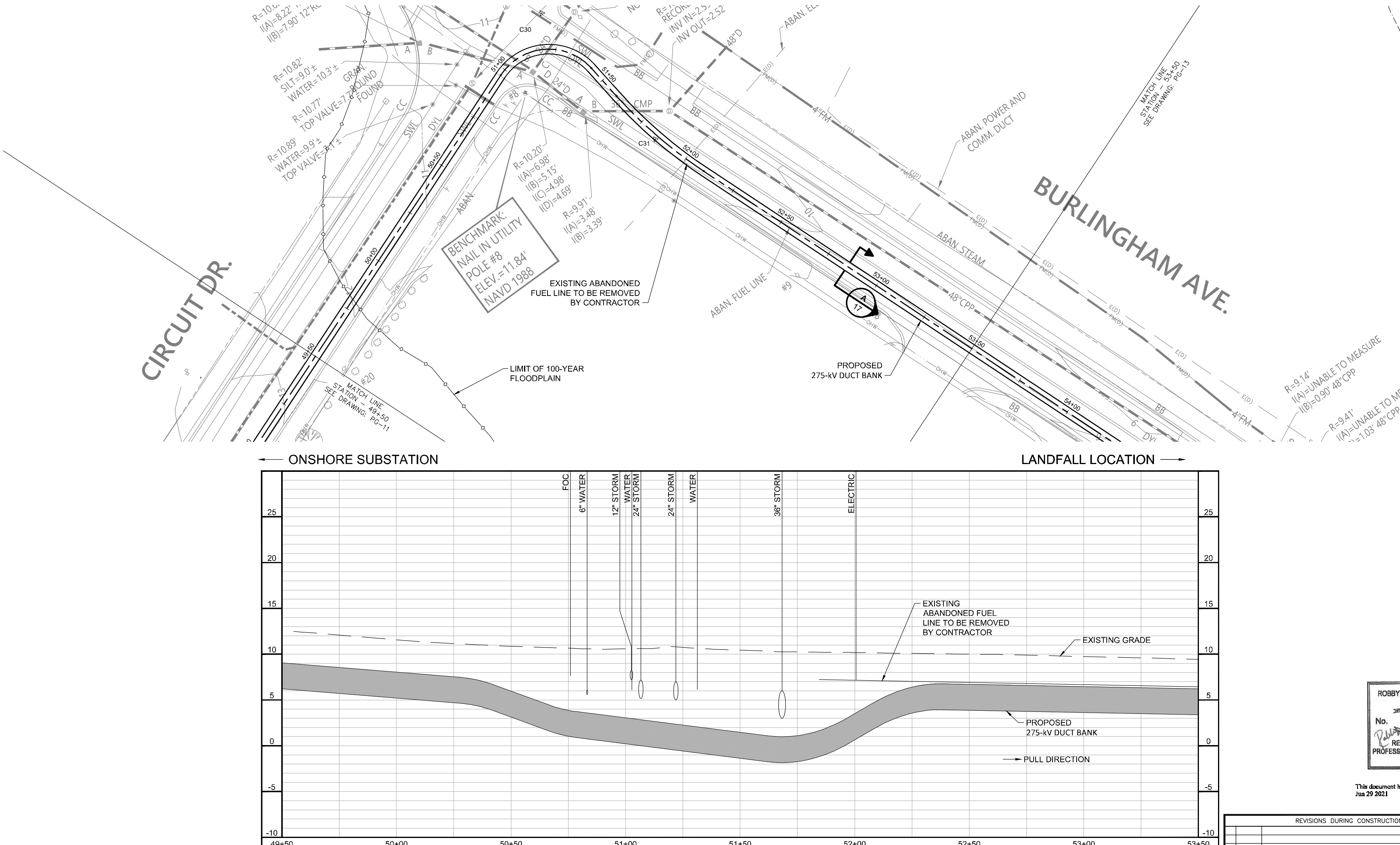
ES VER: 05/2015



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PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

VERTICAL SCALE IN FEET: 0, 5', 10'

HORIZONTAL SCALE IN FEET: 0, 10', 20', 40'

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

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REVOLUTION WIND
275-kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY	CHK	APP	APP
J. BARRINGER-BMcD	M. DAGENAIS-BMcD	N. SCOTT-BMcD	
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20	DATE
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	PG-12

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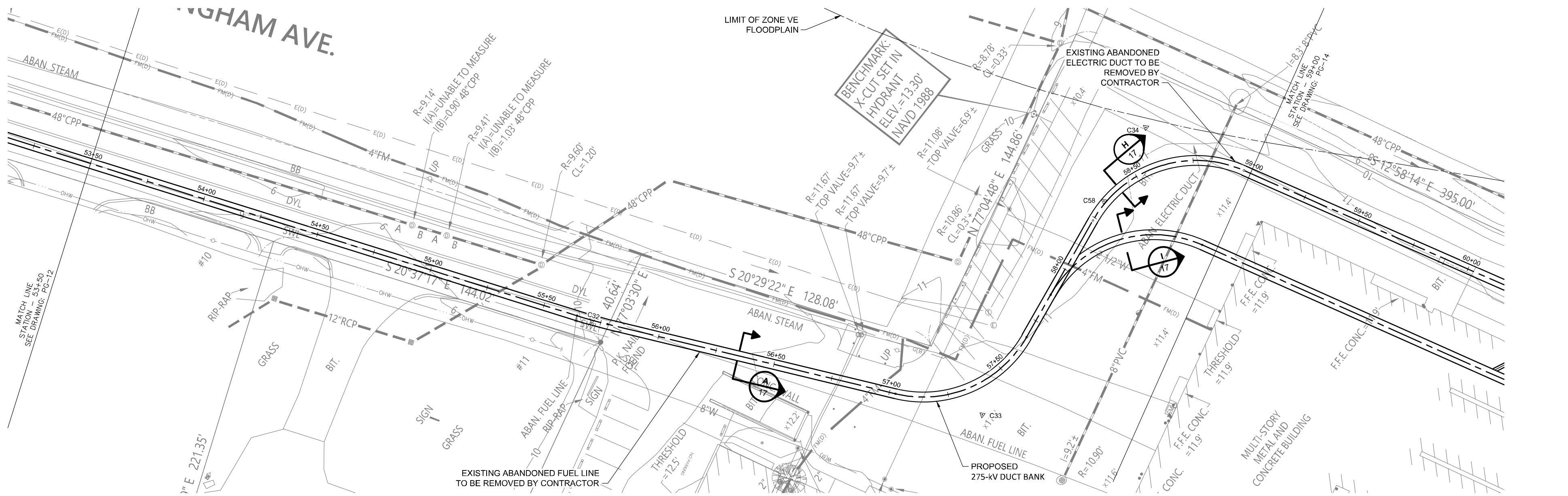
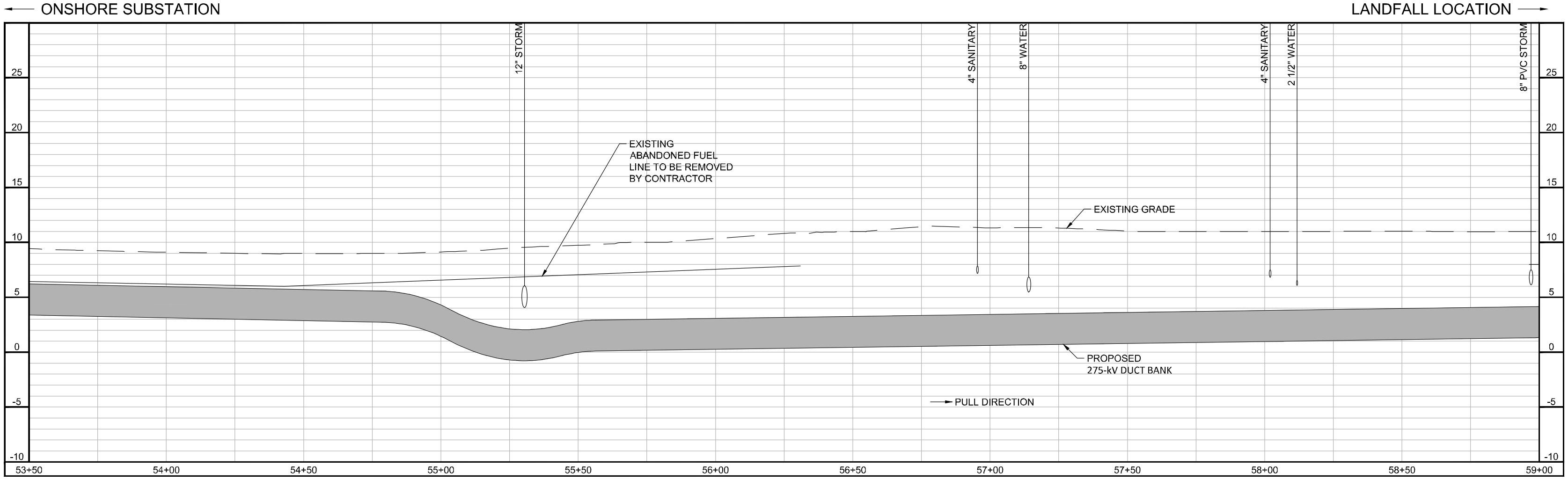


← ONSHORE SUBSTATION — LANDFALL LOCATION →



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PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

VERTICAL SCALE IN FEET (0, 5', 10')

HORIZONTAL SCALE IN FEET (0, 10', 20', 40')

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
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B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

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REVOLUTION WIND
275-kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY	CHK	APP	APP
J. BARRINGER-BMcD	M. DAGENAIS-BMcD	N. SCOTT-BMcD	
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20	DATE
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. PG-13	

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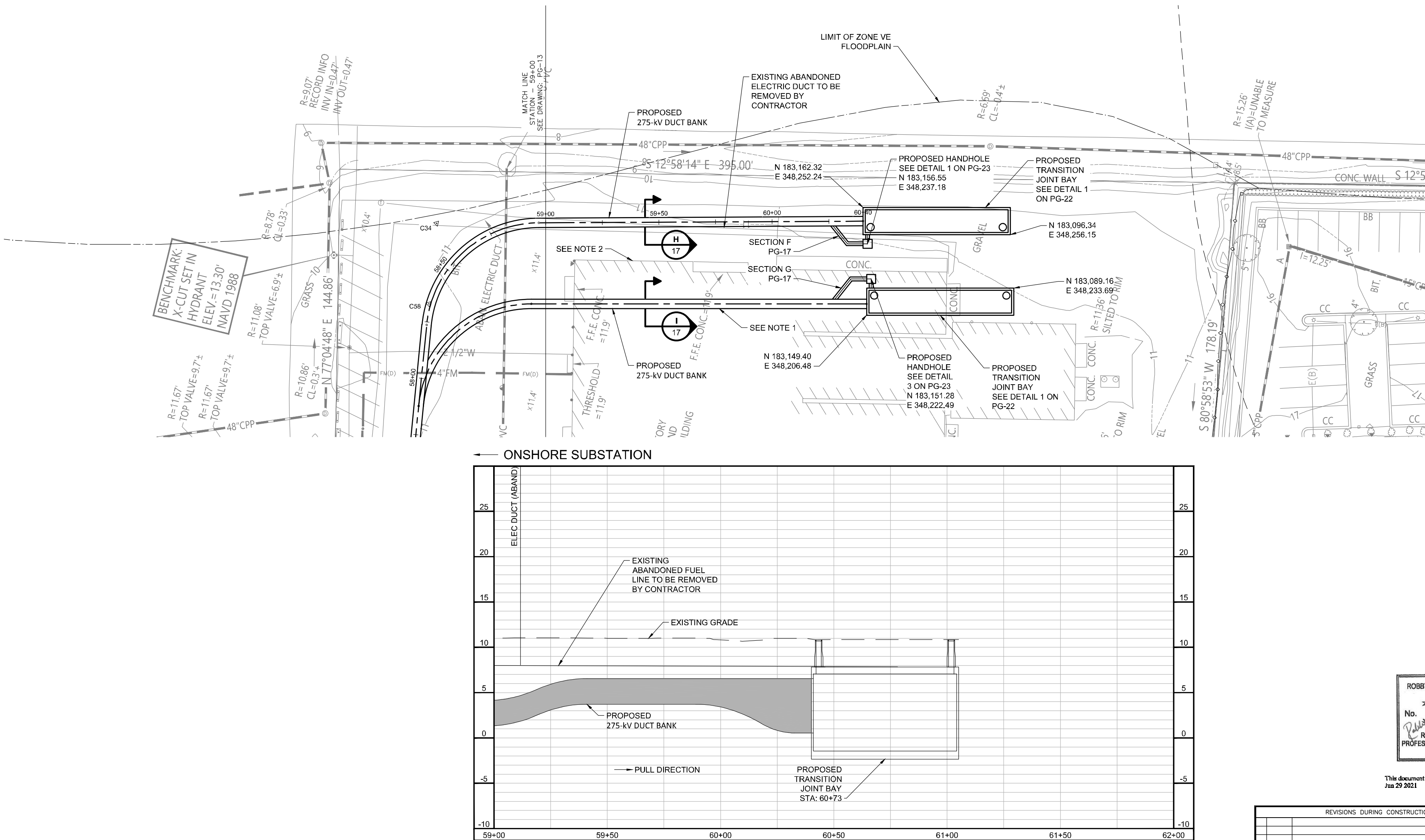

ISSUED FOR PERMIT

PRELIMINARY - NOT FOR CONSTRUCTION

VERTICAL SCALE IN FEET

HORIZONTAL SCALE IN FEET

NOTES:

1. IT IS ASSUMED GRADE WILL BE THE SAME FOR THE BOTH ALIGNMENTS INTO TRANSITION JOINT BAYS
2. EXISTING BUILDING TO BE DEMOLISHED PRIOR TO START OF CONSTRUCTION.
3. LANDFALL HDD DESIGN COMPLETED BY MOTT MACDONALD.

ROBBYN LYNN REED No. 11127 REGISTERED PROFESSIONAL ENGINEER CIVIL

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REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
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B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

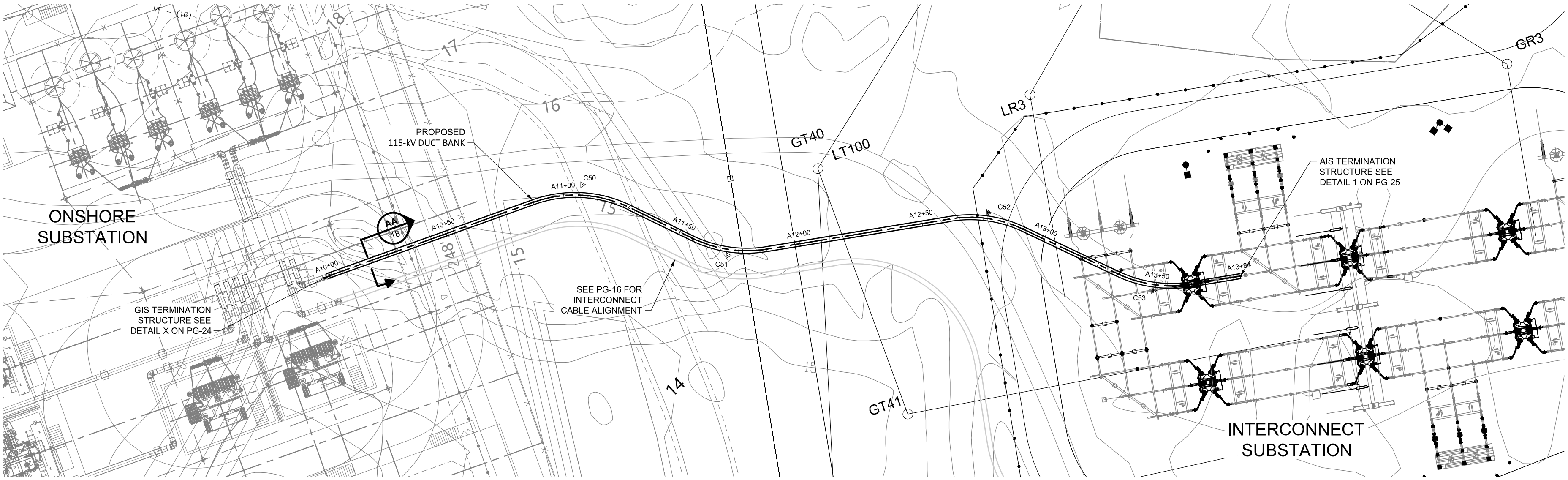
Revolution Wind — Powered by Ørsted & Eversource

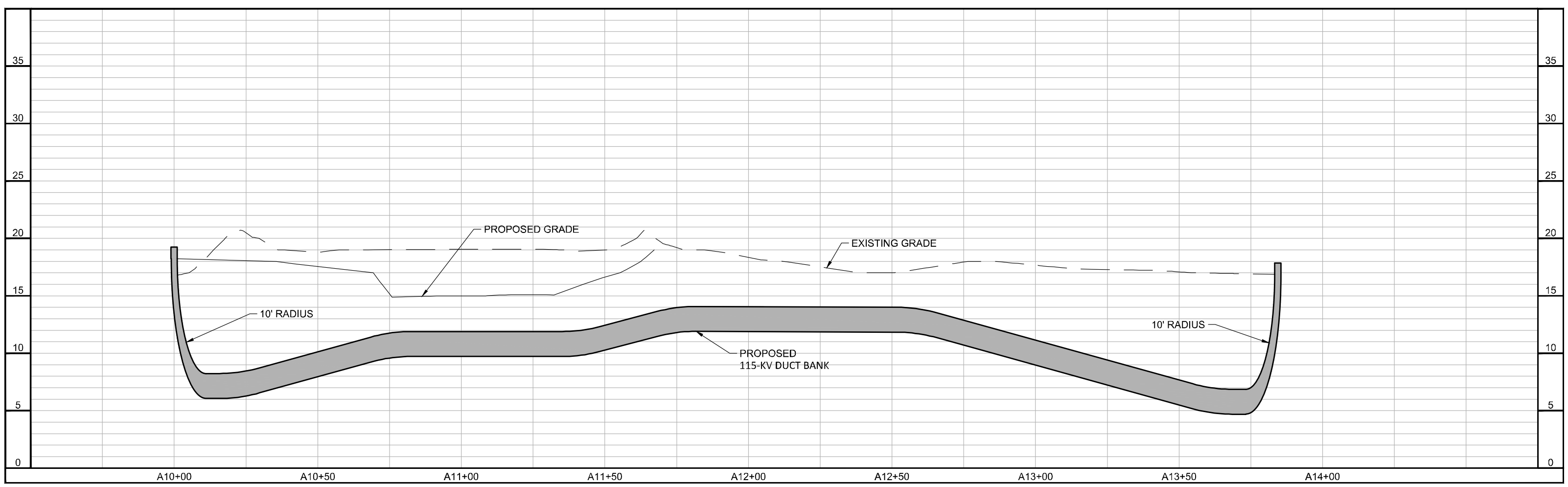
REVOLUTION WIND
275-kV ONSHORE CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD, DATE 10/5/20; CHK M. DAGENAIS-BMcD, DATE 10/5/20; APP N. SCOTT-BMcD, DATE 10/5/20

H-SCALE N.T.S. V-SCALE N.T.S. SIZE ARCH D

PG-14





ISSUED FOR PERMIT

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

VERTICAL SCALE IN FEET (0, 5', 10')

HORIZONTAL SCALE IN FEET (0, 10', 20', 40')

NOTES:

1. PROPOSED GRADE PER VHB GRADING PLAN DATED 11/02/2020

ROBBYN LYNN REED
No. 11127
REGISTERED PROFESSIONAL ENGINEER
CIVIL

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Jun 29 2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

Revolution Wind | Powered by Ørsted & Eversource

REVOLUTION WIND
115-kV INTERCONNECT CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD	CHK M. DAGENAIS-BMcD	APP N. SCOTT-BMcD	APP
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20	DATE
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	PG-15

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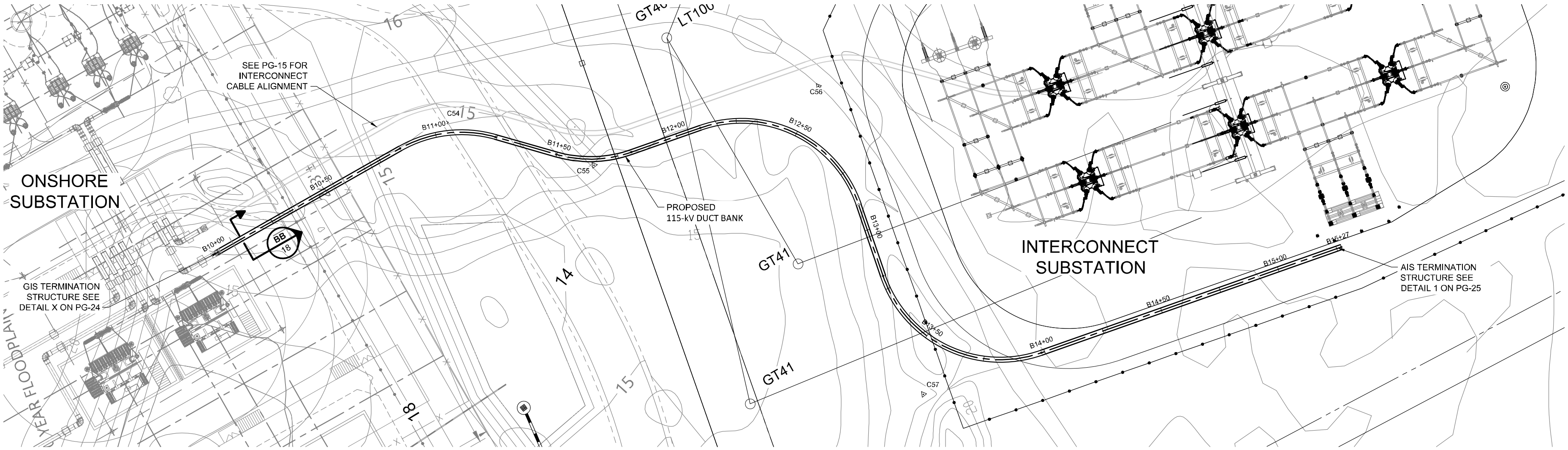

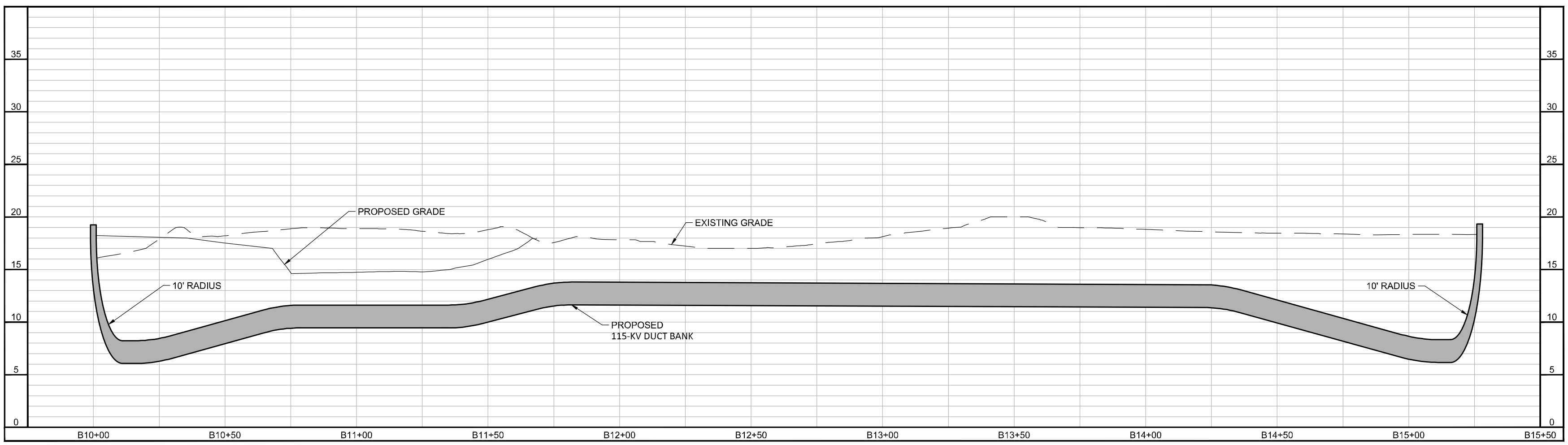

ROBBYN LYNN REED
No. 11127
REGISTERED PROFESSIONAL ENGINEER CIVIL

This document has been digitally sealed. Jun 29 2021

NOTES:

1. PROPOSED GRADE PER VHB GRADING PLAN DATED 11/02/2020

ISSUED FOR PERMIT

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

VERTICAL SCALE IN FEET: 0, 5', 10'

HORIZONTAL SCALE IN FEET: 0, 10', 20', 40'

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

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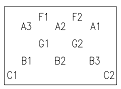
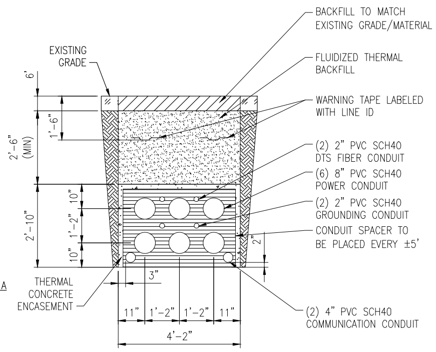
REVOLUTION WIND
115–kV INTERCONNECT CABLE DOUBLE CIRCUIT
PLAN AND PROFILE
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
J. BARRINGER–BMcD	M. DAGENAIS–BMcD	N. SCOTT–BMcD	
DATE 10/5/20	DATE 10/5/20	DATE 10/5/20	DATE
H–SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V–SCALE N.T.S.	V.S.	R.Z.DWG.	
R.Z. PROJ. NUMBER		DWG NO.	PG-16

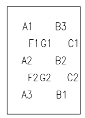


CONDUIT NAMING FOR SECTION A

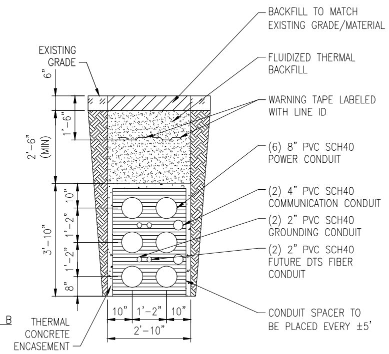


TYPICAL DOUBLE CIRCUIT 275kV DUCT BANK CROSS SECTION

SECTION A
NTS

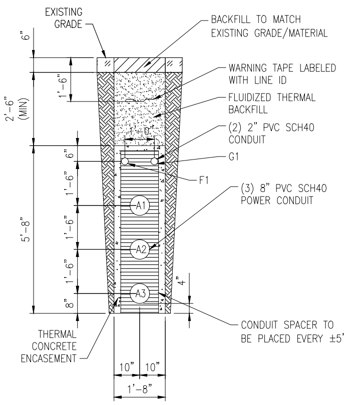


CONDUIT NAMING FOR SECTION B



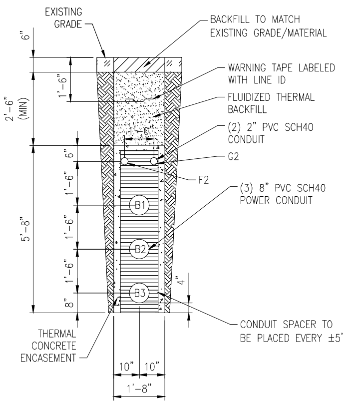
DOUBLE CIRCUIT 275kV DUCT BANK CROSS SECTION

SECTION B
NTS



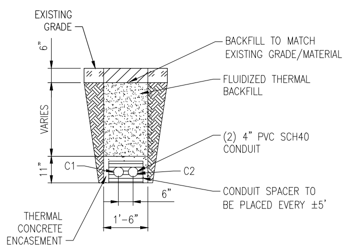
SINGLE CIRCUIT 275kV DUCT BANK CROSS SECTION AT VAULTS

SECTION C
NTS



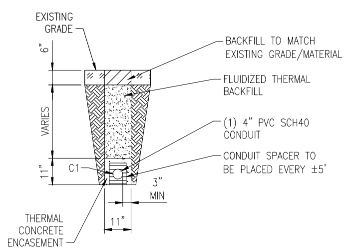
SINGLE CIRCUIT 275kV DUCT BANK CROSS SECTION AT VAULTS

SECTION D
NTS



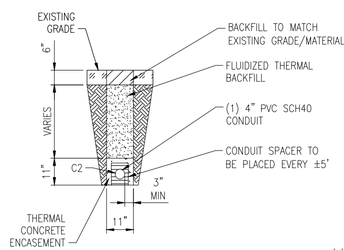
COMMUNICATION DUCT BANK

SECTION E
NTS



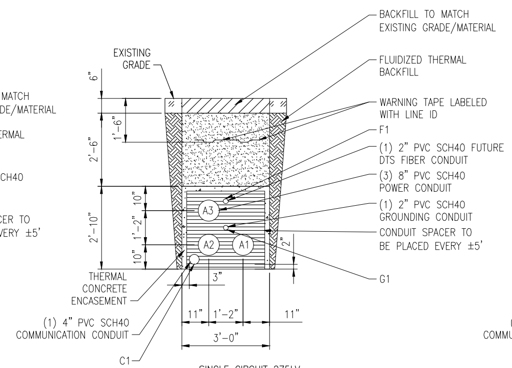
COMMUNICATION DUCT BANK

SECTION F
NTS



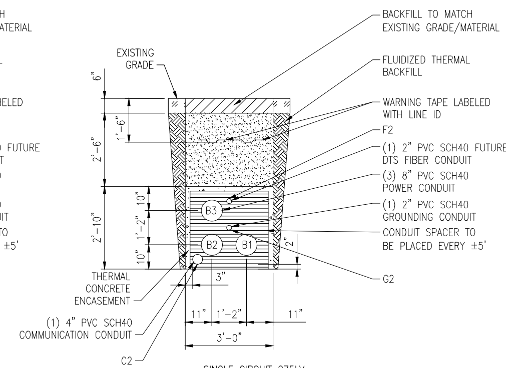
COMMUNICATION DUCT BANK

SECTION G
NTS



SINGLE CIRCUIT 275kV DUCT BANK CROSS SECITON

SECTION H
NTS



SINGLE CIRCUIT 275kV DUCT BANK CROSS SECTION

SECTION I
NTS

NOTES:

1. DIMENSIONAL ROUNDING, OUTSIDE DIMENSIONS ROUNDED UP TO THE NEAREST INCH.
2. DUCT BANK MINIMUM OF COVER SHALL BE 3'-0". UNLESS OTHERWISE APPROVED IN WRITING.

ISSUED FOR PERMIT

PRELIMINARY - NOT FOR CONSTRUCTION

ROBBYN LYNN REED
No. 11127
REGISTERED PROFESSIONAL ENGINEER
CIVIL

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A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

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TITLE: REVOLUTION WIND
ONSHORE CABLE DUCT BANK CROSS SECTION DETAILS
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD	CHKD M. DAGENAIS-BMcD	APP N. SCOTT-BMcD	APP
DATE 09/30/20	DATE 09/30/20	DATE 09/30/20	DATE
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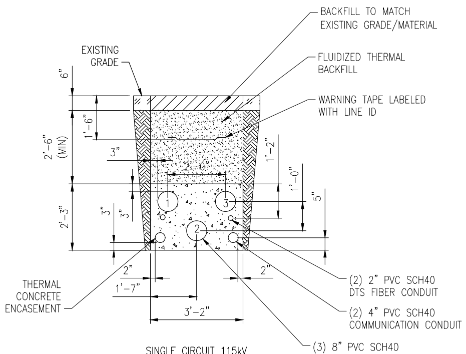
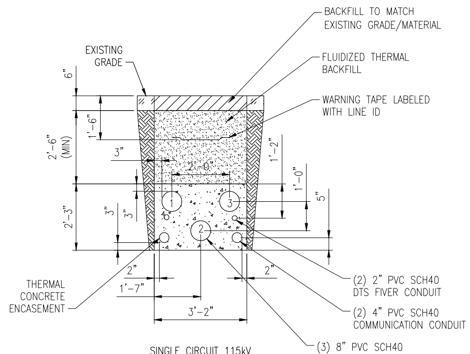
V-SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. PG-17	



SINGLE CIRCUIT 115kV DUCT BANK CROSS SECTION

SECTION AA
NTS



SINGLE CIRCUIT 115kV DUCT BANK CROSS SECTION

SECTION BB
NTS

NOTES:

1. DIMENSIONAL ROUNDING, OUTSIDE DIMENSIONS ROUNDED UP TO THE NEAREST INCH.
2. DUCT BANK MINIMUM DEPTH OF COVER SHALL BE 3'-0". UNLESS OTHERWISE APPROVED IN WRITING.

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TITLE REVOLUTION WIND

INTERCONNECT DUCT BANK CROSS SECTION DETAILS
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD	CHKD M. DAGENAIS–BMcD	APP N. SCOTT–BMcD	APP
DATE 09/30/20	DATE 09/30/20	DATE 09/30/20	DATE
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. PG-18	

ES VERE 05/2015

6/29/2021 9:49 AM – jbarringer – \\bmcd\dfs\Clients\TND\NUSC\126851_revwindeng\Design\underground\CADD\Working\18 INTERCONNECT DUCT BANK.dwg – CROSS SECTION

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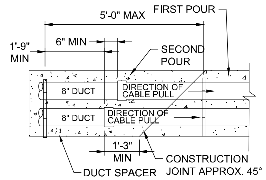
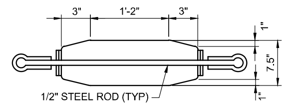


CONSTRUCTION JOINT DETAIL

DETAIL 1 / -
NTS

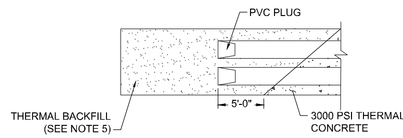
NOTE:

1. 2" AND 4" DUCTS NOT SHOWN FOR CLARITY.



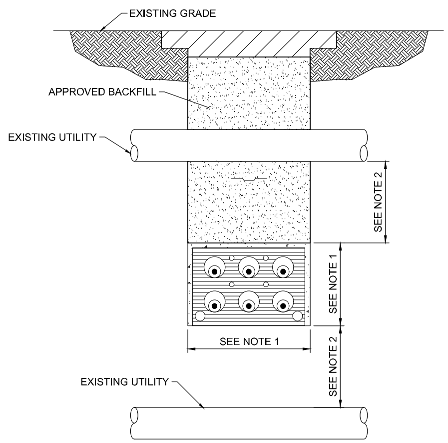
TYPICAL MANDREL DETAIL

DETAIL 2 / -
NTS



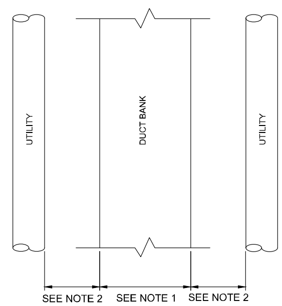
TEMPORARY CONDUIT STUB OUT DETAILS

DETAIL 3 / -
NTS



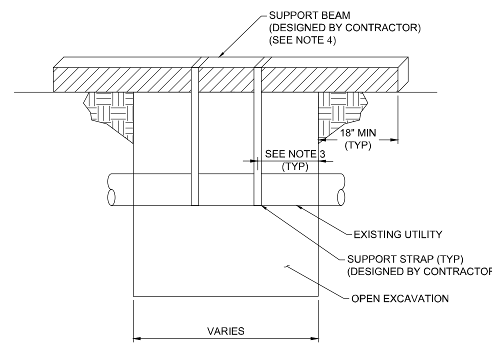
TYPICAL DUCT BANK WITH UTILITY CLEARANCE

DETAIL 5 / -
NTS



TYPICAL HORIZONTAL UTILITY CLEARANCE DETAIL

DETAIL 6 / -
NTS



TYPICAL PIPE SUPPORT ACROSS OPEN EXCAVATION

DETAIL 7 / -
NTS

GENERAL NOTES:

1. SEE DRAWING PG-17 AND PG-18 FOR CONDUIT SECTION.
2. 2'-0" MIN. CLEARANCE MAINTAINED UNLESS OTHERWISE NOTED ON PLAN AND PROFILE.
3. 2'-0" MAX SPAN, OR DIRECTED BY THE UTILITY WHICHEVER IS LESS.
4. CONTRACTOR SHALL SUBMIT METHOD OF SUPPORT TO RESPECTIVE UTILITY OWNERS FOR APPROVAL PRIOR TO CONSTRUCTION.
5. PROVIDE A MINIMUM OF 3'-0" OF THERMAL BACKFILL AROUND ALL SIDES OF CONDUITS.

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PRELIMINARY - NOT FOR CONSTRUCTION

ROBBYN LYNN REED
No. 11127
REGISTERED PROFESSIONAL ENGINEER
CIVIL

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TITLE: REVOLUTION WIND
DUCT BANK SECTIONS
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD	CHK M. DAGENAIS-BMcD	APP N. SCOTT-BMcD	APP
DATE 09/30/20	DATE 09/30/20	DATE 09/30/20	DATE
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. PG-19	

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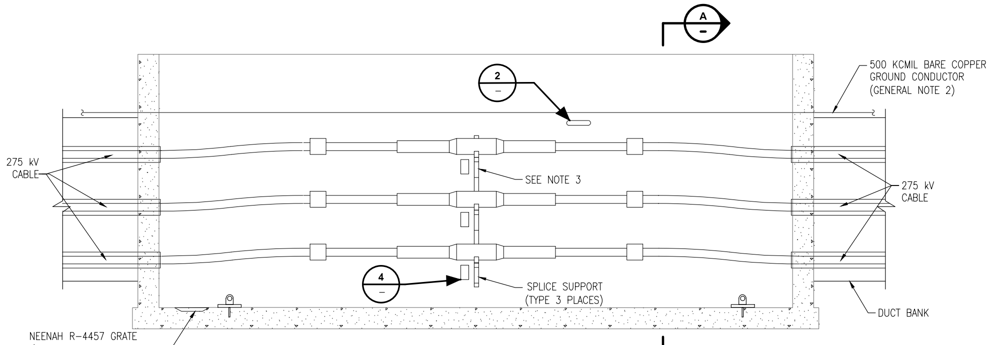
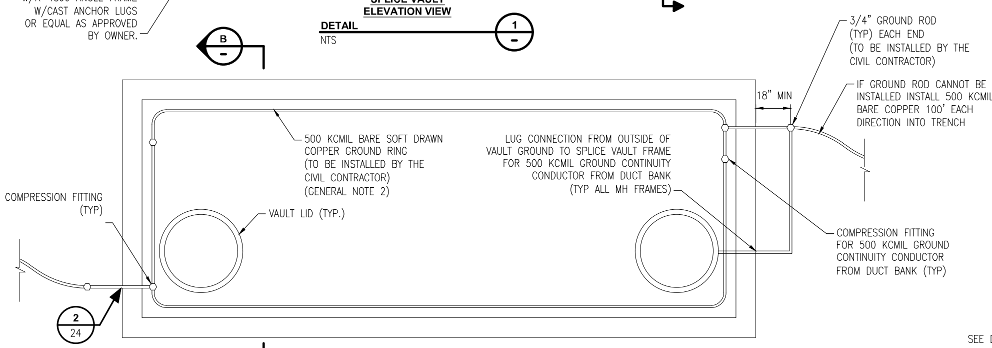


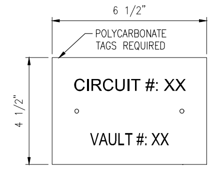
SPLICE VAULT ELEVATION VIEW
DETAIL 1
NTS



VAULT GROUNDING DETAIL PLAN VIEW
DETAIL 3
NTS

NOTES:

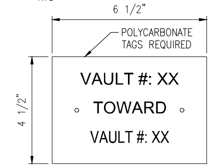
1. CIVIL CONTRACTOR SHALL ATTACH POLYCARBONATE TAG 1'-6" BELOW FINISHED GRADE ON THE INSIDE OF THE CHIMNEY AND ON THE VAULT WALL OPPOSITE THE RACKING.



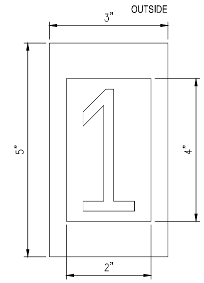
CIRCUIT IDENTIFICATION TAG
DETAIL 2
NTS

NOTES:

1. CIVIL CONTRACTOR SHALL ATTACH TAG 6" FROM THE CONDUIT ON EACH END WALL OF SPLICE VAULT AS SHOWN IN SECTION A WITH DELINEATION OF NEXT SPLICE VAULT IN THE CIRCUIT AND DISTANCE TO SPLICE VAULT.



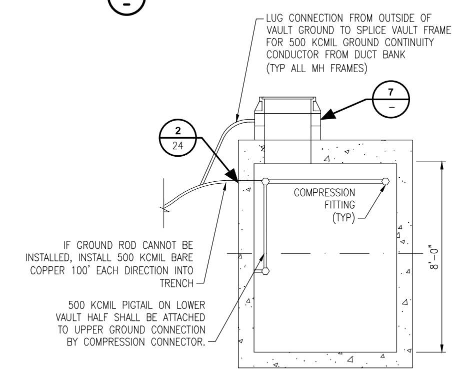
TOWARD SIGN
DETAIL 5
NTS



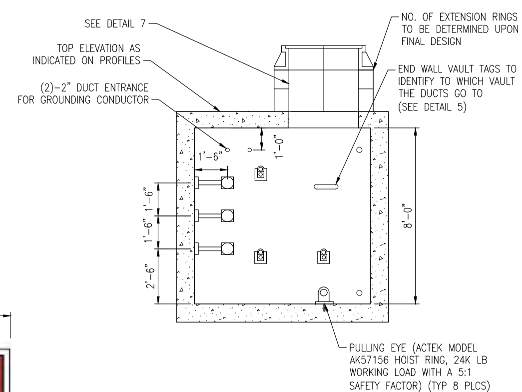
DETAIL 4
NTS

NOTES:

1. CHARACTER SHALL BE 4" HIGH BOLD TYPE.
2. CHARACTER SHALL BE CENTERED ON SIGN.
3. – BACKGROUND: WHITE
   – LETTERING: BLACK
   – CHARACTERS: 1, 2, & 3 AS SHOWN.



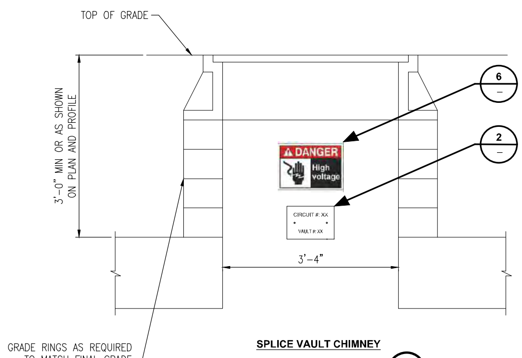
SPLICE VAULT SECTION
B
NTS



GENERAL NOTES:

1. GROUND PIGTAILS TO EXTEND A MINIMUM OF 18 INCHES FROM BOTH SIDES OF VAULT WALL PENETRATION.
2. GROUND CLIPS MAX 1' FROM ALL MANHOLE CORNERS, AND MAX 4' OC SPACING ALONG WALLS USE 1/2" PVC COATED. MALLEABLE IRON RIGID STEEL CONDUIT 1 HOLE STRAP WITH BACKSTRAP. ALL HARDWARE AND INSERTS TO BE STAINLESS STEEL.
3. ALL GROUND CONNECTIONS TO MANHOLE RACKS ETC. SHALL BE VIA A TINNED CU 1 HOLE.
4. PASS GROUND CONDUCTOR THROUGH VAULT WALL AND SUPPORT ALONG VAULT WALL AS HIGH AS POSSIBLE BUT NO MORE THAN 12" DOWN FROM VAULT CEILING.
5. BOND GROUNDS FROM EARTHING TO VAULT/DUCTBANK GROUND.
6. CABLE VENDOR IS TO PLACE PHASE DESIGNATIONS.
7. CABLE SUPPORT TO BE DESIGNED AND CONSTRUCTED BY CABLE VENDOR.

PRELIMINARY: FOR REFERENCE ONLY



SPLICE VAULT CHIMNEY
DETAIL 7
NTS

DANGER WARNING SIGN
DETAIL 6
NTS

SPLICE VAULT SECTION A
NTS

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ROBBYN LYNN REED
No. 11127
REGISTERED PROFESSIONAL ENGINEER
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REVOLUTION WIND
SPLICE VAULT DETAILS
NORTH KINGSTOWN, RHODE ISLAND

BY	CHK	APP	APP
J. BARRINGER-BMcD	M. DAGENAIS-BMcD	N. SCOTT-BMcD	
DATE 09/30/20	DATE 09/30/20	DATE 09/30/20	DATE
H-SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.DWG.	
R.E. PROJ. NUMBER		DWG NO.	PG-20

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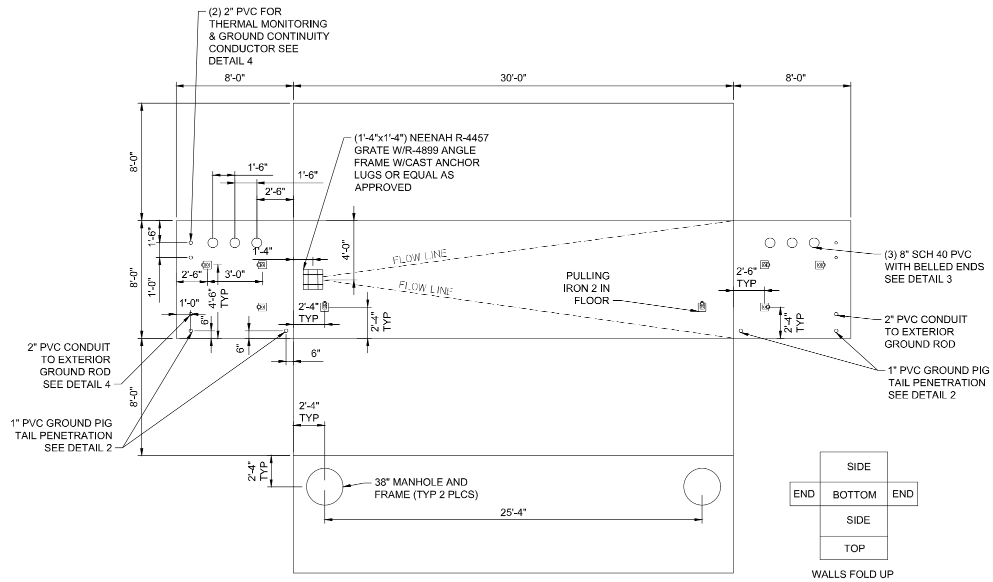
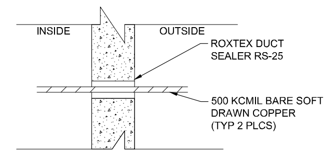
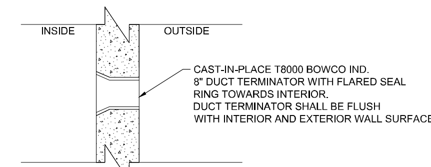


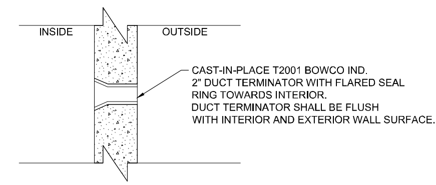
TYPICAL XLPE SPLICE VAULT DEVELOPMENT PLAN
DETAIL 1
NTS



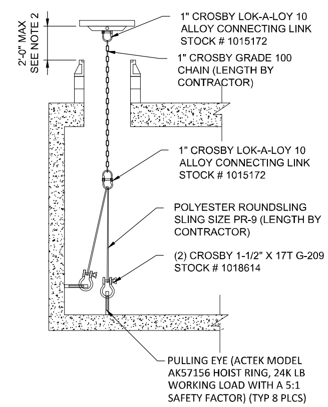
2" DUCT TERMINATOR DETAIL PROFILE VIEW
DETAIL 2
NTS



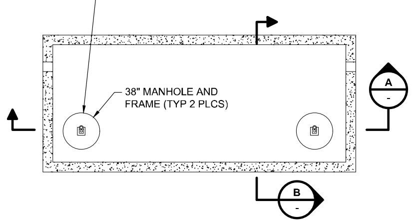
8" DUCT TERMINATOR DETAIL
DETAIL 3
NTS



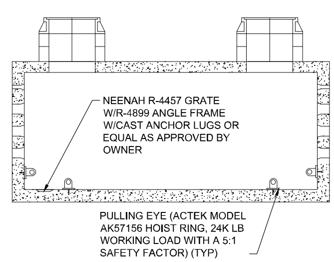
2" DUCT TERMINATOR DETAIL
DETAIL 4
NTS



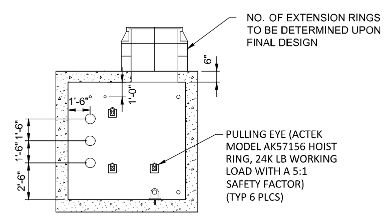
MANHOLE TETHER DETAIL
DETAIL 6
NTS



SPLICE VAULT PLAN VIEW
DETAIL 5
NTS



ELEVATION VIEW
SECTION A
NTS



SIDE ELEVATION VIEW
SECTION B
NTS

PRELIMINARY: FOR REFERENCE ONLY

NOTES:

1. FERROUS REBAR WITHIN SPLICE CHAMBER WALLS SHALL NOT FORM A CLOSED LOOP AROUND ANY INDIVIDUAL 8" CONDUIT OPENING.
2. CONTRACTOR TO ADJUST TETHER SYSTEM FOR MAXIMUM COVER RISE OF 24".
3. MANHOLE DIMENSIONS SHOWN ARE INSIDE DIMENSIONS.
4. ALL PULLING EYES SHALL BE DESIGNED FOR MULTIDIRECTIONAL CABLE PULLS.
5. ALL PIPE SIZES ARE NOMINAL.

ISSUED FOR PERMIT

PRELIMINARY - NOT FOR CONSTRUCTION

ROBBYN LYNN REED
No. 11127
REGISTERED PROFESSIONAL ENGINEER CIVIL

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A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

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REVOLUTION WIND
SPLICE VAULT DETAILS
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD	CHK M. DAGENAIS–BMcD	APP N. SCOTT–BMcD
DATE 09/30/20	DATE 09/30/20	DATE 09/30/20
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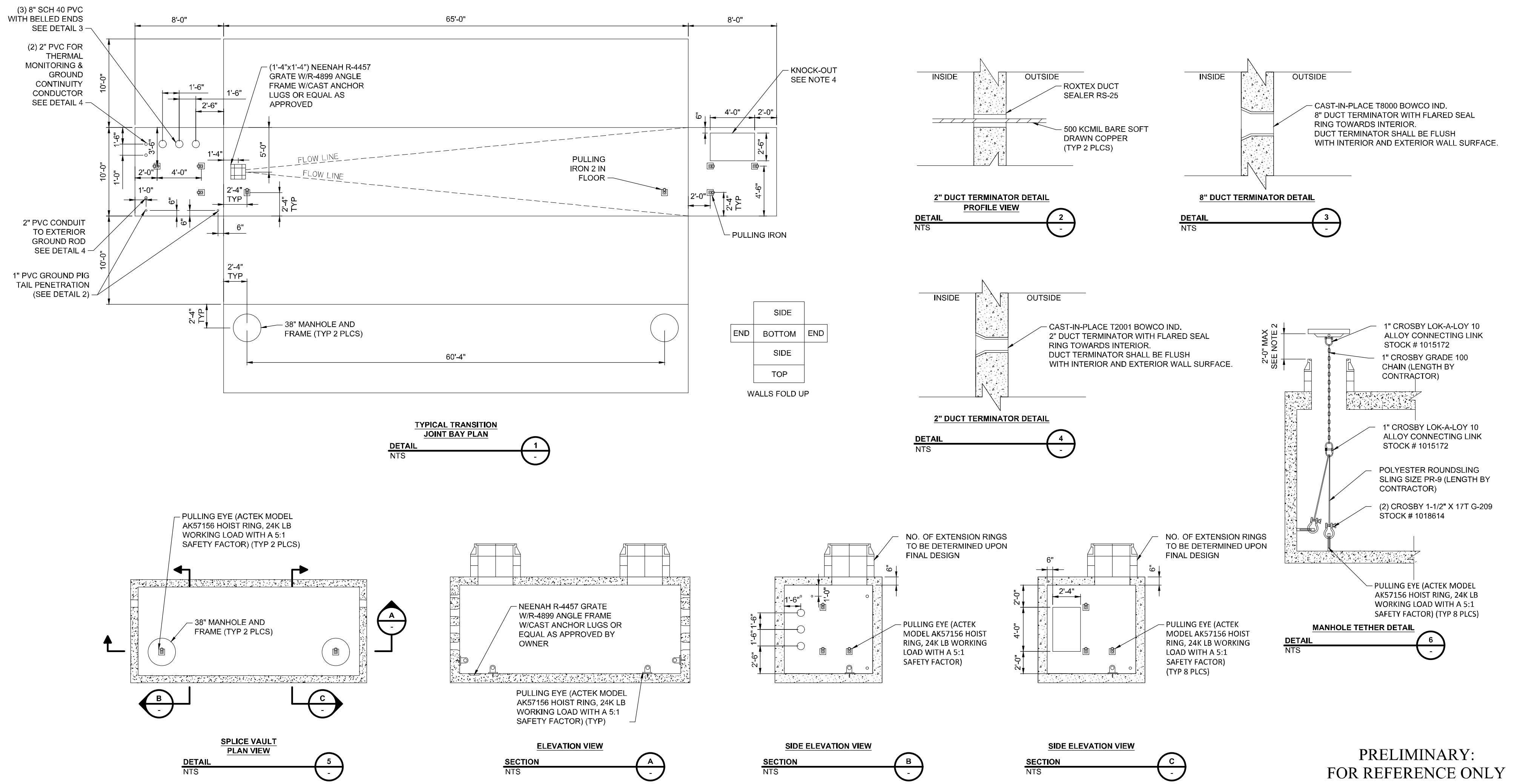
V-SCALE N.T.S.		

DWG NO. PG-21



PRELIMINARY:
FOR REFERENCE ONLY

NOTES:

1. TRANSITION JOINT BAY DIMENSIONS SHOWN ARE INSIDE DIMENSIONS.
2. ALL PULLING EYES SHALL BE DESIGNED FOR MULTIDIRECTIONAL CABLE PULLS.
3. ALL PIPE SIZES ARE NOMINAL.
4. CONCRETE KNOCK-OUT SHALL BE FREE OF REINFORCEMENT AND SHALL BE AVAILABLE FOR FUTURE PENETRATION OF PIPE AND CONDUIT FOR THE REFERENCED DIMENSIONS.
5. FERROUS REBAR WITHIN SPLICE CHAMBER WALLS SHALL NOT FORM A CLOSED LOOP AROUND ANY INDIVIDUAL 8" CONDUIT OPENING.
6. CONTRACTOR TO ADJUST TETHER SYSTEM FOR MAXIMUM COVER RISE OF 24".

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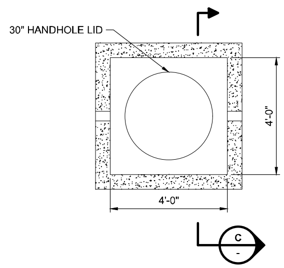
REVOLUTION WIND

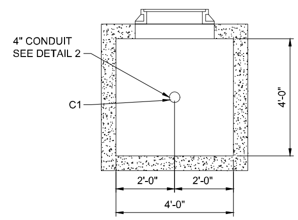
TRANSITION JOINT BAY DETAILS
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER-BMcD | CHK M. DAGENAIS-BMcD | APP N. SCOTT-BMcD
DATE 09/30/20 | DATE 09/30/20 | DATE 09/30/20
H-SCALE N.T.S. | SIZE ARCH D
V-SCALE N.T.S.
DWG NO. PG-22



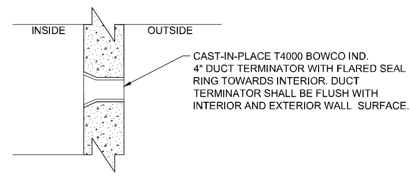
HANDHOLE PLAN VIEW

DETAIL 1 -
NTS



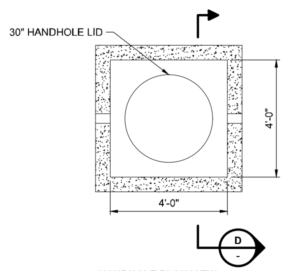
ELEVATION VIEW

SECTION C -
NTS



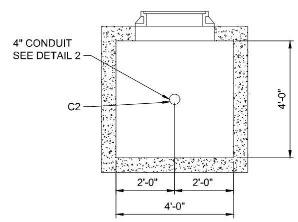
4" DUCT TERMINATOR DETAIL

DETAIL 2 -
NTS



HANDHOLE PLAN VIEW

DETAIL 3 -
NTS



ELEVATION VIEW

SECTION D -
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REVISIONS DURING CONSTRUCTION

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TITLE REVOLUTION WIND

HANDHOLE DETAILS
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD	CHK M. DAGENAIS–BMcD	APP N. SCOTT–BMcD	APP
DATE 09/30/20	DATE 09/30/20	DATE 09/30/20	DATE
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R.E. PROJ. NUMBER		DWG NO. PG-23	

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6/29/2021 9:49 AM – jbarringer – \\bmcd\dfs\Clients\TND\NUSC\126851_revwindeng\Design\underground\CADD\Working\21 VAULT AND HANDHOLE DETAILS.dwg – HANDHOLE

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TITLE REVOLUTION WIND

EXPORT RISER STRUCTURE DETAILS
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD	CHKD M. DAGENAIS–BMcD	APP N. SCOTT–BMcD	APP
DATE 09/30/20	DATE 09/30/20	DATE 09/30/20	DATE
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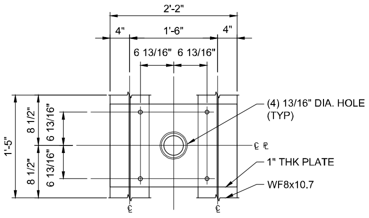
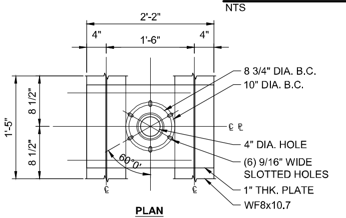
R.E. PROJ. NUMBER		DWG NO. PG-24	



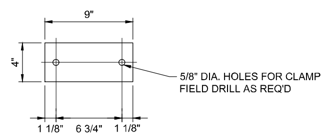
PLAN

DETAIL 3 CABLE TERMINATOR MOUNT
NTS



PLAN

DETAIL 4 ARRESTER MOUNT
NTS



DETAIL 5 CLAMP SHIM PLATE
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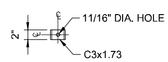

DETAIL 6 GROUNDING ATTACHMENT BRKT.
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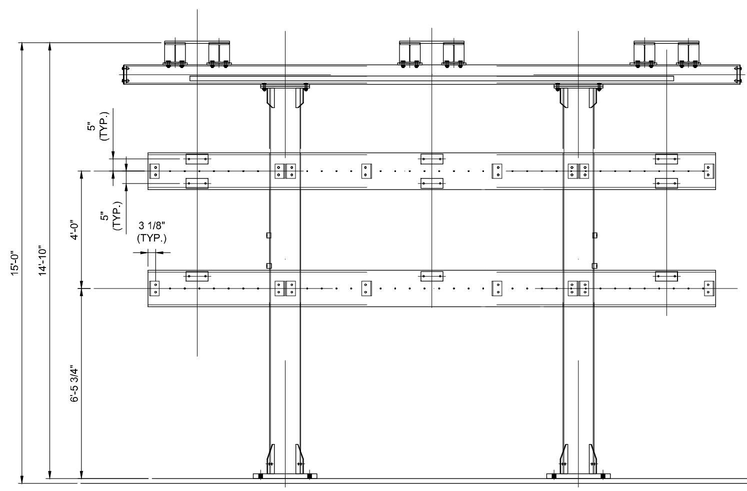
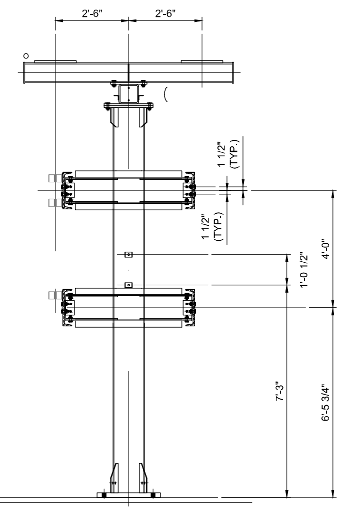


DETAIL 1 SUBSTATION FRONT VIEW
NTS



DETAIL 2 SUBSTATION SIDE VIEW
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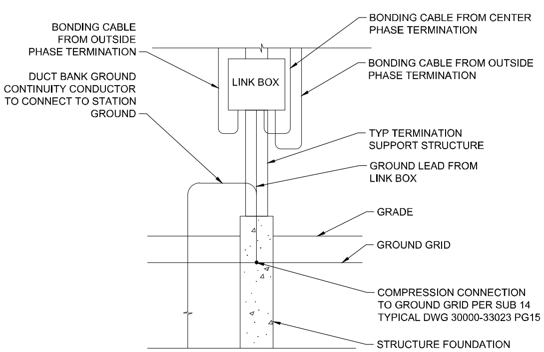
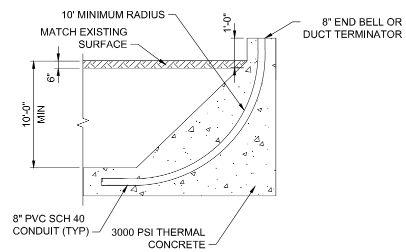


DETAIL 7 TYPICAL LINK BOX WIRING DIAGRAM
NTS



DETAIL 8 TERMINATION STRUCTURE SIDE ELEVATION
-

TERMINATION STRUCTURE NOTES:

1. FOR GENERAL NOTES, SEE DRAWING PG-02.
2. CABLE ACCESSORIES CONTRACTOR SHALL PROVIDE ALL MATERIALS TO COMPLETE CABLE AND CABLE BONDING INSTALLATION.
3. ANNULAR VOID BETWEEN CABLE AND CONDUIT SHALL BE SEALED WITH DUCT SEAL.
4. FOR CABLE ELEVATIONS SEE PLAN AND PROFILE DRAWINGS.

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REVOLUTION WIND

INTERCONNECT RISER STRUCTURE DETAILS
NORTH KINGSTOWN, RHODE ISLAND

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W.E. PROJ. NUMBER		DWG NO. PG-25	

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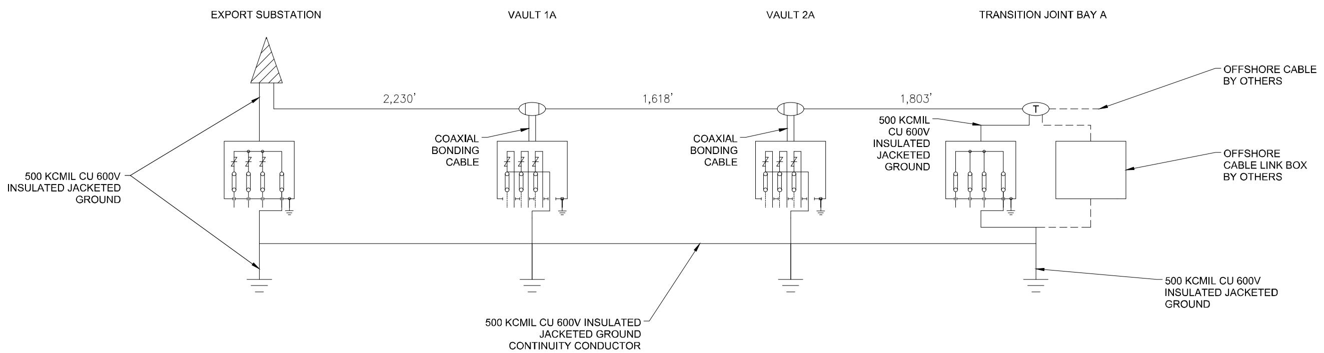
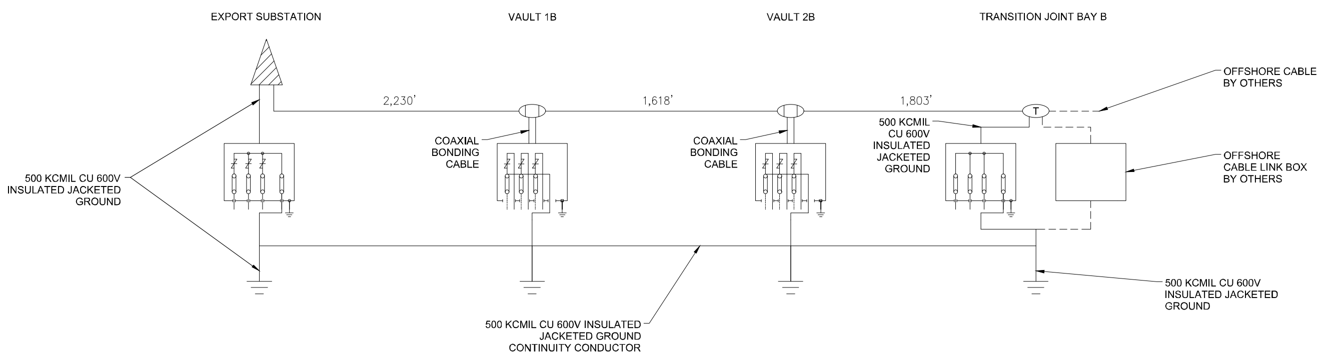


CIRCUIT A
EXPORT SUBSTATION
TO TRANSITION JOINT BAY A

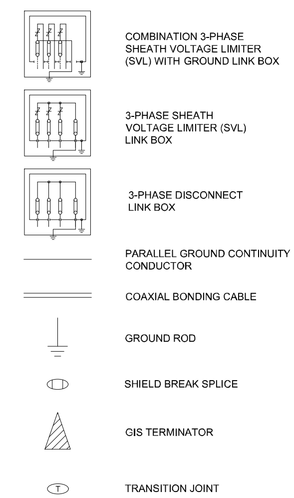
DETAIL 1 / -
NTS



CIRCUIT B
EXPORT SUBSTATION
TO TRANSITION JOINT BAY B

DETAIL 2 / -
NTS

LEGEND:



NOTES:

1. ALL LINK BOXES IN VAULTS TO HAVE VIEWING WINDOWS.

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TITLE
REVOLUTION WIND
EXPORT CABLE BONDING DIAGRAMS
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD	CHKD M. DAGENAIS–BMcD	APP N. SCOTT–BMcD	APP
DATE 09/30/20	DATE 09/30/20	DATE 09/30/20	DATE
H-SCALE N.T.S. / V-SCALE N.T.S.	SIZE ARCH D / V.S.	FIELD BOOK & PAGES / R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. PG-26	

6/29/2021 9:48 AM – jbarringer – \\bmcd\dfs\Clients\TND\NUSC\126851_revwindeng\Design\underground\CADD\Working\27 REV_WIND BONDING SCHEMATIC.dwg – PG-26 EXPORT CABLE BONDING DIAGRAMS

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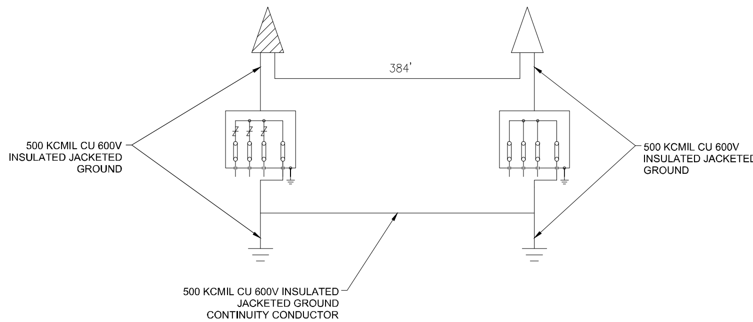

EXPORT SUBSTATION TO INTERCONNECT SUBSTATION DETAIL 1 / -

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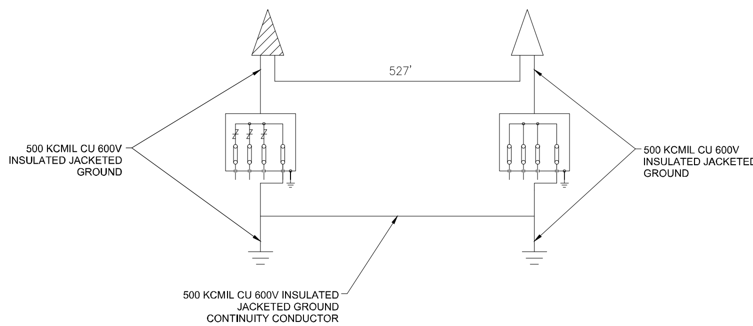

EXPORT SUBSTATION TO INTERCONNECT SUBSTATION DETAIL 2 / -

NTS

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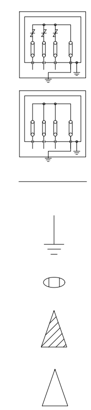

3-PHASE SHEATH VOLTAGE LIMITER (SVL) LINK BOX

3-PHASE DISCONNECT LINK BOX

PARALLEL GROUND CONTINUITY CONDUCTOR

GROUND ROD

SHIELD BREAK SPLICE

GIS TERMINATOR

OPEN AIR TERMINATOR

NOTES:

1. ALL LINK BOXES IN VAULTS TO HAVE VIEWING WINDOWS.

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REVOLUTION WIND
INTERCONNECT CABLE BONDING DIAGRAMS
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD	CHK M. DAGENAIS–BMcD	APP N. SCOTT–BMcD	APP
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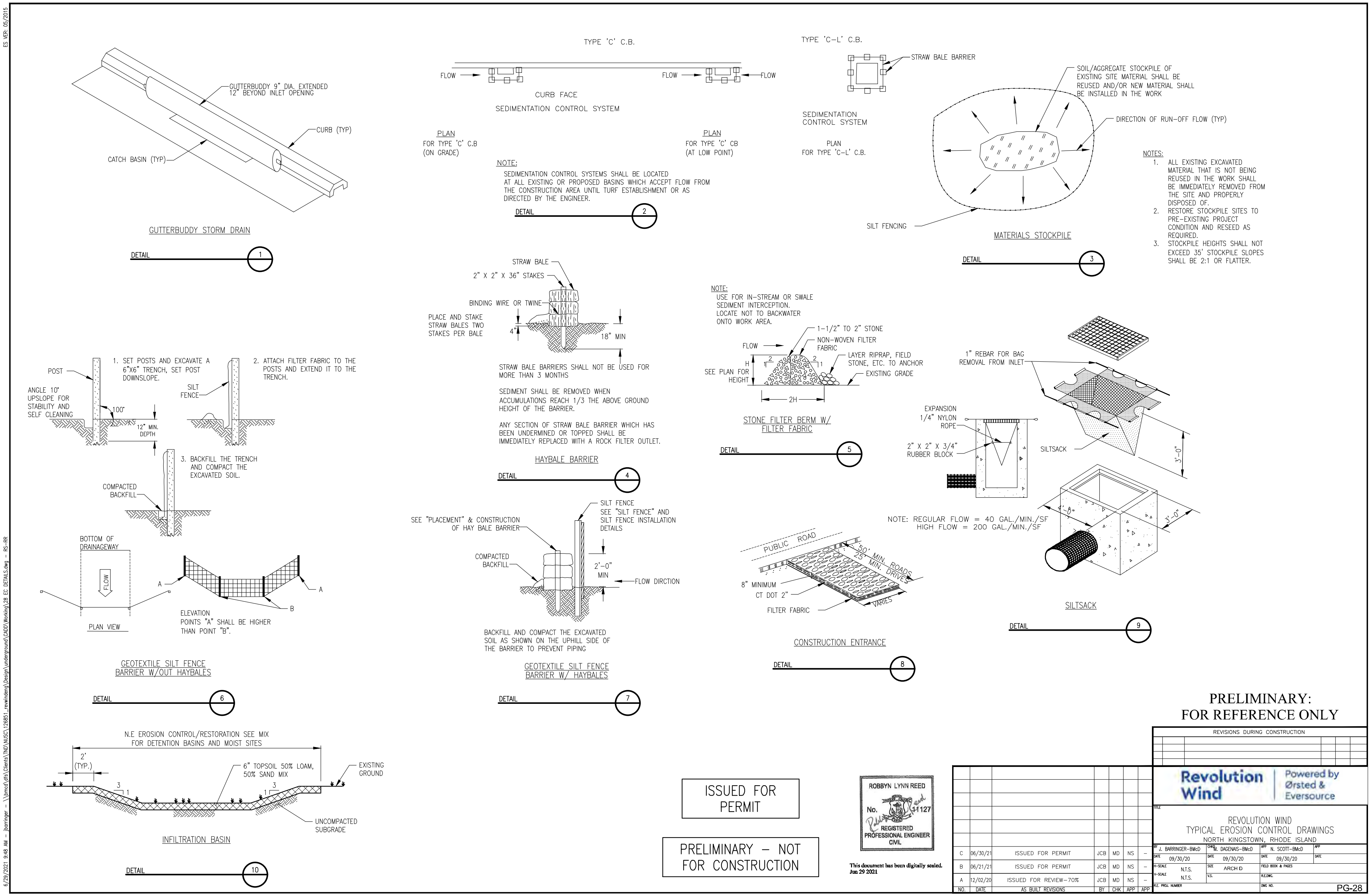

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GENERAL NOTES:

SEQUENCE OF BMP INSTALLATION AND REMOVAL NOTES

CONSTRUCTION MUST BE IN ACCORDANCE WITH THE FOLLOWING SCHEDULE. THIS SCHEDULE IS DESIGNED TO MINIMIZE SOIL EROSION AND SEDIMENTATION. THE CONTRACTOR MAY DEVIATE SLIGHTLY FROM THE STAGING OF PERMANENT SITE IMPROVEMENTS, BUT NO DEVIATION FROM THE RELATIVE ORDER OF EROSION AND SEDIMENTATION CONTROL MEASURES WILL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM LOCAL CONSERVATION DISTRICT (LCD) OR RISCC.

FACILITIES TO CONTROL THE TRANSPORT OF SOIL MATERIAL FROM THE CONSTRUCTION AREA SHALL BE INSTALLED PRIOR TO ANY EARTH DISTURBANCE.

NOTE: THE STAGING OF EARTHMOVING ACTIVITIES FOR THIS PROJECT IS A GENERAL DESCRIPTION OF THE WORK REQUIRED. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH PROJECT OWNER STANDARDS, THE RISCC REGULATIONS, AND ALL OTHER APPLICABLE FEDERAL, STATE OR LOCAL REQUIREMENTS.

ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE FOLLOWING SEQUENCE. EACH STAGE SHALL BE COMPLETED BEFORE ANY FOLLOWING STAGE IS INITIATED (EXCEPT AS INDICATED BELOW). DEVIATION FROM THAT SEQUENCE MUST BE APPROVED IN WRITING FROM THE LOCAL CONSERVATION DISTRICT /DEPARTMENT OF ENVIRONMENTAL CONSERVATION (RISCC). CLEARING & GRUBBING SHALL BE LIMITED TO THOSE AREAS DESCRIBED IN EACH STAGE.

THE CONTRACTOR IS ADVISED THAT ALL WORK BE COMPLETED IN COMPLIANCE WITH THE RISCC WETLANDS PERMIT.

1. SCHEDULE WORK TO MINIMIZE THE LENGTH OF TIME THAT BARE SOIL WILL BE EXPOSED TO THE ELEMENTS.
2. FOLLOW THE CONSTRUCTION/EROSION CONTROL IMPLEMENTATION PLAN AS OUTLINED ON THE DRAWINGS.
3. IMPLEMENT CONTROL MEASURES AS SPECIFIED; HOWEVER, THE CONTRACTOR MAY INSERT ADDITIONAL CONSTRUCTION PHASES IN ORDER TO EXPEDITE HIS WORK.
4. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BMPS TO MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENT POLLUTION AND NOTIFY THE LCD/RISCC.
5. ALL OFF-SITE WASTE AND BORROW AREAS MUST HAVE AN E&S PLAN APPROVED BY THE LOCAL COUNTY CONSERVATION DISTRICT OR RISCC FULLY IMPLEMENTED PRIOR TO BEING ACTIVATED. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE REMOVAL OF ANY EXCESS MATERIAL, NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT CONDITIONS, AND/OR OTHER STATE AND FEDERAL REGULATIONS.
6. CONSTRUCTION SEQUENCE IS AS FOLLOWS:
7. PRE-CONSTRUCTION MEETING TO BE HELD BY PROJECT MANAGER, A REPRESENTATIVE FROM RHODE ISLAND STATE CONSERVATION COMMITEE (RISCC) (IF REQUIRED BY PERMIT CONDITIONS), ALL CONTRACTORS INVOLVED IN EARTH DISTURBANCE ACTIVITIES, AND THE OPERATOR'S ENGINEER PRIOR TO LAND DISTURBING ACTIVITIES. PROVIDE THE REQUIRED 7 DAY NOTICE FOR SCHEDULING OF THE PRE-CONSTRUCTION MEETING. ALL PARTIES LISTED ARE REQUIRED TO ATTEND.
8. CONTRACTOR TO INSTALL TEMPORARY CONSTRUCTION FENCE, TEMPORARY CONSTRUCTION ENTRANCE, AND SILT FENCE AROUND THE SITE.
9. CONTRACTOR TO BEGIN CLEARING AND GRUBBING OF THE SITE, CHIPS and TOPSOIL TO BE DISPOSED OF AT AN APPROVAL OFFSITE LOCATION.
10. CONTRACTOR TO PREPARE SITE FOR DRILLING OPERATION INCLUDING MOBILIZATION AND SET UP OF DRILLING EQUIPMENT AND OTHER NECESSARY ITEMS.
11. REMOVE SEDIMENT FROM BEHIND SILT FENCE, AS REQUIRED. REMOVAL SHALL BE ON A PERIODIC BASIS (EVERY SIGNIFICANT RAINFALL) OR AS NECESSARY TO ENSURE PROPER FUNCTION OF THE FILTER SOCK. INSPECTION OF EROSION CONTROL MEASURES SHALL BE ON A WEEKLY BASIS. SEDIMENT COLLECTED SHALL BE DEPOSITED AND SPREAD EVENLY UPLAND ON SLOPES DURING CONSTRUCTION.
12. CONTRACTOR TO BEGIN HORIZONTAL DIRECTIONAL DRILLING (HDD) OPERATIONS.
13. IMMEDIATELY AFTER EARTH DISTURBANCE ACTIVITIES CEASE LONGER THAN 14 DAYS IN ANY AREA OR SUBAREA OF THE PROJECT, THE OPERATOR SHALL STABILIZE ALL DISTURBED AREAS.
14. CONTRACTOR TO COMPLETE DRILLING OPERATIONS & RESTORE SITE PER THE PLAN.
15. DURING NON-GERMINATING MONTHS, PROTECTIVE BLANKETING SHALL BE APPLIED AS DESCRIBED IN THE PLAN. AREAS NOT AT FINISHED GRADE, WHICH WILL BE REACTIVATED WITHIN 1 YEAR, MAY BE STABILIZED IN ACCORDANCE WITH THE TEMPORARY STABILIZATION SPECIFICATIONS. THOSE AREAS WHICH WILL NOT BE REACTIVATED WITHIN 1 YEAR SHALL BE STABILIZED IN ACCORDANCE WITH THE PERMANENT STABILIZATION SPECIFICATIONS.
16. FINAL GRADES SHALL REFLECT PRE-CONSTRUCTION ELEVATIONS. BACKFILL AS NEEDED WITH A CLEAN LOAMY SAND AND SEED. PLACEMENT OF TOPSOIL, FERTILIZER, AND MULCH SHALL ONLY BE WITHIN THE DESIGNATED ROAD SHOULDER AREA, OUTSIDE THE LIMITS OF THE "CLEARING AREA". A PROTECTIVE BLANKET OF COIR MAT 400, OR APPROVED EQUIVALENT, SHALL BE PLACED OVER SEED IN THE "CLEARING AREA".SEED MIXTURE TO BE INSTALLED MARCH 15- MAY 15 OR AUGUST 15 - SEPTEMBER 30.
17. ALL AREAS THAT HAVE BEEN DISTURBED WHICH HAVE REACHED FINAL GRADE SHALL BE PERMANENTLY STABILIZED.
18. REMOVE SILT FENCE AFTER ALL EXPOSED SURFACES ARE STABILIZED. REMOVE TEMPORARY CONSTRUCTION FENCING.
19. AN AREA SHALL BE CONSIDERED TO HAVE ACHIEVED FINAL STABILIZATION WHEN IT HAS A MINIMUM UNIFORM 80% PERENNIAL VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED SURFACE EROSION AND SUBSURFACE CHARACTERISTICS SUFFICIENT TO RESIST SLIDING AND OTHER MOVEMENTS.

STANDARD EROSION & SEDIMENTATION CONTROL PLAN NOTES

1. ALL EARTH DISTURBANCES, INCLUDING CLEARING AND GRUBBING AS WELL AS CUTS AND FILLS SHALL BE DONE IN ACCORDANCE WITH THE APPROVED E&S PLAN. A COPY OF THE APPROVED DRAWINGS (STAMPED, SIGNED AND DATED BY THE REVIEWING AGENCY) MUST BE AVAILABLE AT THE PROJECT SITE AT ALL TIMES. THE REVIEWING AGENCY SHALL BE NOTIFIED OF ANY CHANGES TO THE APPROVED PLAN PRIOR TO IMPLEMENTATION OF THOSE CHANGES. THE REVIEWING AGENCY MAY REQUIRE A WRITTEN SUBMITTAL OF THOSE CHANGES FOR REVIEW AND APPROVAL AT ITS DISCRETION.
2. AT LEAST 7 DAYS PRIOR TO THE PRE-CONSTRUCTION MEETING, THE OWNER AND/OR OPERATOR SHALL INVITE ALL CONTRACTORS, THE LANDOWNER, APPROPRIATE MUNICIPAL OFFICIALS, THE E&S PLAN PREPARER, THE LICENSED PROFESSIONAL RESPONSIBLE FOR OVERSIGHT OF CRITICAL STAGES OF IMPLEMENTATION OF THE PCSM PLAN, AND A REPRESENTATIVE FROM THE RISCC TO AN ON-SITE PRE-CONSTRUCTION MEETING.
3. AT LEAST 72 HOURS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, OR EXPANDING INTO AN AREA PREVIOUSLY UNMARKED, THE CONTRACTOR SHALL CONTACT 811 DIG SAFE RI (1-888-DIGSAFE) FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES.
4. ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE SEQUENCE PROVIDED ON THE PLAN DRAWINGS. DEVIATION FROM THAT SEQUENCE MUST BE APPROVED IN WRITING FROM THE RISCC PRIOR TO IMPLEMENTATION.
5. CLEARING, GRUBBING, AND TOPSOIL STRIPPING SHALL BE LIMITED TO THOSE AREAS DESCRIBED IN EACH STAGE OF THE CONSTRUCTION SEQUENCE. ALL MATERIAL CLEARED, GRUBBED, OR STRIPPED FROM THE SITE SHALL BE TRANSPORTED AND DISPOSED OFFSITE AT A PRE-APPROVED FACILITY. GENERAL SITE CLEARING, GRUBBING AND TOPSOIL STRIPPING MAY NOT COMMENCE IN ANY STAGE OR PHASE OF THE PROJECT UNTIL THE EROSION AND SEDIMENT BEST MANAGEMENT PRACTICES SPECIFIED BY THE BMP SEQUENCE FOR THAT STAGE OR PHASE HAVE BEEN INSTALLED AND ARE FUNCTIONING AS DESCRIBED IN THIS E&S PLAN.
6. AT NO TIME SHALL CONSTRUCTION VEHICLES BE ALLOWED TO ENTER AREAS OUTSIDE THE LIMIT OF DISTURBANCE BOUNDARIES SHOWN ON THE PLAN MAPS. THESE AREAS MUST BE CLEARLY MARKED AND FENCED OFF BEFORE CLEARING AND GRUBBING OPERATIONS BEGIN.
7. TOPSOIL AND CLEAN LOAMY SAND BACKFILL SHALL BE STOCKPILED IN SEPARATED PILES AT THE LOCATION(S) SHOWN ON THE PLAN MAPS(S) IN THE AMOUNT NECESSARY TO COMPLETE THE FINISH GRADING OF ALL EXPOSED AREAS THAT ARE TO BE STABILIZED BY VEGETATION. TOPSOIL SHALL ONLY BE UTILIZED FOR THE ESTABLISHMENT OF TURF GRASS WITHIN THE DESIGNATED ROAD SHOULDER AREA. EACH STOCKPILE SHALL BE PROTECTED IN THE MANNER SHOWN ON THE PLAN DRAWINGS. STOCKPILE HEIGHTS SHALL NOT EXCEED 35 FEET. STOCKPILE SLOPES SHALL BE 3H: 1V OR FLATTER. STOCKPILES SHALL BE PROTECTED FROM WIND AND WATER EROSION BY COVERING DAILY WITH A TARP AND SURROUNDING WITH SILT FENCE OR STRAW BALES.
8. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/ORSEDIMENT POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES TO MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENT POLLUTION AND NOTIFY THE RISCC.
9. ALL OFF-SITE WASTE AND BORROW AREAS MUST HAVE AN E&S PLAN APPROVED BY THE LOCAL AUTHORITY OR THE RISCC AND FULLY IMPLEMENTED PRIOR TO BEING ACTIVATED.
10. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ANY MATERIAL BROUGHT ON SITE IS CLEAN FILL, AND DOES NOT CONTAIN ANY CONSTITUENTS THAT WOULD BE DELETERIOUS TO PLANT GROWTH OR AQUATIC ORGANISMS.
11. ALL PUMPING OF WATER FROM ANY WORK AREA SHALL BE DONE ACCORDING TO THE PROCEDURE DESCRIBED IN THIS PLAN, OVER UNDISTURBED VEGETATED AREAS AND AT A NON-EROSIVE VELOCITY.
12. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT BMPS SHALL BE MAINTAINED PROPERLY. MAINTENANCE SHALL INCLUDE INSPECTIONS OF ALL EROSION AND SEDIMENT BMPS AFTER EACH RUNOFF EVENT AND ON A WEEKLY BASIS. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK, INCLUDING CLEAN OUT, REPAIR, REPLACEMENT, REGRADING, RESEEDING, REMULCHING AND RENETTING MUST BE PERFORMED IMMEDIATELY. IF THE E&S BMPS FAIL TO PERFORM AS EXPECTED, REPLACEMENT BMPS, OR MODIFICATIONS OF THOSE INSTALLED WILL BE REQUIRED.
13. A LOG SHOWING DATES THAT E&S BMPS WERE INSPECTED AS WELL AS ANY DEFICIENCIES FOUND AND THE DATE THEY WERE CORRECTED SHALL BE MAINTAINED ON THE SITE AND BE MADE AVAILABLE TO REGULATORY AGENCY OFFICIALS AT THE TIME OF INSPECTION.
14. SEDIMENT TRACKED ONTO ANY PUBLIC ROADWAY OR SIDEWALK SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY AND DISPOSED IN THE MANNER DESCRIBED IN THIS PLAN. IN NO CASE SHALL THE SEDIMENT BE WASHED, SHOVELED, OR SWEPT INTO ANY ROADSIDE DITCH, STORM SEWER, OR SURFACE WATER.
15. ALL SEDIMENT REMOVED FROM BMPS SHALL BE DISPOSED OF IN THE MANNER DESCRIBED IN THE PLAN.
16. ROADWAY SHOULDERS THAT WILL BE SEEDED TO GRASS TURF (MIX#1) ARE TO RECEIVE TOPSOIL, AND SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 3 TO 5 INCHES -- 6 TO 12 INCHES ON COMPACTED SOILS -- PRIOR TO PLACEMENT OF TOPSOIL. ROADWAY SHOULDERS TO BE VEGETATED SHALL HAVE A MINIMUM 4 INCHES OF TOPSOIL IN PLACE PRIOR TO SEEDING. ALL OTHER DISTURBED AREAS THAT WILL BE SEEDED TO NATIVE GRASSES (SEED MIXTURES #2 & #3) SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 6 INCHES PRIOR TO PLACEMENT OF CLEAN LOAMY SAND. A PROTECTIVE BLANKET OF COIR MAT 400, OR APPROVED EQUIVALENT, SHALL BE PLACED OVER SEED IN THE "CLEARING AREA".
17. ALL FILL SOILS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
18. ALL EARTHEN FILLS SHALL BE PLACED IN COMPACTED LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
19. FILL SOILS SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
20. FROZEN MATERIALS OR SOFT, MUCKY, OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED INTO FILLS.
21. FILL SHALL NOT BE PLACED OR COMPACTED ON SATURATED OR FROZEN SURFACES.
22. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE RI ECP STANDARD SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
23 ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY UPON REACHING FINISHED GRADE. FINISHED GRADES SHALL REFLECT PRE-CONSTRUCTION CONDITIONS. SEEDED AREAS WITHIN 15 FEET OF A SURFACE WATER, OR AS OTHERWISE SHOWN ON THE PLAN DRAWINGS, SHALL BE COVERED WITH AN EROSION CONTROL BLANKET ACCORDING TO THE STANDARDS OF THIS PLAN.
24. IMMEDIATELY AFTER EARTH DISTURBANCE ACTIVITIES CEASE IN ANY AREA OR SUBAREA OF THE PROJECT, THE OPERATOR SHALL STABILIZE ALL DISTURBED AREAS. DURING NON-GERMINATING MONTHS, PROTECTIVE EROSION CONTROL BLANKETING SHALL BE APPLIED AS DESCRIBED IN THE PLAN. AREAS NOT AT FINISHED GRADE, WHICH WILL BE REACTIVATED WITHIN 1 YEAR, MAY BE STABILIZED IN ACCORDANCE WITH THE TEMPORARY STABILIZATION SPECIFICATIONS. THOSE AREAS WHICH WILL NOT BE REACTIVATED WITHIN 1 YEAR SHALL BE STABILIZED IN ACCORDANCE WITH THE PERMANENT STABILIZATION SPECIFICATIONS.
25. PERMANENT STABILIZATION IS DEFINED AS A MINIMUM UNIFORM, PERENNIAL 80% VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED EROSION. CUT AND FILL SLOPES SHALL BE CAPABLE OF RESISTING FAILURE DUE TO SLUMPING, SLIDING, OR OTHER MOVEMENTS.
26. E&S BMPS SHALL REMAIN FUNCTIONAL AS SUCH UNTIL ALL AREAS TRIBUTARY TO THEM ARE PERMANENTLY STABILIZED OR UNTIL THEY ARE REPLACED BY ANOTHER BMP APPROVED BY THE LOCAL CONSERVATION DISTRICT OR THE DEPARTMENT.
27. AFTER FINAL SITE STABILIZATION HAS BEEN ACHIEVED, TEMPORARY EROSION AND SEDIMENT BMPS MUST BE REMOVED OR CONVERTED TO PERMANENT POST CONSTRUCTION STORMWATER MANAGEMENT BMPS. AREAS DISTURBED DURING REMOVAL OR CONVERSION OF THE BMPS SHALL BE STABILIZED IMMEDIATELY. IN ORDER TO ENSURE RAPID REVEGETATION OF DISTURBED AREAS, SUCH REMOVAL/CONVERSIONS ARE TO BE DONE ONLY DURING THE GERMINATING SEASON.
28. FAILURE TO CORRECTLY INSTALL E&S BMPS, FAILURE TO PREVENT SEDIMENT-LADEN RUNOFF FROM LEAVING THE CONSTRUCTION SITE, OR FAILURE TO TAKE IMMEDIATE CORRECTIVE ACTION TO RESOLVE FAILURE OF E&S BMPS MAY RESULT IN ADMINISTRATIVE, CIVIL, AND/OR CRIMINAL PENALTIES.
29. CONCRETE WASH WATER SHALL IN NO CASE BE ALLOWED TO ENTER ANY SURFACE WATERS OR GROUNDWATER SYSTEMS.
30. EROSION CONTROL BLANKETING SHALL BE INSTALLED ON ALL SLOPES STEEPER THAN 3H:1V OR WITHIN 15 FEET OF A SURFACE WATER AND ON ALL OTHER DISTURBED AREAS SPECIFIED ON THE PLAN MAPS AND/OR DETAIL SHEETS.

NOTICES TO CONTRACTOR

1. THE CONTRACTOR SHALL VERIFY AND ADHERE TO ALL REQUIRED PERMITS PRIOR TO STARTING WORK.
2. THE CONTRACTOR SHALL ASSURE THAT THE APPROVED EROSION AND SEDIMENT CONTROL PLAN IS PROPERLY AND COMPLETELY IMPLEMENTED.
3. ALL WORK WITHIN THE PUBLIC RIGHT-OF-WAY SHALL BE COORDINATED WITH THE AGENCY HAVING JURISDICTION.

GENERAL EROSION & SEDIMENT CONTROL NOTES

1. AT MINIMUM, ALL BMPs ARE TO BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT. A WRITTEN REPORT MUST ALSO BE COMPLETED, DOCUMENTING EACH INSPECTION AND, IF NECESSARY, ANY REPAIR, REPLACEMENT OR MAINTENANCE ACTIVITY.
2. INSPECT SNOW PLACEMENT AREAS DURING THE THAW CYCLE. INSTALL EROSION & SEDIMENT CONTROL BMPs DURING QUICK THAWS AND WHEN SNOW MELT RUNOFF IS CONCENTRATED OR IS CAUSING EROSION.
3. DISCHARGING SEDIMENT LADEN WATER WHICH WILL CAUSE OR CONTRIBUTE TO THE DEGRADATION OF A BENEFICIAL USE OF A WATER OF THE STATE FROM THE CONSTRUCTION SITE, A DEWATERING SITE, OR SEDIMENT BASIN/TRAP INTO ANY WATER BODY, WETLAND OR STORM DRAIN WITHOUT FILTRATION OR EQUIVALENT TREATMENT IS PROHIBITED.
4. DISCHARGES ORIGINATING FROM OFF-SITE SOURCES, WHICH FLOW THROUGH OR ACROSS THE AREAS DISTURBED BY CONSTRUCTION, SHALL BE DIVERTED AROUND THE ACTIVE CONSTRUCTION AREA WHENEVER POSSIBLE.
5. STAGING AREAS, ASSEMBLY AREAS, TEMPORARY EQUIPMENT AND NON-HAZARDOUS MATERIAL STORAGE AREAS SHALL BE LOCATED OUTSIDE THE 100-YR FLOOD ZONE. HAZARDOUS MATERIAL STORAGE AREAS SHALL BE LOCATED AT LEAST 100 FEET BACK FROM SURFACE WATER BODIES.
6. ALL EXCAVATED MATERIALS THAT WILL NOT BE USED ON THE SITE CANNOT BE STORED IN THE FLOODPLAIN AND MUST BE HAULED TO A DISPOSAL SITE LOCATED OUTSIDE OF THE FLOODPLAIN.
7. CONSTRUCTION STAGING AREAS AND TEMPORARY SOIL STOCKPILES SHALL BE LOCATED A MINIMUM OF 100 FEET AWAY FROM THE EDGE OF A WETLAND OR OTHERWISE RISCC APPROVED SEPARATION DISTANCE.
8. MEASURES SHALL BE TAKEN TO PREVENT TRENCHES FROM DRAINING A WETLAND OR CHANGING ITS HYDROLOGY.
9. IT IS DESIRED THAT THE AMOUNT AND DURATION OF ANY OPEN TRENCHING BE MINIMIZED DURING THE PROJECT.
10. IF STOCKPILES ARE EXPOSED FOR GREATER THAN 14 DAYS, THEY SHALL BE SEEDED WITH AN ANNUAL SEED MIXTURE AND MULCHED WITH STRAW AS SPECIFIED BY THE PROJECT OWNER.

INTERIM AND PERMANENT STABILIZATION

1. INTERIM STABILIZATION

   TEMPORARY SEEDING FOR INTERIM STABILIZATION IS A TYPE OF BMP THAT MUST BE PROVIDED WHERE LAND DISTURBANCE IS NECESSARY, AND EXPOSED FOR MORE THAN 14 DAYS UNLESS DIRECTED BY THE PROJECT OWNER.

   THE INSTALLATION OF AN EROSION CONTROL BLANKET UPON SEEDED AREAS IS CONSIDERED TO BE AN INTERIM STABILIZATION BMP TO PROTECT THE SEEDBED UNTIL VEGETATION IS ESTABLISHED.

2. PERMANENT STABILIZATION

   UPON COMPLETION OF ANY EARTH DISTURBANCE ACTIVITY, THE SITE SHALL BE IMMEDIATELY SEEDED, OR OTHERWISE PROTECTED FROM ACCELERATED EROSION AND SEDIMENTATION. A PROTECTIVE BLANKET OF COIR MAT 400, OR APPROVED EQUIVALENT, SHALL BE PLACED OVER SEED IN THE "CLEARING AREA".

   THE STANDARD FOR VEGETATIVE COVER AS STABILIZATION IS PERENNIAL VEGETATION THAT IS ESTABLISHED WITH A UNIFORM COVERAGE DENSITY OF 80% ACROSS THE DISTURBED AREA. THE APPLICATION OF SEED IS DONE TO ACHIEVE PERMANENT STABILIZATION.

3. STABILIZATION DURING NON-GROWING SEASONS

   WHEN UTILITY CONSTRUCTION MUST BE DONE AND IS COMPLETED DURING A NON-GROWING SEASON, INTERIM STABILIZATION BMPs MUST BE IMPLEMENTED AND ADEQUATELY MAINTAINED. THE BMPs SHOULD BE INSPECTED WEEKLY (UNLESS SNOW COVERED) TO IDENTIFY AREAS THAT BECOME BARE.

   BARE AREAS SHOULD BE COVERED WITH A PROPERLY INSTALLED EROSION CONTROL BLANKET. ALL TEMPORARY EROSION AND SEDIMENT POLLUTION CONTROLS MUST BE MAINTAINED UNTIL PERENNIAL VEGETATION IS ESTABLISHED.

4. WHERE REQUIRED, ALONG THE ROAD SHOULDER, STRAW MULCH MUST BE APPLIED AT A MINIMUM OF 2.0 TONS PER ACRE. STRAW MULCH SHALL NOT BE APPLIED WITHIN THE DEGINATED "CLEARING AREAS".
5. STRAW MULCH SHALL BE APPLIED IN LONG STRANDS, NOT FINELY CHOPPED OR BROKEN.
6. THE PLACEMENT OF FERTILIZER AND LIME SHALL ONLY BE WITHIN THE DESIGNATED ROAD SHOULDER, OUTSIDE THE LIMITS OF THE "CLEARING AREA". PRIOR TO ANY SEEDING, LIME OR FERTILIZATION APPLICATION, A SOIL TEST SHALL BE PERFORMED TO DETERMINE THE pH FACTOR AND GUIDE THE APPLICATION RATE.
7. SEED DISTURBED AREAS PER THE EROSION AND SEDIMENT CONTROL PLANS. IN AREAS OF STEEP SLOPES OR OBVIOUS AREAS WHERE POTENTIAL EROSION MAY OCCUR, AN EROSION CONTROL MAT OR FLEXIBLE GROWTH MEDIUM (FGM) SHALL BE USED. FGM SHALL BE APPLIED PER MANUFACTURER SPECIFICATIONS. FERTILIZER AND MULCH SHALL ONLY BE WITHIN THE DESIGNATED ROAD SHOULDER AREA, OUTSIDE THE LIMITS OF THE "CLEARING AREA".

PRELIMINARY:
FOR REFERENCE ONLY

ISSUED FOR PERMIT

PRELIMINARY – NOT FOR CONSTRUCTION

ROBBYN LYNN REED
No. 11127
REGISTERED PROFESSIONAL ENGINEER
CIVIL

This document has been digitally sealed.
Jun 29 2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP
C	06/30/21	ISSUED FOR PERMIT	JCB	MD	NS	–
B	06/21/21	ISSUED FOR PERMIT	JCB	MD	NS	–
A	12/02/20	ISSUED FOR REVIEW–70%	JCB	MD	NS	–

Revolution Wind | Powered by Ørsted & Eversource

TITLE
REVOLUTION WIND
EROSION CONTROL NOTES
NORTH KINGSTOWN, RHODE ISLAND

BY J. BARRINGER–BMcD	CHK M. DAGENAIS–BMcD	APP N. SCOTT–BMcD	APP
DATE 09/30/20	DATE 09/30/20	DATE 09/30/20	DATE
H–SCALE N.T.S.	SIZE ARCH D	FIELD BOOK & PAGES	
V–SCALE N.T.S.	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	PG-29

6/29/2021 9:52 AM – jbarringer – \\bmcd\dfs\Clients\TND\NUSC\126851_revwindeng\Design\underground\CADD\Working\29 EC NOTES.dwg – 29 EC NOTES

\\BMCD\DFS\CLIENTS\TND\NUSC\126851_REVWINDENG\DESIGN\UNDERGROUND\CADD\WORKING\29 EC NOTES.DWG 6/29/2021 9:52 AM JBARRINGER

SESC Plans

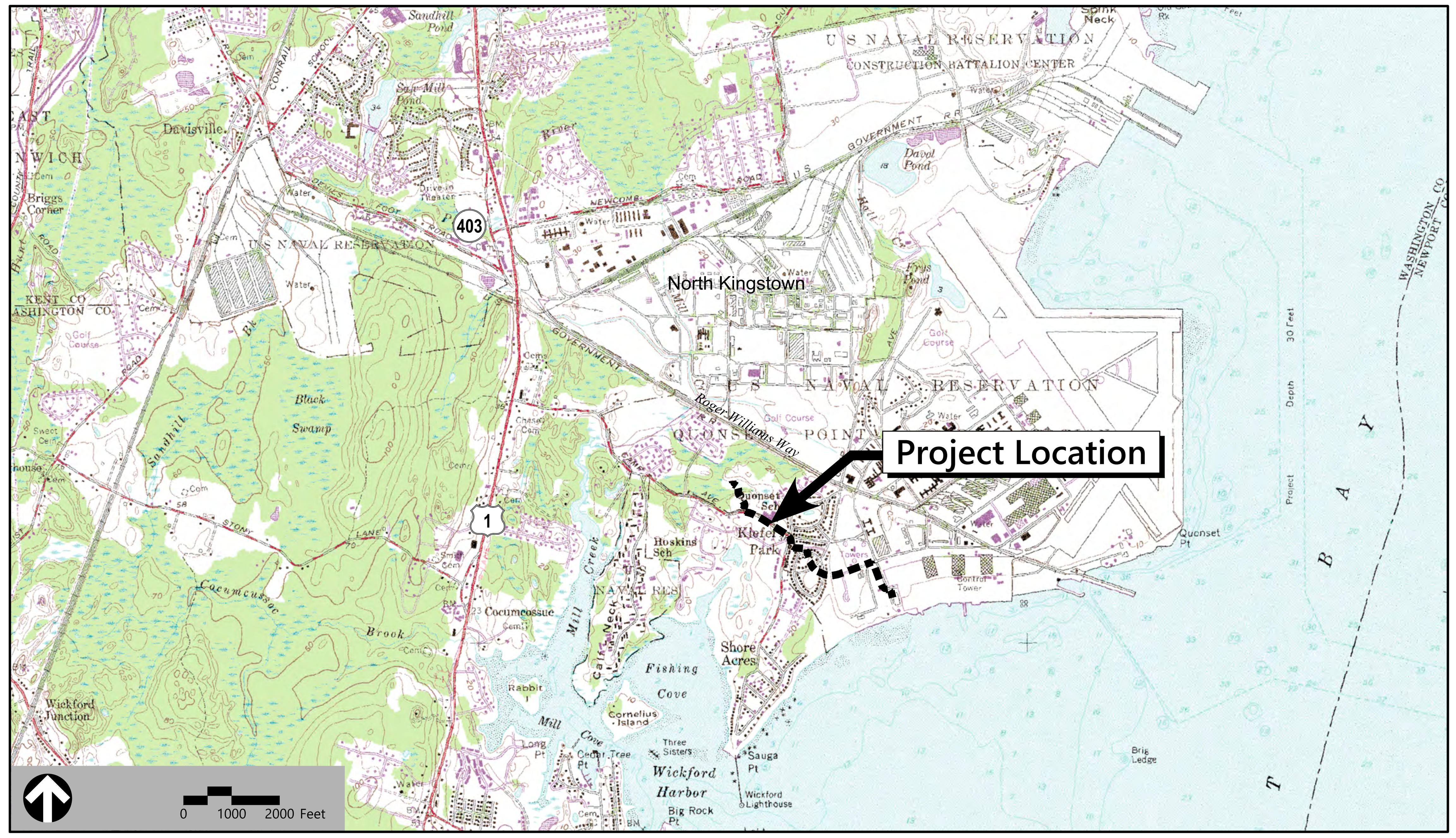
Issued for	RIPDES Permitting
Date Issued	June 30, 2021
Latest Issue	June 30, 2021

Revolution Wind Proposed Onshore Cable Transmission Route

North Kingstown, RI

Revolution Wind
Powered by Ørsted & Eversource

vhb.com
vhb
1 Cedar Street
Suite 400
Providence, RI 02903
401.272.8100



Owner/Applicant

Revolution Wind, LLC
56 Exchange Terrace
Suite 300
Providence, RI 02903

Assessor's Map: 179
Lots: 001, 030

Sheet Index

For more information see plans titled:
275-KV and 115-KV Transmission Line Onshore Cable Route
Underground Transmission Line Construction Contract Drawings
by Burns & McDonnell
9400 Ward Parkway
Kansas City, MO 64114

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

VHB Project : 73032.01 Revolution Wind Proposed Cable Route
Issued for : RIPDES 06/30/2021

\\VHB\GBL\PROJ\PROVIDENCE\73032.01 RWF-EXPORT CABLE (2)\CAD\EV\PLANSET\SESC\SESC COV 29 June 2021

ES VER: 05/2015

Legend

Exist. | Prop.

- PROPERTY LINE
- PROJECT LIMIT LINE
- RIGHT-OF-WAY/PROPERTY LINE
- EASEMENT
- BUILDING SETBACK
- PARKING SETBACK
- BASELINE (10+00)
- CONSTRUCTION LAYOUT
- ZONING LINE
- TOWN LINE
- LIMIT OF DISTURBANCE
- WETLAND LINE WITH FLAG
- FLOODPLAIN
- AREA OF LAND WITHIN 50' FEET
- 100' FOOT RIVERBANK WETLAND
- BORDERING LAND SUBJECT TO FLOODING (BLSF)
- WETLAND BUFFER ZONE (BZ)
- NO DISTURB ZONE (NDZ)
- 200' RIVERFRONT AREA (200'RA)
- GRAVEL ROAD
- EDGE OF PAVEMENT (EOP)
- BITUMINOUS BERM (BB)
- BITUMINOUS CURB (BC)
- CONCRETE CURB (CC)
- CURB AND GUTTER (CG)
- EXTRUDED CONCRETE CURB (ECC)
- MONOLITHIC CONCRETE CURB (MCC)
- PRECAST CONC. CURB (PCC)
- SLOPED GRAN. EDGING (SGE)
- VERT. GRAN. CURB (VGC)
- LIMIT OF CURB TYPE
- SAWCUT
- BUILDING
- BUILDING ENTRANCE
- LOADING DOCK (LD)
- BOLLARD
- SIGN
- DOUBLE SIGN
- STEEL GUARDRAIL
- WOOD GUARDRAIL
- PATH
- TREE LINE
- WIRE FENCE
- FENCE
- STOCKADE FENCE
- STONE WALL
- RETAINING WALL
- STREAM / POND / WATER COURSE
- DETENTION BASIN
- HAY BALES
- SILT FENCE
- SILT SOCK / STRAW WATTLE
- MINOR CONTOUR (4)
- MAJOR CONTOUR (20)

Exist. | Prop.

- CONCRETE
- HEAVY DUTY PAVEMENT
- BUILDINGS
- RIPRAP
- CONSTRUCTION EXIT
- WASHED CRUSHED STONE YARD
- TOP OF CURB ELEVATION (27.35 TC×)
- BOTTOM OF CURB ELEVATION (26.85 BC×)
- SPOT ELEVATION (132.75×)
- TOP & BOTTOM OF WALL ELEVATION (45.0 TW, 38.5 BW×)
- BORING LOCATION
- TEST PIT LOCATION
- MONITORING WELL (MW)
- UNDERDRAIN (UD)
- DRAIN (12"D)
- ROOF DRAIN (6"RD)
- SEWER (12"S)
- FORCE MAIN (FM)
- OVERHEAD WIRE (OHW)
- WATER (6"W)
- FIRE PROTECTION (4"FP)
- DOMESTIC WATER (2"DW)
- GAS (G)
- ELECTRIC (E)
- STEAM (STM)
- TELEPHONE (T)
- FIRE ALARM (FA)
- CABLE TV (CATV)
- CATCH BASIN CONCENTRIC
- CATCH BASIN ECCENTRIC
- DOUBLE CATCH BASIN CONCENTRIC
- DOUBLE CATCH BASIN ECCENTRIC
- GUTTER INLET
- DRAIN MANHOLE CONCENTRIC
- DRAIN MANHOLE ECCENTRIC
- TRENCH DRAIN (TD)
- PLUG OR CAP
- CLEANOUT (CO)
- FLARED END SECTION
- HEADWALL
- SEWER MANHOLE CONCENTRIC
- SEWER MANHOLE ECCENTRIC
- CURB STOP & BOX (CS)
- WATER VALVE & BOX (WV)
- TAPPING SLEEVE, VALVE & BOX (TSV)
- SIAMESE CONNECTION
- FIRE HYDRANT (HYD)
- WATER METER (WM)
- POST INDICATOR VALVE (PIV)
- WATER WELL
- GAS GATE (GG)
- GAS METER (GM)
- ELECTRIC MANHOLE (EMH)
- ELECTRIC METER (EM)
- LIGHT POLE
- TELEPHONE MANHOLE (TMH)
- TRANSFORMER PAD (T)
- UTILITY POLE
- GUY POLE
- GUY WIRE & ANCHOR
- HAND HOLE (HH)
- PULL BOX (PB)

Abbreviations

General

ABAN	ABANDON
ACR	ACCESSIBLE CURB RAMP
ADJ	ADJUST
APPROX	APPROXIMATE
BIT	BITUMINOUS
BS	BOTTOM OF SLOPE
BWLL	BROKEN WHITE LANE LINE
CONC	CONCRETE
DYCL	DOUBLE YELLOW CENTER LINE
EL	ELEVATION
ELEV	ELEVATION
EX	EXISTING
FDN	FOUNDATION
FFE	FIRST FLOOR ELEVATION
GRAN	GRANITE
GTD	GRADE TO DRAIN
LA	LANDSCAPE AREA
LOD	LIMIT OF DISTURBANCE
MAX	MAXIMUM
MIN	MINIMUM
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
PERF	PERFORATED
PROP	PROPOSED
REM	REMOVE
RET	RETAIN
R&D	REMOVE AND DISPOSE
R&R	REMOVE AND RESET
SWEL	SOLID WHITE EDGE LINE
SWLL	SOLID WHITE LANE LINE
TS	TOP OF SLOPE
TYP	TYPICAL

Utility

CB	CATCH BASIN
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
DCB	DOUBLE CATCH BASIN
DMH	DRAIN MANHOLE
CIP	CAST IRON PIPE
COND	CONDUIT
DIP	DUCTILE IRON PIPE
FES	FLARED END SECTION
FM	FORCE MAIN
F&G	FRAME AND GRATE
F&C	FRAME AND COVER
GI	GUTTER INLET
GT	GREASE TRAP
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HH	HANDHOLE
HW	HEADWALL
HYD	HYDRANT
INV	INVERT ELEVATION
I=	INVERT ELEVATION
LP	LIGHT POLE
MES	METAL END SECTION
PIV	POST INDICATOR VALVE
PWW	PAVED WATER WAY
PVC	POLYVINYLCHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
R=	RIM ELEVATION
RIM=	RIM ELEVATION
SMH	SEWER MANHOLE
TSV	TAPPING SLEEVE, VALVE AND BOX
UG	UNDERGROUND
UP	UTILITY POLE

Notes

General

1. CONTRACTOR SHALL NOTIFY "DIG-SAFE" (1-888-344-7233) AT LEAST 72 HOURS BEFORE EXCAVATING.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SECURITY AND JOB SAFETY. CONSTRUCTION ACTIVITIES SHALL BE IN ACCORDANCE WITH OSHA STANDARDS AND LOCAL REQUIREMENTS.
3. AREAS DISTURBED DURING CONSTRUCTION AND NOT RESTORED WITH IMPERVIOUS SURFACES (BUILDINGS, PAVEMENTS, WALKS, ETC.) SHALL RECEIVE 6 INCHES LOAM AND SEED.
4. WORK WITHIN THE LOCAL RIGHTS-OF-WAY SHALL CONFORM TO LOCAL MUNICIPAL STANDARDS. WORK WITHIN STATE RIGHTS-OF-WAY SHALL CONFORM TO THE LATEST EDITION OF THE STATE HIGHWAY DEPARTMENTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES.
5. UPON AWARD OF CONTRACT, CONTRACTOR SHALL MAKE NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN NECESSARY PERMITS, PAY FEES, AND POST BONDS ASSOCIATED WITH THE WORK INDICATED ON THE DRAWINGS, IN THE SPECIFICATIONS, AND IN THE CONTRACT DOCUMENTS. DO NOT CLOSE OR OBSTRUCT ROADWAYS, SIDEWALKS, AND FIRE HYDRANTS, WITHOUT APPROPRIATE PERMITS.
6. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
7. IN THE EVENT THAT SUSPECTED CONTAMINATED SOIL, GROUNDWATER, AND OTHER MEDIA ARE ENCOUNTERED DURING EXCAVATION AND CONSTRUCTION ACTIVITIES BASED ON VISUAL, OLFACTORY, OR OTHER EVIDENCE, THE CONTRACTOR SHALL STOP WORK IN THE VICINITY OF THE SUSPECT MATERIAL TO AVOID FURTHER SPREADING OF THE MATERIAL, AND SHALL NOTIFY THE OWNER IMMEDIATELY SO THAT THE APPROPRIATE TESTING AND SUBSEQUENT ACTION CAN BE TAKEN.
8. CONTRACTOR SHALL PREVENT DUST, SEDIMENT, AND DEBRIS FROM EXITING THE SITE AND SHALL BE RESPONSIBLE FOR CLEANUP, REPAIRS AND CORRECTIVE ACTION IF SUCH OCCURS.
9. DAMAGE RESULTING FROM CONSTRUCTION LOADS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO OWNER.
10. CONTRACTOR SHALL CONTROL STORMWATER RUNOFF DURING CONSTRUCTION TO PREVENT ADVERSE IMPACTS TO OFF SITE AREAS, AND SHALL BE RESPONSIBLE TO REPAIR RESULTING DAMAGES, IF ANY, AT NO COST TO OWNER.
11. THIS PROJECT DISTURBS MORE THAN ONE ACRE OF LAND AND FALLS WITHIN THE RIPDES CONSTRUCTION GENERAL PERMIT (CGP) PROGRAM AND RIDEM JURISDICTION. PRIOR TO THE START OF CONSTRUCTION CONTRACTOR IS TO FILE A NOTICE OF INTENT WITH THE RIDEM IN ACCORDANCE WITH THE RIPDES REGULATIONS.
12. STAGING AND STOCKPILE AREAS SHALL NOT BE LOCATED WITHIN ANY WETLAND AND ABUTTING RESOURCE AREA AND SHALL BE LOCATED WITHIN THE LOD.

11\. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND INSTALLING THE FOLLOWING ITEMS ON SITE AND REDLINING THE PLAN FOR RECORD KEEPING PURPOSES AS REQUIRED BY THE RIPDES PERMIT:
a. BUILDING MATERIALS STAGING AREAS
b. STOCKPILE AREAS. EROSION CONTROLS SHALL BE PLACED AT THE BASE OF ALL STOCKPILES
c. DESIGNATED WASHOUT AND REFUELING AREAS.
d. TEMPORARY SEDIMENT BASIN AREAS.

Existing Conditions Information

1. BASE PLAN: THE PROPERTY LINES SHOWN WERE DETERMINED BY AN ACTUAL FIELD SURVEY CONDUCTED BY VHB,INC. THE TOPOGRAPHY AND PHYSICAL FEATURES ARE FROM AERIAL MAPPING COMPILED BY WSP FROM IMAGERY ACQUIRED IN 2010 AND SUPPLEMENTED BY A FIELD SURVEY CONDUCTED BY VHB, INC. BETWEEN OCTOBER, 2019 AND JANUARY 2021.
   A. DELINEATION OF THE WETLANDS AND PLACEMENT OF THE FLAGS WAS PERFORMED BY: VHB.
   B. FLAGS MARKING THE WETLANDS WERE LOCATED BY: VHB, SURVEY.
2. TOPOGRAPHY: ELEVATIONS ARE BASED ON NAVD 88.

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1. THESE PLANS AND CORRESPONDING CADD DOCUMENTS ARE INSTRUMENTS OF PROFESSIONAL SERVICE, AND SHALL NOT BE USED, IN WHOLE OR IN PART, FOR ANY PURPOSE OTHER THAN FOR WHICH IT WAS CREATED WITHOUT THE EXPRESSED, WRITTEN CONSENT OF VHB. ANY UNAUTHORIZED USE, REUSE, MODIFICATION OR ALTERATION, INCLUDING AUTOMATED CONVERSION OF THIS DOCUMENT SHALL BE AT THE USER'S SOLE RISK WITHOUT LIABILITY OR LEGAL EXPOSURE TO VHB.
2. CONTRACTOR SHALL NOT RELY SOLELY ON ELECTRONIC VERSIONS OF PLANS, SPECIFICATIONS, AND DATA FILES THAT ARE OBTAINED FROM THE DESIGNERS, BUT SHALL VERIFY LOCATION OF PROJECT FEATURES IN ACCORDANCE WITH THE PAPER COPIES OF THE PLANS AND SPECIFICATIONS THAT ARE SUPPLIED AS PART OF THE CONTRACT DOCUMENTS.
3. SYMBOLS AND LEGENDS OF PROJECT FEATURES ARE GRAPHIC REPRESENTATIONS AND ARE NOT NECESSARILY SCALED TO THEIR ACTUAL DIMENSIONS OR LOCATIONS ON THE DRAWINGS. THE CONTRACTOR SHALL REFER TO THE DETAIL SHEET DIMENSIONS, MANUFACTURERS' LITERATURE, SHOP DRAWINGS AND FIELD MEASUREMENTS OF SUPPLIED PRODUCTS FOR LAYOUT OF THE PROJECT FEATURES.

Erosion Control

1. PRIOR TO STARTING ANY OTHER WORK ON THE SITE, THE CONTRACTOR SHALL NOTIFY APPROPRIATE AGENCIES AND SHALL INSTALL EROSION CONTROL MEASURES AS SHOWN ON THE PLANS AND AS IDENTIFIED IN FEDERAL, STATE, AND LOCAL APPROVAL DOCUMENTS PERTAINING TO THIS PROJECT.
2. CONTRACTOR SHALL INSPECT AND MAINTAIN EROSION CONTROL MEASURES DAILY, AND REMOVE SEDIMENT THEREFROM ON A WEEKLY BASIS AND WITHIN TWELVE HOURS AFTER EACH STORM EVENT AND DISPOSE OF SEDIMENTS IN AN UPLAND AREA SUCH THAT THEY DO NOT ENCUMBER OTHER DRAINAGE STRUCTURES AND PROTECTED AREAS.
3. CONTRACTOR SHALL BE FULLY RESPONSIBLE TO CONTROL CONSTRUCTION SUCH THAT SEDIMENTATION SHALL NOT AFFECT REGULATORY PROTECTED AREAS, WHETHER SUCH SEDIMENTATION IS CAUSED BY WATER, WIND, OR DIRECT DEPOSIT.
4. CONTRACTOR SHALL PERFORM CONSTRUCTION SEQUENCING SUCH THAT EARTH MATERIALS ARE EXPOSED FOR A MINIMUM OF TIME BEFORE THEY ARE COVERED, SEEDED, OR OTHERWISE STABILIZED TO PREVENT EROSION.
5. UPON COMPLETION OF CONSTRUCTION AND ESTABLISHMENT OF PERMANENT GROUND COVER, CONTRACTOR SHALL REMOVE AND DISPOSE OF EROSION CONTROL MEASURES AND CLEAN SEDIMENT AND DEBRIS FROM ENTIRE DRAINAGE AND SEWER SYSTEMS.
6. A CROSS SLOPE SHALL BE PLACED ON THE STABILIZED CONSTRUCTION EXIT TO DIRECT RUNOFF TO AN ONSITE SETTLING AREA. IF DEEMED NECESSARY AFTER CONSTRUCTION BEGINS, A WASH PAD MAY BE INCLUDED TO WASH OFF VEHICLE WHEELS BEFORE LEAVING THE PROJECT SITE.
7. TEMPORARY SEDIMENT BASINS WILL BE DESIGNED EITHER AS EXCAVATIONS OR BERMED STORMWATER DETENTION STRUCTURES THAT WILL RETAIN RUNOFF FOR A SUFFICIENT PERIOD OF TIME TO ALLOW SUSPENDED SOIL PARTICLES TO SETTLE OUT PRIOR TO DISCHARGE. BASINS WILL BE LOCATED AS DETERMINED BY THE CONTRACTOR BASED ON CONSTRUCTION NEEDS. POINT OF DISCHARGE FROM SEDIMENT BASINS WILL BE STABILIZED TO MINIMIZE EROSION.
8. VEGETATIVE SLOPE STABILIZATION WILL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. VEGETATIVE SLOPE STABILIZATION WILL BE USED TO MINIMIZE EROSION ON SLOPES OF 3:1 OR STEEPER. ESTABLISHMENT OF TEMPORARY AND PERMANENT VEGETATIVE COVER MAY BE ESTABLISHED BY HYDRO-SEEDING OR SODDING. A SUITABLE TOPSOIL, GOOD SEEDBED PREPARATION, AND ADEQUATE LIME, FERTILIZER AND WATER WILL BE PROVIDED FOR EFFECTIVE ESTABLISHMENT OF THESE VEGETATIVE STABILIZATION METHODS. MULCH WILL ALSO BE USED AFTER PERMANENT SEEDING TO PROTECT SOIL FROM THE IMPACT OF FALLING RAIN AND TO INCREASE THE CAPACITY OF THE SOIL TO ABSORB WATER.
9. STABILIZATION OF DISTURBED AREAS MUST BE INITIATED IMMEDIATELY WHENEVER CLEARING, GRADING, EXCAVATION OR OTHER EARTH DISTURBANCE ACTIVITIES ARE PERMANENTLY CEASED ON ANY PORTION OF THE SITE, OR TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT BE RESUMED FOR A PERIOD EXCEEDING FOURTEEN (14) CALENDAR DAYS. STABILIZATION MUST BE COMPLETED USING VEGETATIVE STABILIZATION MEASURES WHERE POSSIBLE.
10. ALL DISTURBED SOILS EXPOSED PRIOR TO OCTOBER 15TH SHALL BE SEEDED BY THAT DATE. ANY SUCH AREAS WHICH DO NOT HAVE ADEQUATE VEGETATIVE STABILIZATION BY NOVEMBER 15TH MUST BE STABILIZED THROUGH THE USE OF NON-VEGETATIVE EROSION CONTROL MEASURES. IF WORK CONTINUES WITHIN ANY OF THESE AREAS DURING THE PERIOD FROM OCTOBER 15TH TO APRIL 15TH CARE MUST BE TAKEN TO ENSURE THAT ONLY THE AREA REQUIRED FOR THE DAY'S WORK IS EXPOSED, AND ALL ERODIBLE SOIL MUST BE STABILIZED WITHIN FIVE (5) WORKING DAYS.

Erosion Control Maintenance Requirements

SITE OWNERS AND OPERATORS MUST ENSURE THAT ALL EROSION, RUNOFF, SEDIMENT, AND POLLUTION PREVENTION CONTROLS REMAIN IN EFFECTIVE OPERATING CONDITION AND ARE PROTECTED FROM ACTIVITIES THAT WOULD REDUCE THEIR EFFECTIVENESS. SITE OWNERS AND OPERATORS MUST ALSO ENSURE THAT ALL EROSION, RUNOFF, SEDIMENT, AND POLLUTION PREVENTION CONTROLS ARE INSPECTED AT THE REQUIRED FREQUENCY REQUIREMENTS LISTED BELOW. IF THE DESIGNATED SITE INSPECTOR FINDS A PROBLEM (I.E. EROSION, RUNOFF, SEDIMENT OR POLLUTION PREVENTION CONTROLS REQUIRE REPLACEMENT, REPAIR, OR MAINTENANCE), THE OWNER AND OPERATOR MUST ENSURE THAT THE NECESSARY REPAIRS OR MODIFICATIONS ARE MADE IN ACCORDANCE WITH THE FOLLOWING:

1. INITIATE WORK TO FIX THE PROBLEM IMMEDIATELY AFTER DISCOVERING THE PROBLEM, AND COMPLETE SUCH WORK BY THE CLOSE OF THE NEXT WORK DAY, IF THE PROBLEM DOES NOT REQUIRE SIGNIFICANT REPAIR OR REPLACEMENT, OR IF THE PROBLEM CAN BE CORRECTED THROUGH ROUTINE MAINTENANCE.
2. WHEN INSTALLATION OF A NEW CONTROL OR A SIGNIFICANT REPAIR IS NEEDED, SITE OWNERS AND OPERATORS MUST ENSURE THAT THE NEW OR MODIFIED CONTROL PRACTICE IS INSTALLED AND MADE OPERATIONAL BY NO LATER THAN SEVEN (7) CALENDAR DAYS FROM THE TIME OF DISCOVERY WHERE FEASIBLE. IF IT IS INFEASIBLE TO COMPLETE THE INSTALLATION OR REPAIR WITHIN SEVEN (7) CALENDAR DAYS, THE REASONS WHY IT IS INFEASIBLE MUST BE DOCUMENTED IN THE SESC PLAN ALONG WITH THE SCHEDULE FOR INSTALLING THE STORMWATER CONTROL(S) AND MAKING IT OPERATIONAL AS SOON AS PRACTICABLE AFTER THE 7-DAY TIMEFRAME. WHERE THESE ACTIONS RESULT IN CHANGES TO ANY OF THE STORMWATER CONTROL MEASURES OUTLINED IN THE SESC PLAN, SITE OWNERS AND OPERATORS MUST MODIFY THE SESC PLAN ACCORDINGLY WITHIN SEVEN (7) CALENDAR DAYS OF COMPLETING THIS WORK IN ACCORDANCE WITH THE FOLLOWING:
   a. THE OWNER AND OPERATOR SHALL AMEND THE SESC PLAN WITHIN SEVEN (7) DAYS WHENEVER THERE IS A CHANGE IN DESIGN, CONSTRUCTION, OPERATION, MAINTENANCE OR OTHER PROCEDURE WHICH HAS A SIGNIFICANT EFFECT ON THE POTENTIAL FOR THE DISCHARGE OF POLLUTANTS, OR IF THE SESC PLAN PROVES TO BE INEFFECTIVE IN ACHIEVING ITS OBJECTIVES. IN ADDITION, THE SESC PLAN SHALL BE AMENDED TO IDENTIFY ANY NEW OPERATOR THAT WILL IMPLEMENT A COMPONENT OF THE SESC PLAN. THE AMENDED SESC PLAN MUST BE KEPT ON FILE AT THE CONSTRUCTION SITE AND ANY SESC PLAN MODIFICATIONS MUST BE DOCUMENTED. ANY AMENDMENTS TO CONTROL MEASURES WHICH INVOLVED THE PRACTICE OF ENGINEERING, MUST FIRST BE REVIEWED, SIGNED, AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF RHODE ISLAND.
3. IF CORRECTIVE ACTIONS ARE REQUIRED, THE SITE OWNER AND OPERATOR MUST ENSURE THAT ALL CORRECTIVE ACTIONS ARE DOCUMENTED ON THE INSPECTION REPORT IN WHICH THE PROBLEM WAS FIRST DISCOVERED. THESE CORRECTIVE ACTIONS MUST BE DOCUMENTED, SIGNED, AND DATED BY THE SITE OPERATOR ONCE ALL NECESSARY REPAIRS HAVE BEEN COMPLETED.
4. SOIL EROSION AND SEDIMENT CONTROL INSPECTION REQUIREMENTS
   MINIMUM FREQUENCY - EACH OF THE FOLLOWING AREAS MUST BE INSPECTED BY OR UNDER THE SUPERVISION OF THE OWNER AND OPERATOR AT LEAST ONCE EVERY SEVEN (7) CALENDAR DAYS AND WITHIN TWENTY FOUR (24) HOURS AFTER ANY STORM EVENT WHICH GENERATES AT LEAST 0.25 INCHES OF RAINFALL PER TWENTY-FOUR (24) HOUR PERIOD AND/OR AFTER A SIGNIFICANT AMOUNT OF RUNOFF:
   a. ALL AREAS THAT HAVE BEEN CLEARED, GRADED, OR EXCAVATED AND THAT HAVE NOT YET COMPLETED STABILIZATION;
   b. ALL STORMWATER EROSION, RUNOFF, AND SEDIMENT CONTROL MEASURES (INCLUDING POLLUTION PREVENTION PRACTICES) INSTALLED AT THE SITE TO COMPLY WITH THIS PERMIT;
   c. CONSTRUCTION MATERIAL, UNSTABILIZED SOIL STOCKPILES, WASTE, BORROW, OR EQUIPMENT STORAGE, AND MAINTENANCE AREAS THAT ARE COVERED BY THIS PERMIT AND ARE EXPOSED TO PRECIPITATION;
   d. ALL AREAS WHERE STORMWATER TYPICALLY FLOWS WITHIN THE SITE, INCLUDING TEMPORARY DRAINAGE WAYS DESIGNED TO DIVERT, CONVEY, AND/OR TREAT STORMWATER;
   e. ALL POINTS OF DISCHARGE FROM THE SITE;
   f. ALL LOCATIONS WHERE TEMPORARY OR PERMANENT SOIL STABILIZATION MEASURES HAVE BEEN IMPLEMENTED.
   g. ALL LOCATIONS WHERE VEHICLES ENTER OR EXIT THE SITE.

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

vhb

REVISIONS DURING CONSTRUCTION

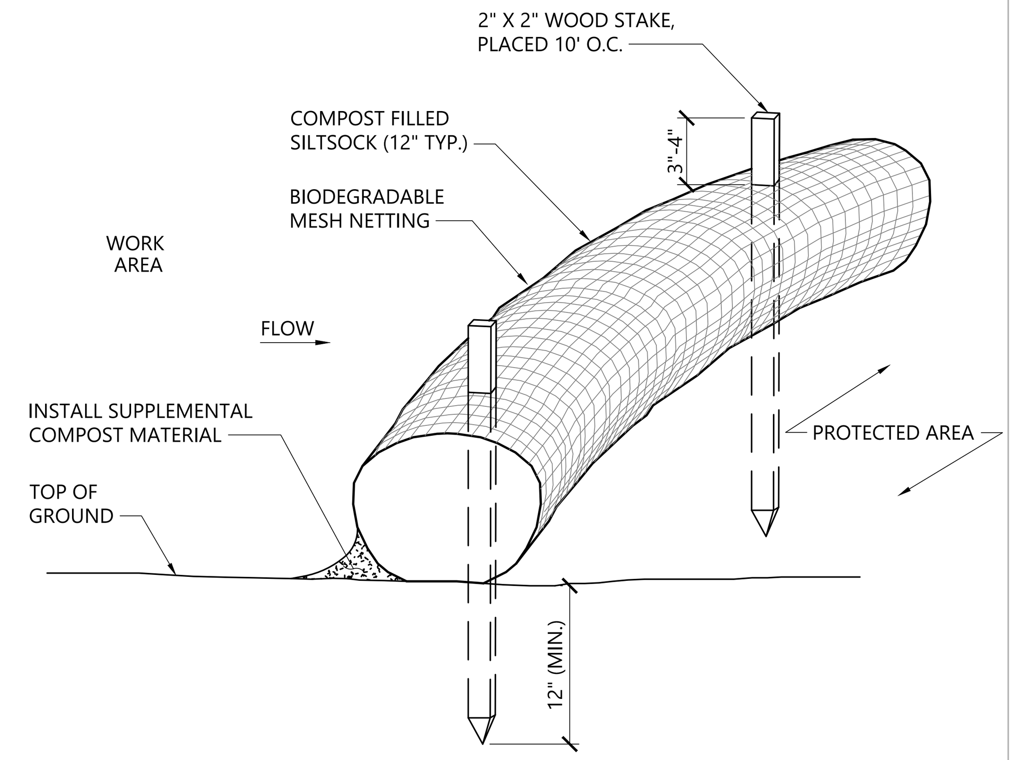
NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

Revolution Wind | Powered by Ørsted & Eversource

TITLE: REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
LEGEND & GENERAL NOTES
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-02	

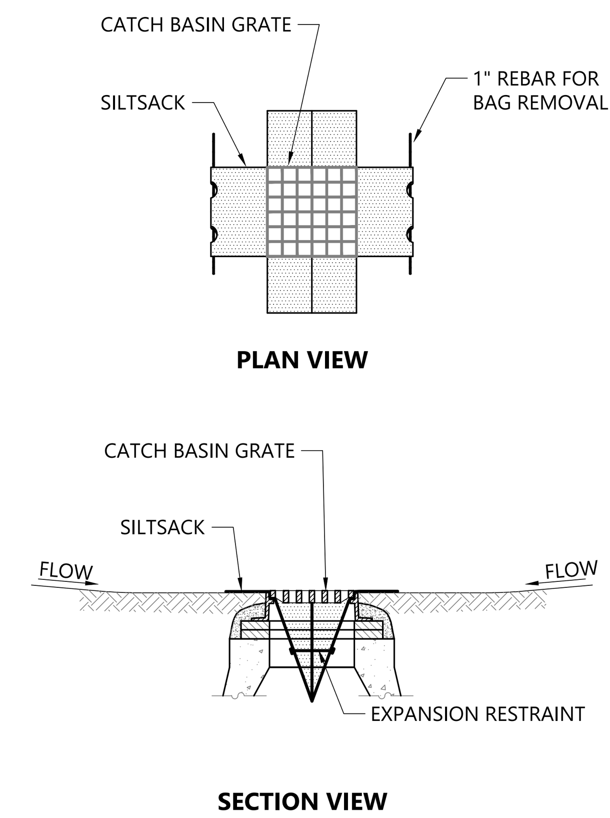
Curb Inlet or Drop Inlet Catch Basin Protection
06/2021
N.T.S. Source: VHB



NOTES

1. SILTSOCK SHALL BE FILTREXX SILTSOXX, OR APPROVED EQUAL.
2. SILTSOCKS SHALL OVERLAP A MINIMUM OF 12 INCHES.
3. SILTSOCK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS, AND REPAIR OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.
4. COMPOST MATERIAL SHALL BE DISPERSED ON SITE, AS DETERMINED BY THE ENGINEER.
5. IF NON BIODEGRADABLE NETTING IS USED THE NETTING SHALL BE COLLECTED AND DISPOSED OF OFFSITE.

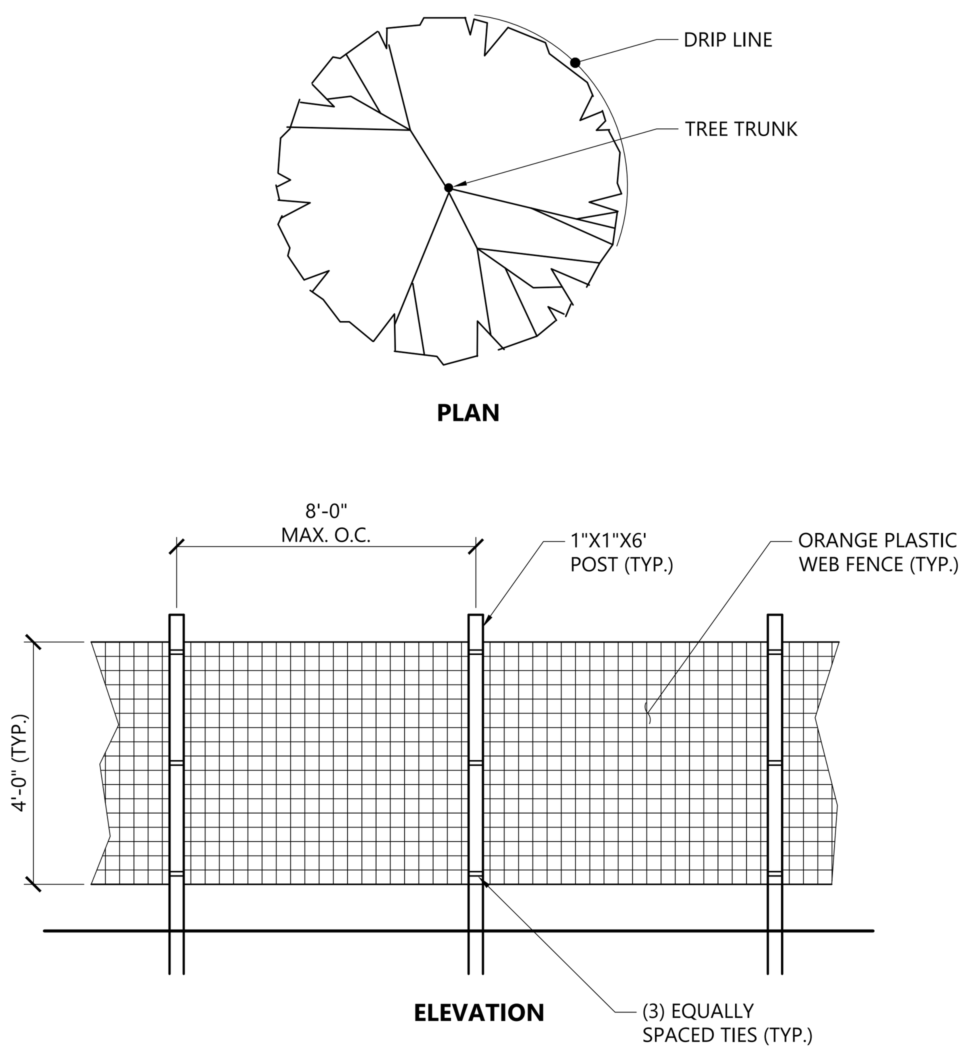
Siltsock - Erosion Control Barrier
1/16
N.T.S. Source: VHB LD_658



NOTES

1. INSTALL SILTSACK IN ALL CATCH BASINS WHERE INDICATED ON THE PLAN BEFORE COMMENCING WORK OR IN PAVED AREAS AFTER BINDER COURSE IS PLACED AND HAY BALES HAVE BEEN REMOVED.
2. GRATE TO BE PLACED OVER SILTSACK.
3. SILTSACK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS AND CLEANING OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED. MAINTAIN UNTIL UPSTREAM AREAS HAVE BEEN PERMANENTLY STABILIZED

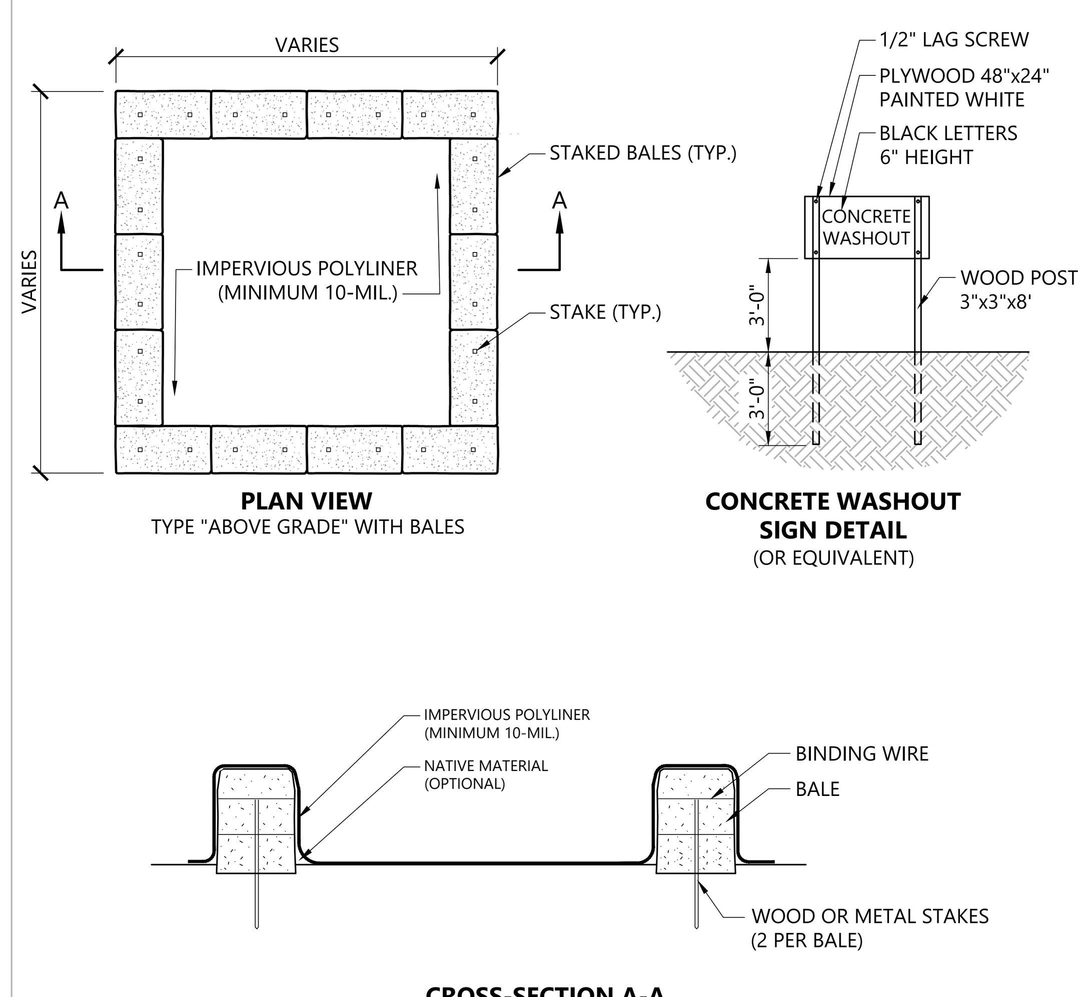
Siltsack Sediment Trap
1/16
N.T.S. Source: VHB LD_674



NOTES

1. INSTALL TREE PROTECTION FENCE AT THE DRIP LINE OF EXISTING TREES TO REMAIN.

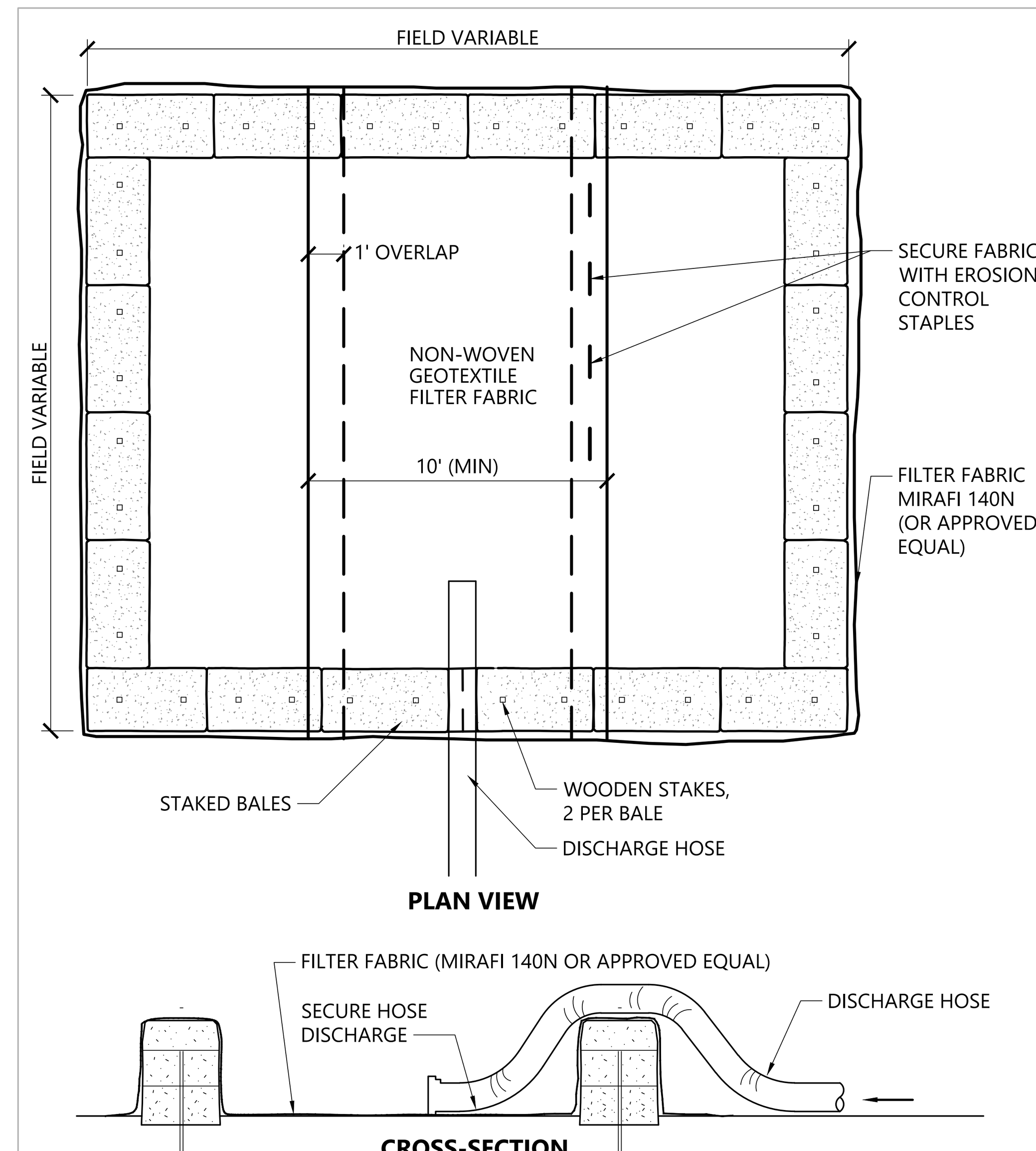
Tree Protection Fence
1/16
N.T.S. Source: VHB LD_610



NOTES

1. FINAL LOCATION TO BE DETERMINED BY CONTRACTOR BASED ON SITE CONDITIONS.
2. KEEP AS FAR FROM DRAINAGE CHANNELS AND WETLAND AREAS AS PRACTICAL.
3. SUMPS TO BE CLEANED AND WASTE CONCRETE REMOVED AND PROPERLY DISPOSED OF UPON COMPLETION OF WORK.

Concrete Washout
12/17
N.T.S. Source: VHB



NOTES

1. NUMBER OF BALES MAY VARY DEPENDING ON SITE CONDITIONS.
2. THE BASIN TO BE SIZED TO PREVENT DISCHARGE WATER FROM OVERTOPPING BASIN.

Dewatering Straw Bale Basin
1/16
N.T.S. Source: VHB LD_690

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RENEE L. CODEGA
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REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

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REVISIONS DURING CONSTRUCTION			

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
DETAILS
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-03	

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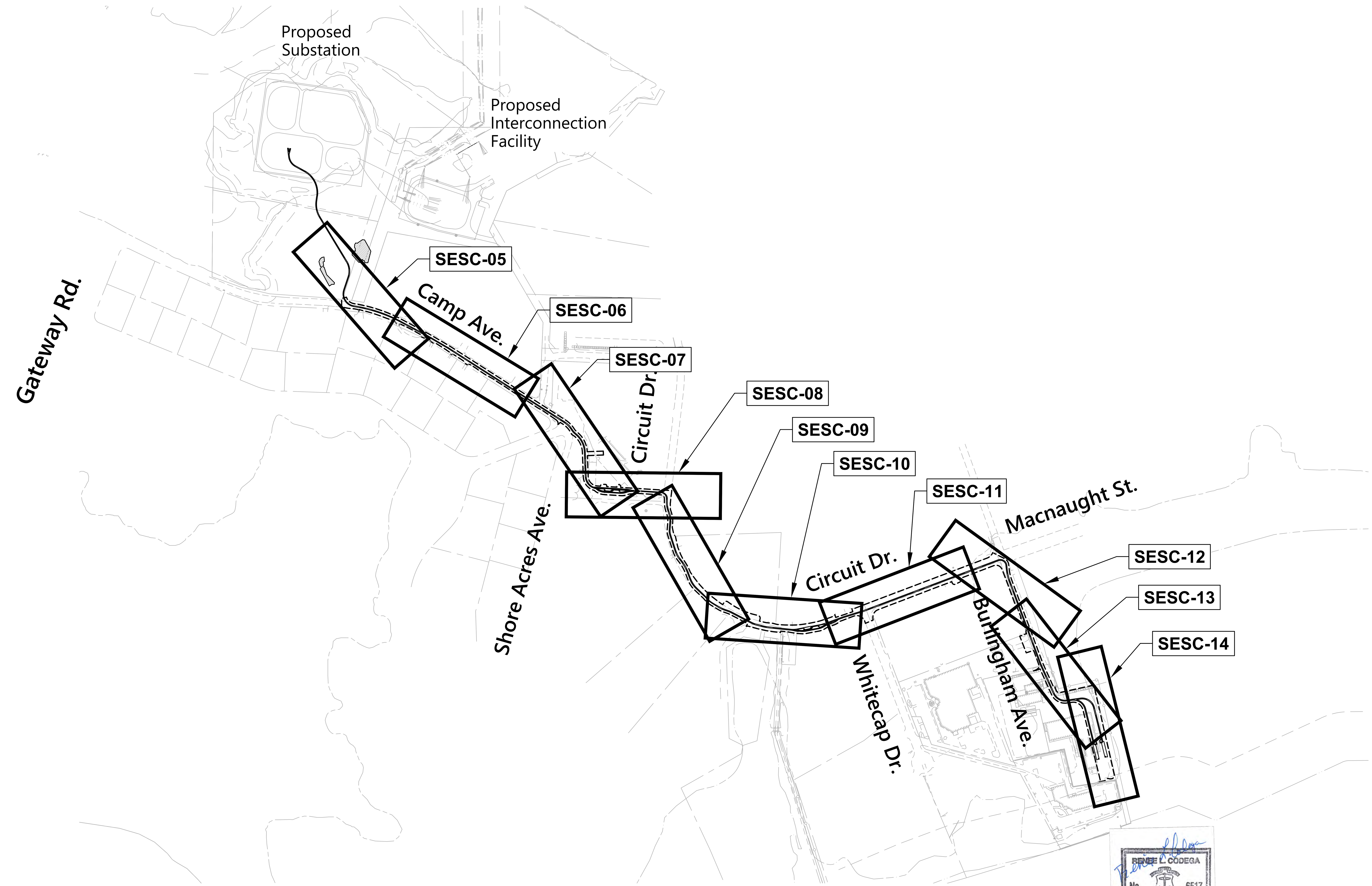

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NORTH

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SCALE IN FEET

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RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

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NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
KEY MAP
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
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V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-04	

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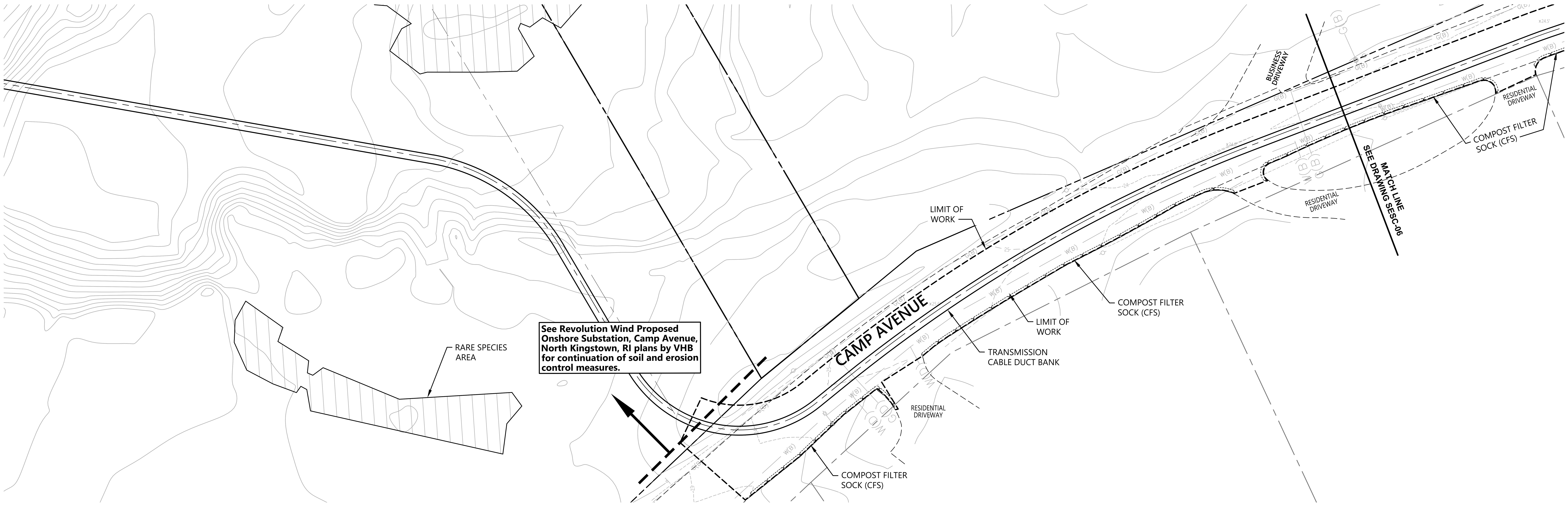

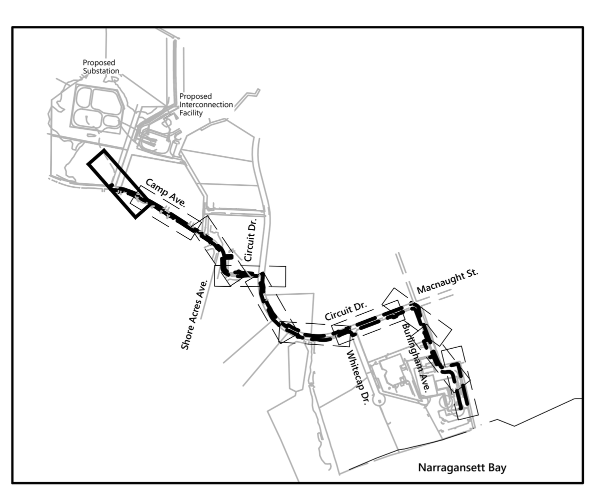

Key
Not To Scale

LEGEND

- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

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NORTH

0 20 40
SCALE IN FEET

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RENEE L. CODEGA
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6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 1
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
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V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	SESC-05

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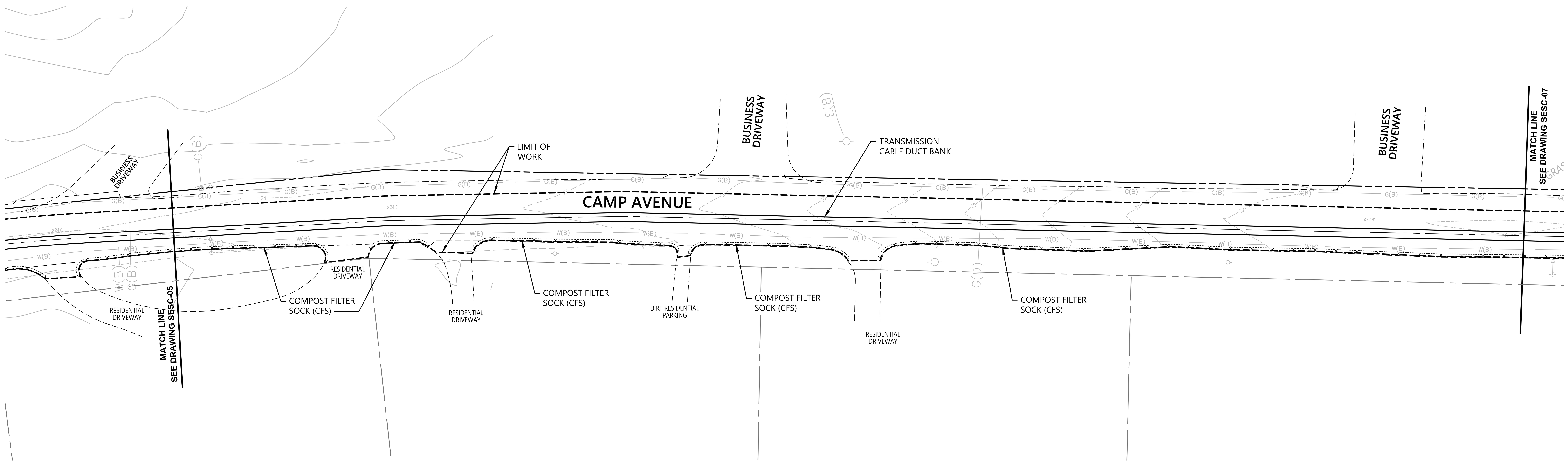

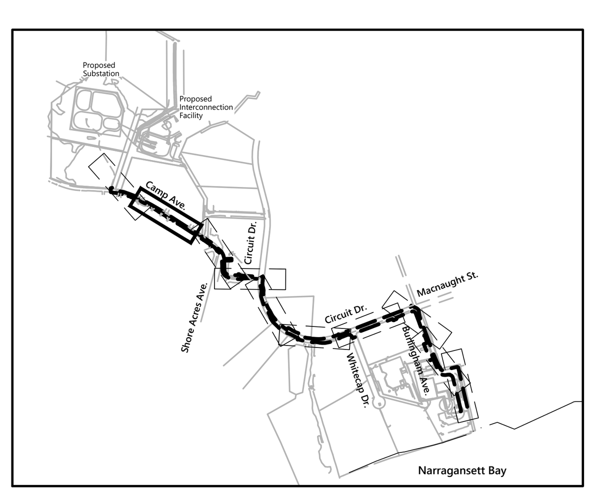

Key
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LEGEND
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- CATCH BASIN PROTECTION

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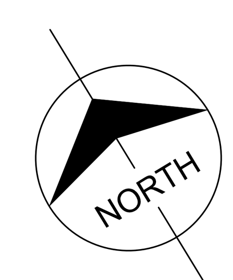

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6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 2
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-06	

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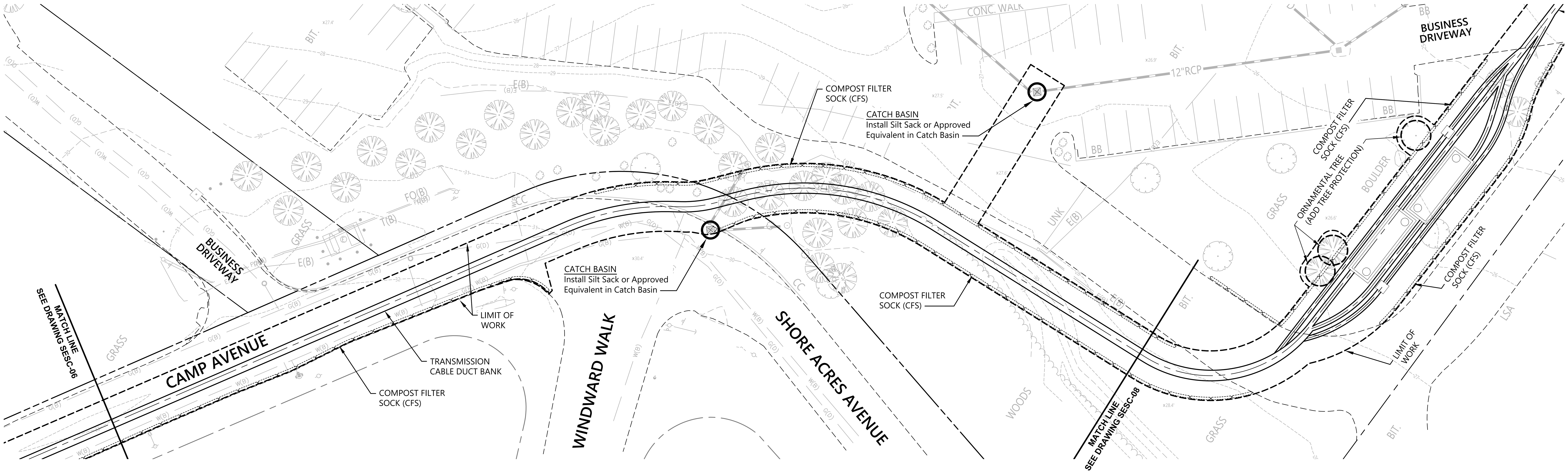

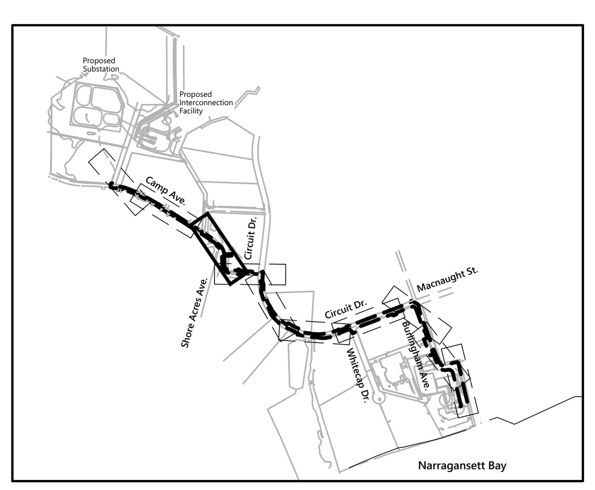

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LEGEND

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SCALE IN FEET

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RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 3
NORTH KINGSTOWN, RHODE ISLAND

BY	CHK'D	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-07	

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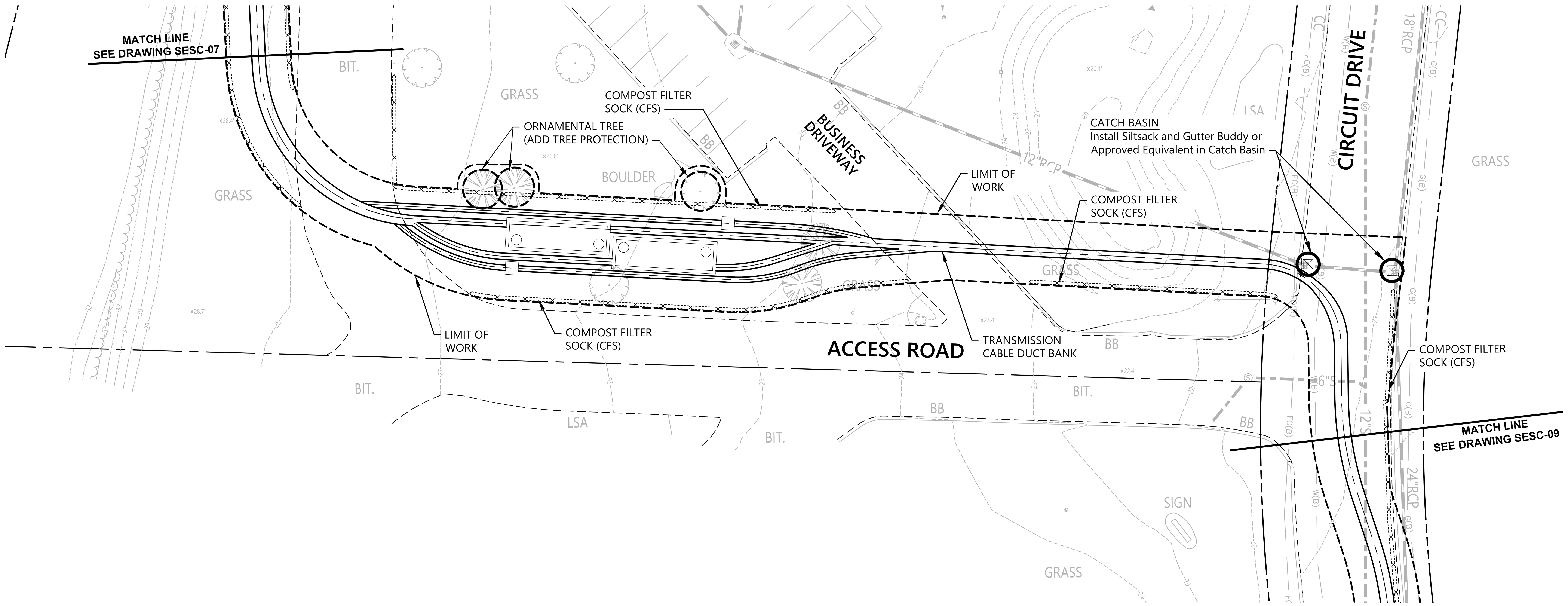

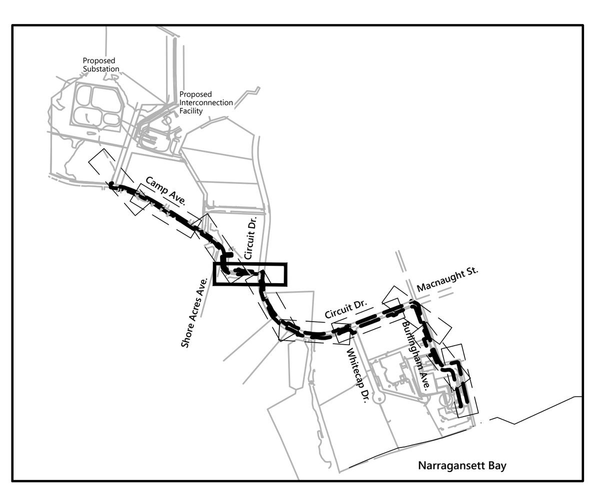

Key

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ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

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0 20 40
SCALE IN FEET

vhb

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 4
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-08	

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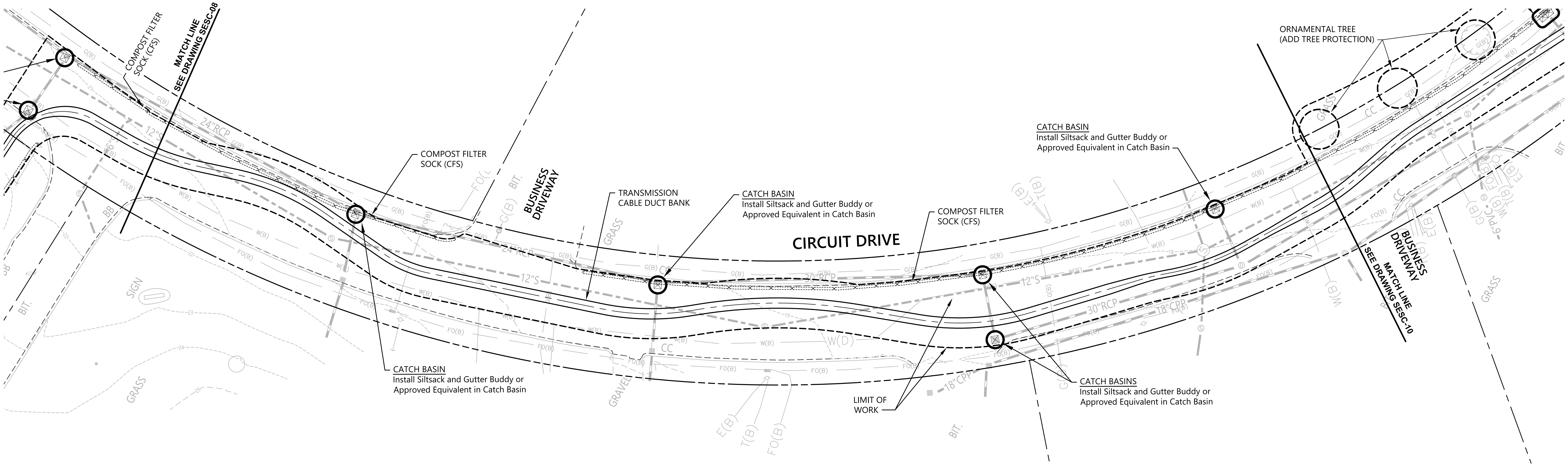
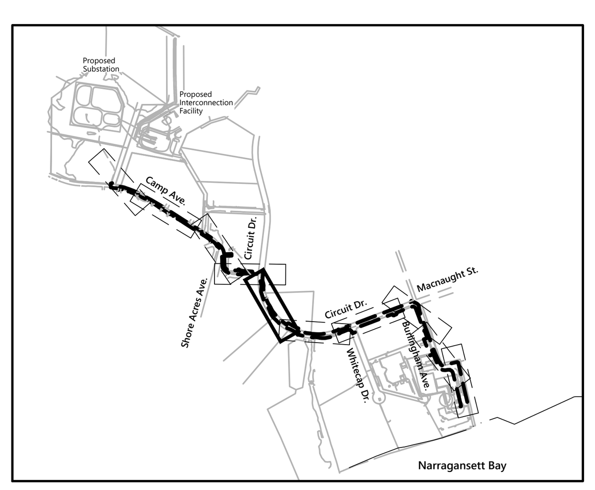
ES VER: 05/2015





Key

Not To Scale

LEGEND

- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 20 40

SCALE IN FEET

vhb

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 5
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	SESC-09

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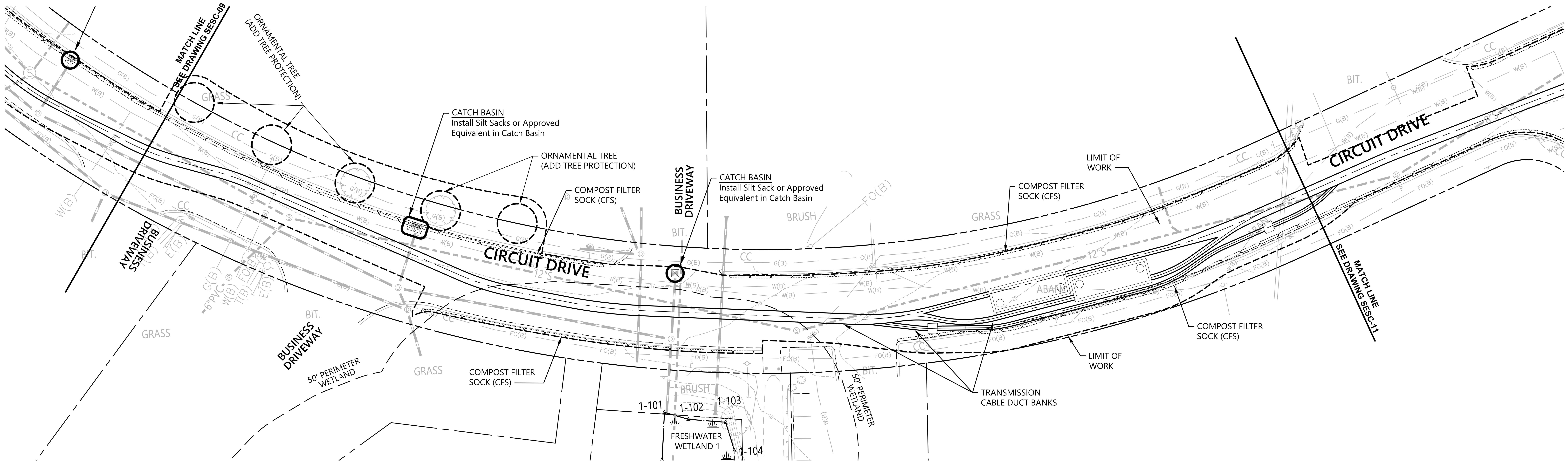

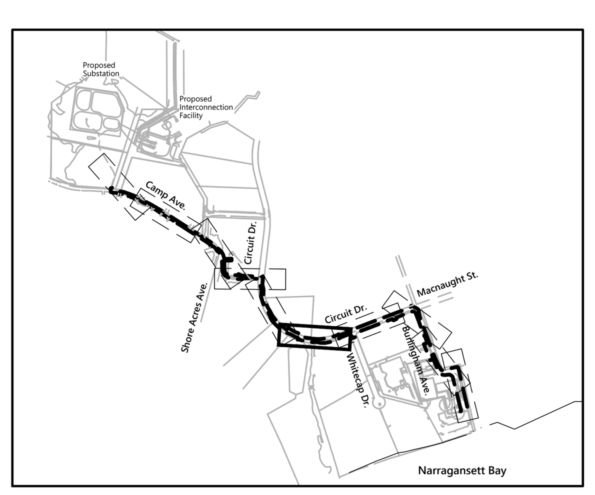

Key
Not To Scale

LEGEND

- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 20 40
SCALE IN FEET

vhb

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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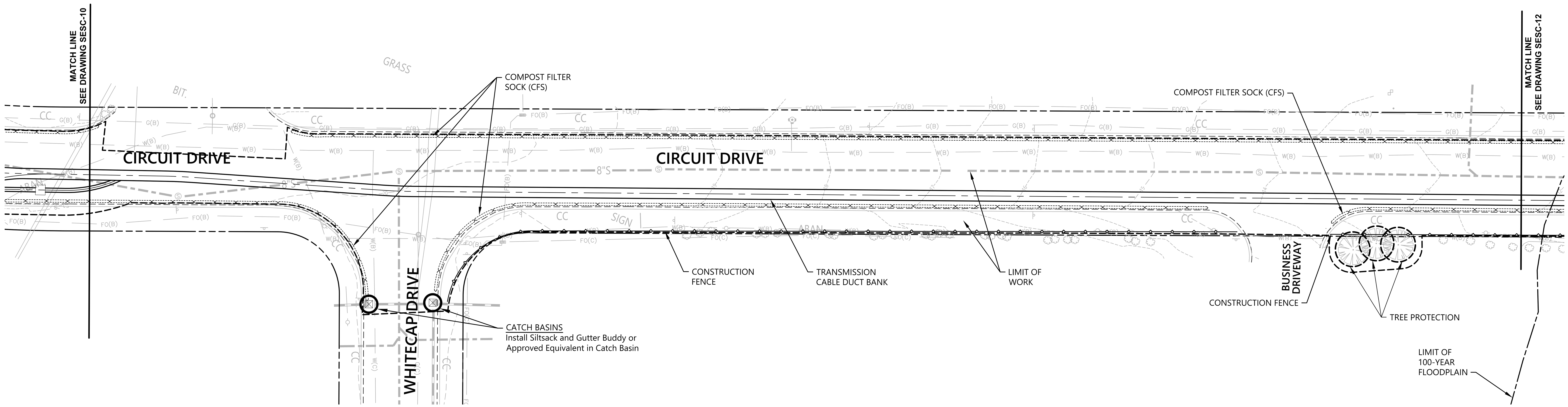
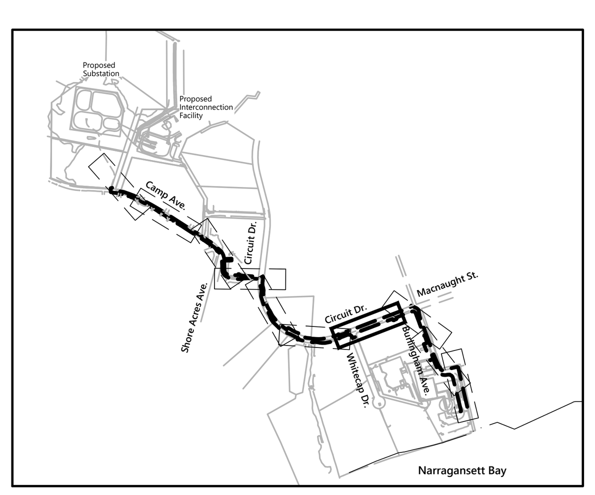
TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 6
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-10	

ES VER: 05/2015





Key

Not To Scale

LEGEND

PROPERTY LINE	PROPOSED TRANSMISSION CABLE DUCT BANK
ROADWAY TLO	LIMIT OF DISTURBANCE
WETLAND EDGE WITH FLAG	COMPOST FILTER SOCK (CFS)
WETLAND AREA	CONSTRUCTION FENCE
COASTAL FEATURE	CATCH BASIN PROTECTION
50' PERIMETER WETLAND	
200' CONTIGUOUS AREA	
100-YEAR FLOODPLAIN	
FLOODPLAIN (ZONE VE)	

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 20 40
SCALE IN FEET

vhb

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 7
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-11	

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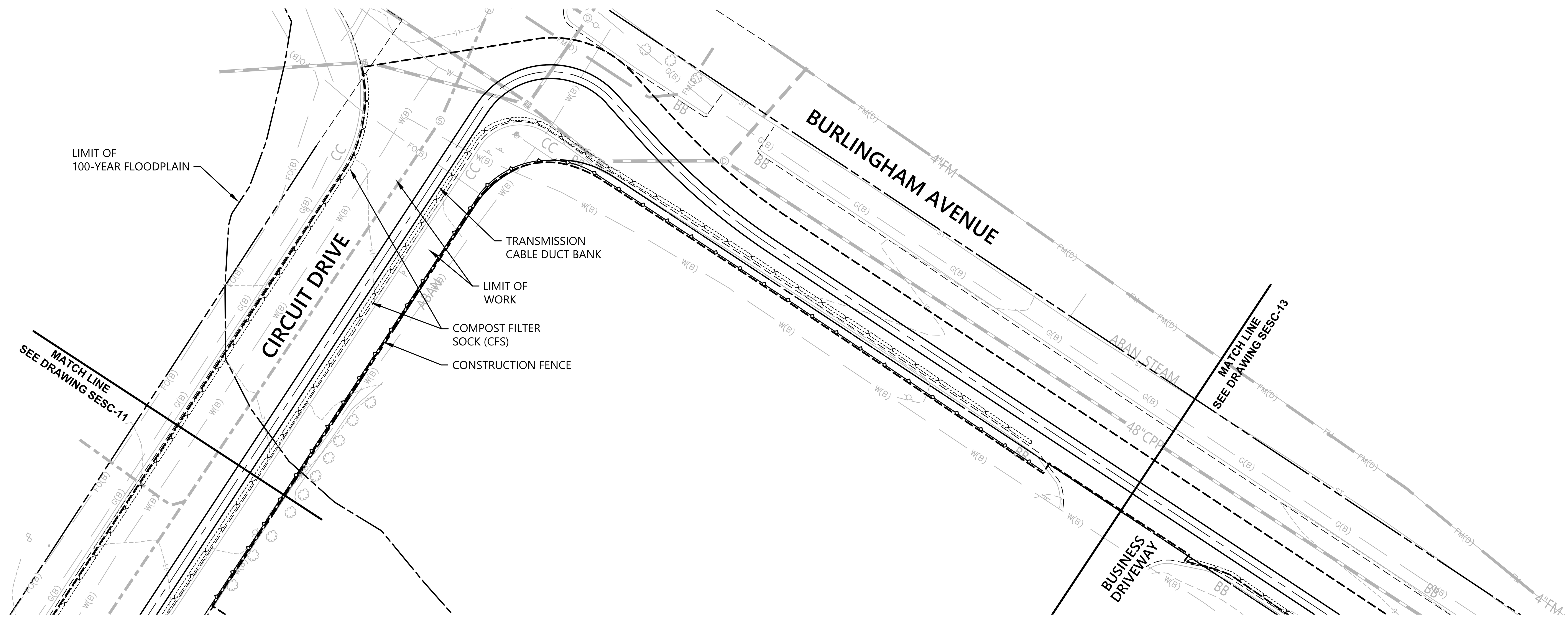

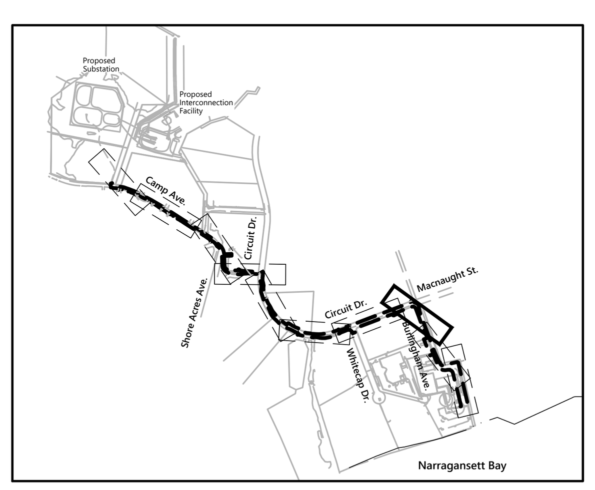

Key
Not To Scale

LEGEND

- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 20 40
SCALE IN FEET

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 8
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-12	

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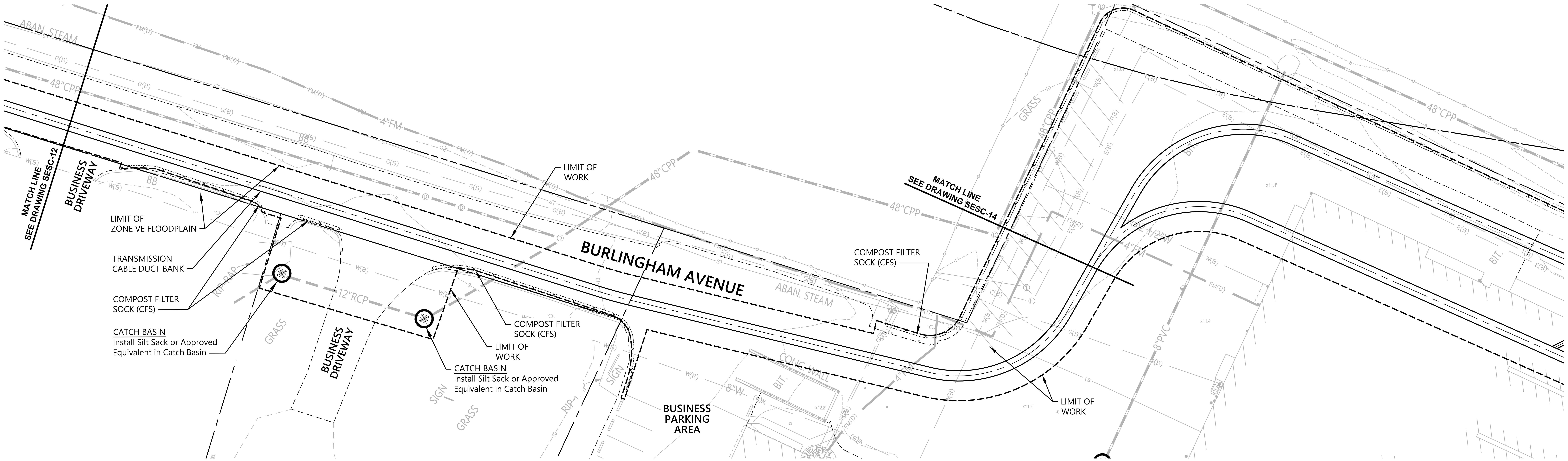
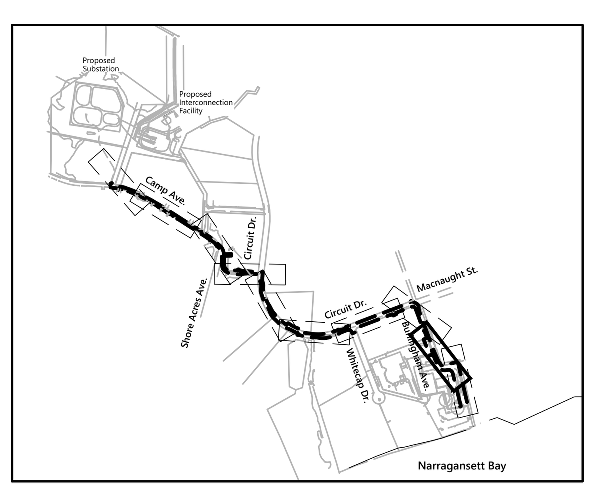
ES VER: 05/2015





Key

Not To Scale

LEGEND

PROPERTY LINE	PROPOSED TRANSMISSION CABLE DUCT BANK
ROADWAY TLO	LIMIT OF DISTURBANCE
WETLAND EDGE WITH FLAG	COMPOST FILTER SOCK (CFS)
WETLAND AREA	CONSTRUCTION FENCE
COASTAL FEATURE	CATCH BASIN PROTECTION
50' PERIMETER WETLAND	
200' CONTIGUOUS AREA	
100-YEAR FLOODPLAIN	
FLOODPLAIN (ZONE VE)	

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 20 40
SCALE IN FEET

vhb

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 9
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	SESC-13

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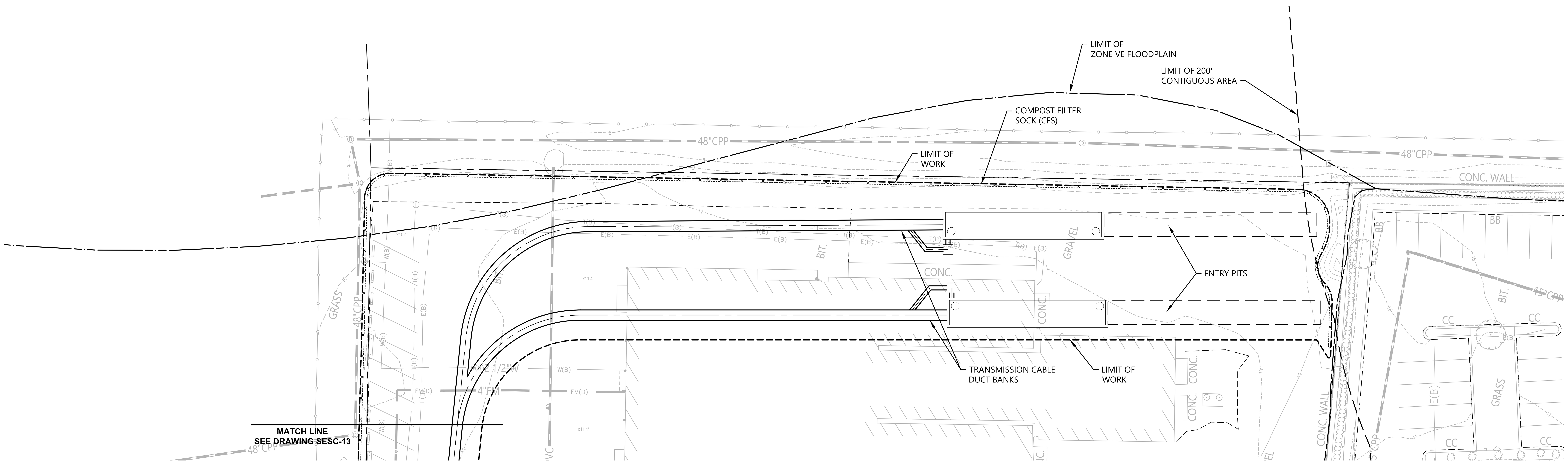
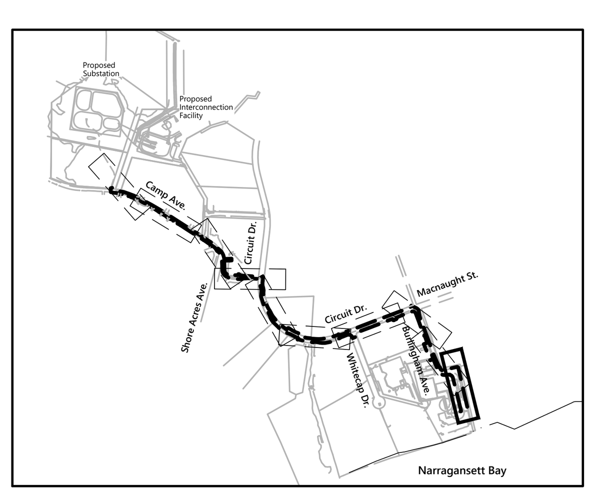
ES VER: 05/2015





Key
Not To Scale

LEGEND

PROPERTY LINE	PROPOSED TRANSMISSION CABLE DUCT BANK
ROADWAY TLO	LIMIT OF DISTURBANCE
WETLAND EDGE WITH FLAG	COMPOST FILTER SOCK (CFS)
WETLAND AREA	CONSTRUCTION FENCE
COASTAL FEATURE	CATCH BASIN PROTECTION
50' PERIMETER WETLAND	
200' CONTIGUOUS AREA	
100-YEAR FLOODPLAIN	
FLOODPLAIN (ZONE VE)	

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 20 40
SCALE IN FEET

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

vhb

REVISIONS DURING CONSTRUCTION

NO. | DATE | AS BUILT REVISIONS | BY | CHK | APP | APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 10
NORTH KINGSTOWN, RHODE ISLAND

DATE 06/30/21
H-SCALE AS NOTED
SIZE ARCH D
DWG NO. SESC-14

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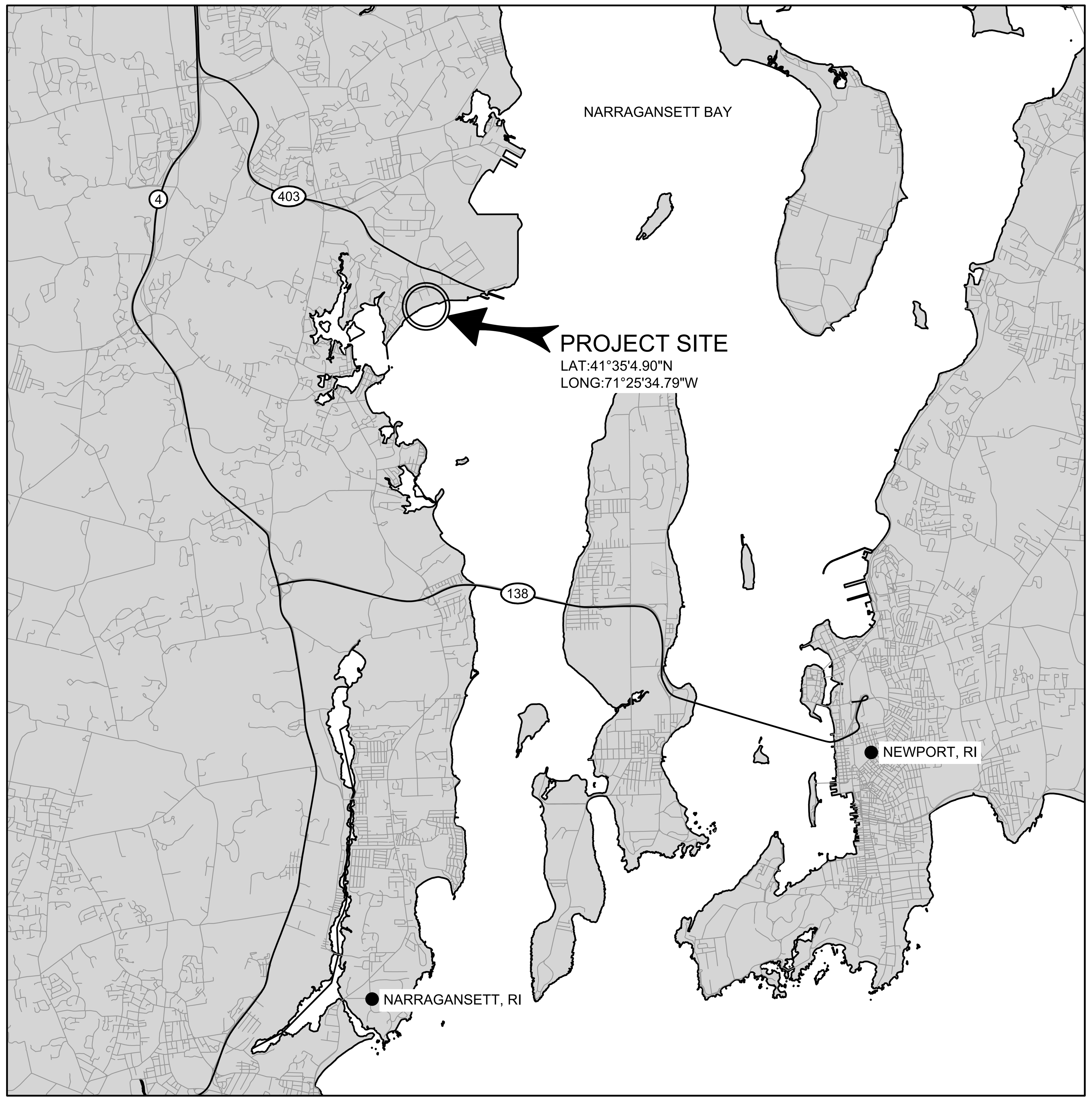
REVOLUTION WIND

HDD LANDFALL DESIGN

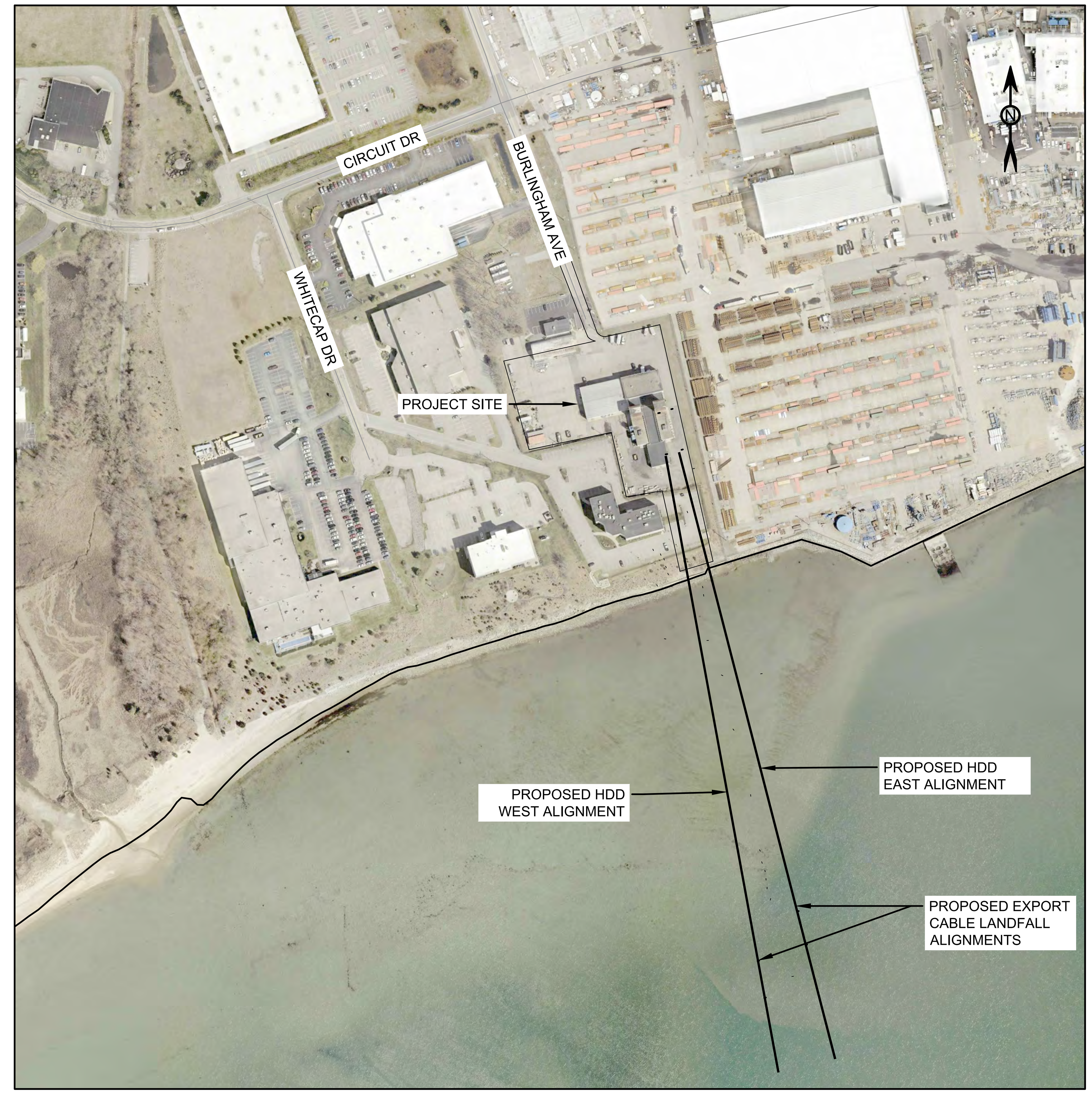


VICINITY MAP

0 6,000 12,000
SCALE IN FEET

DRAWING INDEX

NAME	SHEET #
COVER SHEET	1
OVERALL SITE PLAN	2
HDD EAST LANDFALL	3
HDD WEST LANDFALL	4
EXCAVATION DETAILS HDD EAST LANDFALL	5
EXCAVATION DETAILS HDD WEST LANDFALL	6



LOCATION MAP

0 200 400
SCALE IN FEET

Rev.	Date	Accep.	Appr.	Description
D	06/18/21	ML	GD	ISSUED FOR PERMIT
C	06/01/21	ML	GD	ISSUED FOR FURTHER REVIEW
B	05/19/21	ML	GD	ISSUED FOR FURTHER REVIEW
A	05/03/21	ML	GD	ISSUED FOR REVIEW

Drawn by	Accepted	Approved
05/03/2021 KLH	05/03/2021 ML	05/03/2021 GD

Scale	Size	Ørsted Document No.
1" = 100'	D-SIZE	07059047

Supplier | Supplier Document No.

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06/21/2021
ISSUED FOR PERMIT - NOT FOR CONSTRUCTION

CHRISTOPHER A. COCKSHAW
No. 9816
REGISTERED PROFESSIONAL ENGINEER
CIVIL

CONTRACTOR

MOTT MACDONALD

MOTT MACDONALD NY INC.
111 Wood Avenue South
Iselin, NJ 08830-4112
Certificate of Authorization #: 0017019

COVER SHEET
NORTH KINGSTOWN, RHODE ISLAND

DRAWING NUMBER: 07059047
Rev.: D

HDD OVERALL SITE PLAN

SCALE BAR

100' 50' 0' 100'

CROSSING SPECIFIC HDD NOTES:

1. ALL EQUIPMENT SHALL BE STAGED WITHIN THE IDENTIFIED WORK SPACE.
2. ELEVATIONS REFERENCED TO 0.00' MLLW = 4.11' MHHW, 3.86' MHW, 2.24' NAVD88, 1.87' MSL, and 0.16' MLW. HORIZONTAL DATUM REFERS TO NAD83 UTM ZONE 19 US FOOT CENTRAL MERIDIAN 69D W.
3. DIMENSIONS PROVIDED ON THE DRAWING ARE IN FEET, UNLESS OTHERWISE NOTED.
4. ALIGNMENT STATIONING IS HORIZONTAL.

LEGEND:

NATURAL GAS	WATER LINE	ELECTRIC & POLE	STORM MANHOLE	MANMADE SHORELINE
PROPERTY LINE	SANITARY SEWER	LIGHTING ELECTRIC	SIGN	COASTAL BEACH
MINOR CONTOUR	EXISTING FENCE	RETAINING WALL	ELECTRIC BOX	WATER USE CATEGORY 6
MINOR CONTOUR	COMMUNICATIONS LINE	STORM DRAIN	CATCH BASIN	

06/21/2021

ISSUED FOR PERMIT - NOT FOR CONSTRUCTION

CHRISTOPHER A. COCKSHAW
No. 9816
REGISTERED PROFESSIONAL ENGINEER
CIVIL

Rev.	Date	Accep.	Appr.	Description
D	06/18/21	ML	GD	ISSUED FOR PERMIT
C	06/01/21	ML	GD	ISSUED FOR FURTHER REVIEW
B	05/19/21	ML	GD	ISSUED FOR FURTHER REVIEW
A	05/03/21	ML	GD	ISSUED FOR REVIEW

Drawn by	Accepted	Approved
05/03/2021 KLH	05/03/2021 ML	05/03/2021 GD

Scale	Size	Ørsted Document No.
1" = 100'	D-SIZE	07059048

Supplier

Supplier Document No.

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HDD OVERALL SITE PLAN
NORTH KINGSTOWN, RHODE ISLAND

DRAWING NUMBER: 07059048

Rev.: D

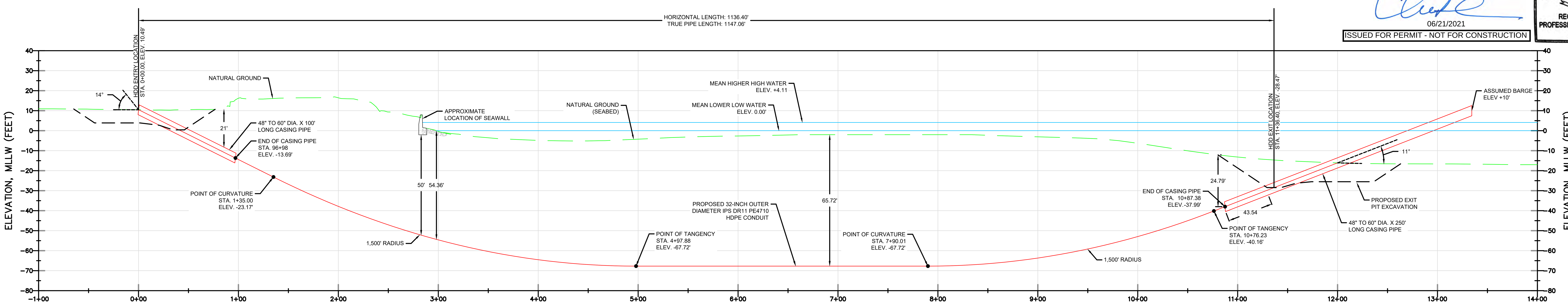
HDD EAST SITE PLAN

SCALE BAR
50' 25' 0' 50'

CHRISTOPHER A. COCKSHAW
No. 9816
REGISTERED PROFESSIONAL ENGINEER CIVIL

06/21/2021

ISSUED FOR PERMIT - NOT FOR CONSTRUCTION



STATION (FEET)
PROFILE

HORIZ. SCALE: 1"=50'
VERT. SCALE: 1"=25'

CROSSING SPECIFIC HDD NOTES:

1. ALL EQUIPMENT SHALL BE STAGED WITHIN THE IDENTIFIED WORK SPACE.
2. ELEVATIONS REFERENCED TO 0.00' MLLW = 4.11' MHHW, 3.86' MHW, 2.24' NAVD88, 1.87' MSL, and 0.16' MLW. HORIZONTAL DATUM REFERS TO NAD83 UTM ZONE 19 US FOOT CENTRAL MERIDIAN 69D W.
3. DIMENSIONS PROVIDED ON THE DRAWING ARE IN FEET, UNLESS OTHERWISE NOTED.
4. ALIGNMENT STATIONING IS HORIZONTAL.
5. METHOD OF HDPE CONDUIT INSTALLATION SHALL BE BY HORIZONTAL DIRECTIONAL DRILL.
6. CONTRACTOR SHALL DETERMINE FINAL LOCATIONS AND DIMENSIONS OF ALL MUD PITS NECESSARY TO ACCOMMODATE THEIR MEANS AND METHODS.
7. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY AND PROTECT ANY FOREIGN UTILITY THAT MAY BE AFFECTED BY THE OPERATIONS. CONTRACTOR SHALL CALL DIG SAFE PRIOR TO CONSTRUCTION. EXISTING UTILITY LOCATIONS AND DEPTHS, INCLUDING PRIVATE SERVICES, ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION OPERATIONS. CONTRACTOR TO STAGE ALL PERSONNEL AND EQUIPMENT WITHIN THE PERMITTED LIMIT OF DISTURBANCE, UNLESS OTHERWISE AUTHORIZED BY THE CLIENT.
8. CONTRACTOR SHALL DETERMINE DIAMETER, GRADE, WALL THICKNESS AND ANY ADDITIONAL LENGTH OF THE TEMPORARY CONDUCTOR CASING. ANY INSTALLED TEMPORARY CONDUCTOR CASING AND OFFSHORE GOAL POSTS SHALL BE FULLY REMOVED UPON COMPLETION OF PULLBACK OPERATIONS. CONTRACTOR TO DETERMINE OFFSHORE GOAL POST SUPPORTS NECESSARY FOR SUPPORTING THE CASING PIPE.
9. HDD EXIT POINT IS LOCATED WITHIN AN EXCAVATION. THIS EXCAVATION WILL HELP ACHIEVE THE REQUIRED BURIAL DEPTH OF THE HDPE CONDUIT. DEPTH AND EXTENT OF EXCAVATION SHOWN ON DRAWINGS SUBJECT TO CHANGE.
10. APPROXIMATE EXIT PIT LOCATION MAY INCLUDE TEMPORARY SUPPORT STRUCTURES. TEMPORARY SUPPORT STRUCTURES INCLUDING BUT NOT LIMITED TO CONDUIT SUPPORT PILES AND SECONDARY PROTECTION MAY BE INSTALLED AT THE EXIT PIT LOCATION TO AID IN THE INSTALLATION OF THE HDD. THESE FEATURES WILL BE REMOVED UPON COMPLETION OF THE CABLE INSTALLATION.
11. THE INITIAL EXIT PIT EXCAVATION SHALL BE CONDUCTED WITH TOOTHED BUCKET. DREDGED SEDIMENT SHALL BE PLACED IN A HOPPER SCOW(S) OR SIMILAR FOR TEMPORARY STORAGE. THE SCOW(S) MAY REQUIRE OCCASIONAL DECANTING TO REMOVE EXCESS WATER DURING DREDGING OPERATIONS. UPON COMPLETION OF THE HDD INSTALLATION, THE DREDGED SEDIMENT SHALL BE USED TO BACKFILL AND RESTORE THE EXIT PIT TO ITS PRE-EXCAVATION CONDITIONS. IF ADDITIONAL FILL IS NECESSARY TO RESTORE THE AREA TO ITS PRE-EXCAVATED CONDITIONS, CLEAN FILL OF SIMILAR GRAINSIZE SHALL BE ACQUIRED FROM AN UPLAND SOURCE AND PLACED AS BACKFILL.
12. STEEL CASING AT EXIT LOCATION SHALL BE INSTALLED OVER THE DRILL PIPE ONCE THE PILOT BORE HAS BEEN COMPLETED.
13. THE MINIMUM ALLOWABLE DRILLING RADIUS SHALL BE 900 FEET BASED ON A 3-JOINT AVERAGE.
14. HDD OPERATIONS SHALL BE CONDUCTED IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS.
15. DOWNHOLE ANNULAR DRILLING FLUID PRESSURES SHALL BE MONITORED AT ALL TIMES DURING THE PILOT BORE DRILLING PROCESS. LOCATION OF MONITORING SHALL BE AS CLOSE TO THE DRILL BIT AS POSSIBLE. CONTRACTOR SHALL MAINTAIN FLUID PRESSURES AS LOW AS POSSIBLE AND REACT TO CLEAN THE BORE SHOULD FLUID PRESSURES DIFFER FROM CALCULATED VALUES.
16. PILOT BORE SHALL BE CONTINUOUSLY TRACKED AT ALL TIMES. NO BLIND SECTIONS SHALL BE PERMITTED, EVEN WHEN THE DRILL BIT IS UNDER WATER.
17. ROCK BAGS OR EQUIVALENT MAY BE TEMPORARILY PLACED WITHIN EXCAVATION TO PREVENT INFILLING DURING HDD OPERATIONS.
18. PRIOR TO CABLE PULL IN, THE DREDGED AREA AT THE END OF THE HDPE CONDUIT MAY REQUIRE TARGETED REMOVAL/CLEARING OF ACCUMULATED SEDIMENT DUE TO INFILLING. TO AVOID DAMAGING THE CONDUIT, THIS WORK SHALL BE CONDUCTED WITH THE USE OF AN AIRLIFT, CONTROLLED FLOW EXCAVATION, AND/OR SUCTION DREDGING OR SIMILAR EQUIPMENT.
19. SOIL IN VICINITY OF THE HDD ENTRY LOCATION SHALL BE COMPACTED FOLLOWING COMPLETION OF HDD OPERATIONS TO AVOID FUTURE SETTLEMENT.
20. SPILL-PREVENTION: REFUELING OF ALL EQUIPMENT SHALL BE COMPLETED IN ACCORDANCE WITH CONTRACTORS JOB SAFETY PLAN.
21. THE HDPE CONDUIT SHALL BE FABRICATED WITHIN THE APPROVED PRODUCT PIPE STRINGING AND FABRICATION AREA.
22. HDPE CONDUIT SHALL BE INTERNALLY AND EXTERNALLY DEBEADED AS IT IS FABRICATED.
23. PRE-INSTALLATION LOW PRESSURE AIR TEST AND MANDREL TEST SIZED 90 PERCENT OF THE HDPE CONDUIT INTERNAL DIAMETER SHALL BE COMPLETED PRIOR TO TOWING TO HDD EXIT LOCATION.
24. POST-INSTALLATION TEST SHALL CONSIST OF PULLING A CALIBRATION TOOL WITH A GAUGING PLATE SIZED TO 90 PERCENT OF HDPE INNER DIAMETER THROUGH THE INSTALLED CONDUIT. MANDREL TO BE SIZED TO 90 PERCENT OF THE HDPE CONDUIT INTERNAL DIAMETER.
25. CONTRACTOR SHALL FULLY FILL THE HDPE CONDUIT WITH WATER DURING PULLBACK OPERATIONS. CONDUIT TO BE LEFT FULL OF WATER.
26. EROSION AND SEDIMENT CONTROL: CONTRACTOR SHALL SUPPLY, INSTALL AND MAINTAIN SEDIMENT CONTROL STRUCTURES IN ACCORDANCE WITH SOIL EROSION AND CONTROL PLAN.
27. CLEANUP / STABILIZATION / RESTORATION: ALL DISTURBED AREAS ONSHORE SHALL BE RETURNED TO THE ORIGINAL CONTOURS. DISTURBED AREAS SHALL BE RETURNED TO ORIGINAL CONDITION OR BETTER.
28. AERIAL IMAGERY PROVIDED BY ESRI BASEMAP IMAGERY, 2020.
29. THIS DRAWING IS BASED ON TOPOGRAPHIC SURVEY DATA PROVIDED BY VHB SEPTEMBER, 2020 AND BATHYMETRY PROVIDED BY NOAA APRIL, 2021. THIS DATA IS USED AS IS AND HAS NOT BEEN VERIFIED BY MOTT MACDONALD.
30. SPILL KITS SHALL BE STAGED AT THE HDD ENTRY AND EXIT LOCATIONS.
31. WATER SOURCE: CONTRACTOR IS RESPONSIBLE FOR SOURCING A RELIABLE WATER SOURCE FOR ALL HDD OPERATIONS. DRILL WATER SHALL BE OBTAINED FROM COMPANY APPROVED SOURCE.
32. DRILL PATH SHOWN ON THE DRAWINGS REFERS TO THE CENTERLINE OF THE PROPOSED HDD INSTALLATION. DRILLING TOLERANCES MAY RESULT IN SLIGHT DEVIATIONS FROM THESE STATIONS AND ELEVATIONS. PILOT BORE DRILLING TOLERANCES ARE AS INDICATED IN TOLERANCE TABLE.

LEGEND:

NATURAL GAS
PROPERTY LINE
MINOR CONTOUR
MINOR CONTOUR
WATER LINE
SANITARY SEWER
EXISTING FENCE
COMMUNICATIONS LINE
ELECTRIC & POLE
LIGHTING ELECTRIC
RETAINING WALL
STORM DRAIN
STORM MANHOLE
SIGN
ELECTRIC BOX
CATCH BASIN

ITEM	TOLERANCE
PILOT ENTRY ANGLE	INCREASE ANGLE UP TO 1° (STEEPER), BUT NO DECREASE IN ANGLE ALLOWED.
PILOT ENTRY LOCATION	AS STAKED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL.
PILOT EXIT ANGLE	DECREASE ANGLE UP TO 2° (FLATTER), BUT NO INCREASES IN EXIT ANGLE ALLOWED.
PILOT EXIT LOCATION	UP TO FIVE (5) FEET SHORTER AND 15 FEET LONGER.
PILOT DEPTH	UP TO THREE (3) FEET SHALLOWER ALLOWED. UP TO EIGHT (8) FEET DEEPER ALLOWED.
PILOT ALIGNMENT	UP TO FIVE (5) FEET LEFT OR RIGHT OF THE OWNER SURVEY CENTERLINE BUT NOT WITHIN THREE (3) FEET OF THE RIGHT-OF-WAY/EASEMENT BOUNDARY.

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B	05/19/21	ML	GD	ISSUED FOR FURTHER REVIEW
A	05/03/21	ML	GD	ISSUED FOR REVIEW

Drawn by: 05/03/2021 KLH
Accepted: 05/03/2021 ML
Approved: 05/03/2021 GD
Scale: 1" = 100'
Size: D-SIZE
Ørsted Document No.: 07015963
Supplier:
Supplier Document No.:

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HDD PLAN & PROFILE
HDD EAST LANDFALL
NORTH KINGSTOWN, RHODE ISLAND

DRAWING NUMBER: 07015963
Rev.: D

HDD WEST SITE PLAN

SCALE BAR
50' 25' 0' 50'

06/21/2021
ISSUED FOR PERMIT - NOT FOR CONSTRUCTION

CHRISTOPHER A. COCKSHAW
No. 9816
REGISTERED
PROFESSIONAL ENGINEER
CIVIL

STATION (FEET)

PROFILE

HORIZ. SCALE: 1"=50'
VERT. SCALE: 1"=25'

CROSSING SPECIFIC HDD NOTES:

1. ALL EQUIPMENT SHALL BE STAGED WITHIN THE IDENTIFIED WORK SPACE.
2. ELEVATIONS REFERENCED TO 0.00' MLLW = 4.11' MHHW, 3.86' MHW, 2.24' NAVD88, 1.87' MSL, and 0.16' MLW. HORIZONTAL DATUM REFERS TO NAD83 UTM ZONE 19 US FOOT CENTRAL MERIDIAN 69D W.
3. DIMENSIONS PROVIDED ON THE DRAWING ARE IN FEET, UNLESS OTHERWISE NOTED.
4. ALIGNMENT STATIONING IS HORIZONTAL.
5. METHOD OF HDPE CONDUIT INSTALLATION SHALL BE BY HORIZONTAL DIRECTIONAL DRILL.
6. CONTRACTOR SHALL DETERMINE FINAL LOCATIONS AND DIMENSIONS OF ALL MUD PITS NECESSARY TO ACCOMMODATE THEIR MEANS AND METHODS.
7. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY AND PROTECT ANY FOREIGN UTILITY THAT MAY BE AFFECTED BY THE OPERATIONS. CONTRACTOR SHALL CALL DIG SAFE PRIOR TO CONSTRUCTION. EXISTING UTILITY LOCATIONS AND DEPTHS, INCLUDING PRIVATE SERVICES, ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION OPERATIONS. CONTRACTOR TO STAGE ALL PERSONNEL AND EQUIPMENT WITHIN THE PERMITTED LIMIT OF DISTURBANCE, UNLESS OTHERWISE AUTHORIZED BY THE CLIENT.
8. CONTRACTOR SHALL DETERMINE DIAMETER, GRADE, WALL THICKNESS AND ANY ADDITIONAL LENGTH OF THE TEMPORARY CONDUCTOR CASING. ANY INSTALLED TEMPORARY CONDUCTOR CASING AND OFFSHORE GOAL POSTS SHALL BE FULLY REMOVED UPON COMPLETION OF PULLBACK OPERATIONS. CONTRACTOR TO DETERMINE OFFSHORE GOAL POST SUPPORTS NECESSARY FOR SUPPORTING THE CASING PIPE.
9. HDD EXIT POINT IS LOCATED WITHIN AN EXCAVATION. THIS EXCAVATION WILL HELP ACHIEVE THE REQUIRED BURIAL DEPTH OF THE HDPE CONDUIT. DEPTH AND EXTENT OF EXCAVATION SHOWN ON DRAWINGS SUBJECT TO CHANGE.
10. APPROXIMATE EXIT PIT LOCATION MAY INCLUDE TEMPORARY SUPPORT STRUCTURES. TEMPORARY SUPPORT STRUCTURES INCLUDING BUT NOT LIMITED TO CONDUIT SUPPORT PILES AND SECONDARY PROTECTION MAY BE INSTALLED AT THE EXIT PIT LOCATION TO AID IN THE INSTALLATION OF THE HDD. THESE FEATURES WILL BE REMOVED UPON COMPLETION OF THE CABLE INSTALLATION.
11. THE INITIAL EXIT PIT EXCAVATION SHALL BE CONDUCTED WITH TOOTHED BUCKET. DREDGED SEDIMENT SHALL BE PLACED IN A HOPPER SCOW(S) OR SIMILAR FOR TEMPORARY STORAGE. THE SCOW(S) MAY REQUIRE OCCASIONAL DECANTING TO REMOVE EXCESS WATER DURING DREDGING OPERATIONS. UPON COMPLETION OF THE HDD INSTALLATION, THE DREDGED SEDIMENT SHALL BE USED TO BACKFILL AND RESTORE THE EXIT PIT TO ITS PRE-EXCAVATION CONDITIONS. IF ADDITIONAL FILL IS NECESSARY TO RESTORE THE AREA TO ITS PRE-EXCAVATED CONDITIONS, CLEAN FILL OF SIMILAR GRAINSIZE SHALL BE ACQUIRED FROM AN UPLAND SOURCE AND PLACED AS BACKFILL.
12. STEEL CASING AT EXIT LOCATION SHALL BE INSTALLED OVER THE DRILL PIPE ONCE THE PILOT BORE HAS BEEN COMPLETED.
13. THE MINIMUM ALLOWABLE DRILLING RADIUS SHALL BE 900 FEET BASED ON A 3-JOINT AVERAGE.
14. HDD OPERATIONS SHALL BE CONDUCTED IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS.
15. DOWNHOLE ANNULAR DRILLING FLUID PRESSURES SHALL BE MONITORED AT ALL TIMES DURING THE PILOT BORE DRILLING PROCESS. LOCATION OF MONITORING SHALL BE AS CLOSE TO THE DRILL BIT AS POSSIBLE. CONTRACTOR SHALL MAINTAIN FLUID PRESSURES AS LOW AS POSSIBLE AND REACT TO CLEAN THE BORE SHOULD FLUID PRESSURES DIFFER FROM CALCULATED VALUES.
16. PILOT BORE SHALL BE CONTINUOUSLY TRACKED AT ALL TIMES. NO BLIND SECTIONS SHALL BE PERMITTED, EVEN WHEN THE DRILL BIT IS UNDER WATER.
17. ROCK BAGS OR EQUIVALENT MAY BE TEMPORARILY PLACED WITHIN EXCAVATION TO PREVENT INFILLING DURING HDD OPERATIONS.
18. PRIOR TO CABLE PULL IN, THE DREDGED AREA AT THE END OF THE HDPE CONDUIT MAY REQUIRE TARGETED REMOVAL/CLEARING OF ACCUMULATED SEDIMENT DUE TO INFILLING. TO AVOID DAMAGING THE CONDUIT, THIS WORK SHALL BE CONDUCTED WITH THE USE OF AN AIRLIFT, CONTROLLED FLOW EXCAVATION, AND/OR SUCTION DREDGING OR SIMILAR EQUIPMENT.
19. SOIL IN VICINITY OF THE HDD ENTRY LOCATION SHALL BE COMPACTED FOLLOWING COMPLETION OF HDD OPERATIONS TO AVOID FUTURE SETTLEMENT.
20. SPILL-PREVENTION: REFUELING OF ALL EQUIPMENT SHALL BE COMPLETED IN ACCORDANCE WITH CONTRACTORS JOB SAFETY PLAN.
21. THE HDPE CONDUIT SHALL BE FABRICATED WITHIN THE APPROVED PRODUCT PIPE STRINGING AND FABRICATION AREA.
22. HDPE CONDUIT SHALL BE INTERNALLY AND EXTERNALLY DEBEADED AS IT IS FABRICATED.
23. PRE-INSTALLATION LOW PRESSURE AIR TEST AND MANDREL TEST SIZED 90 PERCENT OF THE HDPE CONDUIT INTERNAL DIAMETER SHALL BE COMPLETED PRIOR TO TOWING TO HDD EXIT LOCATION.
24. POST-INSTALLATION TEST SHALL CONSIST OF PULLING A CALIBRATION TOOL WITH A GAUGING PLATE SIZED TO 90 PERCENT OF HDPE INNER DIAMETER THROUGH THE INSTALLED CONDUIT. MANDREL TO BE SIZED TO 90 PERCENT OF THE HDPE CONDUIT INTERNAL DIAMETER.
25. CONTRACTOR SHALL FULLY FILL THE HDPE CONDUIT WITH WATER DURING PULLBACK OPERATIONS. CONDUIT TO BE LEFT FULL OF WATER.
26. EROSION AND SEDIMENT CONTROL: CONTRACTOR SHALL SUPPLY, INSTALL AND MAINTAIN SEDIMENT CONTROL STRUCTURES IN ACCORDANCE WITH SOIL EROSION AND CONTROL PLAN.
27. CLEANUP / STABILIZATION / RESTORATION: ALL DISTURBED AREAS ONSHORE SHALL BE RETURNED TO THE ORIGINAL CONTOURS. DISTURBED AREAS SHALL BE RETURNED TO ORIGINAL CONDITION OR BETTER.
28. AERIAL IMAGERY PROVIDED BY ESRI BASEMAP IMAGERY, 2020.
29. THIS DRAWING IS BASED ON TOPOGRAPHIC SURVEY DATA PROVIDED BY VHB SEPTEMBER, 2020 AND BATHYMETRY PROVIDED BY NOAA APRIL, 2021. THIS DATA IS USED AS IS AND HAS NOT BEEN VERIFIED BY MOTT MACDONALD.
30. SPILL KITS SHALL BE STAGED AT THE HDD ENTRY AND EXIT LOCATIONS.
31. WATER SOURCE: CONTRACTOR IS RESPONSIBLE FOR SOURCING A RELIABLE WATER SOURCE FOR ALL HDD OPERATIONS. DRILL WATER SHALL BE OBTAINED FROM COMPANY APPROVED SOURCE.
32. DRILL PATH SHOWN ON THE DRAWINGS REFERS TO THE CENTERLINE OF THE PROPOSED HDD INSTALLATION. DRILLING TOLERANCES MAY RESULT IN SLIGHT DEVIATIONS FROM THESE STATIONS AND ELEVATIONS. PILOT BORE DRILLING TOLERANCES ARE AS INDICATED IN TOLERANCE TABLE.

LEGEND:

NATURAL GAS
PROPERTY LINE
MINOR CONTOUR
MINOR CONTOUR
WATER LINE
SANITARY SEWER
EXISTING FENCE
COMMUNICATIONS LINE
ELECTRIC & POLE
LIGHTING ELECTRIC
RETAINING WALL
STORM DRAIN
STORM MANHOLE
SIGN
ELECTRIC BOX
CATCH BASIN

ITEM	TOLERANCE
PILOT ENTRY ANGLE	INCREASE ANGLE UP TO 1° (STEEPER), BUT NO DECREASE IN ANGLE ALLOWED.
PILOT ENTRY LOCATION	AS STAKED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL.
PILOT EXIT ANGLE	DECREASE ANGLE UP TO 2° (FLATTER), BUT NO INCREASES IN EXIT ANGLE ALLOWED.
PILOT EXIT LOCATION	UP TO FIVE (5) FEET SHORTER AND 15 FEET LONGER.
PILOT DEPTH	UP TO THREE (3) FEET SHALLOWER ALLOWED. UP TO EIGHT (8) FEET DEEPER ALLOWED.
PILOT ALIGNMENT	UP TO FIVE (5) FEET LEFT OR RIGHT OF THE OWNER SURVEY CENTERLINE BUT NOT WITHIN THREE (3) FEET OF THE RIGHT-OF-WAY/EASEMENT BOUNDARY.

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Drawn by: 05/03/2021 KLH
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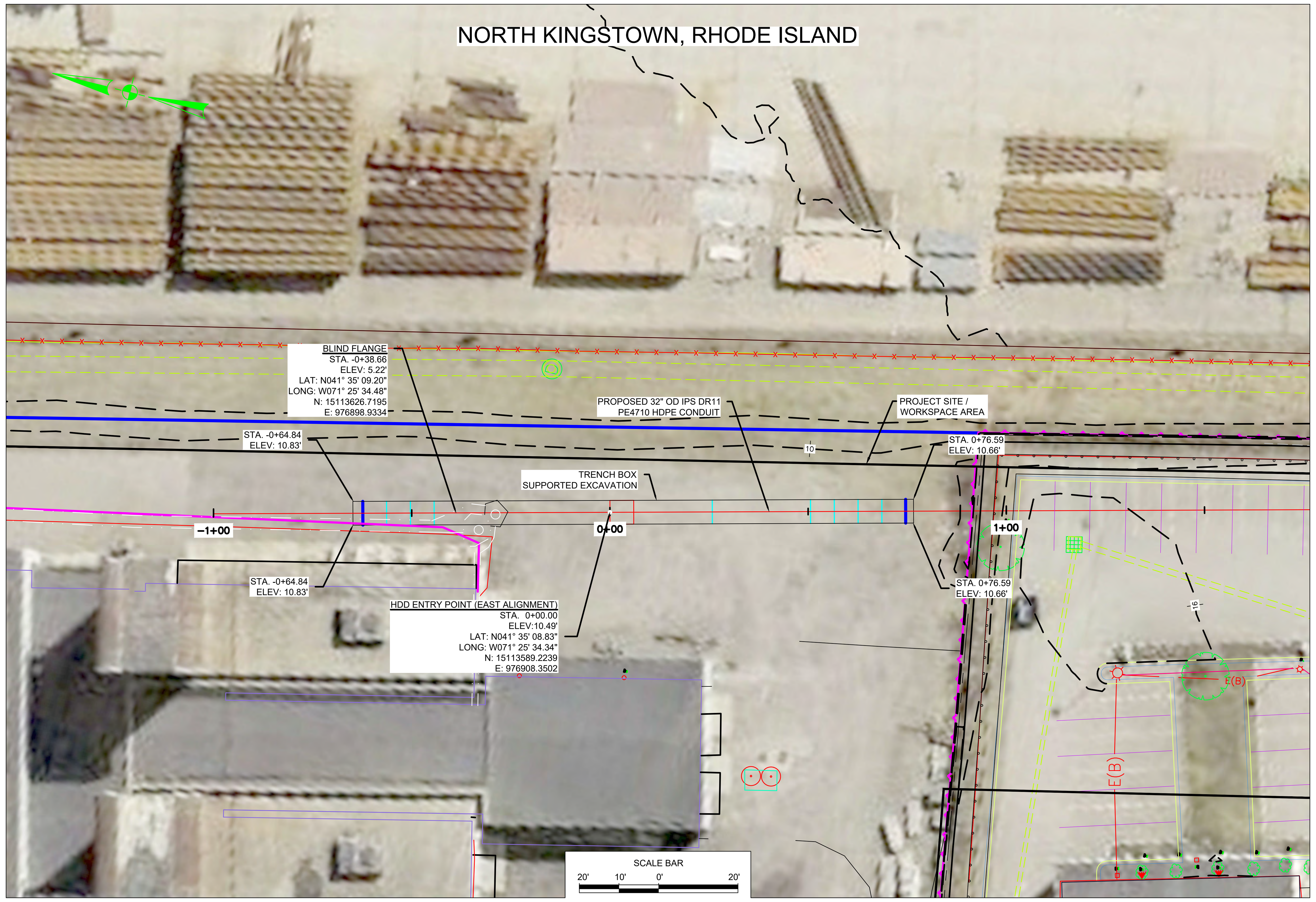
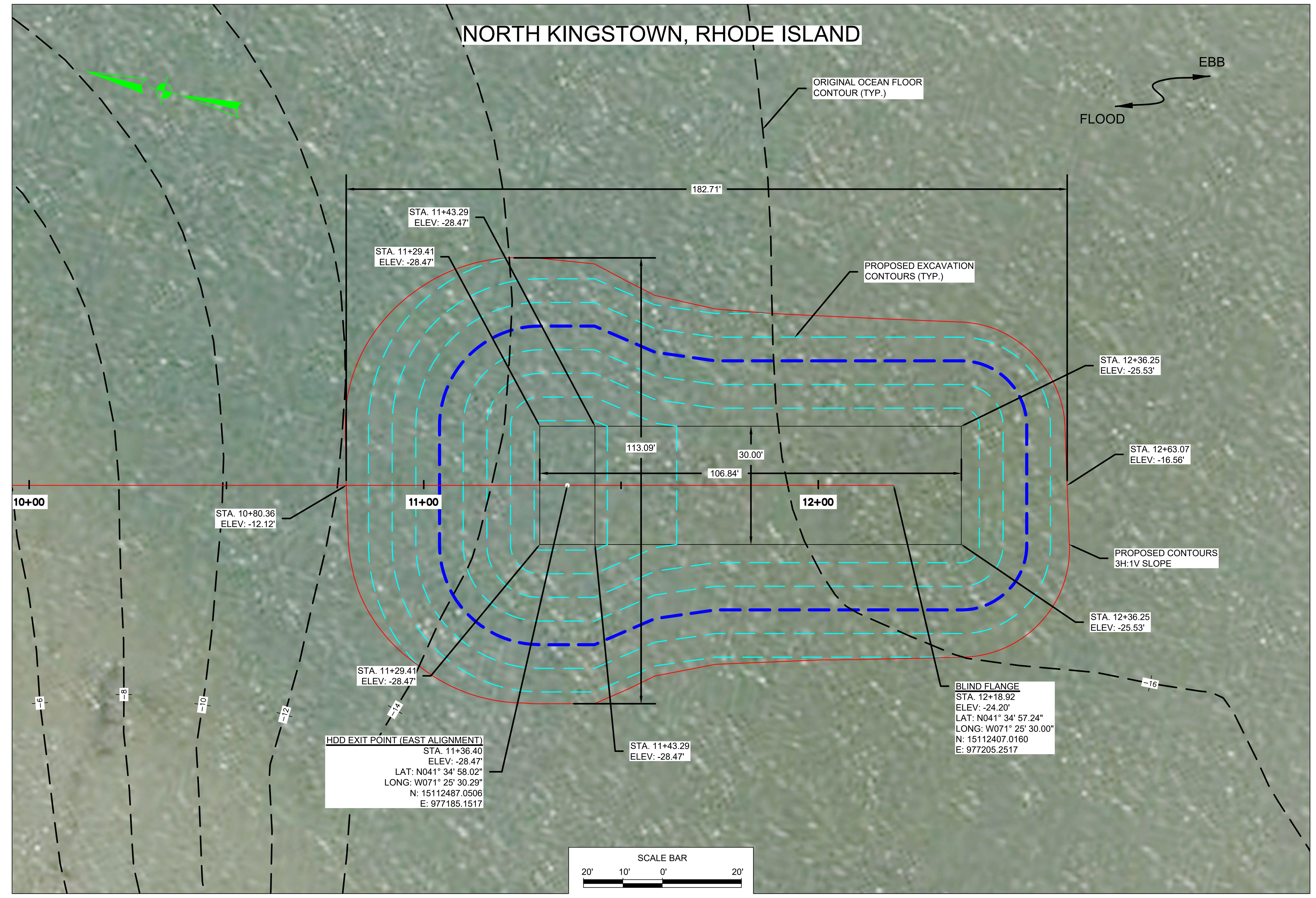
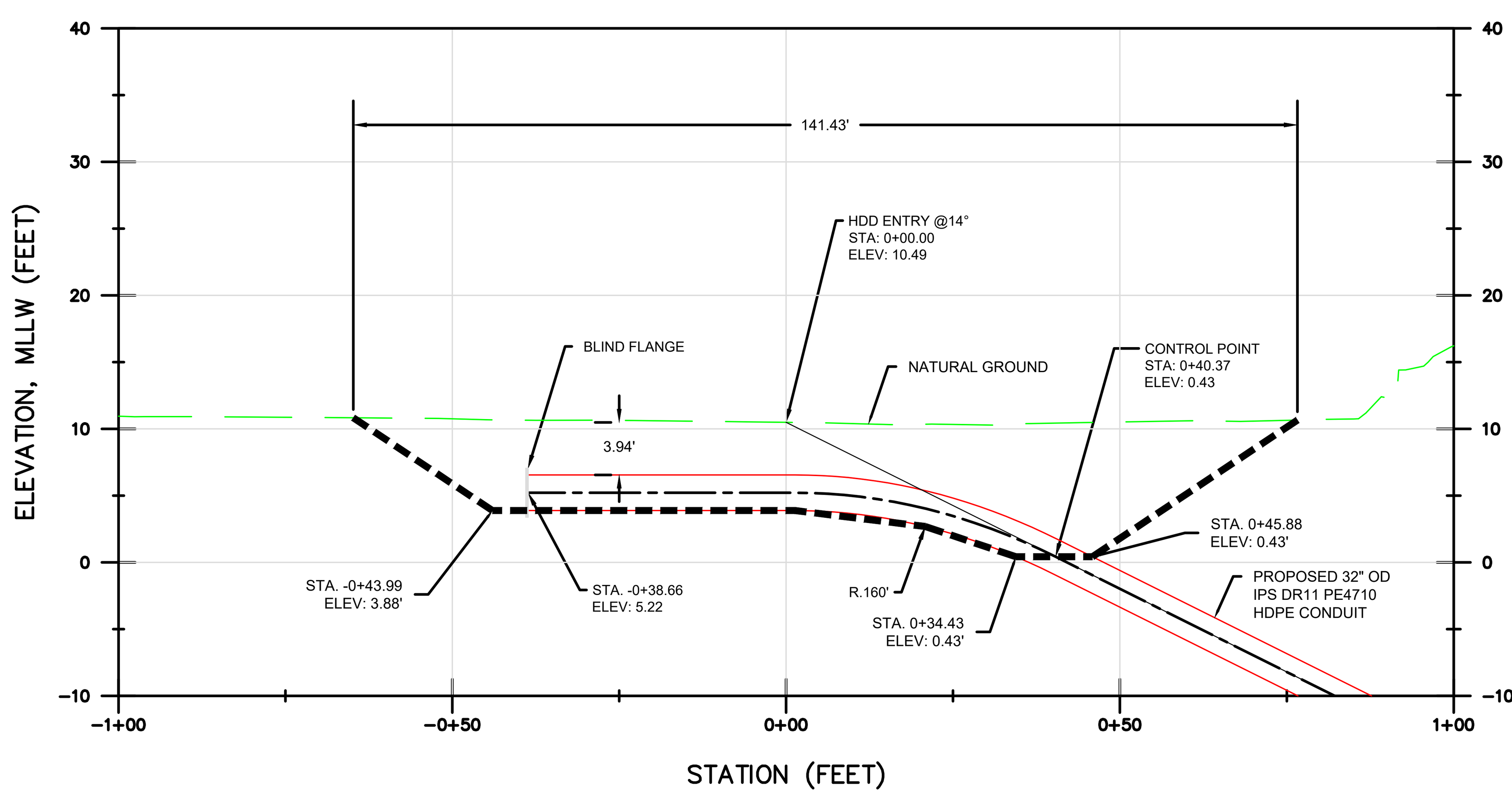
HDD PLAN & PROFILE
HDD WEST LANDFALL
NORTH KINGSTOWN, RHODE ISLAND

DRAWING NUMBER: 07015967
Rev.: D

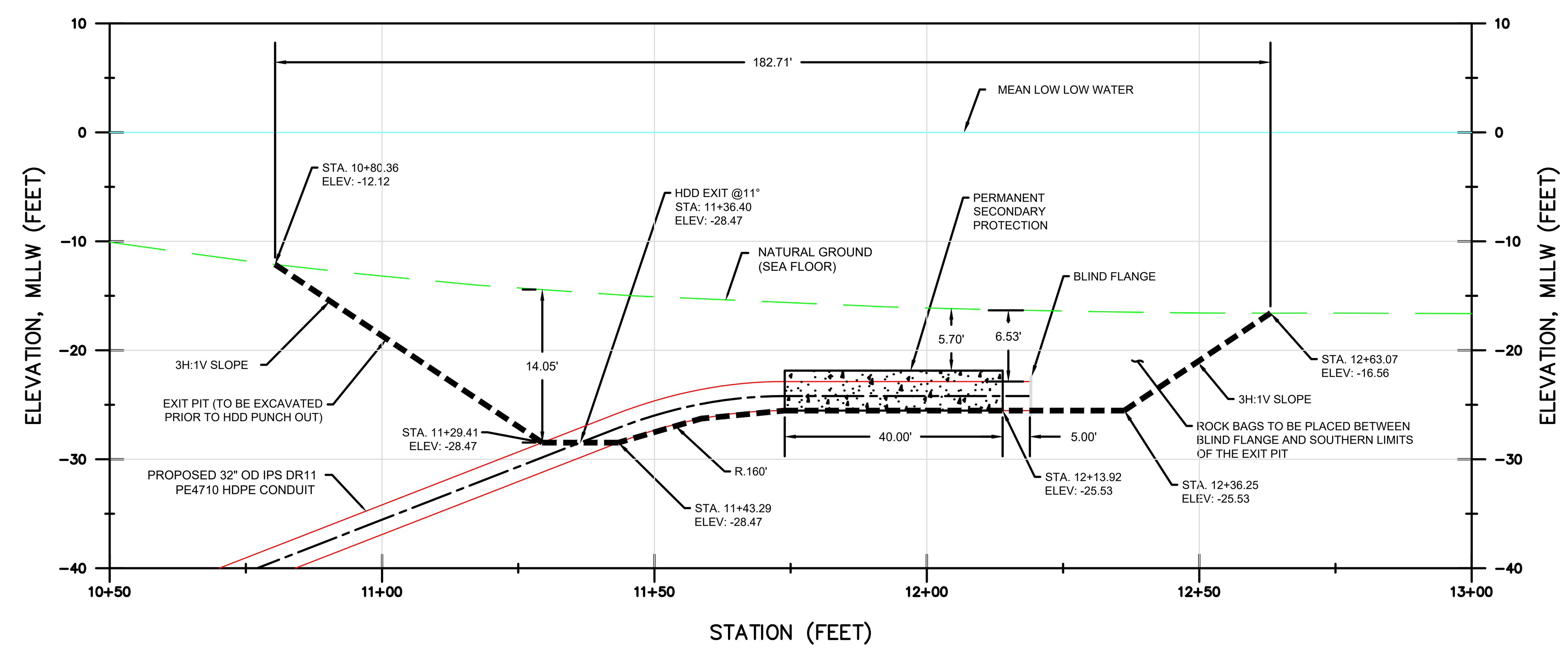






PROFILE

HORIZ. SCALE: 1"=20'
VERT. SCALE: 1"=10'



PROFILE

HORIZ. SCALE: 1"=20'
VERT. SCALE: 1"=10'

LEGEND:

NATURAL GAS		WATER LINE		ELECTRIC & POLE		STORM MANHOLE	
PROPERTY LINE		SANITARY SEWER		LIGHTING ELECTRIC		SIGN	
MINOR CONTOUR		EXISTING FENCE		RETAINING WALL		ELECTRIC BOX	EB
MINOR CONTOUR		COMMUNICATIONS LINE		STORM DRAIN		CATCH BASIN	

06/21/2021

ISSUED FOR PERMIT - NOT FOR CONSTRUCTION

CHRISTOPHER A. COCKSHAW
No. 9816
REGISTERED PROFESSIONAL ENGINEER
CIVIL

NOTES:

1. PERMANENT SECONDARY PROTECTION MAY BE PLACED ABOVE THE HDPE CONDUIT AT THE EXIT PIT EXCAVATION. IF CONCRETE MATTRESSES ARE USED FOR SECONDARY PROTECTION, INDIVIDUAL MATTRESS DIMENSIONS WILL BE APPROXIMATELY 8' WIDE BY 20' LONG BY 1' THICK. IF OTHER SECONDARY PROTECTION METHODS ARE PROPOSED (ROCK BAGS OR SIMILAR), DIMENSIONS MAY VARY.
2. THE ESTIMATED SPOIL VOLUME TO BE EXCAVATED FOR THE PROPOSED OFFSHORE EXIT PIT IS 4,352 CUBIC YARDS AND PROPOSED ONSHORE ENTRY PIT IS 200 CUBIC YARDS.
3. ELEVATIONS REFERENCED TO 0.00' MLLW = 4.11' MHHW, 3.86' MHW, 2.24' NAVD88, 1.87' MSL, AND 0.16' MLW. HORIZONTAL DATUM REFERS TO NAD83 UTM ZONE 19 US FOOT CENTRAL MERIDIAN 69D W.
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5. ALIGNMENT STATIONING IS HORIZONTAL.

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Drawn by: 05/03/2021 MM	Accepted: 05/03/21 GD	Approved: 05/03/21 GD
Scale: 1" = 20'	Size: D-SIZE	Ørsted Document No.: 07015962
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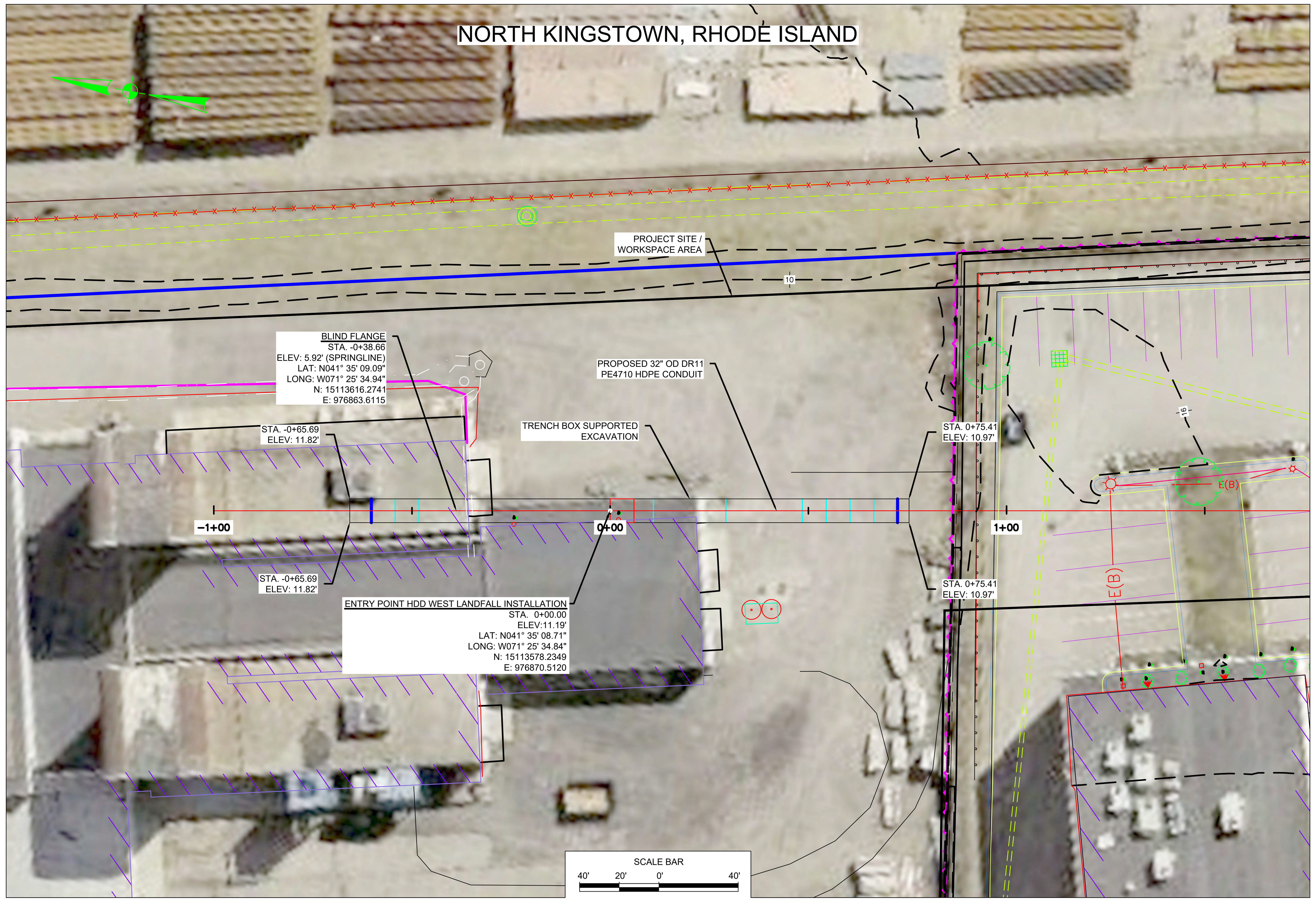
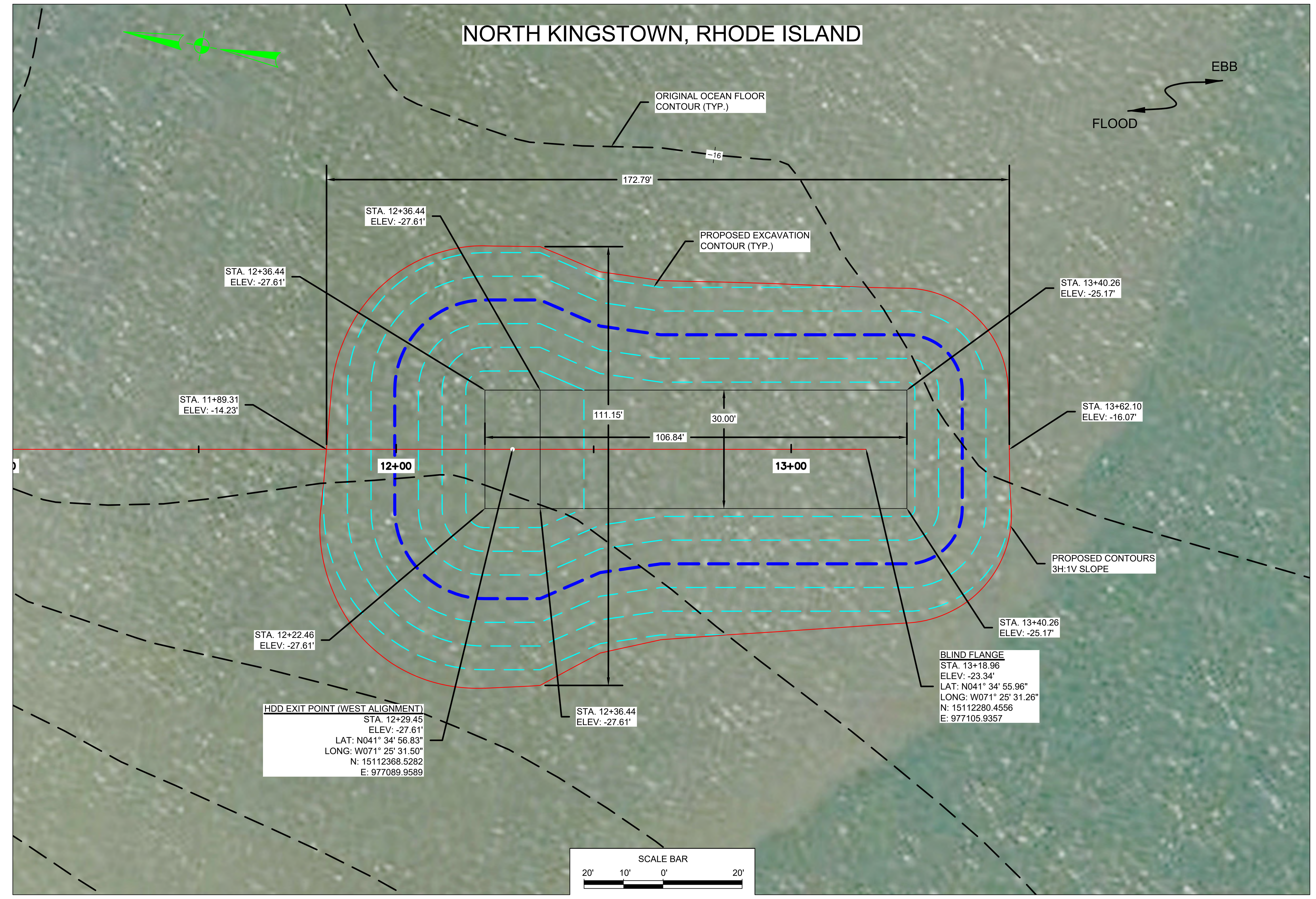
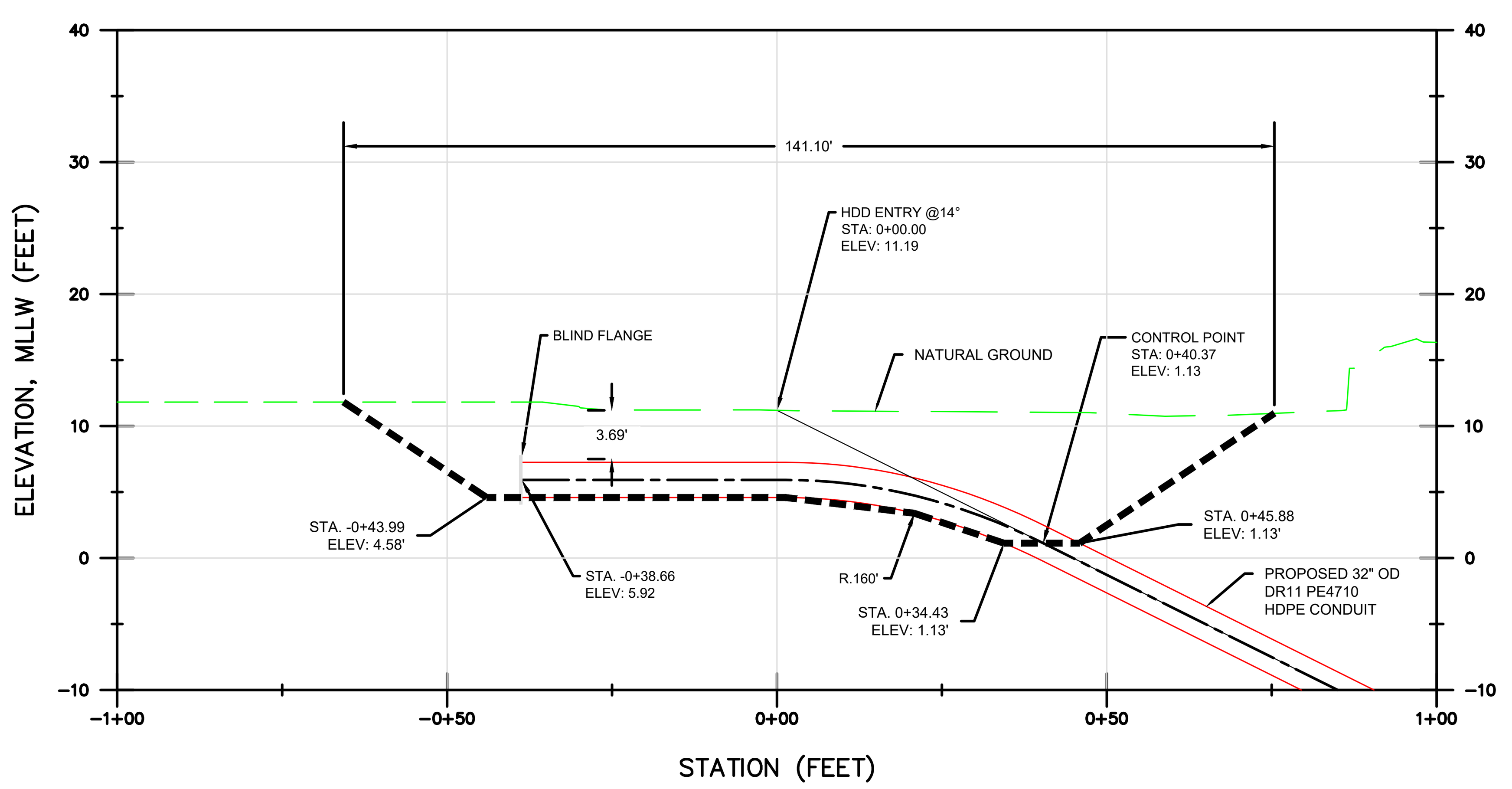
EXCAVATION DETAILS
HDD EAST LANDFALL
NORTH KINGSTOWN, RHODE ISLAND

DRAWING NUMBER: 07015962
Rev.: D







PROFILE

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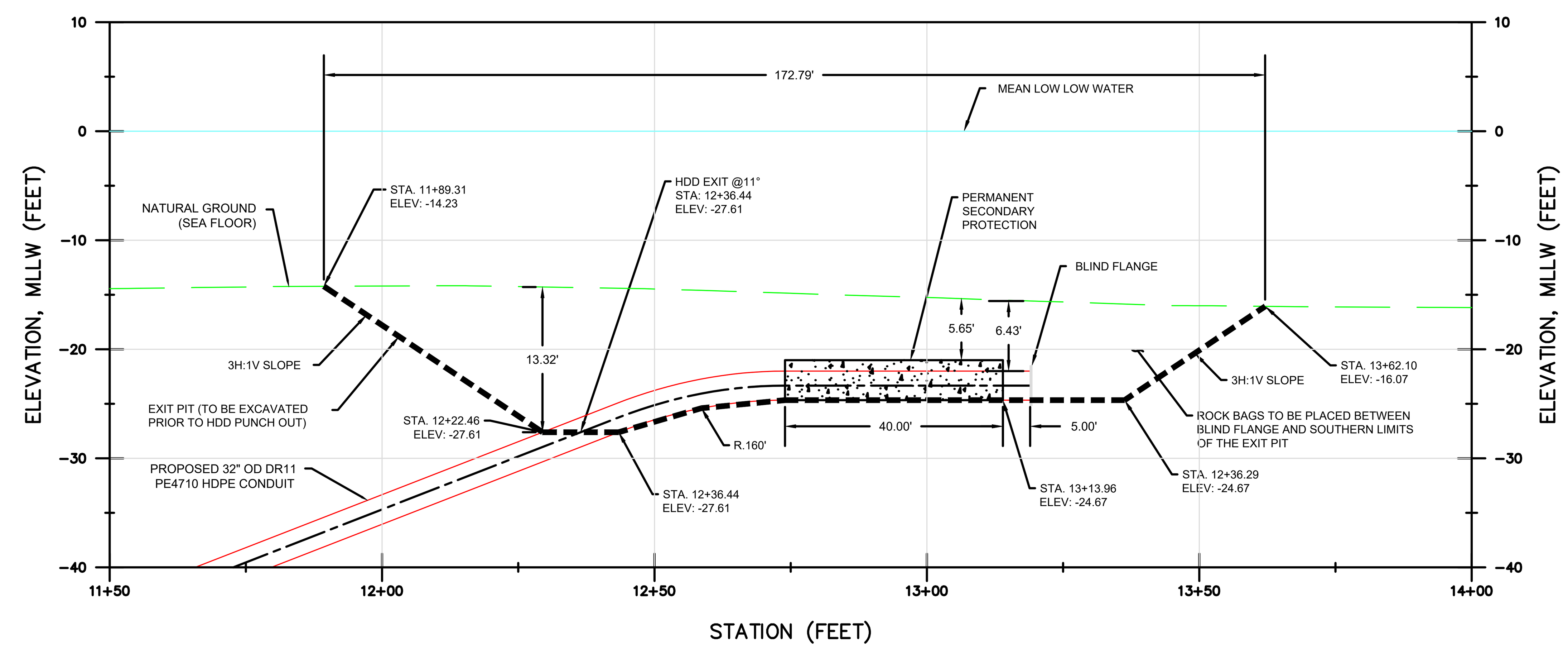
VERT. SCALE: 1"=10'



PROFILE

HORIZ. SCALE: 1"=20'
VERT. SCALE: 1"=10'

LEGEND:

NATURAL GAS		WATER LINE		ELECTRIC & POLE	E E	STORM MANHOLE	
PROPERTY LINE		SANITARY SEWER		LIGHTING ELECTRIC		SIGN	
MINOR CONTOUR	X'	EXISTING FENCE	X X X	RETAINING WALL		ELECTRIC BOX	EB
MINOR CONTOUR	X'	COMMUNICATIONS LINE		STORM DRAIN		CATCH BASIN	

NOTES:
1. PERMANENT SECONDARY PROTECTION MAY BE PLACED ABOVE THE HDPE CONDUIT AT THE EXIT PIT EXCAVATION. IF CONCRETE MATTRESSES ARE USED FOR SECONDARY PROTECTION, INDIVIDUAL MATTRESS DIMENSIONS WILL BE APPROXIMATELY 8' WIDE BY 20' LONG BY 1' THICK. IF OTHER SECONDARY PROTECTION METHODS ARE PROPOSED (ROCK BAGS OR SIMILAR), DIMENSIONS MAY VARY.
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06/21/2021

ISSUED FOR PERMIT - NOT FOR CONSTRUCTION

CHRISTOPHER A. COCKSHAW
No. 9816
REGISTERED PROFESSIONAL ENGINEER
CIVIL

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EXCAVATION DETAILS
HDD WEST LANDFALL
NORTH KINGSTOWN, RHODE ISLAND

DRAWING NUMBER: 07015965
Rev.: D

REVOLUTION WIND

RWEC Design

DRAWING INDEX		
NAME	PAGE	DRAWING SHEET
Cover Sheet	0	1
Circuit 1	1-6	1-6
Circuit 2	7-12	1-6
Typical Crossing	13-22	1-9

Date: 23/06/2021
Created by: XDAEF
Checked by: AMIJA
Accepted by: XANSD
Approved by: HENMN

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Reference system: NAD83 (2011)
Projection: UTM Zone 19N
Vertical reference: NAVD88

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Legend
- Kilometer Point (KP)
- Revolution Wind Export Cable (RWEC) Corridor
- Possible Cable Crossing Intersection*
- Possible Cable Crossings (Fugro)*
- Indicative Circuit 1 Cable Burial Profile
- Indicative Circuit 2 Cable
- 3 NM State Water Limit

Areas of Particular Concern
- Glacial Moraine A
- Glacial Moraine B
- BOEM Lease OSC-A 0486
- Elevation Contours in Meters

Crossing	Depth at Crossing (m, MLLW)	KP
A1	-8.69	9.73
B1	-13.86	11.35
C1	-13.62	11.42
D1	-13.87	11.78
E1	-13.89	11.81
F1	-13.77	11.89
G1	-25.49	18.21

PE STAMP 18/06/2021

CHRISTOPHER A. COCKSHAW
No. 9816
REGISTERED PROFESSIONAL ENGINEER
CIVIL

MOTT MACDONALD

MOTT MACDONALD NY INC.
111 Wood Avenue South
Iselin, NJ 08830-4112
Certificate of Authorization #: 0017019

Notes:

1) Preliminary design, not for construction, and pending final pUXO assessment and micro route engineering.
2) Burial of the RWEC will typically target a depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth for the RWEC will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment.
3) The RWEC Corridor will consist of two distinct buried marine circuits. Micro-siting within the corridor will be completed by the installation contractor.
4) The Indicative Cable Burial Profile shown in this drawing is subject to change based on final cable routing.
5) The elevation data shown in the chart is derived from 2019 Bathymetry from Fugro in MLLW.
6)*Please refer to REV01 Cable Crossing Detail Drawings.
7) Sources: Inspire Environmental, NOAA, NASCA, NPS, BOEM and (c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA).
8) This drawing has been prepared according to data provided and QA/QC'd by Orsted and to be considered solely for cable installation permitting purposes.

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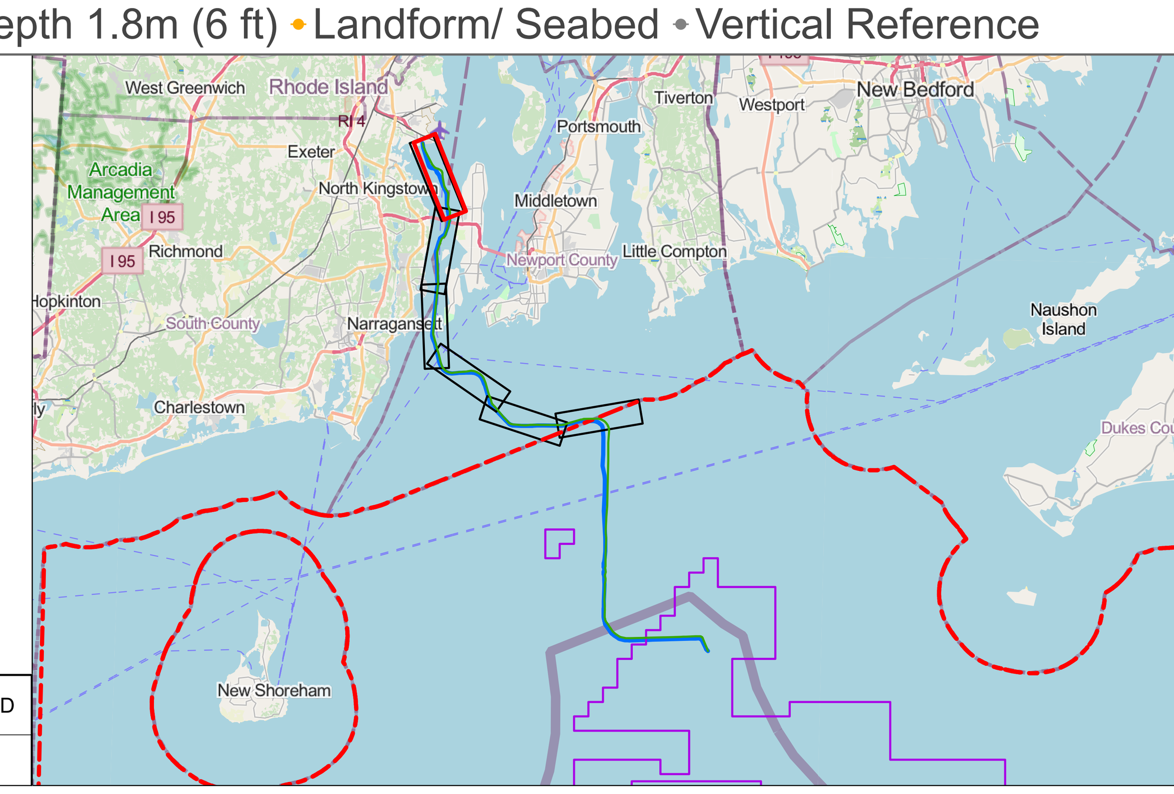
01	18/06/2021	ISSUED FOR PERMITTING	CSS	CAC/CE	ORSTED



Indicative Cable Burial Profile - Circuit 1 (Page 1 of 6)

Date: 16/06/2021
Created by: XDAEF
Checked by: MATJO
Accepted by: XDARY
Approved by: ANFRY

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0 0.15 0.3 0.45 Kilometers
0 0.15 0.3 Nautical Miles

Reference system: NAD83 (2011)
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Vertical reference: NAVD88

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PE STAMP 18/06/2021

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REGISTERED PROFESSIONAL ENGINEER
CIVIL

MOTT MACDONALD

MOTT MACDONALD NY INC.
111 Wood Avenue South
Iselin, NJ 08830-4112
Certificate of Authorization #: 0017019

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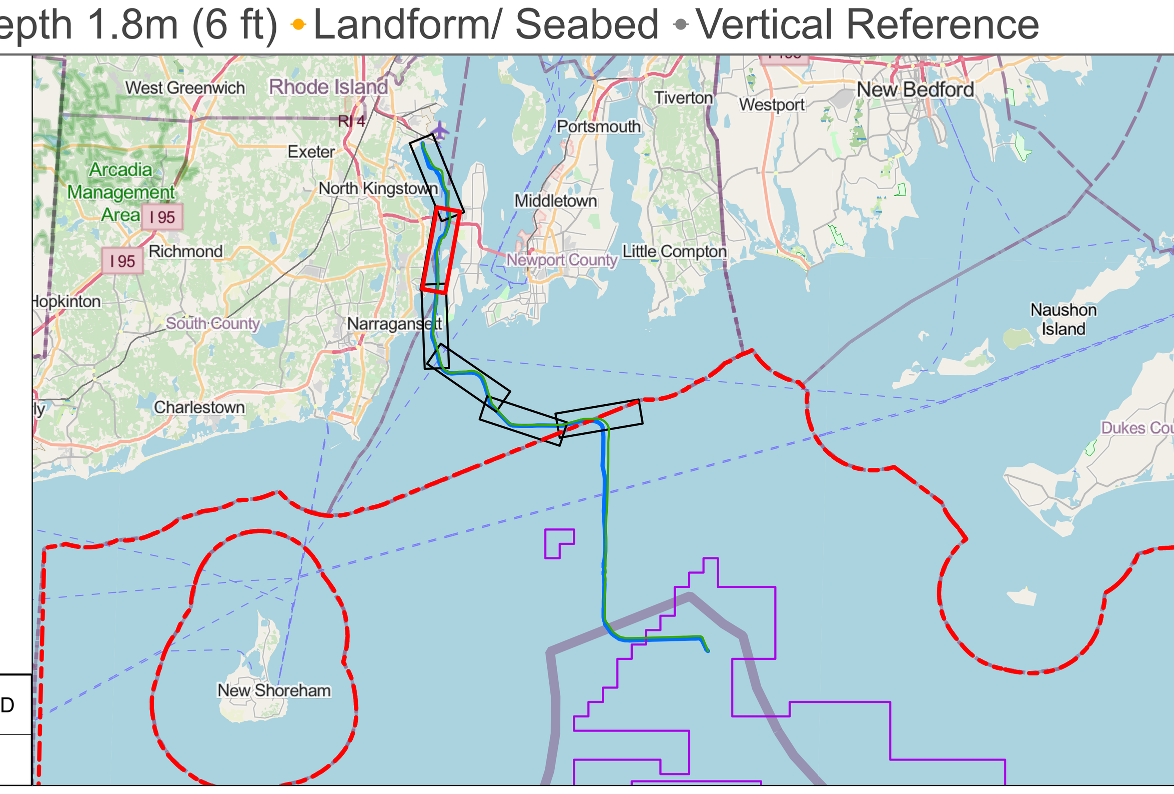

Indicative Cable Burial Profile - Circuit 1 (Page 2 of 6)

Date: 16/06/2021
Created by: XDAEF
Checked by: MATJO
Accepted by: XDARY
Approved by: ANFRY

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0 0.15 0.3 0.45 Kilometers
0 0.15 0.3 Nautical Miles

Reference system: NAD83 (2011)
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PE STAMP 18/06/2021

CHRISTOPHER A. COCKSHAW
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MOTT MACDONALD NY INC.
111 Wood Avenue South
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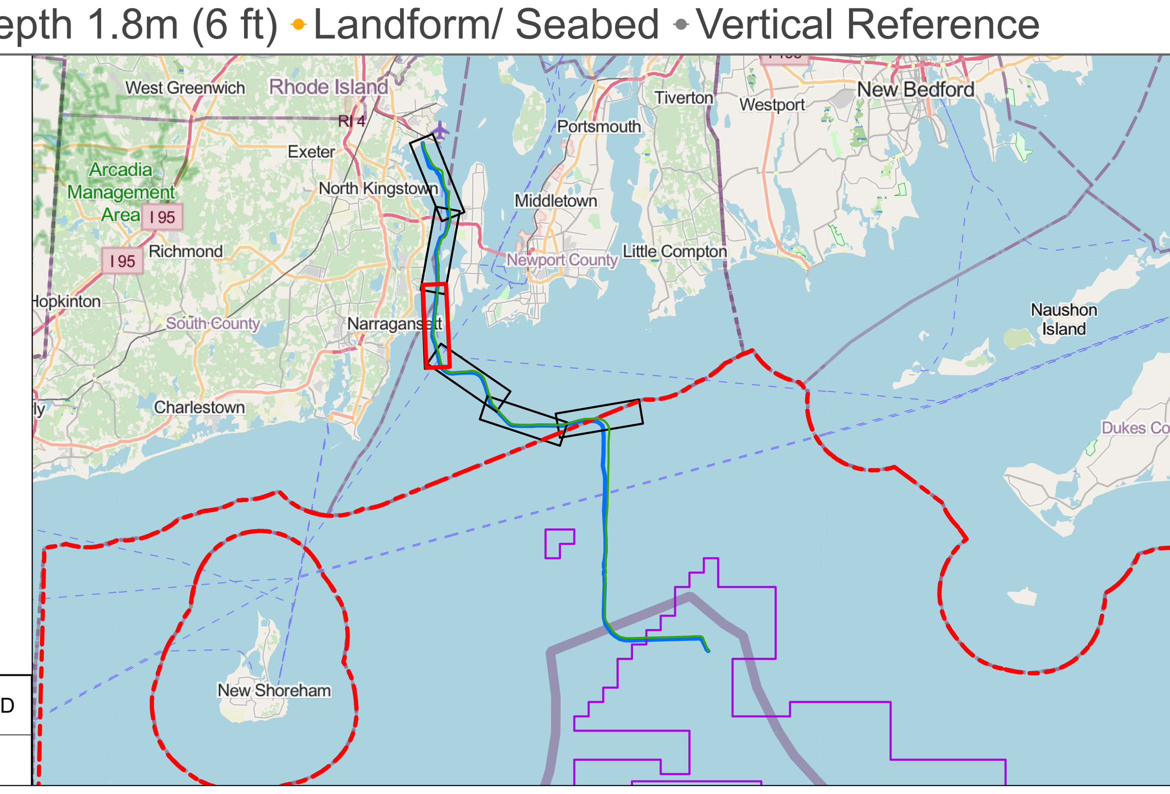

Indicative Cable Burial Profile - Circuit 1 (Page 3 of 6)

Date: 16/06/2021
Created by: XDAEF
Checked by: MATJO
Accepted by: XDARY
Approved by: ANFRY

Revolution Wind | Powered by Ørsted & Eversource

0 0.15 0.3 0.45 Kilometers
0 0.15 0.3 Nautical Miles

Reference system: NAD83 (2011)
Projection: UTM Zone 19N
Vertical reference: NAVD88

ISSUED FOR PERMITTING ONLY - NOT FOR CONSTRUCTION

Legend

- Kilometer Point (KP)
- Revolution Wind Export Cable (RWEC) Corridor
- Possible Cable Crossing Intersection*
- Possible Cable Crossings (Fugro)*
- Indicative Circuit 1 Cable Burial Profile
- Indicative Circuit 2 Cable
- 3 NM State Water Limit

Areas of Particular Concern

- Glacial Moraine A
- Glacial Moraine B
- BOEM Lease OSC-A 0486
- Elevation Contours in Meters

Crossing	Depth at Crossing (m, MLLW)	KP
A1	-8.69	9.73
B1	-13.86	11.35
C1	-13.62	11.42
D1	-13.87	11.78
E1	-13.89	11.81
F1	-13.77	11.89
G1	-25.49	18.21

MOTT MACDONALD

MOTT MACDONALD NY INC.

111 Wood Avenue South
Iselin, NJ 08830-4112

Certificate of Authorization #: 0017019

PE STAMP 18/06/2021

CHRISTOPHER A. COCKSHAW
No. 9816
REGISTERED PROFESSIONAL ENGINEER
CIVIL

Notes:

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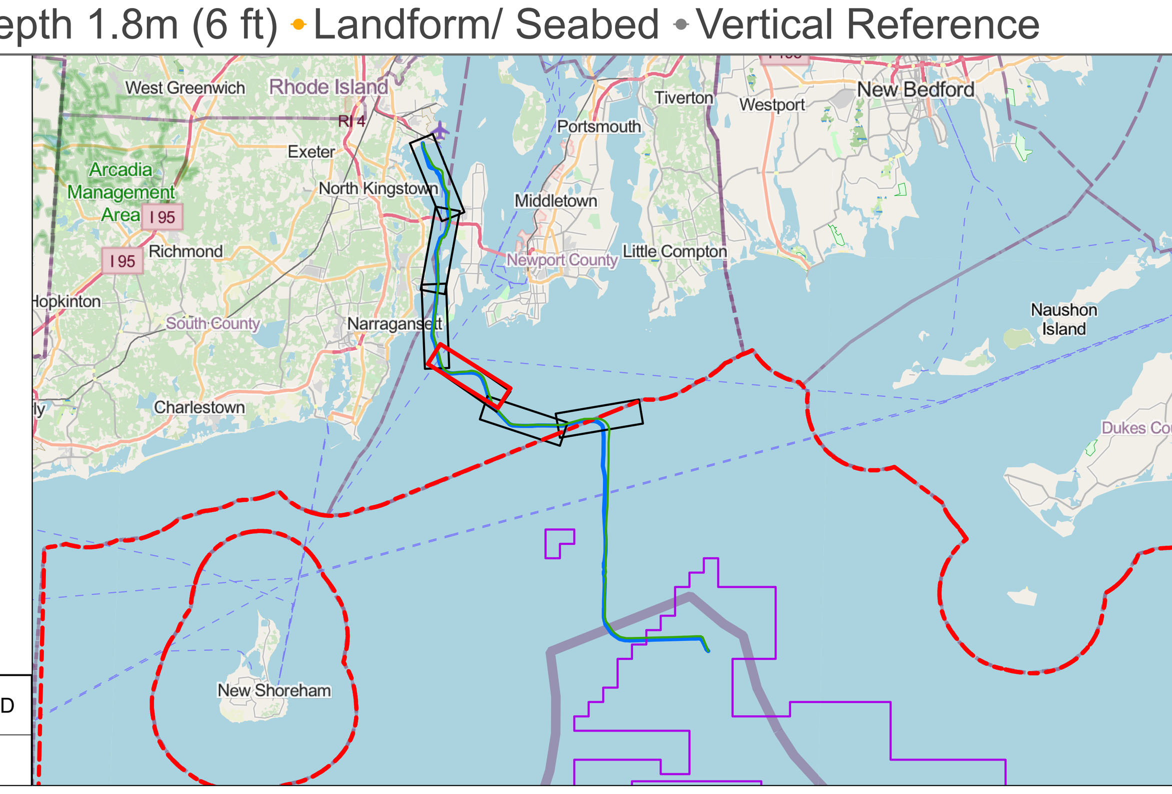

Indicative Cable Burial Profile - Circuit 1 (Page 4 of 6)

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Revolution Wind | Powered by Ørsted & Eversource

0 0.15 0.3 0.45 Kilometers

0 0.15 0.3 Nautical Miles

Reference system: NAD83 (2011)
Projection: UTM Zone 19N
Vertical reference: NAVD88

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- Indicative Circuit 1 Cable Burial Profile
- Indicative Circuit 2 Cable
- 3 NM State Water Limit

Areas of Particular Concern
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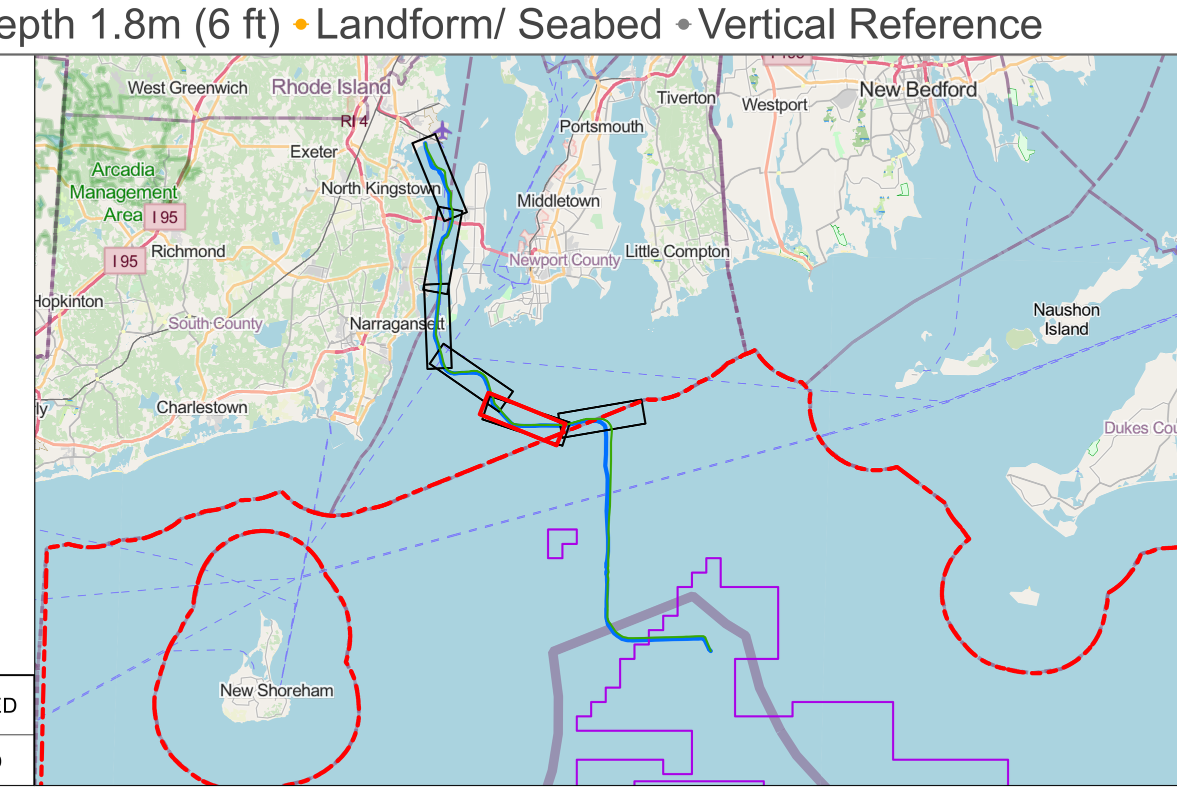

Indicative Cable Burial Profile - Circuit 1 (Page 5 of 6)

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Revolution Wind | Powered by Ørsted & Eversource

0 0.15 0.3 0.45 Kilometers
0 0.15 0.3 Nautical Miles

Reference system: NAD83 (2011)
Projection: UTM Zone 19N
Vertical reference: NAVD88

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- Indicative Circuit 2 Cable
- 3 NM State Water Limit

Areas of Particular Concern

- Glacial Moraine A
- Glacial Moraine B
- BOEM Lease OSC-A 0486
- Elevation Contours in Meters

Crossing	Depth at Crossing (m, MLLW)	KP
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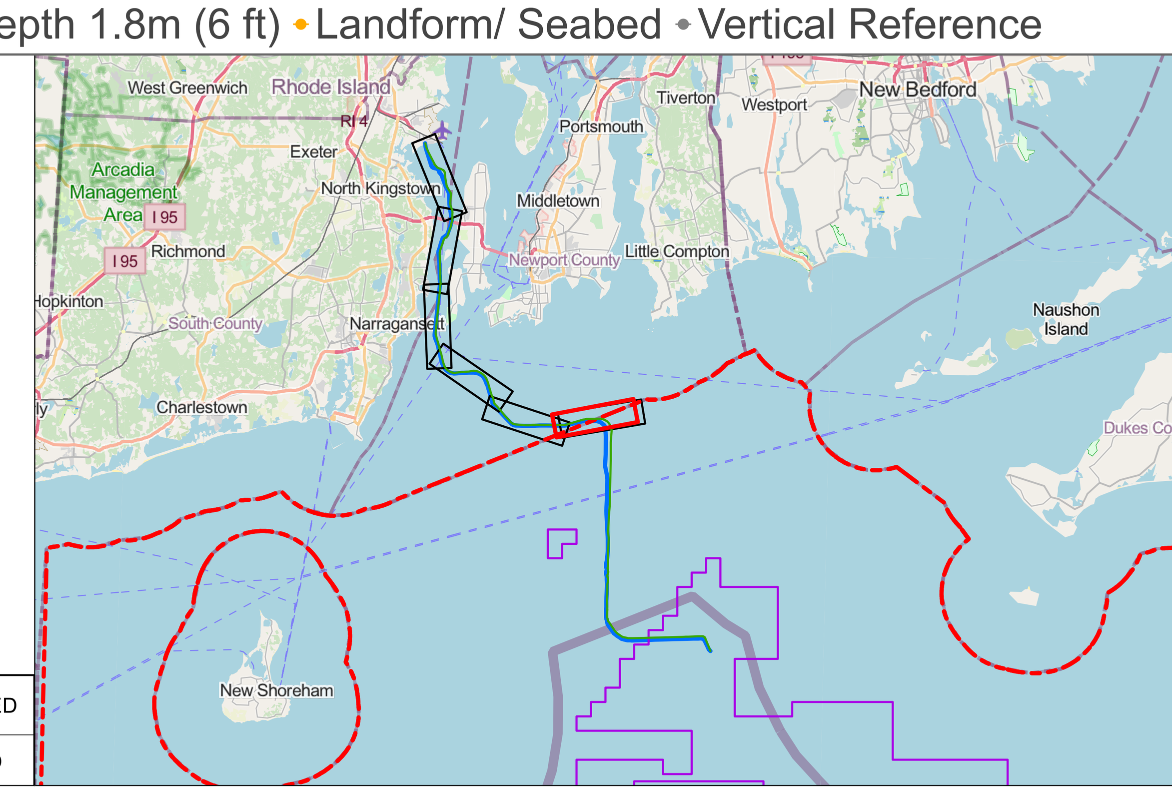

Indicative Cable Burial Profile - Circuit 1 (Page 6 of 6)

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0 0.15 0.3 0.45 Kilometers

0 0.15 0.3 Nautical Miles

Reference system: NAD83 (2011)
Projection: UTM Zone 19N
Vertical reference: NAVD88

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Legend

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- Possible Cable Crossing Intersection*
- Potential Cable Crossings (Fugro)*
- Indicative Circuit 1 Cable Burial Profile
- Indicative Circuit 2 Cable
- 3 NM State Water Limit

Areas of Particular Concern

- Glacial Moraine A
- Glacial Moraine B
- BOEM Lease OSC-A 0486
- Elevation Contours in Meters

Crossing	Depth at Crossing (m, MLLW)	KP
A2	-8.58	9.85
B2	-13.57	11.44
C2	-13.63	11.48
D2	-13.93	11.84
E2	-13.88	11.88
F2	-13.86	11.95
G2	-25.75	18.27

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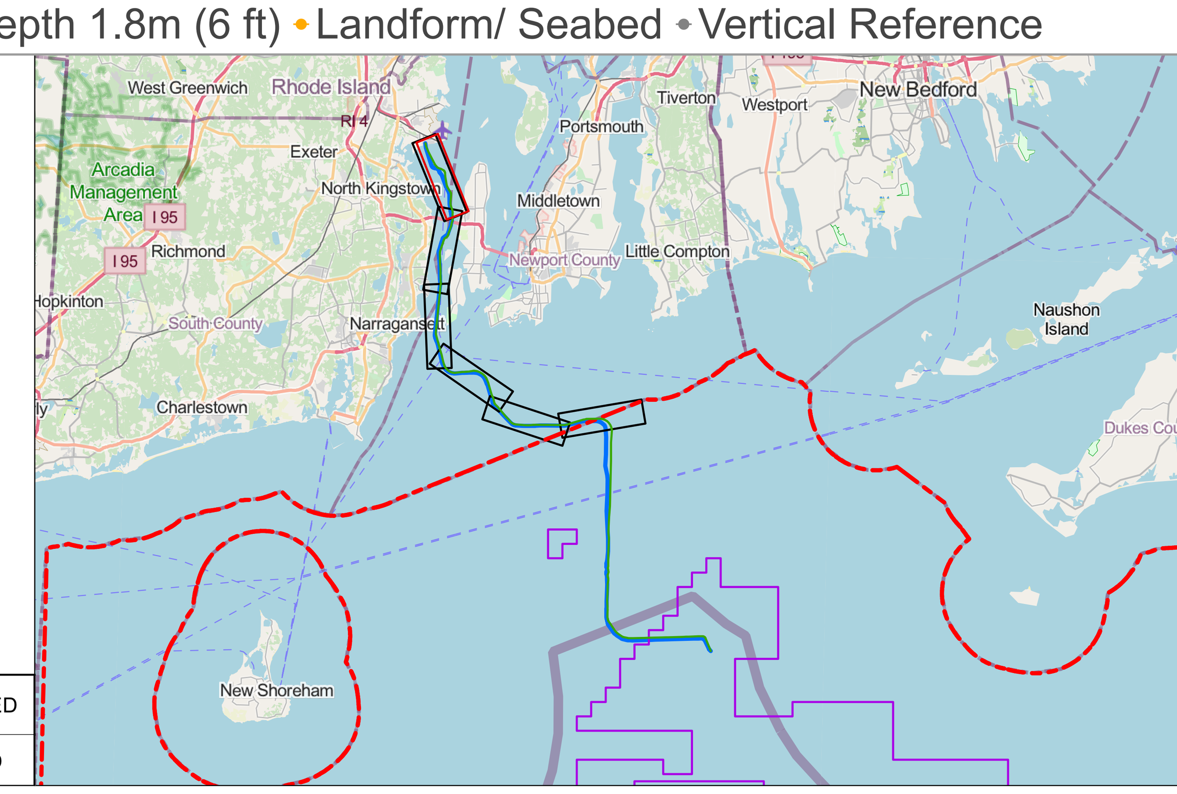

Indicative Cable Burial Profile - Circuit 2 (Page 1 of 6)

Date: 16/06/2021
Created by: XDAEF
Checked by: XCHGG
Accepted by: XDARY
Approved by: ANFRY

Revolution Wind | Powered by Ørsted & Eversource

0 0.3 0.6 Kilometers
0 0.15 0.3 Nautical Miles

Reference system: NAD83 (2011)
Projection: UTM Zone 19N
Vertical reference: NAVD88

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Legend
- Kilometer Point (KP)
- Revolution Wind Export Cable (RWEC) Corridor
- Possible Cable Crossing Intersection*
- Potential Cable Crossings (Fugro)*
- Indicative Circuit 1 Cable Burial Profile
- Indicative Circuit 2 Cable
- 3 NM State Water Limit

Areas of Particular Concern
- Glacial Moraine A
- Glacial Moraine B
- BOEM Lease OSC-A 0486
- Elevation Contours in Meters

Crossing	Depth at Crossing (m, MLLW)	KP
A2	-8.58	9.85
B2	-13.57	11.44
C2	-13.63	11.48
D2	-13.93	11.84
E2	-13.88	11.88
F2	-13.86	11.95
G2	-25.75	18.27

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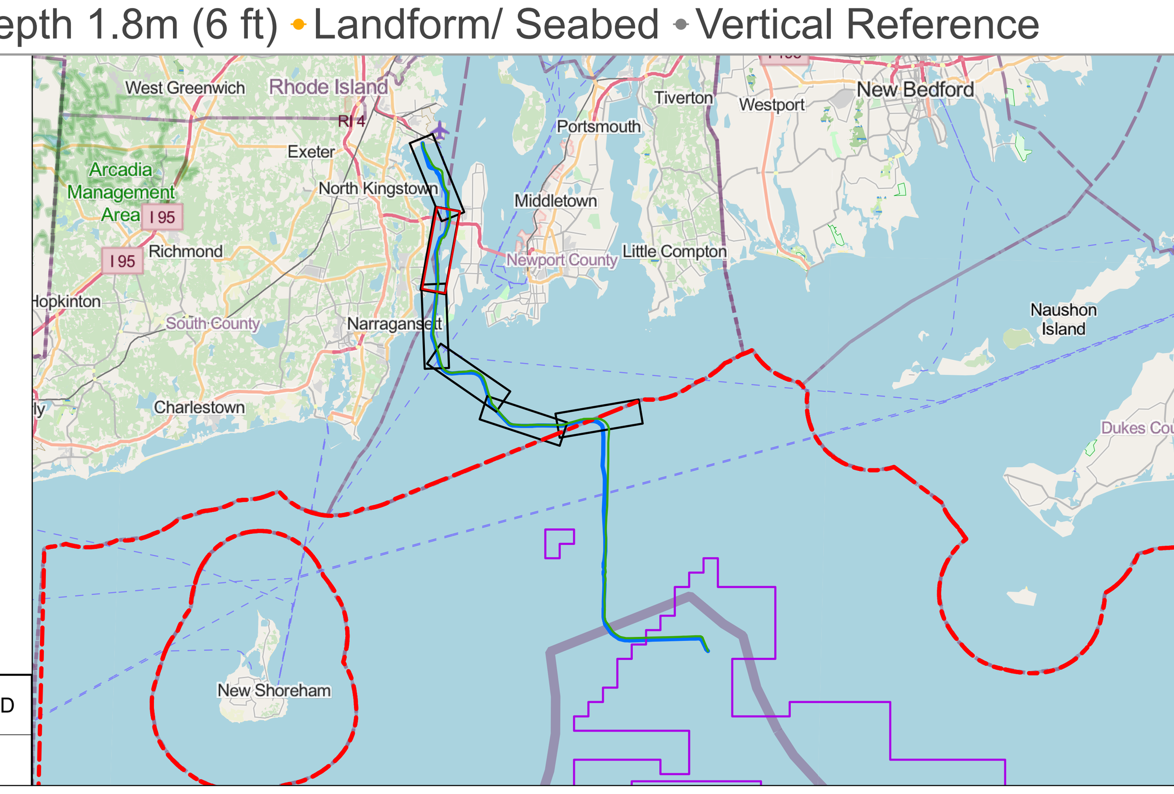

Indicative Cable Burial Profile - Circuit 2 (Page 2 of 6)

Date: 16/06/2021
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Approved by: ANFRY

Revolution Wind | Powered by Ørsted & Eversource

0 0.3 0.6 Kilometers
0 0.15 0.3 Nautical Miles

Reference system: NAD83 (2011)
Projection: UTM Zone 19N
Vertical reference: NAVD88

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Legend

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- Indicative Circuit 2 Cable
- 3 NM State Water Limit
- Areas of Particular Concern
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Crossing	Depth at Crossing (m, MLLW)	KP
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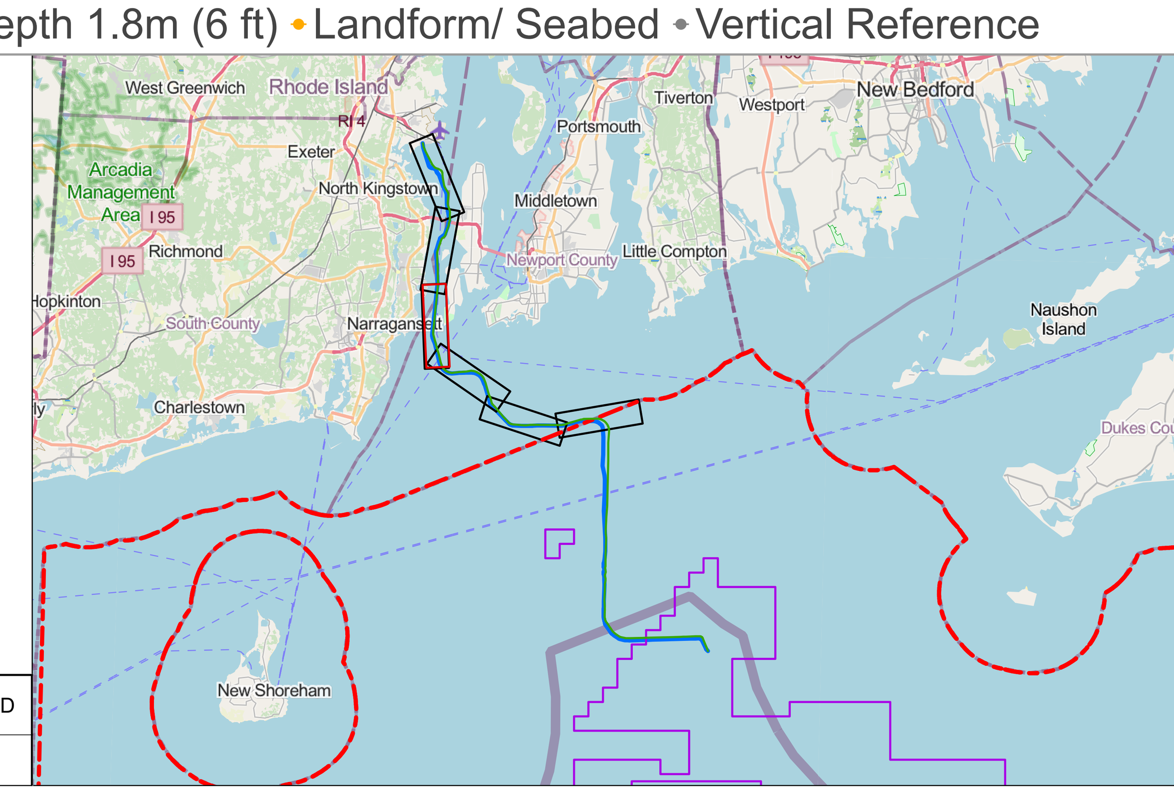

Indicative Cable Burial Profile - Circuit 2 (Page 3 of 6)

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Revolution Wind | Powered by Ørsted & Eversource

0 0.3 0.6 Kilometers
0 0.15 0.3 Nautical Miles

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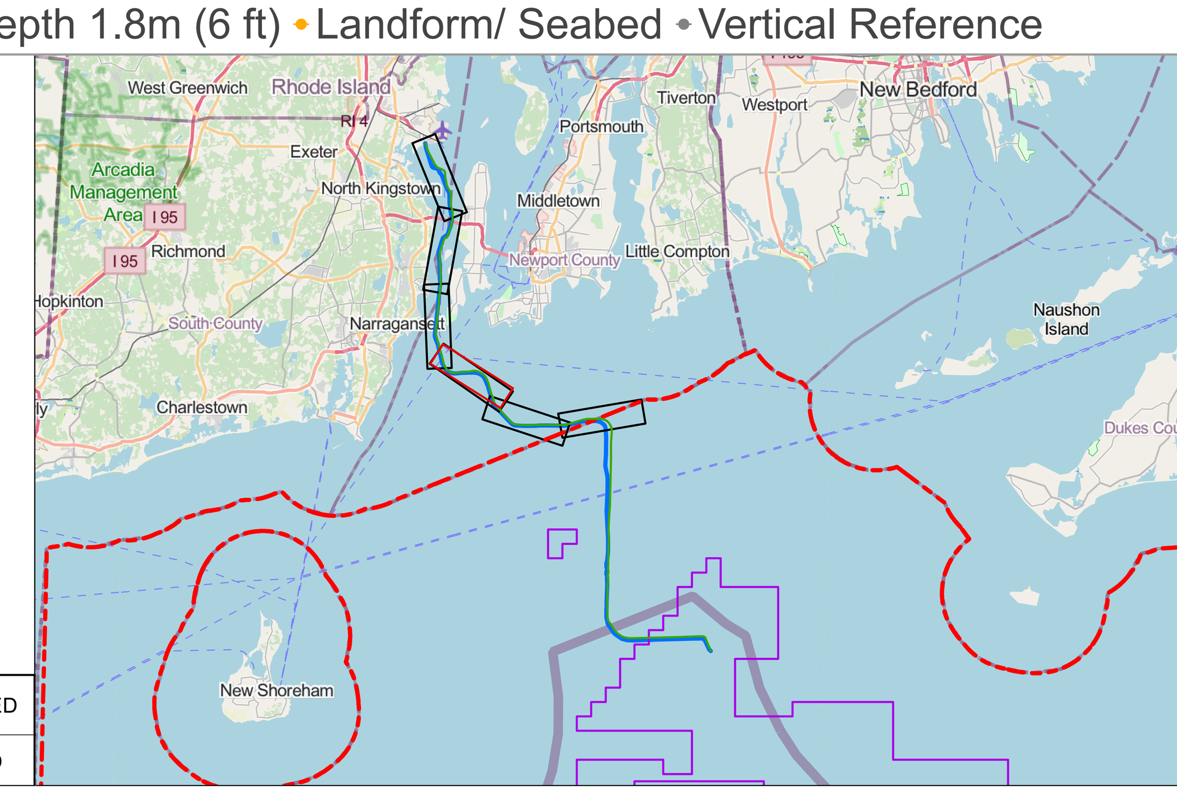

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Revolution Wind

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0 0.3 0.6 Kilometers
0 0.15 0.3 Nautical Miles

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Areas of Particular Concern

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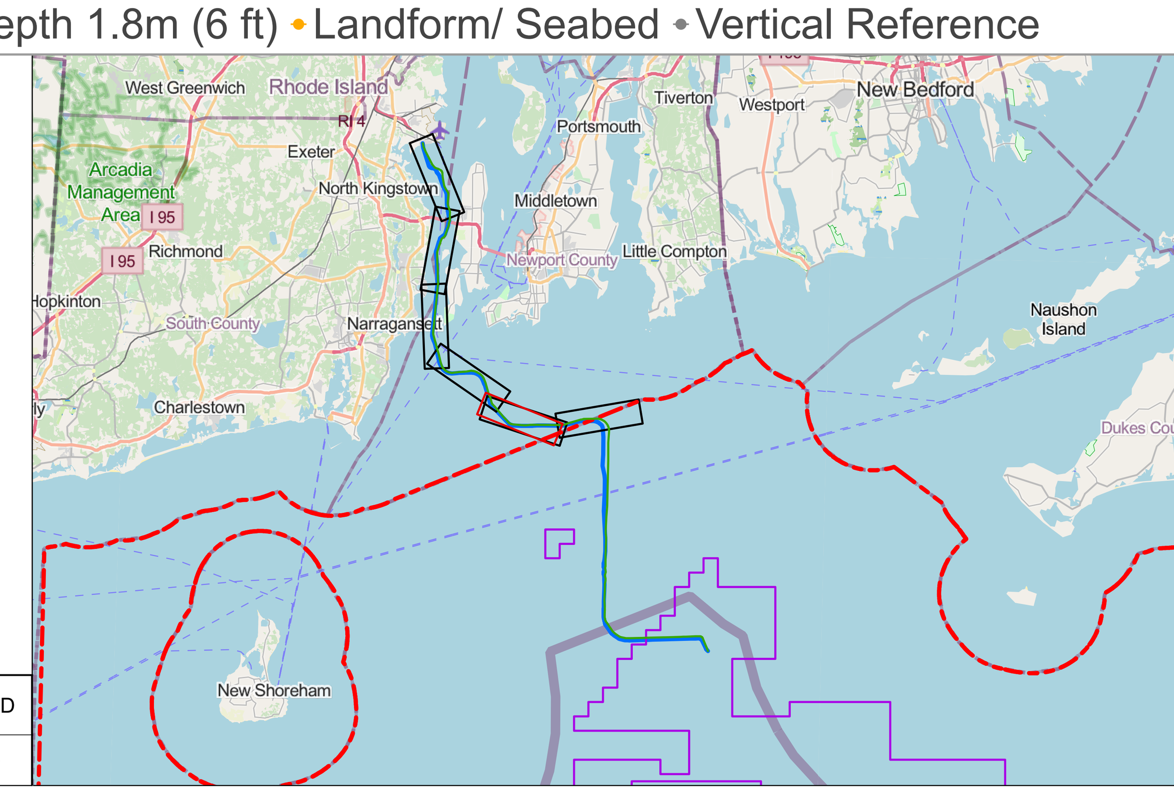

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3) The RWEC Corridor will consist of two distinct buried marine circuits. Micro-siting within the corridor will be completed by the installation contractor.
4) The Indicative Cable Burial Profile shown in this drawing is subject to change based on final cable routing.
5) The elevation data shown in the chart is derived from 2019 Bathymetry from Fugro in MLLW.
6)*Please refer to REV01 Cable Crossing Detail Drawings.
7) Sources: Inspire Environmental, NOAA, NASCA, NPS, BOEM and (c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA).
8) This drawing has been prepared according to data provided and QA/QC'd by Orsted and to be considered solely for cable installation permitting purposes.

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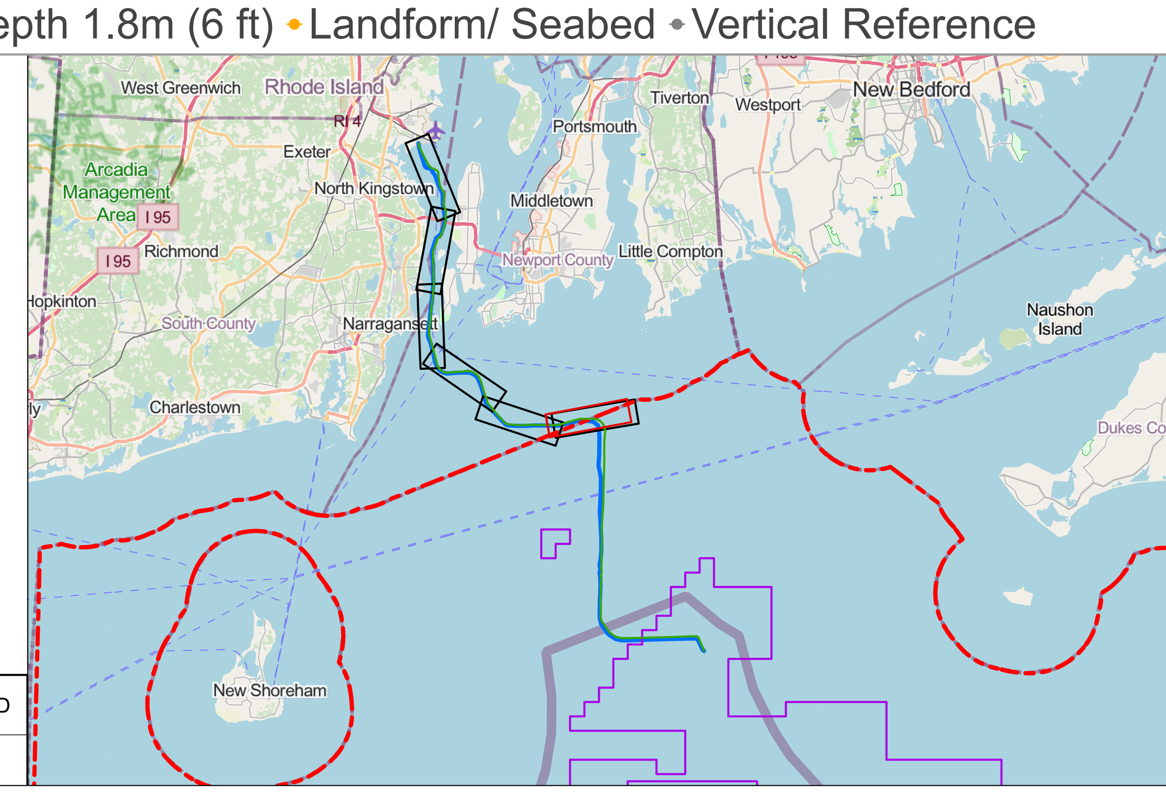


Indicative Cable Burial Profile - Circuit 2 (Page 6 of 6)

Date: 16/06/2021
Created by: XDAEF
Checked by: XCHGG
Accepted by: XDARY
Approved by: ANFRY

Revolution Wind
Powered by Ørsted & Eversource

0 0.3 0.6 Kilometers
0 0.15 0.3 Nautical Miles

Reference system: NAD83 (2011)
Projection: UTM Zone 19N
Vertical reference: NAVD88

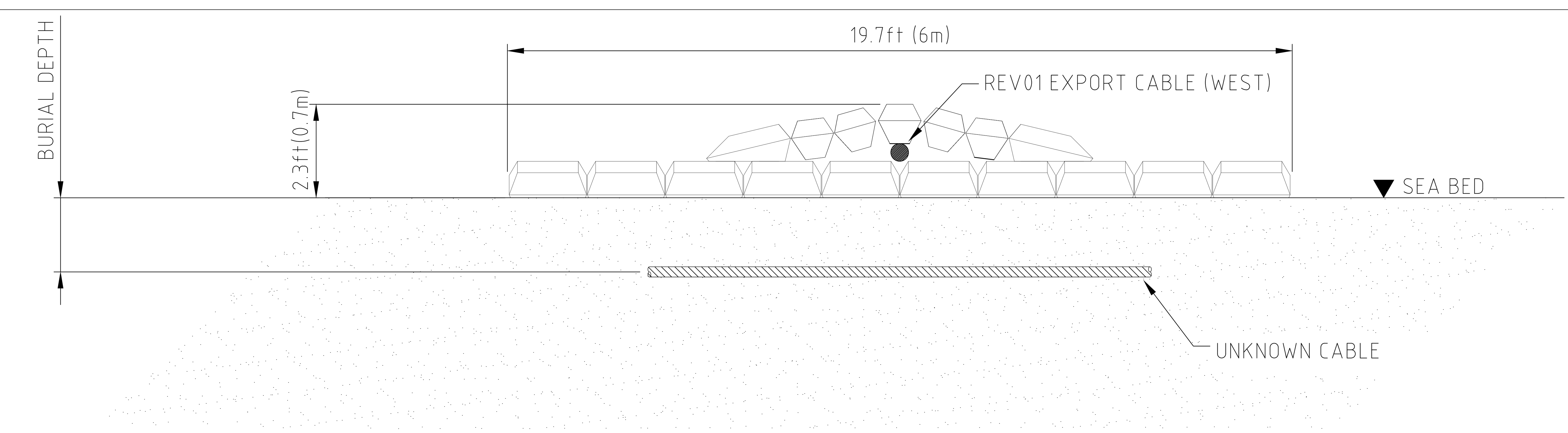
PLAN ON CABLE CROSSING

SECTION A - A

ELEVATION ON MATTRESS CONFIGURATION - (NTS)

NOTES:

1. FOR FURTHER CROSSING DETAIL REFER TO CROSSING DESIGN PACK & MATTRESS INSTALLATION PROCEDURE
2. COORDINATE SYSTEM - NAD83(2011)UTM ZONE 19N
3. PRE-LAY MATTRESSES: 3 OFF
4. POST LAY MATTRESSES: 12 OFF
5. POST LAY MATTRESSES WILL BE LAID TO FOLLOW "AS LAID" CABLE POSITION.
6. DISTANCE TO TRANSITION OF BURIAL TO BE AGREED WITH ASSET OWNER, AND WILL ALSO DEPEND ON CABLE BURIAL METHOD
7. THIS DRAWING HAS BEEN PREPARED ACCORDING TO DATA PROVIDED AND QA/QC'D BY ORSTED AND TO BE CONSIDERED SOLELY FOR CABLE INSTALLATION PERMITTING PURPOSES.



SECTION B - B

END ELEVATION ON MATTRESS CONFIGURATION - (NTS)

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No. 9816
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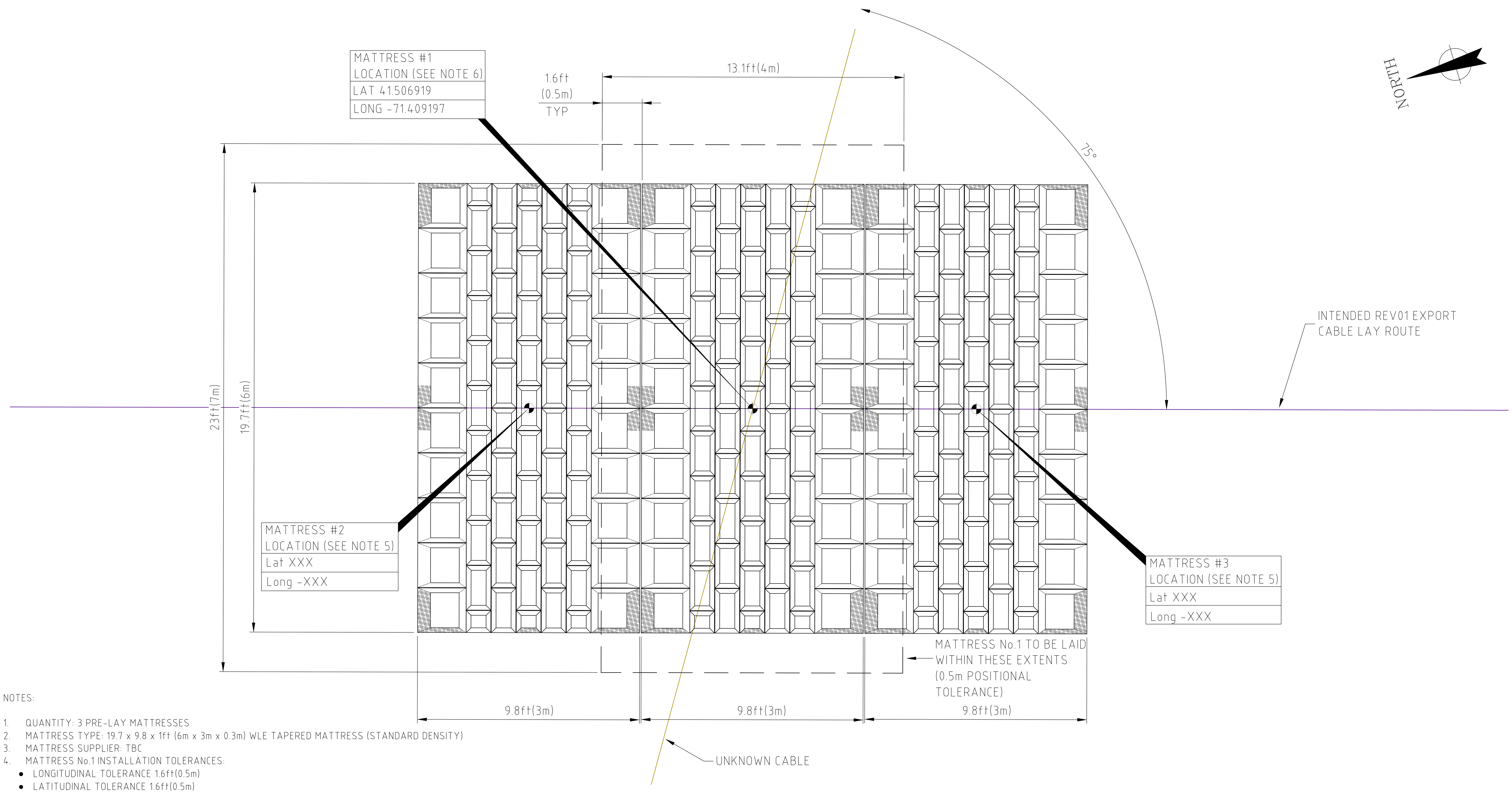
Scale	Size	RDS-PP code			Rev.
NTS	36"X24"				FOR-INITIAL-REVIEW



NOTES:

1. QUANTITY: 3 PRE-LAY MATTRESSES
2. MATTRESS TYPE: 19.7 x 9.8 x 1ft (6m x 3m x 0.3m) WLE TAPERED MATTRESS (STANDARD DENSITY)
3. MATTRESS SUPPLIER: TBC
4. MATTRESS No.1 INSTALLATION TOLERANCES:
   - LONGITUDINAL TOLERANCE 1.6ft(0.5m)
   - LATITUDINAL TOLERANCE 1.6ft(0.5m)
5. MATTRESSES No.2 & No.3 TO BE LAID AS CLOSE TO BEST CASE AS POSSIBLE, HOWEVER RELEVANT TO MATTRESS No.1 TOLERANCES:
   - MAXIMUM OVERLAP OF 1 BLOCK
   - MAXIMUM GAP BETWEEN MATTRESSES OF 1.6ft(0.5m)
6. MATTRESS LOCATION SUBJECT TO MINOR ADJUSTMENT AFTER PRE-LAY ROV SURVEY CONFIRMING CROSSING LOCATION.
7. THIS DRAWING HAS BEEN PREPARED ACCORDING TO DATA PROVIDED AND QA/QC'D BY ORSTED AND TO BE CONSIDERED SOLELY FOR CABLE INSTALLATION PERMITTING PURPOSES.

PLAN ON UNKNOWN CABLE CROSSING - (SCALE 1:50)
PRE-LAY MATTRESS INSTALLATION

PE STAMP 18/06/2021

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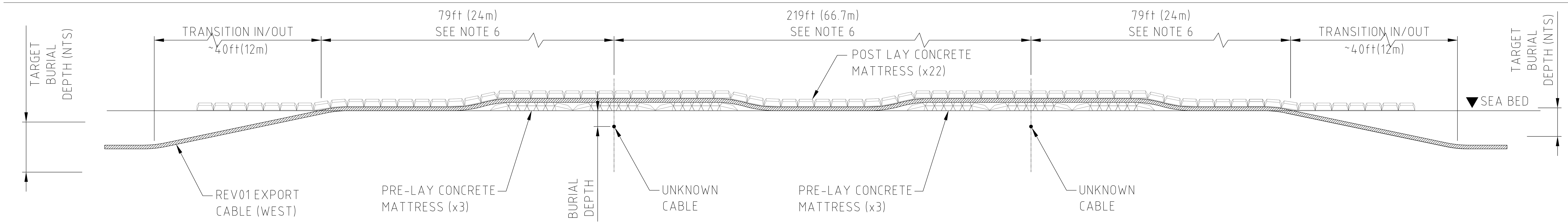
PLAN ON CABLE CROSSING

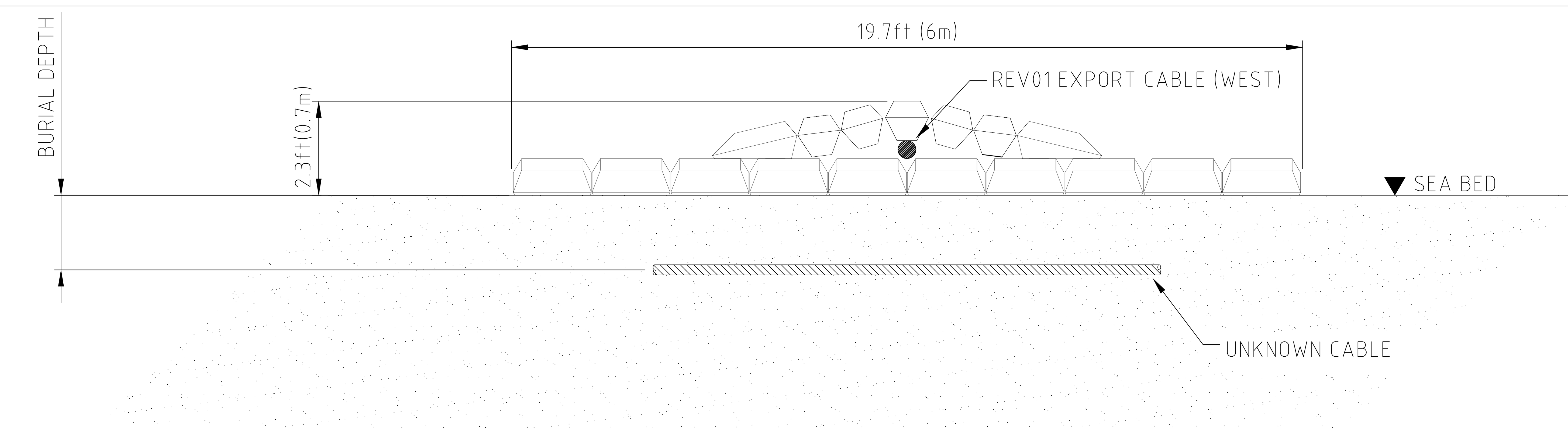


SECTION A - A

ELEVATION ON MATTRESS CONFIGURATION - (NTS)

NOTES:

1. FOR FURTHER CROSSING DETAIL REFER TO CROSSING DESIGN PACK & MATTRESS INSTALLATION PROCEDURE.
2. COORDINATE SYSTEM - NAD83(2011)UTM ZONE 19N
3. PRE-LAY MATTRESSES: 6 OFF
4. POST LAY MATTRESSES: 22 OFF
5. POST LAY MATTRESSES WILL BE LAID TO FOLLOW "AS LAID" CABLE POSITION.
6. DISTANCE TO TRANSITION OF BURIAL TO BE AGREED WITH ASSET OWNER, AND WILL ALSO DEPEND ON CABLE BURIAL METHOD.
7. THIS DRAWING HAS BEEN PREPARED ACCORDING TO DATA PROVIDED AND QA/QC'D BY ORSTED AND TO BE CONSIDERED SOLELY FOR CABLE INSTALLATION PERMITTING PURPOSES.



SECTION B - B

END ELEVATION ON MATTRESS CONFIGURATION - (NTS)

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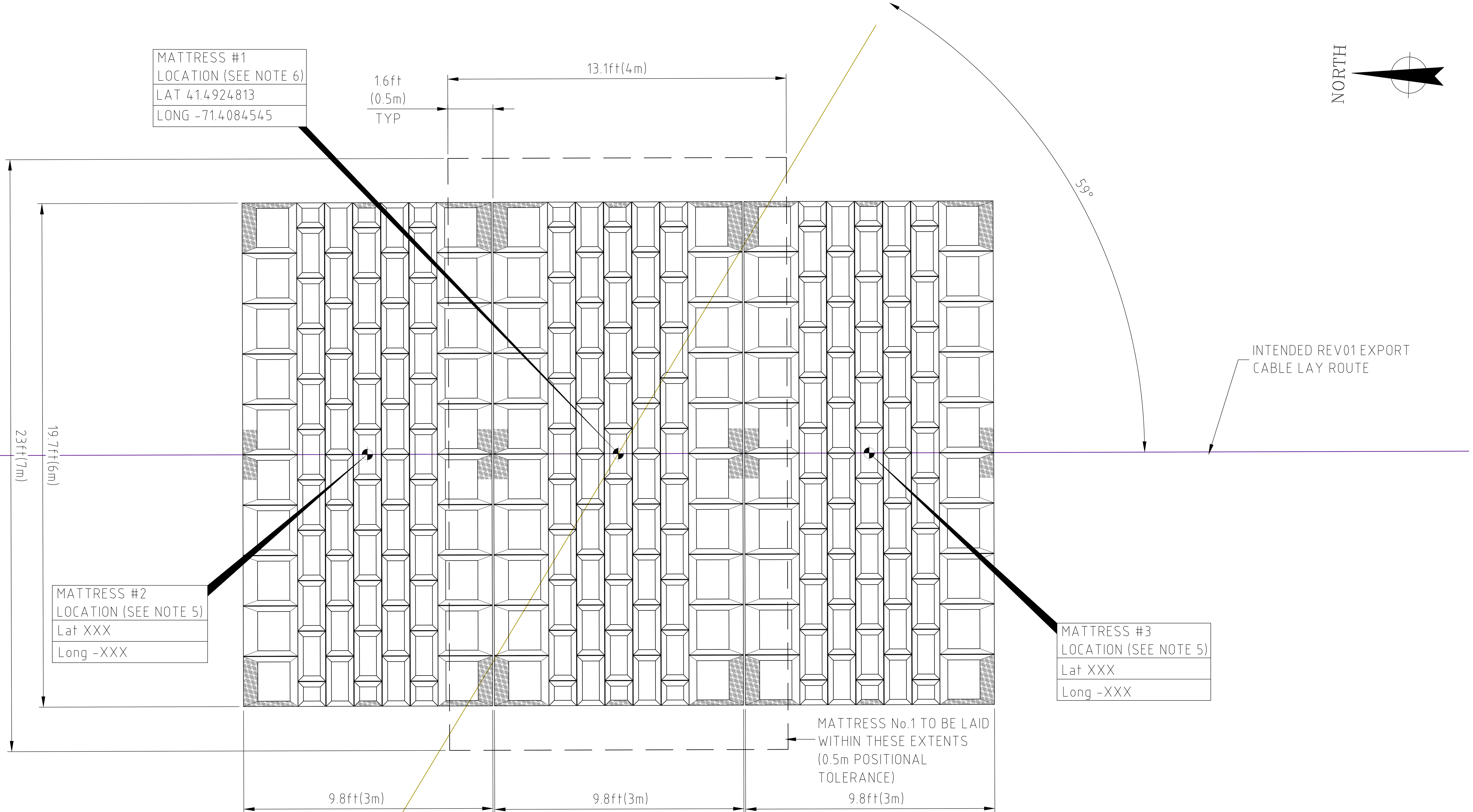

UNKNOWN CABLE

NOTES:

1. QUANTITY: 3 PRE-LAY MATTRESSES
2. MATTRESS TYPE: 19.7 x 9.8 x 1ft (6m x 3m x 0.3m) WLE TAPERED MATTRESS (STANDARD DENSITY)
3. MATTRESS SUPPLIER: TBC
4. MATTRESS No.1 INSTALLATION TOLERANCES:
   - LONGITUDINAL TOLERANCE 1.6ft(0.5m)
   - LATITUDINAL TOLERANCE 1.6ft(0.5m)
5. MATTRESSES No.2 & No.3 TO BE LAID AS CLOSE TO BEST CASE AS POSSIBLE, HOWEVER RELEVANT TO MATTRESS No.1 TOLERANCES:
   - MAXIMUM OVERLAP OF 1 BLOCK
   - MAXIMUM GAP BETWEEN MATTRESSES OF 1.6ft(0.5m)
6. MATTRESS LOCATION SUBJECT TO MINOR ADJUSTMENT AFTER PRE-LAY ROV SURVEY CONFIRMING CROSSING LOCATION.
7. THIS DRAWING HAS BEEN PREPARED ACCORDING TO DATA PROVIDED AND QA/QC'D BY ORSTED AND TO BE CONSIDERED SOLELY FOR CABLE INSTALLATION PERMITTING PURPOSES.

PLAN ON UNKNOWN CABLE CROSSING - (SCALE 1:50)
PRE-LAY MATTRESS INSTALLATION

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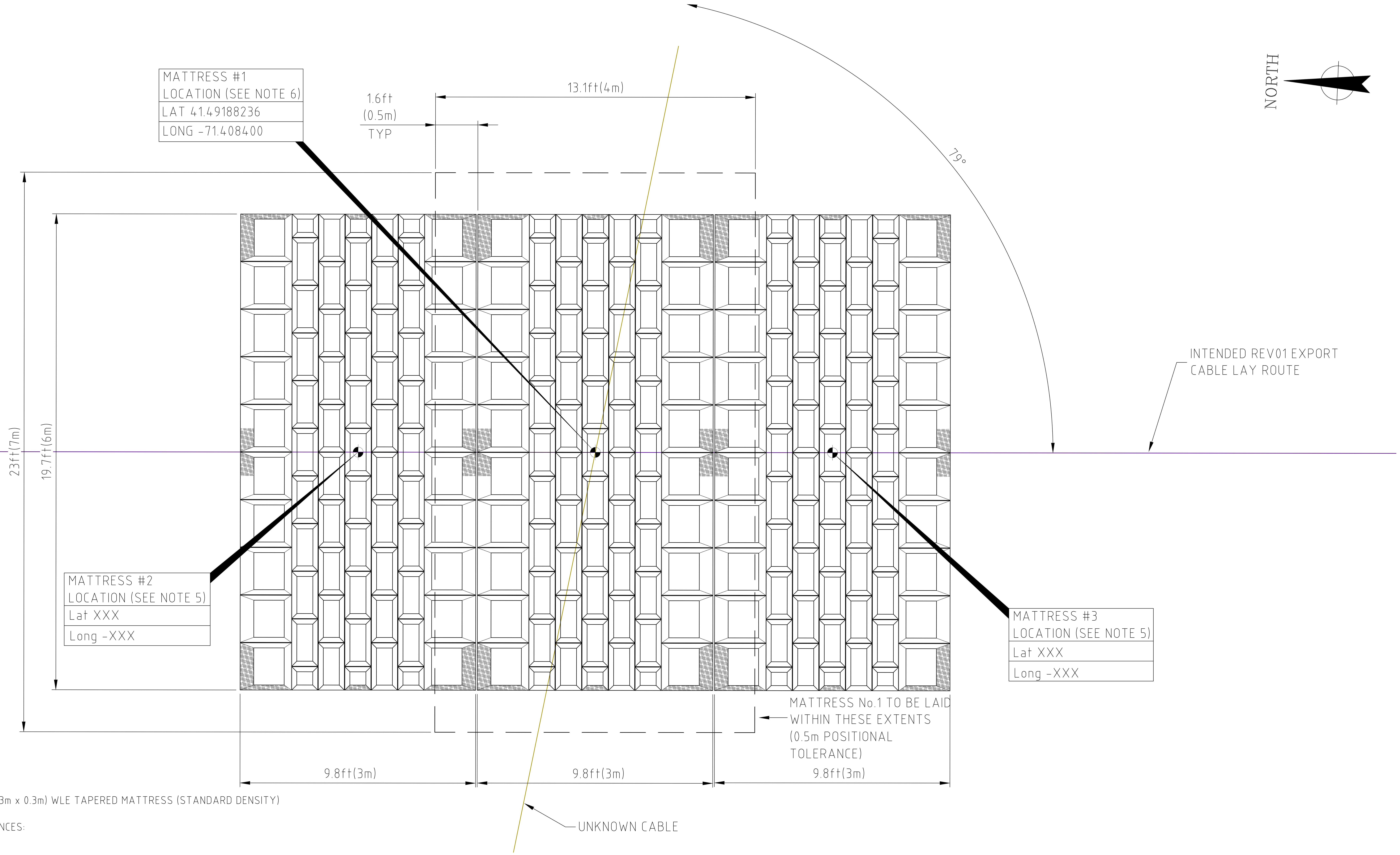

PLAN ON UNKNOWN CABLE CROSSING - (SCALE 1:50)
PRE-LAY MATTRESS INSTALLATION

NOTES:

1. QUANTITY: 3 PRE-LAY MATTRESSES
2. MATTRESS TYPE: 19.7 x 9.8 x 1ft (6m x 3m x 0.3m) WLE TAPERED MATTRESS (STANDARD DENSITY)
3. MATTRESS SUPPLIER: TBC
4. MATTRESS No.1 INSTALLATION TOLERANCES:
   - LONGITUDINAL TOLERANCE 1.6ft(0.5m)
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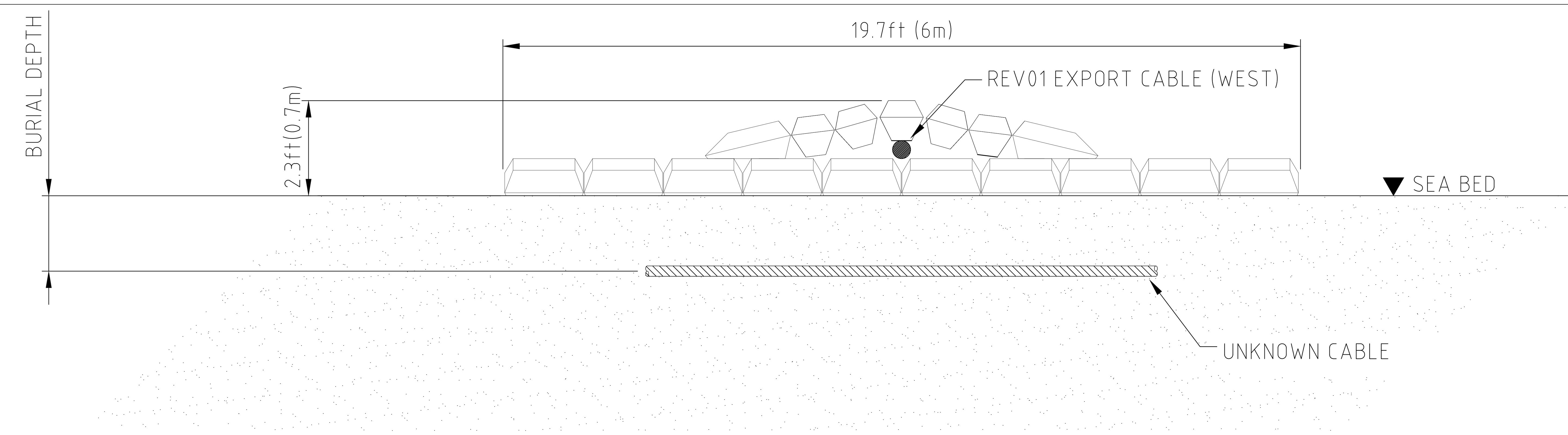
PLAN ON CABLE CROSSING

SECTION A - A
ELEVATION ON MATTRESS CONFIGURATION - (NTS)

NOTES:

1. FOR FURTHER CROSSING DETAIL REFER TO CROSSING DESIGN PACK & MATTRESS INSTALLATION PROCEDURE
2. COORDINATE SYSTEM - NAD83(2011)UTM ZONE 19N
3. PRE-LAY MATTRESSES: 9 OFF
4. POST LAY MATTRESSES: 31 OFF
5. POST LAY MATTRESSES WILL BE LAID TO FOLLOW "AS LAID" CABLE POSITION.
6. DISTANCE TO TRANSITION OF BURIAL TO BE AGREED WITH ASSET OWNER, AND WILL ALSO DEPEND ON CABLE BURIAL METHOD.
7. THIS DRAWING HAS BEEN PREPARED ACCORDING TO DATA PROVIDED AND QA/QC'D BY ORSTED AND TO BE CONSIDERED SOLELY FOR CABLE INSTALLATION PERMITTING PURPOSES.



SECTION B - B
END ELEVATION ON MATTRESS CONFIGURATION - (NTS)

PE STAMP 18/06/2021

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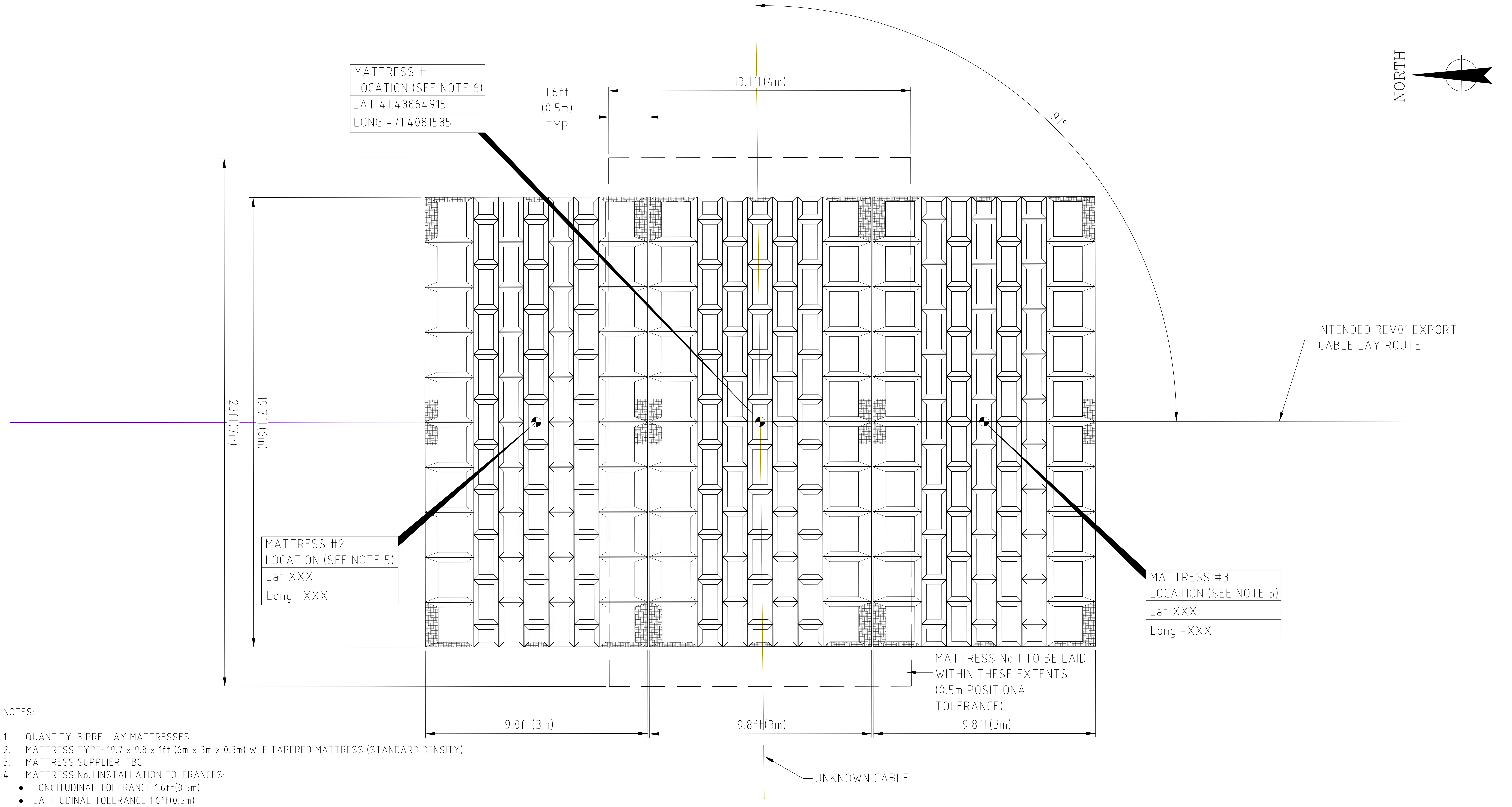

NOTES:

1. QUANTITY: 3 PRE-LAY MATTRESSES
2. MATTRESS TYPE: 19.7 x 9.8 x 1ft (6m x 3m x 0.3m) WLE TAPERED MATTRESS (STANDARD DENSITY)
3. MATTRESS SUPPLIER: TBC
4. MATTRESS No.1 INSTALLATION TOLERANCES:
   - LONGITUDINAL TOLERANCE 1.6ft(0.5m)
   - LATITUDINAL TOLERANCE 1.6ft(0.5m)
5. MATTRESSES No.2 & No.3 TO BE LAID AS CLOSE TO BEST CASE AS POSSIBLE, HOWEVER RELEVANT TO MATTRESS No.1 TOLERANCES:
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PLAN ON UNKNOWN CABLE CROSSING - (SCALE 1:50)
PRE-LAY MATTRESS INSTALLATION

PE STAMP 18/06/2021

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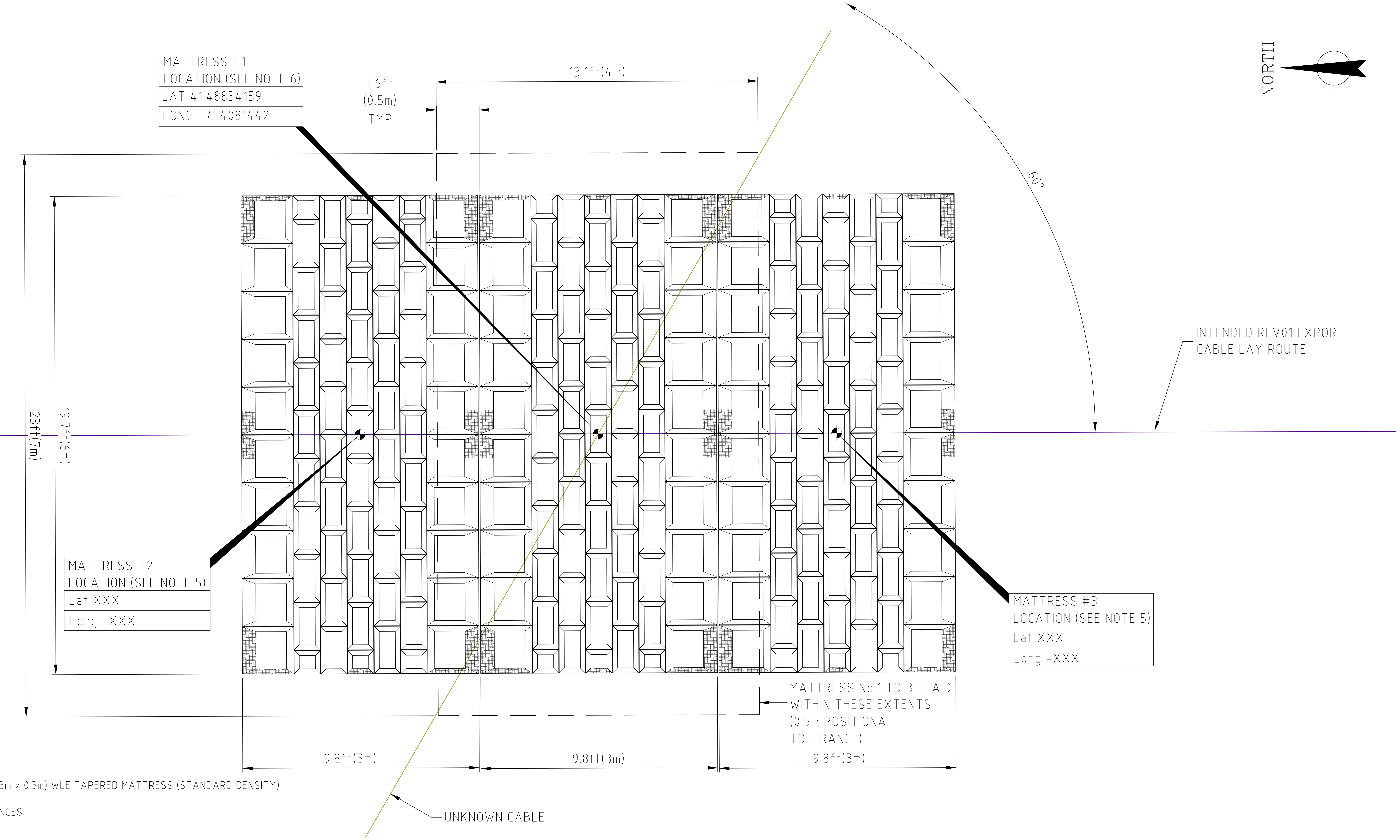

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PLAN ON UNKNOWN CABLE CROSSING - (SCALE 1:50)
PRE-LAY MATTRESS INSTALLATION

PE STAMP 18/06/2021

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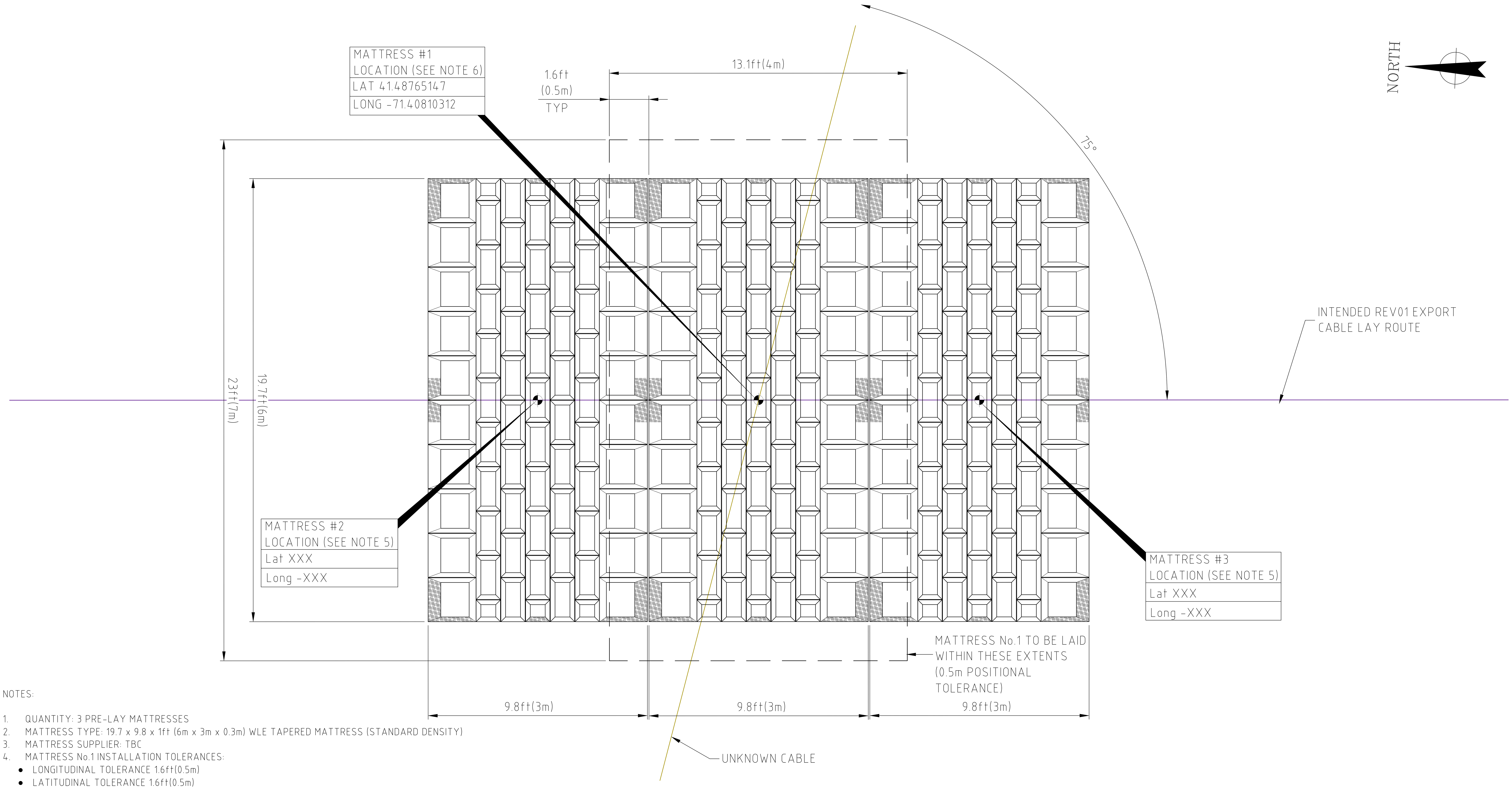

PLAN ON UNKNOWN CABLE CROSSING - (SCALE 1:50)
PRE-LAY MATTRESS INSTALLATION

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Appendix B: Responses to FWW Regulations

- Freshwater Wetlands in the Vicinity of the Coast Wetland Descriptions and Wetland Functions and Values Evaluation and Impacts
- Responses to 650-RICR-20-00-02 Sections 2.10.B.4 Avoidance and Minimization Requirement and 2.10.B.5.d (1) – (6) and 2.10.E Review Criteria for Applications to Alter a Freshwater Wetland

B

Freshwater Wetlands in the Vicinity of the Coast Wetland Descriptions and Wetland Functions and Values Evaluation and Impacts

B.1 OnSS Freshwater Wetland Descriptions

Freshwater wetlands are present at the OnSS parcels. These wetlands are subject to regulation as Freshwater Wetlands in the Vicinity of the Coast (650-RICR-20-00-02) by the CRMC. Freshwater Wetlands present include a small forested wetland, a Swamp with the associated Area of Land within 50 Feet of Wetlands, a Marsh and associated Area of Land within 50 Feet of Wetlands and an off-site stream less than 10 feet (3 m) wide that projects its 100-foot Riverbank Wetland into the Project Area. Descriptions of the wetlands are provided below and are depicted on Figure 3.1.3 in Section 3.1.2.2.

B.1.1Wetland 2

This small (0.03 ac [0.012 ha]) Forested Wetland occupies a closed depression at the base of the capped landfill. It is delineated by a closed circuit of flags numbered 2-100 to 2-107. At some point in the past, Wetland 2 may have been part of Wetland 3, but may have been isolated during land grading that created or closed the adjacent landfill. This wetland occupies the depression created where the slopes of a natural kame meet the slopes of the closed landfill. The vegetation in Wetland 2 consists of poison ivy (*Toxicodendron radicans*) in the herbaceous stratum and is shaded by red maple (*Acer rubrum*).

Soils in this disturbed wetland are similar to the poorly drained Walpole series with a thin layer of fill and sediment over the original soil surface. The presence of a depleted matrix below a dark surface was the field indicator used to classify the soil as hydric. This wetland is saturated near the surface for weeks at the beginning of the growing season and can be quite dry through the summer. The wetland form is concave sloping west toward Wetland 3, but it is separated from Wetland 3 by fill.

B.1.2Wetland 3

Wetland 3 lies south and west of the of the proposed OnSS site and extends off-site. For the purpose of functional assessment, the wetland area is approximately 26.7 acres before the evaluation unit is broken along Mill Creek Drive and restricted by a culvert. The much smaller on-site part of this wetland has been delineated by flags 1-100 to 1-139, 1-145 to 1-159, and 1-202 to 1-205. The gaps in the wetland line occurs where the wetland edge drifts beyond the property limits and then returns. This Swamp is forested with common canopy dominants consisting of red maple, American elm (*Ulmus americana*) and tupelo *(Nyssa sylvatica)*. The shrub stratum includes highbush blueberry (*Vaccinium corymbosum*), winterberry *(Ilex verticillata)* and pepperbush *(Clethra alnifolia*). The heavily shaded herbaceous stratum is often dominated by skunk cabbage (*Symplocarpus foetidus*) in the early spring and later by cinnamon fern (*Osmundastrum cinnamomeum*) with sensitive fern (*Onoclea sensibilis*) also present.

As a larger evaluation unit Wetland 3 abuts roads Camp Avenue, Mill Creek Drive, and Roger Williams Way. Along Mill Creek Drive the wetland abuts multifamily developments. Tributaries to Mill Creek flow through Freshwater Wetland 3 north and west of the OnSS parcel boundary. Based on their linear form and steep channel incision, these streams appear to have been excavated and straightened in part to enhance drainage of Wetland 3.

Soils within this wetland are mapped as Swansea muck, a very poorly drained soil that classifies with the Order of soils characterized by thick accumulations of organic matter at the surface, Histosols. In Rhode Island all Histosols are hydric soils. These soils remain saturated near the surface or flooded for most if not all the growing season. Pit and mound topography is present in this otherwise near level wetland and some shallow excavated depressions are also present.

B.1.3Wetland 4

This wetland straddles the northern boundary of the OnSS parcels. This Marsh consists of patches of open water, few trees and shrubs scattered throughout the wetland interior and a forested margin. The wetland form is a closed depression bounded by a natural kame deposit to the north and northwest and steep fill slopes to the southwest, south, and east. The portion of the wetland on the OnSS site has been delineated with Flags 3-100 to 3-145. Scattered debris and fill are present in and around this wetland which apparently date back to the time when this site was part of Naval Air Station Quonset Point.

Alder (*Alnus incana*) and willow (*Salix bebbiana*, *S*. sp.) are common shrubs scattered around semipermanent pools of shallow open water. Red maple is common around the wetland perimeter and on islands. Skunk cabbage and jewelweed are common herbaceous plants occupying exposed substrates.

Soils are mapped as poorly drained Walpole sandy loam which is poorly drained, but we found soils in most of the wetland interior more similar to the very poorly drained Scarboro mucky sandy loam and Swansea muck. Based on observations of staining on concrete, adventitious roots, and water stained leaves water levels may fluctuate two to three feet (0.6 to 0.9 m) from the winter to late growing season.

Wetland 4 also functions as a cryptic vernal pool based on the findings of a vernal pool survey conducted by VHB in spring 2020. VHB biologists identified three obligate vernal pool species within Wetland 4: wood frog *(Lithobates sylvaticus)*, spotted salamander *(Ambystoma maculatum)*, and fairy shrimp (*Eubranchipus sp*.). A memo documenting the vernal pool survey is included in Appendix J.

The fill slopes within the Area of Land within 50 Feet of Wetlands along the southwest and southern sides of the wetland are characterized by the presence of exposed broken concrete slabs and other demolition disposed during the decommissioning of Naval Air Station Quonset Point. These slopes support impenetrable stands of multiflora rose (*Rosa multiflora*) and Morrow's honeysuckle (*Lonicera morrowii*). Trees include Norway maple (*Acer platanoides*), cottonwood (*Populus deltoides*), big tooth aspen (*Populus grandidentata*) and scattered oaks (*Quercus rubra*, *Q. velutina*).

B.2 Freshwater Wetlands Functions and Values

Table B2-1 provides a summary of the functions and values provided by the three wetlands present at the two OnSS parcels.

Table B2-1 Functions & Values of Freshwater Wetlands in the OnSS and Davisville Substation Parcels

Wetland No.	Wetland Area (ac)[1]	Biological			Hydrologic		Water Quality			Societal Values	
		Fish/Shellfish Habitat	Wildlife Habitat	Production Export	Groundwater Discharge/ Recharge	Flood Alteration	Sediment Toxicant Removal	Nutrient Removal/ Transformation	Sediment Stabilization	Recreation & Aesthetics	RTE Species Habitat
Wetland 2	0.03	-	-	-	X	-	P	-	-	-	-
Wetland 3	26.7	X[2]	P	X	P	P	P	X	X	-	-
Wetland 4	2.1	-	P	-	X	X	X	X	X	-	-

Notes: P=Primary or Principal Function; X = Secondary Function possible provided at a significant level; - = Unlikely to be provided.
1: Area of contiguous wetland east of Mill Creek Drive. 2: Offsite only in Mill Creek.

B.2.1Fish/Shellfish Habitat

Offsite portions of Wetland 3 include tributaries to Mill Creek which may provide fish habitat, but these areas were not investigated because these properties are not within the Project Area. Wetlands within the Project Area do not support fish and shellfish habitat.

B.2.2Wetland Wildlife Habitat

The wildlife species present within the OnSS parcels utilize the habitat resources present both within the two properties which make up the OnSS Site along with offsite resources. The Rhode Island Wildlife Action Plan (RIWAP) (RIDEM et al. 2015) defines habitat as a place where an animal normally lives, often characterized by a dominant plant form (e.g., deciduous forest) or physical characteristic (e.g., a stream or barren). In addition to the type of vegetative cover type, habitat also includes the resources, such as food and water, and conditions present in an area that produces occupancy – including survival and reproduction – by a given organism (Hall et al., 1997). A species may utilize one or several resource areas or vegetation cover types for its habitat. Rhode Island's varied bedrock and surficial geology, soils, topography, and hydrology support a range of plant communities that supports a complex ecological framework for Rhode Island's fish and wildlife diversity (RIDEM et al., 2015). Table B2-2 below provides a list of species observed. Species that are listed under the 2015 RI WAP as species of greatest conservation need ("SGCN") have been indicated in this table.

Wildlife surveys were conducted at the OnSS site on May 6, and May 20, 2021 with a focus on mammals, herptiles, and breeding songbirds. Vernal pool surveys were conducted in spring 2020 and the memo documenting these findings is included in Appendix J. Wildlife observations were also recorded in the summer of 2019 and winter of 2020-2021 during other site investigations.

VHB recorded several wildlife observations within the OnSS Project Area for species that are not specifically wetland dependent but may use wetlands as part of their habitat mosaic. Throughout the OnSS Project Site, including Area of Land within 50 feet of Wetlands 3 and 4, evidence of eastern white-tailed deer *(Odocoileus virginianus)*, eastern cottontail (*Sylvilagus floridanus*), eastern gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), southern redback vole (*Myodes gapperi*), and eastern coyote (*Canis latrans x Canis lycaon*) was observed. It is likely that striped skunk (*Mephitis mephitis*), Virginia opossum (*Didelphis virginiana*), and raccoon (*Procyon lotor*) also visit the site including wetlands but no direct evidence was observed.

Several resident and migratory passerines suited to woodland habitat were observed including black-capped chickadee (*Poecile atricapillus*), tufted titmouse (*Baeolophus bicolor*), white-breasted nuthatch (*Sitta carolinensis*), downy woodpecker (*Dryobates pubescens*), red bellied woodpecker (*Melanerpes carolinus*) and woodland edges such as Carolina wren (*Thryothorus ludovicianus*), mourning dove (*Zenaida macroura*), American robin (*Turdus migratorius*), eastern towhee (*Pipilo erythrophthalmus*) warbling vireo (*Vireo gilvus*), and American redstart (*Setophaga ruticilla*) were observed. No wading birds or waterfowl were ever observed within these wetlands and suitable habitats for these wildlife guilds are not thought to be present.

Several bird species were also observed flying over the OnSS Project Site but there was no indication that they utilize terrestrial habitats within this area. These include chimney swift (*Chaetura pelagica*), herring gull (*Larus argentatus*), osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), and turkey vulture (*Cathartes aura*).

Table B2-2 Wildlife Species Observed within or proximate to Freshwater Wetlands

Species	SGCN	Wetland 2	Wetland 3	Wetland 4
Reptiles and Amphibians				

Species	SGCN	Wetland 2	Wetland 3	Wetland 4
Spotted salamander	X			X
Northern Spring peeper			X	X
Wood frog[e]	X			X
Green frog			X	X
Birds				
Red-tailed hawk			X	
Mourning dove			X	X
Ruby throated hummingbird				X
Red-bellied woodpecker			X	X
Downy woodpecker			X	
Hairy woodpecker	X		X	
Northern flicker	X		X	X
Great crested flycatcher	X		X	X
Warbling vireo			X	
Red-eyed vireo			X	
Blue jay			X	X
American crow			X	X
Black-capped chickadee			X	X
Tufted titmouse			X	X
White-breasted nuthatch			X	
Carolina wren			X	
House wren			X	X
Hermit thrush[w]			X	
American robin			X	X
Gray catbird	X		X	X
Yellow warbler			X	X
American redstart			X	X
Northern waterthrush	X		X	
Common yellowthroat			X	X
Song sparrow			X	X
Northern cardinal			X	X
Red-winged blackbird			X	X
Common grackle			X	X
Brown-headed cowbird			X	X
Baltimore oriole			X	X
American goldfinch			X	X
House sparrow				X

Species	SGCN	Wetland 2	Wetland 3	Wetland 4
Mammals				
Silver-haired bat	X		X	X
Big brown bat	X		X	X
Eastern red bat	X		X	X
Hoary bat	X		X	X
Eastern cottontail			X	
Eastern chipmunk			X	
Gray squirrel			X	X
Southern red-backed vole			X	X
Eastern coyote			X	X
Eastern white-tailed deer			X	X

Legend: SGCN: Species of greatest conservation need http://www.dem.ri.gov/programs/bnatres/fishwild/swap/sgcncomm.pdf, e: egg masses, w: wintering, all birds assumed to be breeding unless otherwise noted.

B.2.2.1 Wetland 2

Description of Wildlife Function

This very small (0.03 ac) wetland does not provide wetland wildlife habitat at any significant level. Wildlife utilizing the adjacent uplands may include Wetland 2 as part of their habitat mosaic as soils in this wetland are not saturated for most of the growing season.

Proposed Impacts

As depicted on the Revolution Wind Proposed Onshore Substation Grading, Drainage, and Utility Plan, Drawing No, C-3.00, direct impact to Wetland 2 is avoided by the OnSS design. Construction in the vicinity of this wetland is not thought to have any detectable effect on wetland wildlife habitat in the OnSS Project Site. Mitigation plantings of native shrubs and grasses are proposed along the north side and south end of the wetland utilizing shrubs that either produce mast and/or are attractive to native pollinators (Refer to Drawing No. W1.01). The hydrology o the wetland will remain supported by directing a discharge point into the east end (upslope) of this wetland from the development.

B.2.2.2 Wetland 3

Description of Wildlife Function

On-site Wetland 3 provides wetland wildlife habitat associated with forested wetlands. Mill Creek does not enter either of the OnSS parcels and all riparian habitats are off-site. Direct evidence of eastern white-tailed deer (prints) and eastern coyote (scat) were observed in Wetland 3. Eastern gray squirrel was observed feeding on red maple seed in Wetland 3 during bird surveys. Other trees and shrubs that produce mast in this wetland include tupelo, American elm, highbush blueberry, and winterberry.

Green frog (*Lithobates clamitans*) and northern spring peeper (*Hyla crucifer*) were identified within Wetland 3 from their calls.

Birds were identified through direct visual observations and vocalizations. Gray catbird (*Dumetella carolinensis*), Carolina wren, common yellowthroat (*Geothlypis trichas*), northern waterthrush (*Parkesia noveboracensis*), and red-winged blackbird (*Agelaius phoeniceus*) were visually observed within the wetland. Standing snags within this wetland likely attract cavity nesting birds such as the four woodpeckers observed (See Table A.2-2), black-capped chickadee, tufted titmouse, and great crested flycatcher.

During the summer of 2019 delineation of wetlands on this site it was noted that wet depressions within this wetland supported prolific mosquito (*Culicidae*) reproduction. While often considered a nuisance and disease vector, these insects are prey for amphibians, several songbirds, and the bats observed on the OnSS site.

By far the most activity observed within Wetland 3 consisted of passerine birds. Table A2-2 lists the species observed within the three wetlands.

Proposed Impacts

As depicted on Drawing No. C-3.00 there are three areas where the proposed LOD of the OnSS approaches Wetland 3 and its Area of Land within 50 Feet of Wetlands. In the vicinity of wetland flags 1-123 to 1-133 south of the OnSS a retaining wall is used to eliminate any encroachment into Area of Land within 50 Feet of Wetlands. For the most part there will be no clearing of trees or shrubs because the clearing limits closely correspond to the existing limits of the landfill cap that is periodically mowed to maintain a short grass cover. The conversion of grassland cover to the substation yard will not significantly affect most wildlife utilizing Wetland 3 as this area is not part of their habitat mosaic. Generalists such as eastern white-tailed deer, song sparrow, or American robin will change their utilization patterns of the site.

In the vicinity of flags 1-149 to 1-151 a lobe of Wetland 3 projects toward the proposed OnSS western limits where trees will be cleared. This clearing is required to maintain a safe open perimeter around the facility. A minimum 40-foot undisturbed, wooded Area of Land within 50 Feet of Wetlands will be maintained and the cleared Area of Land within 50 Feet of Wetlands along with other adjacent existing cleared area will be planted in native trees, shrubs and grasses as shown on Drawing No. W1.01 in Appendix A. These plans are provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under Access to Public Records Act (“APRA”; RIGL § 38-2-1) or Freedom of Information Act (“FOIA”; 5 U.S.C. § 552).

In the vicinity of flags 1-167 to 1-169 and 1-202 to 1-205 the clearing limits for the northwest corner of the OnSS encroach into Area of Land within 50 Feet of Wetlands including a small area inside the OnSS security fence. This encroachment occurs at an existing crossing of Wetland 3 constructed in fill. In addition to planting the disturbed area beyond the retaining wall, plantings will be placed at this crossing.

Impacts to palustrine wetland were completely avoided by shifting the orientation of the OnSS yard and trimming corners as necessary. Work inside Area of Land within 50 Feet of

Wetlands was further minimized by constructing 505 linear feet of retaining wall around the southwest corner of the OnSS and another 185-foot long wall near the northwest corner of the OnSS to shorten slope lengths. The use of retaining walls also obscures any activities occurring within the substation from wildlife utilizing habitats below the elevation of the substation yard.

The limited area of new impervious surfaces in the OnSS along with the use of infiltration for stormwater management minimize impacts to wetland hydrology The OnSS will largely occupy the closed landfill which minimizes the tree clearing requirement and puts a brownfield with limited wildlife habitat value into productive reuse.

B.2.2.3 Wetland 4

Description of Wildlife Function

Wetland 4 is a Marsh formed by a closed depression bounded by a natural kame deposit to the north and northwest and steep fill slopes to the southwest, south, and east. This wetland floods seasonally and functions as a cryptic vernal pool that supports obligate vernal pool species, including wood frog, spotted salamander and fairy shrimp. See Vernal Pool Assessment Technical Memo in Appendix J.

The steeps fill slopes of demolished concrete slabs present an obstacle to some wildlife seeking to enter the wetland from adjacent uplands to the south. Some of the gaps between exposed slabs are used by small mammals such as chipmunks for escape cover and probably den construction.

Within the wetland, species such as red-winged blackbird, common yellow-throat, and yellow warbler (*Setophaga petechia*) nest in shrub thickets. Gray catbird (*Dumetella carolinensis*) and American redstart (*Setophaga ruticilla*) were observed nesting in low trees in the wetland. Other birds were either identified by visual observation or from vocalizations. Wetland 4 has fewer snags and greater areas of shrub cover and open water in comparison with Wetland 3.

The presence of bulky waste such as old tires and disposed appliances in the in this Marsh provide an opportunity for enhancement by removing these foreign objects.

Proposed Impacts

The northeastern corner of the OnSS parallels the limits of Wetland 4. The OnSS yard will be perched seven to nine feet above the wetland along a segment of wetland edge that drops abruptly at the face of a fill slope. These slopes are thickly entangled with invasive species including multiflora rose, Morrow's honeysuckle, and Asiatic bittersweet along with scattered trees. This existing vegetation provides a visual screen preventing attempts to view the wetland from the top of slope.

The OnSS design completely avoids direct impact to Wetland 4. The incorporation of a 178-foot long retaining minimizes encroachment into Area of Land within 50-feet of Wetlands. Disturbed areas below the retaining wall and outside of the OnSS security fence will be planted with native shrubs and grasses that produce mast and/or flowers that are attractive to native pollinators.

The OnSS stormwater management system relies on infiltration for stormwater treatment. This technology along with the most of the OnSS yard remaining pervious will provide continued hydrologic support of the wetland.

The vertical separation and existing vegetation present along the wetland edge adjacent to the proposed OnSS yard mitigate impacts the presence of the facility may have on wildlife utilization beyond that anticipated during the construction period. Further mitigation will be implemented through hand removal or cabling out solid waste within the wetland.

The most important wildlife habitat attribute of Wetland 4 is the provision of breeding habitat for obligate vernal pool species, including wood frog and spotted salamander. Adults of these keystone species disperse into uplands habitats where they prey on insects and other invertebrates and are prey species for reptiles and mammals. This function will not be impacted by the OnSS.

B.2.3Production Export

Wetlands 2, 3, and 4 all providing varying forms of vegetation that provide mast for breeding birds, insects, and other animals such as small mammals.

B.2.4Groundwater and Surface Water Supply

The OnSS project area is situated in stratified drift. The uplands on the site serve as groundwater recharge sites as do wetlands during periods of depressed groundwater. However, for most of the year wetlands serve as discharge sites. Groundwater discharge from the wetlands on and adjacent to the site support flows in Mill Creek.

Camp Avenue and Quonset Point are served by a public water supply. The groundwater at the OnSS site is classified as GB due to the presence of a closed solid waste facility. This precludes any likely future use of the groundwater for public drinking.

The Project will not significantly impact the existing groundwater and surface water supply functions provided by the three wetlands within the OnSS Project Area.

B.2.5Flood Protection

Portions of the OnSS parcels occur within the one-percent annual flood hazard area (Zone AE) with a base flood elevation of 13 ft above North American Vertical Datum of 1988 ("NAVD88"). This floodplain (Wetland 3) extends into the northeast and northwest corners of the OnSS Project Area. This floodplain is established from models assessing the impact projected inland from the one percent annual chance coastal storm rather than modeled from riparian flooding. Coastal floodplain is not a Freshwater Wetland resource. Construction of the OnSS will not adversely affect flood heights driven by coastal storms.

B.2.6Water Quality

All of the wetlands in the project area are presumed to provide at least a limited water quality function. Under existing conditions, runoff from Camp Avenue enters Wetland 3 without treatment. This will not be changed by the Project and all the sediment trapping and nutrient sequestration functions provided by Wetland 3 will not be altered. Wetland 2 likely provides the least significant function as it is small and traps infiltrates runoff from the stable, grassed landfill cap and adjacent forested slopes. This wetland is avoided and will be fed by treated stormwater to maintain its hydrology. Wetland 4 will continue to trap sediment from some of the unstable slopes along its southern edge along.

B.2.7Recreation and Aesthetics

B.2.7.1 Description of Values

The characteristics of Wetland 3 and 4 have been provided above. Wetland 4 is landlocked and not visible from any existing public location so is not thought to provide any significant recreational or aesthetic values. This wetland suffered significant encroachment prior to the Freshwater Wetlands Protection Act during the demolition of Naval Air Station Quonset Point in the early 1970s that continue to detract from its intrinsic aesthetic value.

Wetland 3 includes visible location along Camp Avenue and Mill Creek Drive. The tree canopy of this wetland is dominated by red maple which provides attractive fall colors. There would also be opportunities to observe birds from public access points along these roads which could provide a recreational value.

B.2.7.2 Proposed Impacts

Construction of the OnSS will not affect the limited recreation and aesthetic values that Wetland 3 provides under existing conditions. The same opportunities will exist after the project has been constructed and is operational.

B.2.8RTE Species

B.2.8.1 Description of function and values

To assess whether any federal or state listed rare, threatened, and endangered ("RTE") species or SGCN were present within the Onshore Project Area, VHB evaluated information from the United States Fish and Wildlife Service ("USFWS") Information Planning and Conservation ("IPaC") tool and the RIDEM ERM. Additionally, special attention was made during the biological reconnaissance and wetland delineation field visits to identify occurrences of rare plants. General wildlife records are based on observations made during site investigations in July, August, and September 2019, winter observations were made during February of 2021, and breeding bird surveys in May of 2021. The RI WAP for species tied to specific Key Habitats within the Onshore Project Area, and other pertinent literature, including New England Wildlife (DeGraaf and Yamasaki 2001) were also reviewed.

VHB reviewed online data hosted by the RIDEM Environmental Resource Map (accessed on December 28, 2020). There are no Natural Heritage Database records of state-listed species within the Project Area; however, VHB biologists identified occurrences of sickle-leaved golden aster (*Pityopsis falcata*), a plant species of state concern within Rhode Island within an apparent former gravel excavation pit that sits at a lower elevation than the surrounding grade and has transitioned to a sand barren over time in the southeast corner of Plat 179 Lot 001. Sickle-leaved golden aster is a highly restricted endemic plant that is found only on sandy glacial deposits (Native Plant Trust, 2021). This plant is identifiable by its yellow tubular disk flowers in the center and yellow ray flowers around the center. The RINHP has records of this species occurring within a mapped natural heritage polygon approximately 400 ft (120 m) west of the OnSS parcel boundary.

In addition to review of state-managed databases, VHB generated an Official Species List (List) from the USFWS using the IPaC tool on September 28, 2019 and December 28, 2020 for onshore portions of the Project (see Appendix M). The List indicated that the federally threatened northern long-eared bat (*Myotis septentrionalis*; "NLEB") has the potential to occur within the Project Area. The List indicated that there are no Critical Habitats associated with the NLEB within the Project Area and did not identify any other federally protected species or critical habitats within the onshore portions of the Project.

VHB biologists conducted a presence/potential absence acoustic survey targeting NLEB during July 2020 in accordance with survey guidelines developed by USFWS. Five full-spectrum detectors were deployed within suitable summer habitat along the Onshore Transmission Cable route and within the OnSS parcels. The survey spanned two consecutive calendar nights from July 29-31, 2020 for a total of 10 detector nights. A detector-night spans the evening and early morning hours of two calendar dates. Call analysis determined that there was no indication of NLEB occurring within the survey area and a determination of potential absence was made and submitted to USFWS.

Section 7 consultation under the ESA is on-going as part of the NEPA process lead by BOEM. Appendix L includes a list of all the species observed within the Onshore Project Area.

B.2.8.2 Proposed Impacts

The onshore Project components have been designed to avoid impacts to RTE species where possible and minimize and mitigate impacts where feasible. Mitigation measures are provided in Section 3.1.6.3.

B.2.9Soil Erosion and Sediment Control

The OnSS Project Area occurs in a pitted ice-contact outwash plain that includes areas that are near level to steep-sided kames that rise to narrow summits. Some of these kames are scarred by sand and gravel mining cut faces. Large areas of the OnSS Project Area mapped as MU have been regraded. South of Wetland 4 building demolition is buried beneath a veneer of soil and a closed landfill occupies much of the western OnSS Project Area.

Soils are generally sandy in texture and subsoils and substrates are generally well sorted and structureless. At depth delta fore-set and topset beds are encountered that which consist of cohesive very fine sands and silts that can be susceptible to wind erosion if left exposed without protection.

A site-specific soil erosion and sedimentation control plan has been prepared for the OnSS construction period. This plan was prepared following standards of the RIPDES Program and the RISESCH (refer to the separately bound SESC Plan). The contractor and all subcontractors who participate in earth moving activities will be required to certify that they have read and understand the plan and carry out activities in a manner consistent with the RIPDES General Permit for Stormwater Discharge associated with Construction Activity and the SESC Plan.

Responses to 650-RICR-20-00-02 Sections 2.10.B.4 Avoidance and Minimization Requirement and 2.10.B.5.d (1) – (6) and 2.10.E Review Criteria for Applications to Alter a Freshwater Wetland

B.3 Impacts to Freshwater Wetlands in the Vicinity of the Coast

Under the CRMP Rules and Regulations Governing the Protection and Management of Freshwater Wetlands in the Vicinity of the Coast (Freshwater Wetland Rules), the CRMC is responsible for the review of proposed actions with the mission to *Preserve, protect, and restore the purity and integrity of all freshwater wetlands located in the vicinity of the coast within the State of Rhode Island so that these freshwater wetlands shall be available for all beneficial purposes, and thus protect the health, welfare, and general wellbeing of the people and the environment of Rhode Island* (see 650-RICR-20-00-2.1.C.).

Consistent with the Freshwater Wetland Rules, construction of the OnSS will not directly alter any palustrine wetland. However, there will be two types of unavoidable permanent alteration of the Area of Land within 50 Feet of Wetlands associated with Wetland 3 and 4 totaling 20,346 sf (0.46 ac) as provided in Table B.3-1.

Table B.3-1 Summary of Wetland Areas Altered to Construct the OnSS

	Wetland Area Altered (square foot / square meter)				
		Area of Land within 50 Feet of Wetlands			
		Incorporated into OnSS		Cover Type Conversion	
Wetland No.	Palustrine Wetland	Square Feet	Square Meters	Square Feet	Square Meters
2	0	NA		NA	
3	0	812	75.43	3,834	356.19
4	0	4,093	380.25	11,607	1078.33
Total	**0**	**4,905**	**455.69**	**15,441**	**1434.52**

Source: VHB

Table B3-1 shows that approximately 4,905 square feet (0.11 ac or 0.45 ha) of Area of Land within 50 Feet of Wetlands will be incorporated into the new OnSS yard. An additional 15,441 square feet (0.35 ac or 0.14 ha) will be cleared of trees to create a safe zone around the OnSS security fence and will be replanted in native warm season grasses, wildflowers, and shrubs with mature heights under 15 feet (4.6 m). The native shrub species chosen for this purpose have broad ecological amplitudes and either produce mast taken by wildlife, particularly passerines, or are attractive to native pollinators. The wildflowers chosen also tolerate poor soils and droughty sites and are visited by native pollinators. Sweet fern

(*Comptonia peregrina*) was added to this list as a low shrub because it is a nitrogen fixer and pioneer species on droughty sites.

A portion of the OnSS will be constructed on a closed landfill and buried demolition and bulky waste deposits extend to the southern limits of Wetland 4. This makes the OnSS a productive reuse of an existing brownfield site.

B.4 Avoidance

The following section addresses issues associated with §2.10(B)(4) of the Freshwater Wetland Rules.

(a). *Avoidance: All persons must satisfactorily demonstrate to the CRMC in the form of a written narrative that all probable impacts to freshwater wetlands functions and values have been avoided to the maximum extent possible. The written narrative must describe what steps were taken to avoid impacts to freshwater wetlands. At a minimum, applicants must consider and address the following issues:*

(1). *Whether the primary proposed activity is water-dependent, or whether it requires access to freshwater wetlands as a central element of its primary purpose (e.g., a pier);*

The proposed OnSS is itself not water dependent; however, the purpose of the OnSS is to connect the water-dependent RWEC-RI (and broader Revolution Wind Farm) to the existing Davisville Substation and support the interconnection of the Project to the existing electrical transmission grid. The development of the OnSS will involve impact to freshwater wetland, limited to the Area of Land within 50-ft of a Marsh and Swamp, to achieve the Project purpose.

(2) Whether any areas within the same property or other properties owned or controlled by the applicant could be used to achieve the project purpose without altering the natural character of any freshwater wetlands;

Several points of Interconnection (“POIs”) were evaluated to determine the best route of connecting the power generated from the offshore Revolution Wind Farm to the regional transmission grid. The Davisville POI was identified as the preferred alternative based on the existing infrastructure, proximity to the coastline to minimize onshore transmission routes, and available lands nearby to support the OnSS construction.

Upon selecting the Davisville Substation as the POI a real estate canvass for properties for an OnSS was conducted, as described in (3) below.

(3) Whether any other properties reasonably available to, but not currently owned or controlled by, the applicant could be used to achieve the project purpose while avoiding wetland alterations. A property is reasonably available if, in whole or in part, it can be acquired without excessive cost, taking individual circumstances into account, or, in the case of property owned or controlled by the same family, entity, group of affiliated entities, or local, state or federal government, may be obtained without excessive hardship;

Revolution Wind completed an alternatives analysis before choosing the site for the OnSS. A real estate canvas identified seven potentially available properties using the following criteria:

- Proximity within one mile of the Davisville Substation;
- Minimum 7-ac [2.8 ha] parcel size with minimum 250-ft (76.2 m) parcel width;
- Suitable topography (e.g., gently slopes, above height of coastal flood hazard);
- Not zoned residential;
- Absence of Sensitive Receptors (e.g., schools, day care centers, open-space or recreational areas); and
- Availability, property is either on the market or the owner is willing to sell.

Four properties were eliminated from consideration as they were unavailable for purchase or long term lease. Three properties were carried forward from the canvass and evaluated using GIS map coverages to characterize factors such as buildable area, topography, access, soil-based limitations, soil or groundwater contamination, sensitive natural resources (e.g., wetlands, streams, floodplains, vernal pools, rare species), tree clearing requirements, land use and zoning, sensitive receptors for noise or visual impacts, and potentially conflicting utilities. The three candidate properties are described provided below.

Fujifilm Property

The 26 acre Fujifilm property is 0.25 mi from the TNEC Davisville Substation on Circuit Drive. The property contains two Fujifilm buildings and approximately 14 acres are undeveloped space potentially suitable for an OnSS. It is bounded on the north by a vacant TNEC parcel and land owned by the QDC along the railroad, on the west by Circuit Drive, on the east by Burlingham Avenue, and on the south by other properties. The site is near level with elevations varying from 12 ft to 22 ft above NAVD88 and most of the site at or near elevation 19 ft.

Access would likely be from Circuit Drive with only a short site drive required. The proposed OnSS site would require underground circuits 0.4 mi long to reach the TNEC Davisville substation. This site is the shortest overall (landfall length plus interconnection length) for all options. Wetlands are not present on this site and the site is outside of the CRMC 200-foot Contiguous Area from the Coastal Feature. Most of the site is located below the 0.2% AEP floodplain at approximate elevation of 23 feet NAVD88. Floodplain compensation would not be required in a coastal flood zone. No tree clearing would be required. This site is within the Quonset Business Park District and is marked as Quonset Light Industrial District ("QLID"). There are no sensitive receptors abutting this location.

The Fujifilm's building is an Emergency Planning and Community Right-to-Know Act ("EPCRA") tier II Facility with an Environmental Land Use Restriction (ELUR) where the

OnSS could be sited[29]. There is a 24-inch stormwater culvert running through the middle of the property that may need to be relocated for the OnSS. Siting the OnSS on this parcel would preclude future facility expansion by the owner or others in the industrial park. The QDC recommended against siting the OnSS on this property as other higher and better uses were planned for this area ideal for supporting future industrial or business growth.

QDC Mainsail Drive Property

The QDC-owned Mainsail Drive property is approximately 0.2 miles from the TNEC Davisville Substation on Mainsail Drive. The near level 9.9 acre site is fenced and mostly paved with typical elevations between 14 feet and 18 feet above NAVD88. Currently, this property is frequently used as a material laydown and stockpile area for other construction sites. The site is bounded by the North Kingstown Golf Course to the north and west, Mainsail Drive to the east and Roger Williams Way to the south. There is one stockpile area with elevations reaching elevation 28 feet. No special earthwork would be required to prepare a building pad. This site contains state-regulated freshwater wetlands including a tributary to Mill Creek along the northern boundary with a 100-foot Riverbank Wetland. There is no known soil or groundwater contamination.

Access would likely be from Mainsail Drive. An OnSS constructed at this location would require 0.7 mi of underground conduit to reach the TNEC Davisville substation beginning from the shore. This is the longest onshore cable route overall among the three sites and would cross a railroad and several underground utilities.

QDC Property abutting the Davisville Substation

This undeveloped QDC property is partially open and abuts the existing TNEC Davisville Substation. It consists of two adjacent parcels of land totaling 15.7 acres. The site is bounded by a wetland and TNEC's electric transmission ROW and other undeveloped QDC properties to the north, wooded and residential areas to the west, Camp Avenue to the south, and the TNEC Davisville Substation and Eurofins Microbiology to the east. Access would be from Camp Avenue. Since it abuts the TNEC Davisville Substation this site would have the shortest interconnection.

Much of this site was excavated, filled, and graded during the closure of Naval Air Station Quonset Point with extensive areas composed of buried concrete and steel demolition. Large segments of wetland edge are defined by the abrupt limits of fill slopes. Direct impact to palustrine wetlands and 100-foot Riverbank Wetland would be avoided by a new OnSS constructed at this site, however there would be encroachments into the Area of Land within 50 Feet of Wetlands (wetland buffer).

Portions of the site are within a FEMA Coastal Flood Zone AE one percent Annual Exceedance Probability ("AEP") floodplain with an elevation 13 feet NAVD 88. Most of

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the site is located within the 0.2 percent AEP floodplain at elevation 23 feet above NAVD88. Floodplain compensation is not required for fill placed in coastal floodplains.

An OnSS constructed at this brownfield site would largely occupy the Camp Avenue Dump where demolition materials from the former Naval Air Station Quonset Point have been interred. The dump is capped, and it is ringed with groundwater monitoring wells around the perimeter. There is an ELUR on this site that requires approval from the RIDEM Office of Land Revitalization and Sustainable Materials Management before conducting earthworks. Beneficial reuse of brownfields for the OnSS is consistent with BOEM and RIDEM policy. Because the dump is maintained in lawn grasses only about 3.3 acres (1.34 ha) of woodland will be cleared to develop the 7.1 acres (2.87 ha) OnSS facility. This site was strongly recommended by the QDC which is the owner of the property.

There are no known utilities on this site. The closest sensitive receptor is Fishing Cove Elementary School 0.4 miles (0.64 km) southwest. The OnSS has four abutters (see Appendix Z); two are residential including townhomes/condominiums with a total 137 units. There are five residential properties across Camp Avenue south of the site. The closest residential area is the townhome community at least 280 feet (85.34 m) west of the proposed OnSS fence. The use of these lots for an OnSS will require relief from the QDC and Town of North Kingstown land-use regulations which will be granted through the EFSB process.

Conclusion

Based on parcel size, ability to avoid direct impact to palustrine and Riverbank wetlands and limited disturbance to mostly previously disturbed Area of Land within 50 Feet of Wetlands , proximity to the TNEC Substation, the visual buffer provided to abutters, productive reuse of a brownfield site, and strong QDC preference, the QDC Property abutting the TNEC Substation was advanced as the preferred alternative.

(4) Whether alternative designs, layouts or technologies could be used to avoid freshwater wetlands or impacts on functions and values on the subject property or whether the project purpose could be achieved on other property that is reasonably available and would avoid wetlands;

The OnSS is designed to meet Rhode Island State Building Code/2015 International Building Code, American Society of Civil Engineers ("ASCE") Standard 7-10, ASCE 113, ASCE 24-14, all applicable Institute of Electrical and Electronics Engineers ("IEEE") standards, and local climate and geotechnical conditions. The engineering of these facilities proposes gas-insulated switchgear system bay positions. All of the equipment spacing within the substation and distances from the perimeter fences have been designed in accordance with the National Electric Safety Code[30] which provides for the

30 The NESC is an ANSI standard which covers basic provisions for safeguarding of persons from hazards arising from the installation, operation, or maintenance of conductors and equipment in electrical supply stations, and overhead and underground electric supply and communication lines. It also includes work rules for the construction, maintenance, and operation of electric supply and communication lines and equipment.

safety of the general public as well as the utility personnel that will operate and maintain the station. Other codes that govern the design and maintenance of the Project include the American Concrete Institute, and the American National Standards Institute.

These standards control the design of the fence, the separation distance of the fence to energized equipment, safe clearance distances between energized equipment above ground, and the grounding of all equipment, fencing and surfaces within the yard and around the perimeter of the yard. Following these design criteria, the OnSS layout that is presented avoids direct impact to palustrine wetlands but does encroach into portions of the Area of Land within 50 Feet of Wetlands associated with Wetlands 3 and 4. Wetland avoidance was also achieved by modifying the shape of the yard from a standard rectangular form, specifically to avoid palustrine wetlands. Several other alternative layouts that had directly impacted palustrine wetlands were rejected.

The principal advanced technology used to avoid and minimize impacts to wetlands is the selection of substation equipment insulated with SF_6 gas. Gas insulation technology (versus air insulated) for electrical substations originated in Japan in the 1960, where there was a critical need to develop substations with greatly reduced footprints. It is significantly more expensive than conventional air-insulated substation ("AIS") equipment that uses atmospheric air as the dielectric gas medium. While the conventional, AIS requires several feet of air insulation to isolate a conductor, SF_6 gas insulation only needs inches, allowing a gas insulated facility to fit into areas far smaller than that of an air insulated facility. In the U.S. about five percent of new substations are gas insulated as the technology is deployed only where space is limited (Parnell, 2019).

(5) Whether the applicant has made any attempts (and if so what they were) to avoid alterations to freshwater wetlands by overcoming or removing constraints imposed by zoning, infrastructure, parcel size or the like; and

These factors are not constraints that cause a Freshwater Wetland to be impacted. Construction of the OnSS will not impact a palustrine wetland, however work is proposed in the Area of Land within 50 Feet of a Marsh and a Swamp.

(6) Whether feasible alternatives that would not alter the natural character of any freshwater wetlands on the subject property or on property that is reasonably available, if incorporated into the proposed project, would adversely affect public health, safety or the environment.

Construction of the new OnSS will not directly impact palustrine wetlands. As stated above, all of the equipment spacing within the substation and distances from the perimeter fences have been designed in accordance with the National Electric Safety Code which provides for the safety of the general public as well as the utility personnel that will operate and maintain the station. The OnSS must be built at the proposed scale to achieve the Project purpose of supplying clean, renewable offshore power to the point of interconnection, the existing Davisville Substation. Reductions in equipment spacings below applicable code requirements to reduce the operation

footprint of the OnSS would adversely public safety and the safety of workers in the OnSS.

B.5 Minimization

(b) *Minimization: For any impact to freshwater wetlands that cannot be avoided, the applicant must satisfactorily demonstrate to the CRMC in the written narrative that the impact to wetland functions and values have been reduced to the maximum extent possible. At a minimum, applicants must consider and address the following issues*:

(1) *Whether the proposed project is necessary at the proposed scale or whether the scale of the wetland alteration could be reduced and still achieve the project purpose;*

The OnSS must be constructed at the scale presented to introduce the power exported from the OSSs to the existing electrical grid serving Rhode Island and Connecticut. The equipment list for the facility is provided in Table 2.1-2. Elimination of any piece of equipment would prevent the OnSS from serving its design purpose.

Measures taken to minimize impacts to Area of Land within 50 ft of Wetlands include the incorporation of 868 lf of structural wall, skewing the sides of the OnSS from traditional perpendicular alignment and truncating corners. The arrangement and spacing of equipment and fencing are all determined by governing electrical and safety codes previously described in the avoidance discussion.

(2) *Whether the proposed project is necessary at the proposed location or whether another location within the site could achieve the project purpose while resulting in less impact to the wetland;*

As described in §§(3) above under Avoidance, an alternatives analysis was completed before the proposed site for the OnSS was selected.

(3) *Whether there are feasible alternative designs, layouts, densities or technologies, that would result in less impact to the wetland while still achieving the project purpose; and*

Refer to response to §§(4) under Avoidance above.

(4) Whether reduction in the scale or relocation of the proposed project to minimize impact to the wetland would result in adverse consequences to public health, safety or the environment.

The scale of the Project cannot be reduced by removing essential electrical equipment from the OnSS yard and still fulfill the Project purpose. A summary of the equipment to be installed in the OnSS yard is provided in Table 2.2-1. This design ensures the safe transmission of 115 kV of power from the OnSS to the existing Davisville Substation for distribution to consumers in Rhode Island and Connecticut. Please see §§(4) in Avoidance above for a discussion of the codes governing the safe design of substations.

B.6 Mitigation

c. *Mitigation measures. Measures, methods, or best management practices to avoid alterations of and minimize impacts to wetlands are described in § 2.9(B)(1)(d)(3) of the Freshwater Wetland Rules.*

AA. *Preserving natural areas in and around wetlands*;

Natural areas on the two OnSS Project Area parcels are preserved to the extent practicable by siting the OnSS on a closed landfill. Approximately 3.3 acres of tree clearing will be necessary on the 7.1 acre site. Tree clearing will be necessary for the OnSS access drives, stormwater management facilities, and parts of the approximate 4 ac (1.6 ha) operational footprint of the OnSS and its safety area outside of the fenced perimeter. Grading limits around the OnSS were also reduced through the incorporation of 868 linear feet of structural retaining wall.

BB. *Minimizing the extent of disturbed areas and encouraging the preservation of land in its natural state*;

Again, the Revolution Wind made the conscious effort to site the facility partially on a brownfield which includes a closed landfill and other undelineated areas where demolition materials from the former Naval Air Station Quonset Point were interred. Much of the development will occur on previously disturbed land.

CC. *Designing dense plantings of shrubs and trees between the developed areas and the remaining natural areas*: (i). *to "buffer" impacts from loss of wildlife habitat and loss of natural areas and* (ii). *to reduce the impacts of noise, lighting and other disturbances upon wildlife and the remaining natural areas*;

Over one acre of perimeter plantings consisting of native warm season grasses, wildflowers, and native shrubs are proposed as buffer and general habitat enhancement at the OnSS facility. Trees cannot be planted within 30 ft of the OnSS perimeter fence due to restrictions in the electrical codes governing the OnSS design.

(DD) *Maintaining unrestricted fish and wildlife passage*;

The Project will not impact any palustrine wetland or aquatic habitat potentially occupied by fish. Wildlife that crossed through the OnSS Project Area to reach wetlands will divert around the 4-acre (1.6 ha) OnSS operational footprint but will continue to have free access to all habitats both onsite and offsite.

(EE) *Designing structures and alterations so that they are located outside of flood plain, floodway, areas subject to flooding, flowing bodies of water or other freshwater wetlands*;

The OnSS development does not occupy a floodway and avoids all flowing bodies of water and palustrine wetlands. Some unavoidable encroachment into the Area of Land within 50 feet of Wetlands is needed to construct the OnSS (4,905 sf or 0.11 ac [0.05 ha]), and an additional 15,441 sf (0.35 ac [0.14 ha]) will be converted from wooded or other cover type. These converted areas will be planted with native warm season

grasses, wildflowers, and shrubs that either produce fruit sought by wildlife or are attractive to native pollinators.

Portions of the OnSS are shown in Zone AE with a base flood elevation of 13 feet driven by the water height of the coastal storm. Much of the OnSS is shown in Zone X at risk for the 0.2 percent chance annual coastal storm. The OnSS is being designed so that substation equipment is above the height of the 0.2 percent annual chance flood height. Compensation is not required for fill in coastal floodplains based on the coastal storm.

(FF) *Using best management practices for the stabilization of disturbed areas and the selection, use, and maintenance of temporary or permanent soil erosion and sediment controls in accordance with the latest version of the RI Soil Erosion and Sediment Control Handbook and the RIDEM "Stormwater Management, Design and Installation Rules", 250-RICR-150-10-8*;

The OnSS Soil Erosion and Sedimentation Plan (Appendix A and E) appended to this application strictly adheres to the practices provided in the 2016 update of the RISESCH and the latest version of the Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8).

(GG) *Using best management practice selection and design criteria in accordance with the latest version of the RIDEM "Stormwater Management, Design and Installation Rules," 250-RICR-150-10-8, to reduce post-development stormwater flows and maximize the control, treatment and maintenance of systems that reduce stormwater impacts to acceptable levels*;

The Stormwater Management Report (Appendix U) with completed forms and computations details the Project compliance with 250-RICR-150-10-8.

(HH) Minimizing impervious surface areas such as roads, parking, paving or other surfaces;

Impervious surface have been minimized to a 50 foot paved apron at the site entrance on Camp Avenue and equipment foundations. All other access roads inside the OnSS fence and leading to the facility will be constructed with crushed stone with crushed stone shoulders. Parking will be on open areas of crushed stone inside the OnSS yard. The OnSS yard will also be constructed of crushed stone to ensure water is quickly conducted below grade and infiltrated through a gravel and sand layer to avoid puddling which can be hazardous in a substation.

It should be noted that the substation will not be manned and that the number of vehicle trips generated by the operating facility over a given time period is generally less than that of a single-family home.

(II) *Incorporating compensatory flood storage area(s) where necessary and in compliance with these Rules*;

Compensatory flood storage is not required for fill placed in a coastal flood hazard zone.

(*JJ) Encouraging infiltration of non-contaminated run-off into uncontaminated soils*;

Design of the OnSS relies on infiltration of non-contaminated runoff as the primary form of treatment of stormwater. The RIDEM Office of Land Revitalization and Sustainable Materials Management has approved the use of infiltration for the portion of the OnSS that will be constructed over the closed landfill, with the limitation that only precipitation can be infiltrated to this area. Other infiltration BMPs are described in detail in the Stormwater Management Report (see Appendix U).

(KK) *Preventing channelization or piping of run-off and encouraging sheet flow*;

Stormwater is designed to flow overland across the gravel access drives and through gravel shoulders. Most of the rainfall falling within the OnSS operational footprint will immediately soak into the crushed stone layer before infiltrating though a layer of sand and gravel. If flows exceed the infiltrative capacity of the substrate, they will be collected by underdrains and directed to an infiltration basin capable of handling the volume from the 100-year storm. Details of the stormwater management design are provided in the separately bound Stormwater Management Report (see Appendix U).

(LL) *Landscaping with gradual slopes to maximize sheet flow and infiltration while minimizing channelization*;

The creation of steep slopes was avoided through the use of structural retaining walls to make some of the greater elevation transitions from the OnSS yard to existing ground outside of the operational footprint. Most landscaping will be with native shrubs, wildflowers, and grasses planted in areas where existing grades will not be substantially modified. Note that most of the rainfall falling within the OnSS yard will immediately infiltrate and not leave the yard as sheet flow.

(MM) *Minimizing or eliminating the use or increase of any pollutants, fertilizers, pesticides, herbicides, or any other chemical or organic application which increase pollutant and nutrient loadings*;

These products will not be used for the construction of the OnSS. Herbicides may be used to control nuisance vegetation, especially invasive species, that threaten to encroach into the perimeter of the OnSS yard during the operational phase of this Project. Any herbicide applications will be conducted by state-licensed professionals.

(NN) *Maximizing setbacks of septic systems and other land disturbances from wetlands; and*

Not applicable.

(OO) *Minimizing the withdrawal of surface water or groundwater from wetlands or uplands adjacent to wetlands, especially during dry periods, and minimizing any reduction in river or stream flow.*

There will be no withdrawals of water for this Project.

B.7 Proposed OnSS Wetland Mitigation Proposal

In addition to adhering to the mitigation criteria provided in the Freshwater Wetland Regulations, Revolution Wind proposes to implement some additional measures to enhance the wildlife function of the disturbed Area of Land within 50-feet of Wetlands and some of the adjacent "buffer zone" beyond the 50-feet zone from Wetlands 3 and 4 (Refer to Drawing Nos. W1.01 and W1.02) The plan consists of planting native shrubs, wildflowers and grasses. Revolution Wind have chosen a palette of four shrub species: gray dogwood (*Swida racemosa*), Staghorn sumac (*Rhus typhina*), New Jersey tea (*Ceanothus americanus*) and bayberry (*Morella pensylvanica*). These shrubs were chosen for their wide ecological amplitude and low stature which allows them to be planted within 30 feet of the OnSS. These species also produce fruit or seeds mostly taken by songbirds and are attractive to native pollinators. Approximately 1.1 acres of these shrubs will be planted around the OnSS within disturbed or existing open Area of Land within 50-feet of Wetlands and "buffer" areas within 100 feet of wetlands as shown on the drawings in Appendix A. Additional plantings are continued within the OnSS Project Area along graded slopes more distant from wetlands. These plans are provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under Access to Public Records Act ("APRA"; RIGL § 38-2-1) or Freedom of Information Act ("FOIA"; 5 U.S.C. § 552).

Native grasses and wildflowers will also be sown among the shrub plantings. Creeping red fescue (*Festuca rubra*), a cool season grass native to Europe, will be used as a nursery crop to hasten soil stabilization. This grass will be out competed by the taller native warm-season bunch grasses in the seed mix within two or three growing seasons. The wildflowers in the mix are capable of establishing in droughty, nutrient poor sites and also attract native pollinators. An exception is sweet fern (*Comptonia peregrina*) included in the mix as a hardy pioneer plant capable of establishing on droughty nutrient poor sites that was selected for its ability to fix atmospheric nitrogen. It is also a host plan for grey hairstreak (*Strymon melinus*), a native butterfly.

Beyond these plantings Revolution Wind proposes to remove solid waste and demolition debris scattered across the surface of wetlands and the Area of Land within 50-feet of Wetlands within the OnSS Project Area. This will involve materials that can be collected by hand (e.g., cans, metal shards, rebar) or cabled out (e.g., tires) without causing extensive damage. It is presumed that this activity would be exempt from the Freshwater Wetland Regulations under Rule 2.6.C.1.j. *Removal of manmade trash from watercourses and other wetlands without causing any change in the profile or general character of any watercourse or other wetlands*. This will not only improve the aesthetics of the wetlands but also expose more natural substrate capable of supporting plant growth and the biogeochemical processes that occur on and within wetland substrates.

B.8 Review Criteria

1. *The CRMC will evaluate all projects to determine the extent to which the proposed project will have an impact, either individually or cumulatively, upon wetland functions or values as described in this Rule.*
2. *All such projects shall:*

a. *Be subject to all of the review criteria contained herein and must incorporate those best management practices, best available technologies, and any maintenance or inspection schedules necessary to comply with the applicable criteria*;

Each individual criterion is addressed below.

b. *Not adversely affect any wetland so as to cause any of the impacts identified in § 2.10(E)(3) of this Part below; and*

This criterion is addressed below in 2(c) and 3(a) through (z) in this part.

c. Shall not result in any random, unnecessary or undesirable alteration of freshwater wetland.

The Project is not random or unnecessary because the OnSS is an essential component to support the transmission of renewable electric energy generated from the offshore Revolution Wind Farm into the existing Davisville Substation and wider electric transmission grid serving consumers in Rhode Island and Connecticut. The Project has been proposed in response to the renewable energy directives in Rhode Island and Connecticut. In response to this expressed need and demand, the Project has been awarded three Power Purchase Agreements ("PPAs") to-date, totaling 704 MW of generation capacity: 1) a 200 MW contract with the State of Connecticut approved in December 2018; 2) a 400 MW contract with the State of Rhode Island approved in February 2019; and 3) a 104 MW contract with the State of Connecticut approved in November 2019. The Project is being developed to fulfill its obligations to Connecticut and Rhode Island in accordance with the PPAs. For a more detailed description of the purpose and need for this Project please refer to Section 1.3 of this Category B Assent application.

3. *Before issuing a permit, the CRMC must be satisfied that a proposed project or alteration will not result in*:

a. *Significant reduction in the overall wildlife production or diversity of a wetland*;

Construction of the OnSS avoids all direct impact to palustrine wetlands and converts 0.11 acres of existing Area of Land within 50 feet of the Wetland to non-habitat. The OnSS is not envisioned to have any effect on wildlife diversity in wetlands beyond the construction period where construction activity may cause wildlife to alter habitat utilization patterns.

b. *Significant reduction in the ability of a wetland to satisfy the needs of a particular wildlife species*;

The most significant wetland habitat provided by the OnSS Project Area wetlands is the vernal pool habitat associated with Wetland 4. Construction of the OnSS avoids direct impact to this wetland. Indirect impacts are minimized through the very limited creation of new impervious surfaces and the use of infiltration for stormwater management. By continuing to recharge groundwater through infiltration of stormwater, the OnSS will continue to support the spring hydroperiod of Wetland 4. The proposed wetland alteration will not reduce the ability of Wetland 4 to support the needs of wildlife species. Freshwater Wetland 4 will continue to provide vernal pool

habitat for obligate species. In addition, the Applicant proposes to remove existing waste from within the wetland further enhancing the habitat.

The OnSS also avoids direct impact to Wetlands 2 and 3. Approximately half of the OnSS will be constructed on a closed landfill currently providing limited upland habitat.

The OnSS will not be staffed and once operational will be visited a few times per week by maintenance staff. Larger wildlife species utilizing the OnSS Project Area as part of their habitat have habituated to the presence of human disturbance surrounding the site and will habituate after the OnSS is fully constructed.

c. *Significant displacement or extirpation of any wildlife species from a wetland or surrounding areas due to the alteration of the wetland*;

The proposed wetland alterations are minor and limited to fringes of the Area of Land within 50 Feet of Wetlands. The OnSS was designed to avoid direct wetland impacts, minimize impacts to the wildlife that have been documented to utilize the site, and minimize impacts to other species that may utilize the wetland habitat in the OnSS Project Area.

d. *Any reduction in the ability of the wetland to ensure the long-term viability of any rare animal or rare plant species*;

There are no direct impacts proposed to palustrine wetlands within the OnSS Project Area and there are no known rare animal or plants species within the Freshwater Wetlands.

e. *Any degradation in the natural characteristic(s) of any rare wetland type*;

There are no rare wetland types within or adjacent to the Project Area.

f. *Significant reduction in the suitability of any wetland for use by any resident, migratory, seasonal, transient, facultative, or obligate wildlife species, in either the short- or long-term as a travel corridor; feeding site; resting site; nesting site; escape cover; seasonal breeding or spawning area*;

The OnSS will be constructed outside of palustrine wetlands and its presence will not affect travel corridors which may exist between Wetland 3 and 4. Pool breeding amphibians migrating to and from Wetland 4 will not be obstructed from reaching or leaving the resource area.

The reliance on infiltration for stormwater treatment will help to sustain the existing hydrologic regimes in each of the wetlands as discussed in the Stormwater Management Report (Appendix U).

g. *Any more than a minimal intrusion of, or increase in, less valuable, invasive or exotic plant or animal species in a wetland*;

Due to its past use as a landfill and disposal area for demolition, there are well established populations of invasive species across the OnSS Project Area. This is especially true for the Area of Land within 50 Feet of Wetlands south and west of

Wetland 4 which is an impenetrable thicket of multiflora rose, Morrow's honeysuckle, and Asiatic bittersweet. The presence of the OnSS with its crushed stone surface and the proposed mitigation planting plan may help to slow the spread of invasive species across the OnSS Project Area.

h. *Significant reduction in the wildlife habitat functions and values of any wetland which could disrupt the management program for any game or non-game wildlife species carried out by state or federal fish, game, or wildlife agencies*;

The construction and operation of the OnSS is not anticipated to result in a significant loss of existing wildlife habitat values that could disrupt the management programs for any game or non-game species. Wildlife utilizing wetland habitats that exist on and continue beyond the property limits are habituated to human disturbance surrounding the OnSS Project Area.

i. *Significant reduction in overall current or potential ability of a wetland to provide active or passive recreational activities to the public*;

The wetlands within the OnSS Project Area are on QDC-owned property that is posted and there is no public access. Views of Wetland 3 distant from the Project Area are available from Camp Avenue and Mill Creek Drive. These viewpoints along public roads will continue to afford limited bird/wildlife watching opportunities that would not be diminished by the Project.

j. *Significant disruption of any on-going scientific studies or observations*;

The wetlands in the Project Area are not known to be used for any on-going scientific studies or observations.

k. *Elimination of, or severe limitation to traditional human access to, along the bank of, up or down, or through any rivers, streams, ponds, or other freshwater wetlands*;

There is no public access to the wetlands within the OnSS Project Area. Due to the presence of the closed landfill the property is gated and posted by QDC.

l. *Any reduction in water quality functions and values or negative impacts to natural water quality characteristics, either in the short- or long-term, by modifying or changing: water elevations, temperature regimes, volumes, velocity of flow regimes of water; increasing turbidity; decreasing oxygen; causing any form of pollution; or modifying the amount of flow of nutrients so as to negatively impact wetland functions and values*;

Construction of the OnSS will not remove trees or vegetation from within wetlands or otherwise disturb the wetland substrate. The OnSS has been designed to minimize the creation of new impervious surfaces and relies on infiltration as the final treatment of stormwater. A site specific SESC Plan has been prepared for the OnSS following guidance from the 2016 update to the Rhode Island Soil Erosion and Sediment Control Handbook (see Appendix E), and consistent with the Rhode Island Stormwater Management, Design, and Installation Rules. Together these measures will mitigate any affects to water quality function and values as well as negative impacts to natural water quality characteristics.

m. *Any placement of any matter or material beneath surface water elevations or erection of any barriers within any ponds or flowing bodies of water which could cause any hazards to safety*;

The Project will not create any hazards to safety in this manner.

n. *Significant loss of important open space or significant modification of any uncommon geologic features or archaeological sites that are listed on the National Register of Historic Places or eligible for listing*;

Revolution Wind has performed surveys to identify buried archaeological sites in areas of potential ground disturbance focusing on the Onshore Project Area. Revolution Wind is continuing to investigate the potential for impacts to terrestrial archaeological resources in consultation with RIHPHC and Native American Tribes. A copy of the Project's current Terrestrial Archaeological Resources Assessment is provided under confidential cover to this Category B Assent application because it contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552)((Appendix K).

The site does not contain uncommon geologic features and this QDC-owned property is not listed as open space.

o. *Significant modification to the natural characteristics of any wetland area of unusually high visual quality*;

Only Area of Land within 50 Feet of Wetlands 3 and 4 will be altered. The areas affected are not visible from public viewpoints beyond the property limits and do not possess unusually high visual quality.

p. *Any decrease in the flood storage capacity of any freshwater wetland which could impair the wetland's ability to protect life or property from flooding or flood flows*;

The Project will not reduce flood storage capacities. The flood hazard area mapped within the OnSS Project Area is driven by the height of the coastal storm at the coast and not finite flood volumes associated with riparian floodplains.

q. *Significant reduction of the rate at which flood water is stored by any freshwater wetland during any flood event*

No fill will be placed within a palustrine wetland. The Project will not significantly reduce the rate at which flood water is stored by freshwater wetlands.

r. *Restriction or significant modification of the path or velocities of flood flows for the 1-year, 10-year, or 100-year frequency, 24-hour, Type III storm events so as to cause harm to life, property, or other functions and values provided by freshwater wetlands*;

Construction of the OnSS will not significantly modify the path of flood flows. As described above, no significant changes to drainage patterns within the Project Area are proposed. No restrictions to path of flood flows are proposed.

s. *Placement of any structure or obstruction within a floodway so as to cause harm to life, property, or other functions and values provided by freshwater wetlands*;

No floodways are present within the OnSS Project Area.

t. *Any increase in run-off rates over pre-project levels or any increase in receiving water/wetlands peak flood elevations for the 1-year, 10-year, or 100-year frequency, 24-hour, Type III storm events which could impair the wetland's ability to protect life or property from flooding or flood flows*;

The OnSS stormwater management system has been designed such that there will be no increase in stormwater runoff peak flows for any of the design storms analyzed. Documentation of the pre- and postconstruction drainage analyses are provided in the Stormwater Management Report (Appendix U).

u. *Any increase in run-off volumes and discharge rates which could, in any way, exacerbate flooding conditions in flood-prone areas*;

No increase in stormwater runoff peak flows are proposed for the 1, 10, and 100-yr storm events. Stormwater volumes are also managed through the use of infiltration such that there are no increases post development. See the Stormwater Management Report for further details and analysis.

v. *Significant changes in the quantities and flow rates of surface or groundwater to or from isolated wetlands (e.g., those wetlands without inflow or outflow channels)*;

Freshwater Wetland 4 would be considered isolated in the context of this review criterion. Freshwater Wetland 4 is Design Point-3 under existing and proposed conditions in the Stormwater Management Report. Peak discharge rates to the design point are reduced under proposed conditions for all design storms, and the volume (quantity) of water directed into Wetland 4 directly is reduced by about 10 percent for the one-year storm (2,864 cu ft existing to 2,601 cu ft proposed). Under existing conditions, the discharge from a one-year storm is capable of raising the water level in Wetland 4 by about 0.37 in (0.94 cm). Under proposed conditions the water level could be temporarily raised by as much as 0.34 in (0.85 cm). This difference (0.03 in) for the one-year storm from one part of the contributing watershed is not significant. Actual water levels reached in Wetland 4 are more likely to be influenced by antecedent conditions in the wetland rather than by the small reduction in the volume discharged during this once in a year predicted storm event. The Project has exceeded its goal by infiltrating the entire volume for events as large as the 100-year storm. Infiltration will sustain groundwater elevations critical to supporting the minimum vernal pool hydroperiod in Wetland 4 necessary for spotted salamander and wood frog larvae to complete metamorphosis and emerge from the wetland before it dries.

The Project also maintains hydrologic support for the much smaller Wetland 3 which does not provide vernal pool habitat. Wetland 3 is not isolated with offsite tributaries flowing into Mill Creek.

w. *Placement of any structural best management practices within wetlands, or proposal to utilize wetlands as a detention or retention facility*;

The Project does not propose to place any structural BMPs within wetlands or use wetlands as a detention or retention facility beyond that provided as a natural function.

x. *Any more than a short-term decrease in surface water or groundwater elevations within any wetland;*

Existing drainage patterns were maintained to the maximum extent practicable. Post construction watersheds maintain discharge points to each wetland around the facility. The Project will not withdraw any water from the site.

y. *Non-compliance with the Rhode Island Department of Environmental Management "Water Quality Regulations," 250-RICR-150-05-1; or*

The Project was designed in accordance with 250-RICR-150-10-8 and as such complies with 250-RICR-150-05-1.

z. *Any detrimental modification of the wetland's ability to retain or remove nutrients or act as natural pollution filter.*

The Project will not result in the loss of wetland areas that currently provide nutrient removal and water quality functions.

Appendix C: Coastal Hazards Worksheets

CRMC File Number:

RI CRMC COASTAL HAZARD APPLICATION WORKSHEET

APPLICANT NAME: Revolution Wind, LLC

PROJECT SITE ADDRESS: 574 & 594 Camp Avenue, and 109 Circuit Drive, North Kingstown

STEP 1. PROJECT DESIGN LIFE

■ A. For properties in a FEMA-designated **A** or **X** Zone, provide the first floor elevation (FFE) of the proposed structure referenced to NAVD88, **OR** For properties in a FEMA-designated **V** or **Coastal A** Zone, please provide the elevation of the lowest horizontal structural member (LHSM) referenced to NAVD88.

FFE ft
OR
LHSM elevation 24 **ft**

■ B. How long do you want your project to last? Identify the expected design life for the project (CRMC recommends a **minimum of 30 years**)

Design Life: 35 **yrs**

■ C. Add the number of years you identified in 1B to the current year. (For example, if you are completing this form in the year 2020, and you want your project to last 30 years, your design life year will be 2050.)

Design Life Year: 2056

■ D. **CHECK** beneath the sea level rise (SLR) projection that matches or comes closest to project design life year.

Year	2020	2030	2040	2050	2060	2070	2080	2090	2100
SLR	1.05	1.67	2.33	3.25	4.20	5.35	6.69	8.14	9.61
	◯	◯	◯	◯	◯	◯	◯	◯	◯

Source: Sea Level Rise (SLR) Projections (Feb. 2017). NOAA High Curve, 83% Confidence Interval. Newport, RI Tide Gauge. All values are expressed in feet relative to NAVD88. http://www.corpsclimate.us/ccaceslcurves.cfm

NOTE: The STORMTOOLS sea level rise scenarios depict how high the water will be above the average height of the daily high tide over the 19-year period between 1983 and 2001. There have been between 4 and 5 inches of sea level rise in Rhode Island since then. The higher modeled water level accounts for the uncertainties in ice sheet and ocean dynamics.

STEP 2. SITE ASSESSMENT

■ A. Open *RICRMC Coastal Hazard Mapping Tool*. Following the tutorial along the left side of the screen, enter the project site address and turn on the sea level layer closest to the number you circled in 1D.

■ B. **ENTER** the STORMTOOLS SLR map layer closest to the SLR value you checked in Step 1D above. If the value falls between the available STORMTOOLS SLR map layers, round up to the closest of these sea level rise (SLR) numbers: 1ft, 2ft, 3ft, 5ft, 7ft, 10ft, or 12ft

5 **ft**

■ C. Does the STORMTOOLS SLR map layer you circled above expose your project site to future tidal inundation? **CHECK YES or NO**

◯ **YES**
◯ **NO**

■ D. List any **roads or access routes** that are potentially inundated from SLR. To do this, ZOOM OUT from your project location, change BASEMAP on the viewer to "street view" – see Step 2A.

Camp Avenue, Circuit Drive

*****Please be advised that CRMC staff may also review the implications of sea level rise in combination with nuisance storm flooding and discuss these potential project concerns with the applicant. Nuisance flooding impacts may be viewed in STORMTOOLS here.***

STEP 3. STORMTOOLS DESIGN ELEVATION (SDE)

■ A. Based on the project location, CHECK the SDE Viewer for your site, and open the corresponding tab in Mapping Tool:

◯ **South Coast SDE Viewer: Napatree to Pt. Judith** ◯ **Narragansett Bay SDE Viewer: North and East of Pt. Judith**

■ B. Follow the tutorial included along the left panels of the viewer to enter the address of your project site. Select the tab across the top that corresponds to the sea level rise projection you identified in STEP 1

■ C. Click on the map at project site to identify **STORMTOOLS Design Elevation (SDE)** from the pop up box. **Enter the SDE value:** 21.3 **ft**

RI CRMC COASTAL HAZARD APPLICATION WORKSHEET

STEP 4. SHORELINE CHANGE

■ A. Using the *CRMC Shoreline Change maps*, indicate the transect number closest to your site, and erosion rate listed for that transect.

Transect Number: N/A

Erosion Rate: ______ **ft/year**

■ B. **CHECK** below the Projected Erosion Rate that corresponds to the design life you identified above.

Year	2050	2060	2070	2080	2090	2100
Projected Future Erosion Multiplier	1.34 ○	1.45 ◉	1.57 ○	1.70 ○	1.84 ○	2.00 ○

Source: Projected Shoreline Change Rate multipliers. (Oakley et al., 2016)

■ C. **COMPLETE EROSION SETBACK CALCULATION:**

Historic shoreline change rate, STEP 4A		Design Life, STEP 1C		Projected Future Erosion Multiplier, STEP 4B		Erosion Setback (ft) 4A x 1C x 4B
	X		X		=	

***NOTE:** Setbacks are required per the CRMC Red Book, Section 1.1.9. **A minimum setback of 50-feet is required**, but a greater setback may be necessary and/or desirable based on this analysis.*

STEP 5. CERI & OTHER SITE CONSIDERATIONS

■ A. If you live in a community where a Coastal Environmental Risk Index (CERI) has been completed (Barrington, Bristol, Charlestown, Narragansett, South Kingstown, Warren, Warwick, Westerly), CHECK the level of projected damage to your location, as indicated on the map that corresponds to the design life identified in STEP 1.

CERI Level: Moderate ○ High ○ Severe ○ Extreme ○ Inundated by 2100 ○ Not applicable ◉

■ B. Consider and discuss with your design consultant other forces or factors that might impact the development, such as coastal habitats, shoreline features, public access, wastewater, storm water, depth to water table/groundwater dynamics, saltwater intrusion, or other issues not listed above. In addition, pressure from rising sea levels will result in rising subsurface groundwater levels ultimately effecting wells and septic systems.

STEP 6. LARGE PROJECTS

This step is for Large Projects and Subdivisions only, six (6) or more units, as defined by the CRMC Red Book Section 1.1.6.I(1)(f). This step may be skipped for other projects.

■ A. Use the Sea Level Affecting Marshes Model (SLAMM) Maps to assess potential impacts to large projects and subdivisions from salt marsh migration resulting from projected sea level rise. CRMC SLAMM maps can be accessed here.
The CRMC recommends using the 5-foot SLR projection within SLAMM to assess future potential project impacts on migrating marshes. Does the SLAMM map that corresponds to the design life you identified in STEP 1 expose your project site to future salt marsh migration? **CHECK YES or NO**

○ **YES** ◉ **NO**

STEP 7: DESIGN EVALUATION

■ A. Using Chapter 7 of the RI Shoreline Change SAMP as a guide, investigate mitigation options for the exposure identified above and include that in the final application.

This fully completed Coastal Hazard Application Guidance worksheet must accompany the application. If you are a design or engineering professional, please print and sign here that you have discussed the findings of this worksheet with the Owner.

DESIGN/ENGINEER SIGNATURE: Renee L. Lodego **DATE:** 06/29/2021

OWNER'S SIGNATURE: Kenneth Bowes **DATE:** 06/28/2021

RI CRMC COASTAL HAZARD APPLICATION WORKSHEET

APPLICANT NAME: Revolution Wind, LLC

PROJECT SITE ADDRESS: 574 & 594 Camp Avenue, and 109 Circuit Drive, North Kingstown

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FFE ft
OR
LHSM elevation 24 ft

■ B. How long do you want your project to last? Identify the expected design life for the project (CRMC recommends a **minimum of 30 years**)

Design Life: 35 yrs

■ C. Add the number of years you identified in 1B to the current year. (For example, if you are completing this form in the year 2020, and you want your project to last 30 years, your design life year will be 2050.)

Design Life Year: 2056

■ D. **CHECK** beneath the sea level rise (SLR) projection that matches or comes closest to project design life year.

Year	2020	2030	2040	2050	2060	2070	2080	2090	2100
SLR	1.05	1.67	2.33	3.25	4.20	5.35	6.69	8.14	9.61
	○	○	○	○	○	○	○	○	○

Source: Sea Level Rise (SLR) Projections (Feb. 2017). NOAA High Curve, 83% Confidence Interval. Newport, RI Tide Gauge. All values are expressed in feet relative to NAVD88. http://www.corpsclimate.us/ccaceslcurves.cfm

NOTE: The STORMTOOLS sea level rise scenarios depict how high the water will be above the average height of the daily high tide over the 19-year period between 1983 and 2001. There have been between 4 and 5 inches of sea level rise in Rhode Island since then. The higher modeled water level accounts for the uncertainties in ice sheet and ocean dynamics.

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■ C. Does the STORMTOOLS SLR map layer you circled above expose your project site to future tidal inundation? **CHECK YES or NO** — ○ YES ○ NO

■ D. List any **roads or access routes** that are potentially inundated from SLR. To do this, ZOOM OUT from your project location, change BASEMAP on the viewer to "street view" – see Step 2A.

Camp Avenue, Circuit Drive

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■ C. Click on the map at project site to identify **STORMTOOLS Design Elevation (SDE)** from the pop up box. **Enter the SDE value:** 21.3 ft

STEP 4. SHORELINE CHANGE

■ A. Using the CRMC Shoreline Change maps, indicate the transect number closest to your site, and erosion rate listed for that transect.

Transect Number: 1685
Erosion Rate: 0.5 **ft/year**

■ B. **CHECK** below the Projected Erosion Rate that corresponds to the design life you identified above.

Year	2050	2060	2070	2080	2090	2100
Projected Future Erosion Multiplier	1.34 ○	1.45 ⦿	1.57 ○	1.70 ○	1.84 ○	2.00 ○

Source: Projected Shoreline Change Rate multipliers. (Oakley et al., 2016)

■ C. **COMPLETE EROSION SETBACK CALCULATION:**

Historic shoreline change rate, STEP 4A	Design Life, STEP 1C	Projected Future Erosion Multiplier, STEP 4B	Erosion Setback (ft) 4A x 1C x 4B
0.5	X 35	X 1.45	= 25.4

***NOTE:** Setbacks are required per the CRMC Red Book, Section 1.1.9. **A minimum setback of 50-feet is required**, but a greater setback may be necessary and/or desirable based on this analysis.*

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CERI Level: Moderate ○ High ○ Severe ○ Extreme ○ Inundated by 2100 ○ Not applicable ⦿

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■ A. Use the Sea Level Affecting Marshes Model (SLAMM) Maps to assess potential impacts to large projects and subdivisions from salt marsh migration resulting from projected sea level rise. CRMC SLAMM maps can be accessed here.

○ YES ⦿ NO

The CRMC recommends using the 5-foot SLR projection within SLAMM to assess future potential project impacts on migrating marshes. Does the SLAMM map that corresponds to the design life you identified in STEP 1 expose your project site to future salt marsh migration? **CHECK YES or NO**

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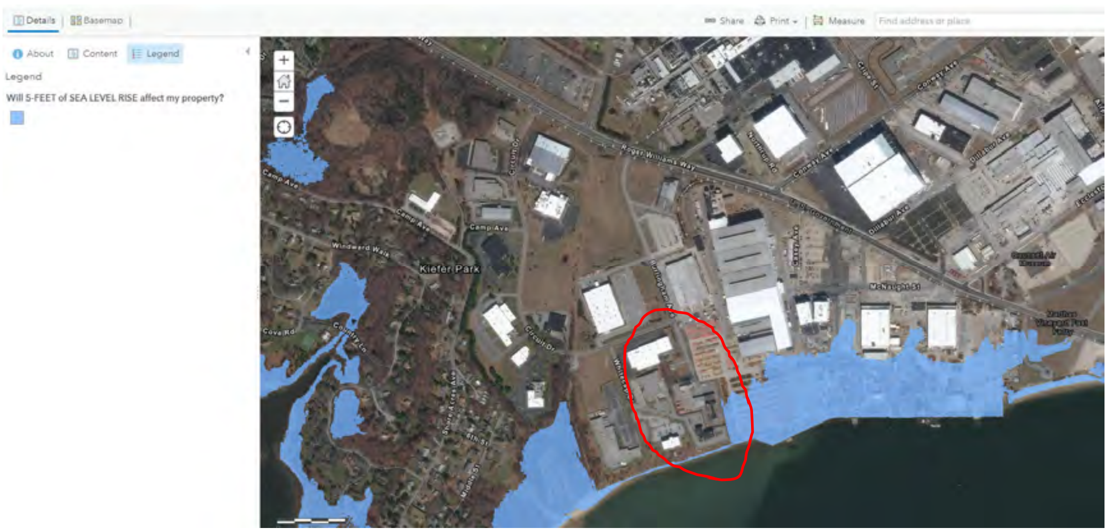
This fully completed Coastal Hazard Application Guidance worksheet must accompany the application. If you are a design or engineering professional, please print and sign here that you have discussed the findings of this worksheet with the Owner.

DESIGN/ENGINEER SIGNATURE: Renee L. Lodegen **DATE:** 06/29/2021

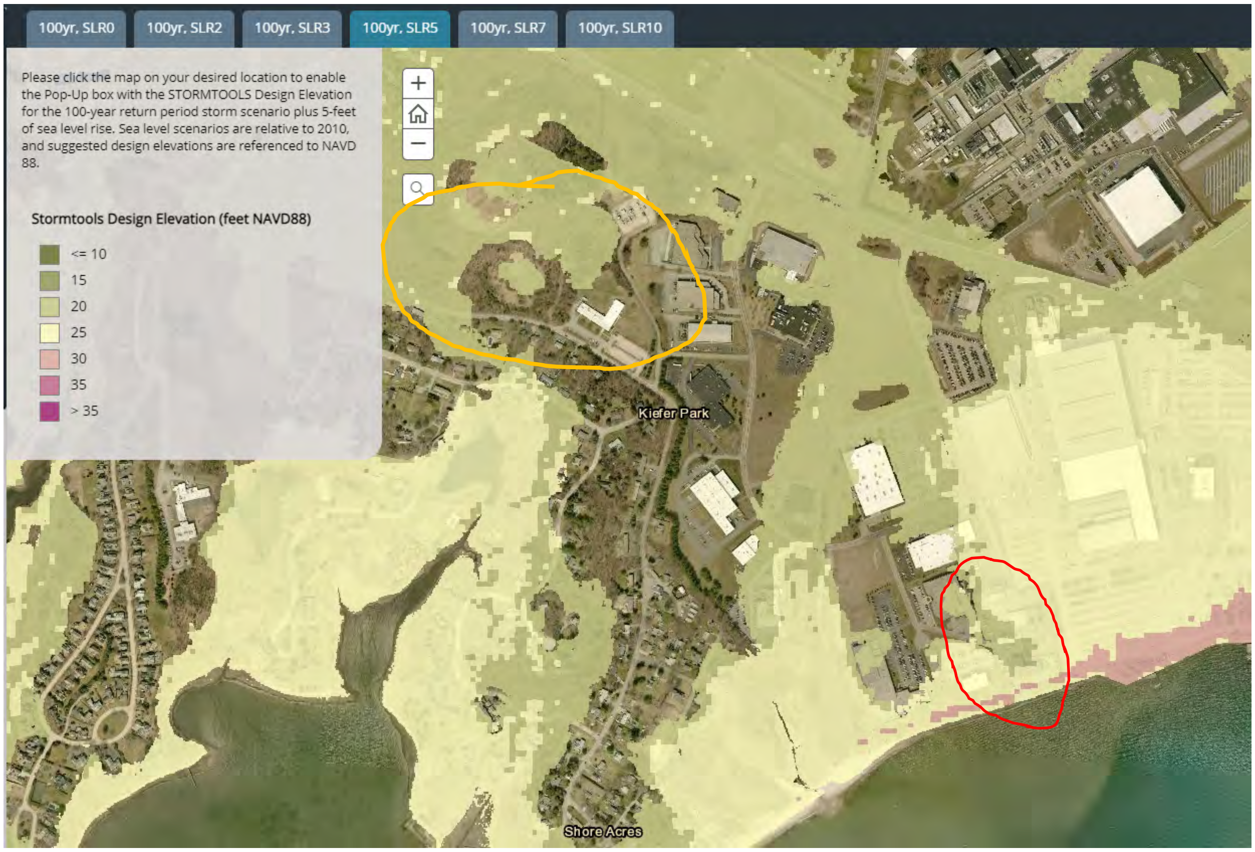
OWNER'S SIGNATURE: Kenneth Bowes **DATE:** 06/28/2021

CRMC Hazard Analysis Application Maps (For Reference)

5 Feet of SLR (2058)



100 year storm + 5 Feet of SLR (2058)



At the OnSS the Storm Design Elevation is 21.3 feet

At the TJB's the Storm Design Elevation is 22 feet

Appendix D: Preliminary Cable Burial Feasibility Assessment

CONFIDENTIAL: Contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552)

Appendix E: Onshore Substation Soil Erosion and Sediment Control Plan Report

Soil Erosion and Sediment Control Plan
For:

Revolution Wind Proposed Onshore Substation

Camp Avenue

North Kingstown, Rhode Island 02852

Assessor's Plat: 179, Lots: 001, 030

Owner:	Facility Owner: Revolution Wind, LLC 56 Exchange Terrace, Suite 300 Providence, RI 02930

Operator:

TO BE DETERMINED UPON CONTRACT AWARD

Estimated Project Dates:	Start Date: Fall 2022
	Completion Date: Fall 2023
SESC Plan Prepared By:	VHB Ashley Cunha, PE 1 Cedar Street Providence, RI 02903 401.272.8100 acunha@vhb.com
SESC Plan Preparation Date:	June 11, 2021
SESC Plan Revision Date:	

OPERATOR CERTIFICATION

Upon contract award, the OPERATOR must sign this certification statement before construction may begin.

I certify under penalty of law that this document and all attachments were prepared under the direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that it is the responsibility of the owner/operator to implement and amend the Soil Erosion and Sediment Control Plan as appropriate in accordance with the requirements of the RIPDES Construction General Permit.

____

Operator Signature: Date

Contractor Representative: Name

Contractor Title: Title

Contractor Company Name: Company Name (if applicable)

Address: Mailing Address

Phone Number: Phone Number

Email Address: Email

TABLE OF CONTENTS

INTRODUCTION

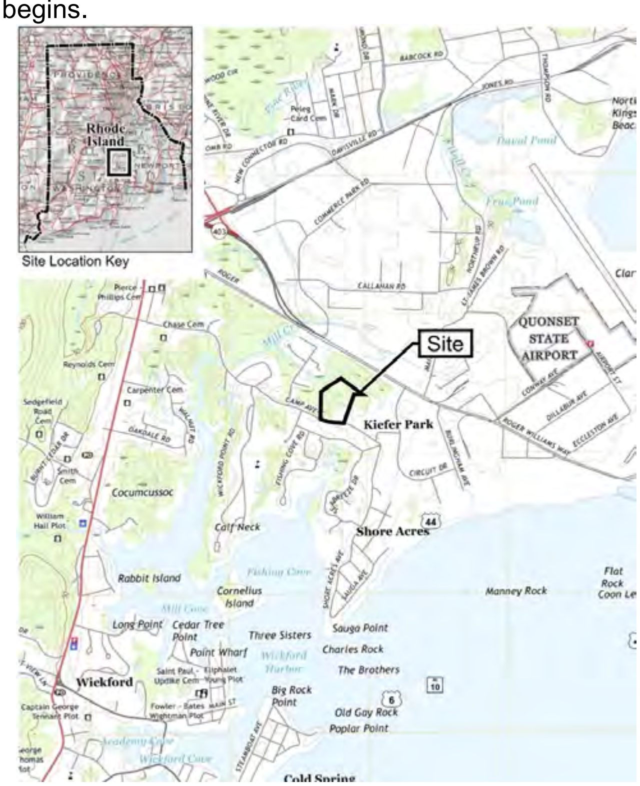
The purpose of erosion, runoff, and sedimentation control measures is to prevent pollutants from leaving the construction site and entering waterways or environmentally sensitive areas during and after construction. This SESC Plan has been prepared prior to the initiation of construction activities to address anticipated worksite conditions. The control measures depicted on the site plan and described in this narrative should be considered the minimum measures required to control erosion, sedimentation, and stormwater runoff at the site. Since construction is a dynamic process with changing site conditions, it is the operator's responsibility to manage the site during each construction phase so as to prevent pollutants from leaving the site. This may require the operator to revise and amend the SESC Plan during construction to address varying site and/or weather conditions, such as by adding or realigning erosion or sediment controls to ensure the SESC Plan remains compliant with the RIPDES Construction General Permit. Records of these changes must be added to the amendment log attached to the SESC Plan, and to the site plans as "red-lined" drawings. Please Note: **Even if practices are correctly installed on a site according to the approved plan, the site is only in compliance when erosion, runoff, and sedimentation are effectively controlled throughout the entire site.**

It is the responsibility of the site owner and the site operator to maintain the SESC Plan at the site, including all attachments, amendments and inspection records, and to make all records available for inspection by RIDEM during and after construction. (RIPDES CGP - Part III.G)

The site owner, the site operator, and the designated site inspector are required to review the SESC Plan and sign the Party Certification pages (Section 8). The primary contractor (if different) and all subcontractors (if applicable) involved in earthwork or exterior construction activities are also required to review the SESC Plan and sign the certification pages before construction begins.

Any questions regarding the SESC Plan, control measures, inspection requirements, or any other facet of this document may be addressed to the RIDEM Office of Water Resources, at 401-222-4700 or via email: water@dem.ri.gov.

SOIL EROSION AND SEDIMENT CONTROL PLAN GUIDENCE



SECTION 1: SITE DESCRIPTION

1.1 Project/Site Information

Project/Site Name:

- Revolution Wind Proposed Onshore Substation
- The project proposes to construct an electric substation with associated access drives, stormwater treatment areas, floodplain compensation area, and wetland mitigation areas.

Project Street/Location:

- Camp Avenue, North Kingstown, Rhode Island

The following are estimates of the construction site area:

- Total Project Area 15.7 acres
- Total Project Area to be Disturbed 7.0 acres

☐ Yes ☒ No The Limits of Disturbance have been marked in the field

1.2 Receiving Waters

RIPDES CGP - Parts IV.A.7 & IV.A.8

List/description of receiving waters that may be impacted during construction:

- Mill Creek and Tributaries from headwaters to Camp Avenue culvert

Are any of the receiving waters in the vicinity of the proposed construction project listed as being impaired or subject to a TMDL?

☐ Yes ☒ No

If yes, List/provide description of 303(d)/TMDL waters and applicable TMDL requirements that must be addressed during construction:

- N/A

1.3 Natural Heritage Area Information

RIPDES CGP - Part III.H

Are there any Natural Heritage Areas being disturbed by the construction activity or will discharges be directed to the Natural Heritage Area as a result of the construction activity?

☐ Yes ☒ No

If yes, describe or refer to documentation which determines the likelihood of an impact on this area and the steps that will be taken to address any impacts.

- The site does not lie within a mapped Natural Heritage and Endangered Species area but there were clusters of sickle-leaved golden aster that were observed and reported by VHB. This area is not being disturbed.
- The Northern Long Eared Bat (NLEB) is present in all of Rhode Island, to be safe tree removal should be avoided between June 1 – July 31st if this cannot be done then acoustic surveys to determine probably absence/presence of NLEB are recommended. Many existing trees are to be preserved in accordance with the plan

1.4 Historic Preservation/Cultural Resources

Are there any historic properties, historic cemeteries or cultural resources on or near the construction site?

☐ Yes ☒ No

Describe how this determination was made and summarize state or tribal review comments:

- Based on a desktop review of the Rhode Island Environmental Resource Map, the National Register, and the North Kingstown Historic District

1.5 Site Features and Constraints

List All Site Constraints and Sensitive Areas that require avoidance and protection through the implementation of control measures:

- See SESC-2 Site Plan for locations of:
  - State-regulated Wetlands
  - Forested areas to be protected
  - Stormwater management areas

SECTION 2: EROSION, RUNOFF, AND SEDIMENT CONTROL

RIPDES Construction General Permit – Part III.J.1 – Erosion, Runoff, and Sediment Controls

2.1 Avoid and Protect Sensitive Areas and Natural Features

Areas of existing and remaining vegetation and areas that are to be protected as identified in the Section 1.6 of the SESC Plan must be clearly identified on the SESC Site Plans for each Phase of Construction. Prior to any land disturbance activities commencing on the site, the Contractor shall physically mark limits of disturbance (LOD) on the site and any areas to be protected within the site, so that workers can clearly identify the areas to be protected.

Feature Requiring Protection	Construction Phase #	Method of Protection	Sheet #
Infiltration Basin 1	1	Silt Sock	SESC-2
Stone Diaphragm 1	1	Silt Sock	SESC-2
Stone Diaphragm 2	1	Silt Sock	SESC-2
15% Slopes	1	Silt Sock	SESC-2

2.2 Minimize Area of Disturbance

Will >5 acres be disturbed in order to complete this project?

☒ Yes ☐ No

Will <5 acres be disturbed or will disturbance activities be completed within a six (6) month window?

☒ Yes ☐ No

Provide discussion regarding the need to phase or not to phase construction activity in this instance.

Based on the answers to the above questions will phasing be required for this project?

☐ Yes ☒ No

The following are estimates of each phase of the construction project:

Phase No. or Identifier	1
Total Area of Phase	7.1 acres
Area to be Disturbed	7.1 acres

Description of Construction Sequencing for Phase 1

Proper sequencing of construction activities is essential to maximize the effectiveness of erosion, runoff, and sediment control measures. Construction sequencing of construction activities for each phase must address the following elements:

1. *Installation of control measures identifying limits of disturbance and areas internal to the site that require protection before start of land disturbance.*
2. *Installation of all erosion, runoff, and sediment controls and temporary pollution prevention measures that are required to be in place and functional before any earthwork begins. This shall be done in accordance with the RI SESC Handbook and/or the RI Department of Transportation Standard Specifications for Road and Bridge Construction (as amended). Upon acceptable completion of site preparation and installation of erosion, runoff, and sediment controls and temporary pollution prevention measures, site construction activities may commence.*
3. *The phasing plan shall address the use of phasing to manage and limit increases in runoff rates and volumes during construction. Designated phases and timing of construction should also address the impacts to important or sensitive habitats.*
4. *Upon commencement of site construction activities, the operator shall initiate appropriate stabilization practices on all disturbed areas as soon as possible, but not more than fourteen (14) days after the construction activity in that area has temporarily or permanently ceased. Such temporary or permanent soil stabilization measures must be installed prior to initiating land disturbance in subsequent phases.*
5. *Routine inspection and maintenance and/or modification of erosion, runoff, and sediment controls and temporary pollution prevention measures while earthwork is ongoing is required.*
6. *Final site stabilization of any disturbed areas after earthwork has been completed and removal of temporary erosion, runoff, and sediment controls and temporary pollution prevention measures.*
7. *Activation of post-construction stormwater treatment conveyances and practices.*

2.3 Minimize the Disturbance of Steep Slopes

Are steep slopes (>15%) present within the proposed project area?

☒ Yes ☐ No

See Plan SESC-2 for locations of steep slopes. Siltsock erosion control barrier will be installed and maintained at these locations.

2.4 Preserve Topsoil

Site owners and operators must preserve existing topsoil on the construction site to the maximum extent feasible and as necessary to support healthy vegetation, promote soil stabilization, and increase stormwater infiltration rates in the post-construction phase of the project.

Will existing topsoil be preserved at the site?

☒ Yes ☐ No

- See Plan SESC-2 for location of proposed landscaped areas that can reuse existing top soil.
- Topsoil may be scraped from the site and stockpiled after vegetation has been cleared and erosion controls have been installed.

Soil compaction must be minimized by maintaining limits of disturbance throughout construction. In instances where site soils are compacted the site owner and operator must restore infiltration capacity of the compacted soils by tilling or scarifying compacted soils and amending soils as necessary to ensure a minimum depth of topsoil is available in these areas. In areas where infiltrating stormwater treatment practices are located compacted soils must be amended such that they will comply the design infiltration rates.

See SESC-1 and SESC 2

2.5 Stabilize Soils

Upon completion and acceptance of site preparation and initial installation of erosion, runoff, and sediment controls and temporary pollution prevention measures, the operator shall initiate appropriate temporary or permanent stabilization practices during all phases of construction on all disturbed areas as soon as possible, but not more than fourteen (14) days after the construction activity in that area has temporarily or permanently ceased.

Any disturbed areas that will not have active construction activity occurring within 14 days must be stabilized using the control measures depicted in the SESC Site Plans, in accordance with the *RI SESC Handbook*, and per manufacturer product specifications.

Only areas that can be reasonably expected to have active construction work being performed within 14 days of disturbance will be cleared/grubbed at any one time. It is NOT acceptable to clear and grub the entire construction site if portions will not be active within the 14-day time frame. Proper phasing of clearing and grubbing activities shall include temporary stabilization techniques for areas cleared and grubbed that will not be active within the 14-day time frame.

All disturbed soils exposed prior to October 15 of any calendar year shall be seeded by that date if vegetative measures are the intended soil stabilization method. Any such areas that do not have adequate vegetative stabilization, as determined by the site operator or designated inspector, by November 15, must be stabilized through the use of non-vegetative erosion control measures. If work continues within any of these areas during the period from October 15 through April 15, care must be taken to ensure that only the area required for that day’s work is exposed, and all erodible soil must be restabilized within 5 working days. In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed (i.e. construction of a motocross track).

Temporary Vegetative Control Measures

- Temporary erosion control seed for quick growing grasses such as wheat, rye or oats shall be planted when exposed areas are not active for 14 days. All permanent grass areas planted with temporary erosion control seed shall be over seeded with permanent seed mix. Apply seed mixture at a rate of 100 pounds per acre.

Seed	**% Weight**	**% Germination Minimum**
Winter Rye	80 Minimum	85
Red Fescue (Creeping)	4 Minimum	80
Perennial Rye Grass	3 Minimum	90
Red Clover	3 Minimum	90
Other Crop Grass	0.5 Maximum	
Noxious Weed Seed	0.5 Maximum	
Inert Matter	1.0 Maximum	

Temporary Non-Vegetative Control Measures

- See SESC plans for locations of compost filter socks, sediment traps, and temporary construction exits.

2.6 Protect Storm Drain Outlets

Temporary or permanent outlet protection must be used to prevent scour and erosion at discharge points through the protection of the soil surface, reduction in discharge velocities, and through the promotion of infiltration. Outlets often have high velocity, high volume flows, and require strong materials that will withstand the forces of stormwater. Storm drain outlet control measures also offer a last line of protection against sediment entering environmentally sensitive areas.

All stormwater outlets that may discharge sediment-laden stormwater flow from the construction site must be protected using the control practices depicted on the approved plan set and in accordance with the *RI SESC Handbook*.

Will temporary or permanent point source discharges be generated at the site as the result of construction of sediment traps or basins, diversions, and conveyance channels?

☐ Yes ☒ No

2.7 Establish Temporary Controls for the Protection of Post-Construction Stormwater Treatment Practices

Temporary measures shall be installed to protect permanent or long-term stormwater control and treatment measures as they are installed and throughout the construction phase of the project so that they will function properly when they are brought online.

Will long-term stormwater treatment practices be installed at the site?

☒ Yes ☐ No

See SESC-2 for locations of proposed Infiltration Basins and stone diaphragms. The native soils present were evaluated as generally suitable for infiltration. This means that these areas will require special protection during construction.

2.8 Divert or Manage Run-on from Up-gradient Areas

Is stormwater from off-site areas anticipated to flow onto the project area or onto areas where soils will be disturbed?

☒ Yes ☐ No

There will be perimeter silt sock installed, see SESC-2.

Pre-Construction and Construction sub-watershed maps are included for each phase in this SESC Plan submittal.

Structural control measures will be used to limit stormwater flow from coming onto the project area, and to divert and slow on-site stormwater flow that is expected to impact exposed soils for the purpose of minimizing erosion, runoff, and the discharge of pollutants from the site.

Control measures shall be installed as depicted on the approved plan set and in accordance with the *RI SESC Handbook* or the *RI Department of Transportation Standard Specifications for Road and Bridge Construction*. **Run-on and Run-off Management**				
Construction Phase #	On-site or Off-site Run-on?	Control measure	Identified on Sheet #	Detail(s) is/are on Sheet #
1	On-site	Silt Sock	SESC-1	1 of 2

2.9 Retain Sediment Onsite through Structural and Non-Structural Practices

SEDIMENT BARRIERS must be installed along the perimeter areas of the site that will receive stormwater from disturbed areas. This also may include the use of sediment barriers along the contour of disturbed slopes to maintain sheet flow and minimize rill and gully erosion during construction. Installation and maintenance of sediment barriers must be completed in accordance with the maintenance requirements specified by the product manufacturer or the *RI SESC Handbook*.

Will sediment barriers be utilized at the toe of slopes and other downgradient areas subject to stormwater impacts and erosion during construction?

☒ Yes ☐ No

- Sediment barriers such as compost sediment tubes will be utilized at the down gradient limits of work with potential impacts to on-site and off-site surface waters and wetlands resource areas as shown on SESC-2

Will sediment barriers be utilized along the contour of slopes to maintain sheet flow and minimize rill and gully erosion during construction?

☐ Yes ☒ No

Sediment barriers will not be used along the contour of slopes on site because the slope lengths above the barriers are within the limits that can be protected by a single barrier as described in Section Six of the Rhode Island Soil Erosion and Sediment Control Handbook.

INLET PROTECTION will be utilized to prevent soil and debris from entering storm drain inlets. These measures are usually temporary and are implemented before a site is disturbed. ALL stormwater inlets &/or catch basins that are operational during construction and have the potential to receive sediment-laden stormwater flow from the construction site must be protected using control measures outlined in the *RI SESC Handbook*.

For more information on inlet protection refer to the *RI SESC Handbook*, Inlet Protection control measure.

Maintenance

The operator must clean, or remove and replace the inlet protection measures as sediment accumulates, the filter becomes clogged, and/or as performance is compromised. Accumulated sediment adjacent to the inlet protection measures should be removed by the end of the same work day in which it is found or by the end of the following work day if removal by the same work day is not feasible.

Do inlets exist adjacent to or within the project area that require temporary protection?

☐ Yes ☒ No

Neither existing nor proposed site runoff is directed to inlet structures.

CONSTRUCTION ENTRANCES will be used in conjunction with the stabilization of construction roads to reduce the amount of sediment tracking off the project. This project has avoided placing construction entrances on poorly drained soils where possible. Where poorly drained soils could not be eliminated, the detail includes subsurface drainage.

Any construction site access point must employ the control measures on the approved SESC site plans and in accordance with the *RI SESC Handbook*. Construction entrances shall be used in conjunction with the stabilization of construction roads to reduce the amount of mud picked up by construction vehicles. All construction access roads shall be constructed prior to any roadway accepting construction traffic.

The site owner and operator must:

1. Restrict vehicle use to properly designated exit points.

2. Use properly designed and constructed construction entrances at all points that exit onto paved roads so that sediment removal occurs prior to vehicle exit.

3. When and where necessary, use additional controls to remove sediment from vehicle tires prior to exit (i.e. wheel washing racks, rumble strips, and rattle plates).

4. Where sediment has been tracked out from the construction site onto the surface of off-site streets, other paved areas, and sidewalks, the deposited sediment must be removed by the end of the same work day in which the track out occurs. Track-out must be removed by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal.

Will construction entrances be utilized at the proposed construction site?

☒ Yes ☐ No

CONSTRUCTION ENTRANCE			
Construction Phase #	Soil Type at the Entrance	Entrance is located on Sheet #	Detail is on Sheet #
1	Merrimack-Urban Land Complex (MU)	SESC-2	SESC-1

Refer to Plan SESC-2 for construction exit locations, details, and maintenance requirements.

STOCKPILE CONTAINMENT will be used onsite to minimize or eliminate the discharge of soil, topsoil, base material or rubble, from entering drainage systems or surface waters. All stockpiles must be located within the limit of disturbance, protected from run-on with the use of temporary sediment barriers and provided with cover or stabilization to avoid contact with precipitation and wind where and when practical.

Stock pile management consists of procedures and practices designed to minimize or eliminate the discharge of stockpiled material (soil, topsoil, base material, rubble) from entering drainage systems or surface waters.

For any stockpiles or land clearing debris composed, in whole or in part, of sediment or soil, you must comply with the following requirements:

1. Locate piles within the designated limits of disturbance.

2. Protect from contact with stormwater (including run-on) using a temporary perimeter sediment barrier.

3. Where practicable, provide cover or appropriate temporary vegetative or structural stabilization to avoid direct contact with precipitation or to minimize sediment discharge.

4. NEVER hose down or sweep soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or surface water.

5. To the maximum extent practicable, contain and securely protect from wind.

STOCKPILE CONTAINMENT				
Construction Phase #	Run-on measures necessary? (yes/no)	Stabilization or Cover Type	Stockpile Containment Measure	Sheet #
All	No	Plastic	Sediment Barrier	Contractor to show locations of stockpile areas to SESC-2

CONSTRUCTED SEDIMENT STRUCTURES

TEMPORARY SEDIMENT TRAPS will be utilized onsite. Design and sizing calculations in accordance with the *RI SESC Handbook*, Section Six are found in Appendix H of this SESC Plan. A summary of the calculations are provided below:

Are temporary sediment traps required at the site?

☒ Yes ☐ No

SEDIMENT TRAPS				
Construction Phase #	Exposed Area (acres)	Trap #	Sheet #	Detail found on Sheet#
1	1.03	TST-1	SESC-2	SESC-1
1	1.30	TST-2	SESC-2	SESC-1
1	1.98	TST-3	SESC-2	SESC-1

Trap #	Wet Storage Volume (cu.ft)	Dry Storage Volume (cu.ft.)	Cleanout Depth (ft)	Provide Reference to Location of Supporting Design and Sizing Calculations
TST-1	1913	2004	1.5	ATTACHMENT H
TST-2	3188	3164	1.5	ATTACHMENT H
TST-3	3825	3704	1.5	ATTACHMENT H

All traps will be functional and installed prior to disturbance in the contributing drainage area. Access for sediment removal is provided on the plans with cleanout depth requirements. The removed sediment will be utilized onsite or disposed of properly off-site.

See Attachment H for Temporary Sediment Trap Calculations

TEMPORARY SEDIMENT BASIN(S) will be utilized onsite. Every effort must be made to prevent erosion and control it near the source.

Are temporary sediment basins required at the site?

☐ Yes ☒ No

There will be no disturbed areas greater than 5 acres and/or disturbed areas greater than one acre but exposed for longer than six months.

2.10 Properly Design Constructed Stormwater Conveyance Channels

Are temporary stormwater conveyance practices required in order to properly manage runoff within the proposed construction project?

☐ Yes ☒ No

The conveyance will be maintained as depicted on SESC Site Plans and in accordance with the *RI SESC Handbook* and if applicable.

Existing and proposed grades allow runoff to sheet flow. There is no need for temporary stormwater conveyance unless otherwise determined by the contractor and site engineer.

2.11 Erosion, Runoff, and Sediment Control Measure List

It is expected that this table and corresponding Inspection Reports will be amended as needed throughout the construction project as control measures are added or modified.

Phase No. #		
Location/Station	**Control Measure Description/Reference**	**Maintenance Requirement**
Downgradient at Site Perimeter – Compost Sediment Tubes	Compost Sediment Tube. Section Six, Sediment Control Measures, Straw Wattles, Compost Tubes and Fiber Rolls - *RI SESC Handbook*.	Inspection should be made after each storm event or 1/week and repair or replacement should be made promptly as needed. Cleanout of accumulated sediment behind the wattle if sediment accumulates to at least ½ the distance between the top of wattle and ground surface.
Construction Entrance	Stone Stabilized Pad. Section Six: Sediment Control Measures – Construction Entrances –*RI SESC Handbook*.	The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto pave surfaces. Provide periodic top dressing with additional stone or additional length as conditions demand. Roads adjacent to entrance shall be clean at the end of each day. If maintenance alone is not enough to prevent excessive track out, increase length of entrance, modify construction access road surface, or install washrack or mudrack.
Project Site Interior – Compost Sediment Tubes around sand filters, Infiltration Basins, Sediment Forebays, QPAs	Compost Sediment Tube. Section Six, Sediment Control Measures, Straw Wattles, Compost Tubes and Fiber Rolls - *RI SESC Handbook*.	Inspection should be made after each storm event or 1/week and repair or replacement should be made promptly as needed. Cleanout of accumulated sediment behind the wattle if sediment accumulates to at least ½ the distance between the top of wattle and ground surface.

Catch Basin Locations	Inlet Protection. Section Six, Inlet Protection - *RI SESC Handbook*.	Inspect and maintain inlet protection devices are every rain event and/or weekly as required. Dispose of sediment properly. Remove all inlet protection devices within 30 days of permanent site stabilization.

SECTION 3: CONSTRUCTION ACTIVITY POLLUTION PREVENTION

The purpose of construction activity pollution prevention is to prevent day to day construction activities from causing pollution.

This section describes the key pollution prevention measures that must be implemented to avoid and reduce the discharge of pollutants in stormwater. Example control measures include the proper management of waste, material handling and storage, and equipment/vehicle fueling/washing/maintenance operations.

Where applicable, include *RI SESC Handbook* or the *RI Department of Transportation Standard Specifications for Road and Bridge Construction* (as amended) specifications.

3.1 Existing Data of Known Discharges from Site

Are there known discharges from the project area?

☐ Yes ☒ No

Describe how this determination was made:

- Survey/field reconnaissance

3.2 Prohibited Discharges

The following discharges are prohibited at the construction site:

- Contaminated groundwater, unless specifically authorized by the DEM. These types of discharges may only be authorized under a separate DEM RIPDES permit.
- Wastewater from washout of concrete, unless the discharge is contained and managed by appropriate control measures.
- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials.
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance. Proper storage and spill prevention practices must be utilized at all construction sites.
- Soaps or solvents used in vehicle and equipment washing.
- Toxic or hazardous substances from a spill or other release.

All types of waste generated at the site shall be disposed of in a manner consistent with State Law and/or regulations.

Will any of the above listed prohibited discharges be generated at the site?

☒ Yes ☐ No

Waste water from concrete washout and paint will be contained and properly store. Spill prevention practices will be implemented onsite.

3.3 Proper Waste Disposal

Building materials and other construction site wastes must be properly managed and disposed of in a manner consistent with State Law and/or regulations.

- A waste collection area shall be designated on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a waterbody or storm drain.
- All waste containers shall be covered to avoid contact with wind and precipitation.
- Waste collection shall be scheduled frequently enough to prevent containers from overfilling.
- All construction site wastes shall be collected, removed, and disposed of in accordance with applicable regulatory requirements and only at authorized disposal sites.
- Equipment and containers shall be checked for leaks, corrosion, support or foundation failure, or other signs of deterioration. Those that are found to be defective shall be immediately repaired or replaced.

Is waste disposal a significant element of the proposed project?

☒ Yes ☐ No

- Building materials and other construction site wastes must be properly managed and disposed of to prevent the discharge of solid materials from wind and precipitation. All types of waste generated at the site shall be disposed of in a manner consistent with State Law and/or regulations. IV.E.2.c.ii
- A waste collection area shall be designated on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a waterbody or storm drain.
- All waste containers shall be covered to avoid contact with wind and precipitation.
- Waste collection shall be scheduled frequently enough to prevent containers from overfilling.
- All construction site wastes shall be collected, removed, and disposed of in accordance with applicable regulatory requirements and only at authorized disposal sites.
- Equipment and containers shall be checked for leaks, corrosion, support or foundation failure, or other signs of deterioration. Those that are found to be defective shall be immediately repaired or replaced.
- All materials stored on-site shall be stored neatly in their original containers in accordance with manufacturers' specifications and identified by the manufacturer's label. These materials shall be stored at a single on-site location, and in a locked structure accessible only to the contractor.
- Whenever possible, all substances shall be used in entirety before properly disposing of the container.
- The contractor shall inspect the site daily to ensure proper use and disposal of materials.
- For hazardous materials, any product shall be used or disposed in accordance with the manufacturer or local and state recommended methods and procedures.

- All on-site construction vehicles shall be routinely inspected for oil and fuel leaks, and provided regular preventive maintenance. Any discharged petroleum products shall be cleaned up immediately. No petroleum products shall be discharged to any storm drains.
- Any asphalt substances shall be applied according to the manufacturer's directions.
- Unless specifically identified for installation by the accompanying plan set, no concrete, asphalt, paints, detergents, or other materials shall be discharged on-site. Concrete trucks shall not discharge surplus concrete or drum wash water to the ground surface.
- All hazardous wastes placed on-site shall have a secondary containment such as drum overpacks or impermeable dikes with a volume capacity at least 10 percent greater than the hazardous material volume. All hazardous materials shall be locked in a covered storage area accessible only to designated properly trained staff. Any hazardous waste spills shall be cleaned up immediately, and if the spill amount is equal to or exceeds the EPA Reportable Quantity (RQ) for that substance in accordance with 40 CFR Parts 1010, 117, or 302, the contractor shall immediately contact the National Response Center at 1-800-424-8802. The contractor will also be responsible for submitting in writing a description of the release to the EPA Regional Office and Rhode Island Department of Environmental Management providing the date and circumstances of the release and the steps to be taken to prevent another release. The manufacturer's directions for cleaning up spills shall be clearly posted at a designated on-site location, and construction personnel shall be made aware of the procedures and location of cleanup supplies. Personnel shall wear appropriate protective gear and have proper training to prevent injury from contact with any hazardous substances.
- Any fertilizers applied to the site shall be applied sparingly and in a uniform manner as recommended by the manufacturer.

3.4 Spill Prevention and Control

All chemicals and/or hazardous waste material must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. All areas where potential spills can occur and their accompanying drainage points must be described. The owner and operator must establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. The operator must establish and make highly visible location(s) for the storage of spill prevention and control equipment and provide training for personnel responsible for spill prevention and control on the construction site.

Are spill prevention and control measures required for this particular project?

☒ Yes ☐ No

- The need for a field spill plan shall be evaluated specific to the project for regulatory requirements under SPCC regulations or local ordinances. A field spill plan would include information on fuels and oils being used, approximate amounts in each container or type of equipment, location, fueling location, secondary containment, response and notification procedures, including contact phone numbers, etc. All personnel shall be briefed on spill prevention and response prior to the commencement of construction. The state-specific EG-501 and EG-502 shall be followed in the event of a spill.
- Typical construction activities do not require the use or storage of large quantities of oil or hazardous materials (i.e., greater than 55 gallons). However, oil and/or hazardous materials (OHM) may be required in limited quantities to support construction or vehicle operations. Best practices shall be followed in the use and storage of OHM which include but are not limited to: storage and refueling greater than 100 feet from resource areas; maintenance of spill response equipment at work locations sufficient to handle incidental releases from operating equipment; general training for on-site personnel for spill clean-up response for

incidental releases of OHM; and contracting with an on-call spill response contractor that is capable of managing incidental and significant releases of OHM . Storage of OHM shall be done in accordance with any applicable regulatory requirements.

- All spills of OHM shall be immediately stopped and contained, if it is safe to do so. For releases of oils or hazardous materials owned by a contractor, the contractor is responsible to make all required notifications to regulatory agencies and to ensure that the release is properly responded to. The contractor is also responsible for hiring contractors for the cleanup of these releases and properly disposal of any related waste off-site at an appropriate facility. All releases of OHM to the environment in Rhode Island are considered "Reportable".

3.5 Control of Allowable Non-Stormwater Discharges

Are there allowable non-Stormwater discharges present on or near the project area?

☐ Yes ☒ No

Allowable non-storm water discharges, which are described in the General Permit, that may reasonably be expected to be present and to be mixed with storm water discharges include water for control dust, discharge of clean groundwater from excavations after treatment, and firefighting activities.
Contractor to provide additional discharges and control measures

Are there any known or proposed contaminated discharges, including anticipated contaminated dewatering operations, planned on or near the project area?

☐ Yes ☒ No

3.6 Control Dewatering Practices

Site owners and operators are prohibited from discharging groundwater or accumulated stormwater that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation, unless such waters are first effectively managed by appropriate control measures.

Examples of appropriate control measures include, but are not limited to, temporary sediment basins or sediment traps, sediment socks, dewatering tanks and bags, or filtration systems (e.g. bag or sand filters) that are designed to remove sediment. Uncontaminated, non-turbid dewatering water can be discharged without being routed to a control.

At a minimum the following discharge requirements must be met for dewatering activities:

1. Do not discharge visible floating solids or foam.
2. To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. In no case will surface waters be considered part of the treatment area.
3. At all points where dewatering water is discharged, utilize velocity dissipation devices.
4. With filter backwash water, either haul it away for disposal or return it to the beginning of the treatment process.
5. Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.

6. Dewatering practices must involve the implementation of appropriate control measures as applicable (i.e. containment areas for dewatering earth materials, portable sediment tanks and bags, pumping settling basins, and pump intake protection.)

Is it at all likely that the site operator will need to implement construction dewatering in order to complete the proposed project?

☒ Yes ☐ No

Work within groundwater may require dewatering during the yard installation, utility pipe and utility structure installation. Dewatering basins will be used and can be seen on SESC-1

3.7 Establish Proper Building Material Staging Areas

All construction materials that have the potential to contaminate stormwater must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. Designated areas shall be approved by the site owner/engineer. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in the discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

- You can expect to see building materials and utility infrastructure to be staged on the site. The contractor shall manage these activities and revise SESC 1 accordingly.

3.8 Minimize Dust

Dust control procedures and practices shall be used to suppress dust on a construction site during the construction process, as applicable. Precipitation, temperature, humidity, wind velocity and direction will determine amount and frequency of applications. However, the best method of controlling dust is to prevent dust production. This can best be accomplished by limiting the amount of bare soil exposed at one time. Dust Control measures outlined in the *RI SESC Handbook* shall be followed. Other dust control methods include watering, chemical application, surface roughening, wind barriers, walls, and covers.

- Fugitive dust will be controlled by applying water using a water truck with a rear sprayer or other similar device in a manner which does not result in the creation of runoff.

3.9 Designate Washout Areas

At no time shall any material (concrete, paint, chemicals) be washed into storm drains, open ditches, streets, streams, wetlands, or any environmentally sensitive area. The site operator must ensure that construction waste is properly disposed of, to avoid exposure to precipitation, at the end of each working day.

Will washout areas be required for the proposed project?

☒ Yes ☐ No

Concrete wash outs shall be used for management of concrete waste. Concrete and concrete washout water shall not be deposited or discharged directly on the ground, or in catch basins or other drainage structures. Concrete washouts shall be located in areas as depicted on the SESC Site Plans. Following the completion of concrete pouring operations, the wash outs shall be disposed of off-site with other construction debris.

3.10 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices

Vehicle fueling shall not take place within regulated wetlands or buffer zone areas, or within 50-feet of the storm drain system. Designated areas shall be depicted on the SESC Site Plans, or shall be approved by the site owner.

Vehicle maintenance and washing shall occur off-site, or in designated areas depicted on the SESC Site Plans or approved of by the site owner. Maintenance or washing areas shall not be within regulated wetlands or buffer zone areas, or within 50-feet of the storm drain system. Maintenance areas shall be clearly designated, and barriers shall be used around the perimeter of the maintenance area to prevent stormwater contamination.

Construction vehicles shall be inspected frequently for leaks. Repairs shall take place immediately. Disposal of all used oil, antifreeze, solvents and other automotive-related chemicals shall be according to applicable regulations; at no time shall any material be washed down the storm drain or in to any environmentally sensitive area.

- When refueling vehicles, Company personnel or contractors at field locations shall bring vehicles or equipment (except for fixed equipment such as drill rigs) to an access area outside of environmentally sensitive areas (such as waterways, wetlands, buffer zones or drinking water sources), or as specified in permit conditions. A paved area such as a parking lot or roadway is preferred, to minimize the possibility of spill or release to the environment. The driver shall take all usual and reasonable environmental and safety precautions during refueling, such as connecting a safety grounding strap between the fuel tank and vehicle or equipment being refueled. The driver shall frequently check for fuel spills, drips, or seeps during the refueling operation. Small equipment such as pumps and generators shall be placed in small swimming pools or on absorbent blankets/pads, to contain any accidental fuel spills. Small swimming pools with absorbent blankets/pads, and/or other secondary containment, shall be used for refueling of fixed equipment in wetlands and should be maintained to prevent accumulation of precipitation.
- Routine vehicle maintenance shall not be conducted on project sites.
- When other vehicle or equipment maintenance operations (such as emergency repairs) occur, company personnel or contractors at field locations shall bring vehicles or equipment to an access location a minimum of 100 feet away from catch basins. A paved area, such as a parking lot or roadway, is a preferred field maintenance location to minimize the possibility of spills or releases to the environment. Crews shall take all usual and reasonable environmental precautions during repair or maintenance operations. Precautions shall be taken to prevent oil or hazardous material release to the environment. These precautions include (but are not limited to) deployment of portable basins or similar secondary containment devices, use of ground covers, such as plastic tarpaulins.
- Cleaning of tools and equipment shall be conducted away from drainage catchments to the maximum extent possible. A paved area such as a parking lot or roadway is preferred, to minimize the possibility of spill or release to the environment. Crews shall wipe up all minor drips or spills of grease and oil at field locations.
- The Contractor shall designate areas on the SESC Site Plans at least 100 feet away from drainage catchments.

3.11 Chemical Treatment for Erosion and Sediment Control

Chemical stabilizers, polymers, and flocculants are readily available on the market and can be easily applied to construction sites for the purposes of enhancing the control of erosion, runoff, and sedimentation. The following guidelines should be adhered to for construction sites that plan to use treatment chemicals as part of their overall erosion, runoff, and sedimentation control strategy.

The U.S. Environmental Protection Agency has conducted research into the relative toxicity of chemicals commonly used for the treatment of construction stormwater discharges. The research conducted by the EPA focused on different formulations of chitosan, a cationic compound, and both cationic and anionic polyacrylamide (PAM). In summary, the studies found significant toxicity resulting from the use of chitosan and cationic PAM in laboratory conditions, and significantly less toxicity associated with using anionic PAM. EPA's research has led to the conclusion that the use of treatment chemicals for erosion, runoff, and sedimentation control requires proper operator training and appropriate usage to avoid risk to aquatic species. In the case of cationic treatment chemicals additional safeguards may be necessary.

Application/Installation Minimum Requirements

If a site operator plans to use polymers, flocculants, or other treatment chemicals during construction the SESC plan must address the following:

1. Treatment chemicals shall not be applied directly to or within 100 feet of any surface water body, wetland, or storm drain inlet.

2. Use conventional erosion, runoff, and sedimentation controls prior to and after the application of treatment chemicals. Use conventional erosion, runoff, and sedimentation controls prior to chemical addition to ensure effective treatment. Chemicals may only be applied where treated stormwater is directed to a sediment control (e.g. temporary sediment basin, temporary sediment trap or sediment barrier) prior to discharge.

3. Sites shall be stabilized as soon as possible using conventional measures to minimize the need to use chemical treatment.

4. Select appropriate treatment chemicals. Chemicals must be selected that are appropriately suited to the types of soils likely to be exposed during construction and to the expected turbidity, pH, and flow rate of stormwater flowing into the chemical treatment system or treatment area. **Soil testing is essential. Using the wrong form of chemical treatment will result in some form of performance failure and unnecessary environmental risk.**

5. Minimize discharge risk from stored chemicals. Store all treatment chemicals in leak-proof containers that are kept under storm-resistant cover and surrounded by secondary containment structures (e.g., spill berms, decks, spill containment pallets), or provide equivalent measures, designed and maintained to minimize the potential discharge of treatment chemicals in stormwater or by any other means (e.g., storing chemicals in covered areas or having a spill kit available on site).

6. Use chemicals in accordance with good engineering practices and specifications of the chemical provider/supplier. You must also use treatment chemicals and chemical treatment systems in accordance with good engineering practices, and with dosing specifications and sediment removal design specifications provided by the supplier of the applicable chemicals, or document specific departures from these practices or specifications and how they reflect good engineering practice.

Will chemical stabilizers, polymers, flocculants or other treatment chemicals be utilized on the proposed construction project?

☒ Yes ☐ No

1. *List Manufacturer's name and product name for each treatment chemical proposed for use at the site.*
2. *Attach a copy of applicable Material Safety Data Sheets (MSDSs) or Safety Data Sheets (SDS) for each proposed treatment chemical.*
3. *Provide the results of third party toxicity testing of the materials proposed for use at the site.*
4. *Provide a certification from the site owner and operator that all proposed treatment chemicals are the same as those used in the toxicity tests and will not be altered in any way.*
5. *Provide an explanation as to why conventional erosion, runoff, and sediment control measures, alone or in combination, will not be sufficient to prevent turbidity impacts and sedimentation in downstream receptors.*
6. *Provide a plan prepared in consultation with the chemical treatment manufacturer(s) or authorized manufacturer's representative which includes the following:*
    a. *Identification of the areas of the site where treatment chemicals will be applied and the name, location, and distance to all downstream receptors that have the potential to be impacted from the discharges from the treatment areas.*
    b. *List the expected start and end dates or specific phases of the project during which each treatment chemical will be applied.*
    c. *Provide test results for representative soils from the site, and any recommendations from the manufacturer based on the soil tests, indicating the type of treatment chemical and the recommended application rate.*
    d. *List the frequency, method, and rates of application which are designed to ensure that treatment chemical concentrations will not exceed 50% of the IC25 or NOEC toxicity values, whichever is less, for each treatment chemical proposed.*
    e. *Provide the frequency of inspection and maintenance of the treatment chemical application system.*
    f. *List the method proposed for the collection, removal, and disposal or stabilization of settled particles to prevent re-suspension.*
    g. *Describe the training that will be provided to all persons who will handle and use treatment chemicals at the construction site. Training must include appropriate, product-specific training and proper dosing requirements for each product.*

Treatment Chemical SESC Plan Weekly Inspection Report Documentation Requirements

1. Document the type and quantity of treatment chemicals applied.

2. List the date, duration of discharge, and estimated discharge rate.

3. Provide an estimate of the volume of water treated.

4. Provide an estimate of the concentration of treatment chemicals in the discharge, with supporting calculations.

3.12 Construction Activity Pollution Prevention Control Measure List

It is expected that this table will be amended as needed throughout the construction project.

Phase No. #1		
Location/Station	**Control Measure Description/Reference**	**Maintenance Requirement**
Downgradient Project Site Perimeter	Section 6 Compost Sediment Tubes –*RI SESC Handbook*.	Inspection should be made within 24 hours after each storm event producing 0.25 inches of rainfall in a 24 hour period or weekly. Repair or replacement should be made promptly as needed. Cleanout of accumulated sediment behind the tube if sediment accumulates to at least ½ the distance between the top of compost tube and ground surface.
Stabilized Construction Entrance	Stone Stabilized Pad. Section Six: Sediment Control Measures – Construction Entrances –*RI SESC Handbook*.	The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto paved surfaces. Provide periodic top dressing with additional stone or additional length as conditions demand. Roads adjacent to entrance shall be clean at the end of each day. If maintenance alone is not enough to prevent excessive track out, increase length of entrance, modify construction access road surface, or install washrack or mudrack.
Around BMP Perimeter (sand filters, infiltration basins, and sediment forebays, QPA's)	Section 6 Compost Sediment Tubes –*RI SESC Handbook*.	Inspection should be made after each storm event (as above) or weekly and repair or replacement should be made promptly as needed. Cleanout of accumulated sediment behind the tube if sediment accumulates to at least ½ the distance between the top of compost tube and ground surface.

SECTION 4: CONTROL MEASURE INSTALLATION, INSPECTION, and MAINTENANCE

4.1 Installation

Complete the installation of temporary erosion, runoff, sediment, and pollution prevention control measures by the time each phase of earth-disturbance has begun. All stormwater control measures must be installed in accordance with good judgment, including applicable design and manufacturer specifications. Installation techniques and maintenance requirements may be found in manufacturer specifications and/or the *RI SESC Handbook*.

See SESC-1 and SESC-2

4.2 Monitoring Weather Conditions

Anticipating Weather Events - Care will be taken to the best of the operator's ability to avoid disturbing large areas prior to anticipated precipitation events. Weather forecasts must be routinely checked, and in the case of an expected precipitation event of over 0.25-inches over a 24-hour period, it is highly recommended that all control measures should be evaluated and maintained as necessary, prior to the weather event. In the case of an extreme weather forecast (greater than one-inch of rain over a 24-hour period), additional erosion/sediment controls may need to be installed.

Storm Event Monitoring For Inspections - At a minimum, storm events must be monitored and tracked in order to determine when post-storm event inspections must be conducted. Inspections must be conducted and documented at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event, which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff or snowmelt.

The weather gauge station and website that will be utilized to monitor weather conditions on the construction site is as follows:

www.wunderground.com

- Station ID: KRINORTH87
- Location: North Kingstown, RI
- Lat: 41° 32' 60" N (41.55), Long: 71° 27' 36" E (71.46)
- Elevation: (41.55), (71.46)

4.3 Inspections

Minimum Frequency - Each of the following areas must be inspected by or under the supervision of the owner and operator at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event, which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff or snowmelt:

a. All areas that have been cleared, graded, or excavated and where permanent stabilization has not been achieved;

b. All stormwater erosion, runoff, and sediment control measures (including pollution prevention control measures) installed at the site;

c. Construction material, unstabilized soil stockpiles, waste, borrow, or equipment storage, and maintenance areas that are covered by this permit and are exposed to precipitation;

d. All areas where stormwater typically flows within the site, including temporary drainage ways designed to divert, convey, and/or treat stormwater;

e. All points of discharge from the site;

f. All locations where temporary soil stabilization measures have been implemented;

g. All locations where vehicles enter or exit the site.

Reductions in Inspection Frequency - If earth disturbing activities are suspended due to frozen conditions, inspections may be reduced to a frequency of once per month. The owner and operator must document the beginning and ending dates of these periods in an inspection report.

Qualified Personnel – The site owner and operator are responsible for designating personnel to conduct inspections and for ensuring that the personnel who are responsible for conducting the inspections are "qualified" to do so. A "qualified person" is a person knowledgeable in the principles and practices of erosion, runoff, sediment, and pollution prevention controls, who possesses the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of the permit.

Recordkeeping Requirements - All records of inspections, including records of maintenance and corrective actions must be maintained with the SESC Plan. Inspection records must include the date and time of the inspection, and the inspector's name, signature, and contact information.

General Notes

- A separate inspection report will be prepared for each inspection.
- The Inspection Reference Number shall be a combination of the RIPDES Construction General Permit No - consecutively numbered inspections. ex/ Inspection reference number for the **4**th inspection of a project would be: RIR10####-**4**
- Each report will be signed and dated by the Inspector and must be kept onsite.
- Each report will be signed and dated by the Site Operator.
- The corrective action log contained in each inspection report must be completed, signed, and dated by the site operator once all necessary repairs have been completed.
- It is the responsibility of the site operator to maintain a copy of the SESC Plan, copies of all completed inspection reports, and amendments as part of the SESC Plan documentation at the site during construction.

Failure to make and provide documentation of inspections and corrective actions under this part constitutes a violation of your permit and enforcement actions under 46-12 of R.I. General Laws may result.

4.4 Maintenance

Maintenance procedures for erosion and sedimentation controls and stormwater management structures/facilities are described on the SESC Site Plans and in the *RI SESC Handbook*.

Site owners and operators must ensure that all erosion, runoff, sediment, and pollution prevention controls remain in effective operating condition and are protected from activities that would reduce their effectiveness. Erosion, runoff, sedimentation, and pollution prevention control measures must be maintained throughout the course of the project.

Note: It is recommended that the site operator designates a full-time, on-site contact person responsible for working with the site owner to resolve SESC Plan-related issues.

4.5 Corrective Actions

If, in the opinion of the designated site inspector, corrective action is required, the inspector shall note it on the inspection report and shall inform the site operator that corrective action is necessary. The site operator must make all necessary repairs whenever maintenance of any of the control measures instituted at the site is required.

In accordance with the *RI SESC Handbook*, the site operator shall initiate work to fix the problem immediately after its discovery, and complete such work by the close of the next work day, if the problem does not require significant repair or replacement, or if the problem can be corrected through routine maintenance.

When installation of a new control or a significant repair is needed, site owners and operators must ensure that the new or modified control measure is installed and made operational by no later than seven (7) calendar days from the time of discovery where feasible. If it is infeasible to complete the installation or repair within seven (7) calendar days, the reasons why it is infeasible must be documented in the SESC Plan along with the schedule for installing the control measures and making it operational as soon as practicable after the 7-day timeframe. Such documentation of these maintenance procedures and timeframes should be described in the inspection report in which the issue was first documented. If these actions result in changes to any of the control measures outlined in the SESC Plan, site owners and operators must also modify the SESC Plan accordingly within seven (7) calendar days of completing this work.

SECTION 5: AMENDMENTS

:

This SESC Plan is intended to be a working document. It is expected that amendments will be required throughout the active construction phase of the project. **Even if practices are installed on a site according to the approved plan, the site is only in compliance when erosion, runoff, and sedimentation are effectively controlled throughout the entire site for the entire duration of the project.**

The SESC Plan shall be amended within seven (7) days whenever there is a change in design, construction, operation, maintenance or other procedure which has a significant effect on the potential for the discharge of pollutants, or if the SESC Plan proves to be ineffective in achieving its objectives (i.e. the selected control measures are not effective in controlling erosion or sedimentation).

In addition, the SESC Plan shall be amended to identify any new operator that will implement a component of the SESC Plan.

All revisions must be recorded in the Record of Amendments Log Sheet, which is contained in Attachment G of this SESC Plan, and dated red-lined drawings and/or a detailed written description must be appended to the SESC Plan. Inspection Forms must be revised to reflect all amendments. Update the Revision Date and the Version # in the footer of the Report to reflect amendments made.

All SESC Plan Amendments, except minor non-technical revisions, must be approved by the site owner and operator. Any amendments to control measures that involve the practice of engineering must be reviewed, signed, and stamped by a Professional Engineer registered in the State of RI.

The amended SESC plan must be kept on file at the site while construction is ongoing and any modifications must be documented.

Attach a copy of the Amendment Log.

SECTION 6: RECORDKEEPING

RIPDES Construction General Permit – Parts III.D, III.G, III.J.3.b.iii, & V.O

It is the site owner and site operator's responsibility to have the following documents available at the construction site and immediately available for RIDEM review upon request:

- A copy of the fully signed and dated SESC Plan, which includes:
  - A copy of the General Location Map
    INCLUDED AS ATTACHMENT A
  - A copy of all SESC Site Plans
    INCLUDED AS ATTACHMENT B
  - A copy of the RIPDES Construction General Permit INCLUDED AS ATTACHMENT C
  - A copy of any regulatory permits (RIDEM Freshwater Wetlands Permit, CRMC Assent, RIDEM Water Quality Certification, RIDEM Groundwater Discharge Permit, RIDEM RIPDES Construction General Permit authorization letter, etc.)
    INCLUDED AS ATTACHMENT D
  - The signed and certified NOI form or permit application form INCLUDED AS ATTACHMENT E
  - Completed Inspection Reports w/Completed Corrective Action Logs
    INCLUDED AS ATTACHMENT F
  - SESC Plan Amendment Log
    INCLUDED AS ATTACHMENT G
  - Temporary Sediment Trap Calculations

    INCLUDED AS ATTACHMENT H

SECTION 7: PARTY CERTIFICATIONS

RIPDES Construction General Permit – Part V.G

All parties working at the project site are required to comply with the Soil Erosion and Sediment Control Plan (SESC Plan including SESC Site Plans) for any work that is performed on-site. The site owner, site operator, contractors and sub-contractors are encouraged to advise all employees working on this project of the requirements of the SESC Plan. A copy of the SESC Plan is available for your review at the following location: Insert Onsite Location Here, or may be obtained by contacting the site owner or site operator.

The site owner and site operator and each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement.

I acknowledge that I have read and understand the terms and conditions of the Soil Erosion and Sediment Control (SESC) Plan for the above designated project and agree to follow the control measures described in the SESC Plan and SESC Site Plans.

Site Owner:

Insert Company or Organization Name
Insert Name
Insert Address
Insert City, State, Zip Code
Insert Telephone Number, Insert Fax/Email

____
signature/date

Site Operator:

Insert Company or Organization Name

Insert Name
Insert Address ______________________________
Insert City, State, Zip Code signature/date
Insert Telephone Number, Insert Fax/Email

Designated Site Inspector:
Insert Company or Organization Name
Insert Name
Insert Address ______________________________
Insert City, State, Zip Code signature/date
Insert Telephone Number, Insert Fax/Email

SubContractor SESC Plan Contact:
Insert Company or Organization Name
Insert Name
Insert Address ______________________________
Insert City, State, Zip Code signature/date
Insert Telephone Number, Insert Fax/Email

LIST OF ATTACHMENTS

Attachment A - General Location Map

Attachment B - SESC Site Plans

Attachment C - Copy of RIPDES Construction General Permit and Authorization to Discharge

Attachment D - Copy of Other Regulatory Permits

Attachment E - Copy of RIPDES NOI

Attachment F - Inspection Reports w/ Corrective Action Log

Attachment G - SESC Plan Amendment Log

Attachment H – Temporary Sediment Trap Calculations

0 1000 2000 Feet

Project Location Map
Revolution Wind
Proposed Onshore Substation
North Kingstown, Rhode Island

Figure 1

RIPDES Permit No. RIR1#####

AUTHORIZATION TO DISCHARGE UNDER THE RHODE ISLAND POLLUTANT DISCHARGE ELIMINATION SYSTEM

GENERAL PERMIT FOR STORMWATER DISCHARGE ASSOCIATED WITH CONSTRUCTION ACTIVITY

In compliance with the provisions of Chapter 46-12 of the Rhode Island general Laws, as amended, except as provided in Part I.B.3 of the permit, operators of stormwater discharges associated with construction activity located in the State of Rhode Island are authorized to discharge in accordance with the conditions and requirements set forth herein.

Operators of stormwater discharges associated with construction activity within Rhode Island who intend to be authorized by this general permit must meet the application requirements outlined in Part I.D.1 of the permit. Authorization to discharge shall be granted in accordance with Part I.D of this permit.

This general permit shall become effective on September 26, 2018.

The general permit and the authorization to discharge expire at midnight, two years from the effective date, or September 25, 2020.

Signed this 26th day of September, 2018.

Eric A Beck, PE, Chief
Groundwater and Wetlands Protection
Office of Water Resources
Rhode Island Department of Environmental Management
Providence, Rhode Island

General Permit
Rhode Island Pollutant Discharge Elimination System
Stormwater Discharge Associated with Construction Activity

Effective Date: September 26, 2018

Valid ONLY in accordance with Part I.D.

Expiration Date: September 25, 2020

Rhode Island Department of Environmental Management
Office of Water Resources
RIPDES Program

GENERAL PERMIT
RHODE ISLAND POLLUTANT DISCHARGE ELIMINATION SYSTEM
STORMWATER DISCHARGE ASSOCIATED WITH CONSTRUCTION ACTIVITY

PLEASE READ THIS PERMIT CAREFULLY!

The RIPDES Program of the Office of Water Resources realizes that effective regulatory mechanisms to control erosion and sedimentation are currently required by the RIDEM Freshwater Wetland Program, the RIDEM Water Quality Certification Program, the RIDEM UIC/Groundwater Discharge Permit Program, the RI Coastal Resources Management Council (CRMC); and in those towns/cities which have a Qualifying Local Program (QLP) that has been formally approved by the Department (see RIPDES Rule 15.01(i) for the definition of Qualifying State, or Local Programs). **Regardless of the means of obtaining approval, the permittee is still responsible for complying with all terms and conditions of this permit and any other applicable State, local and/or federal regulations. The Department will be held harmless for any failure of the permittee to comply with this permit.**

I. GENERAL COVERAGE UNDER THIS PERMIT

A. Permit Area. This permit applies to all areas of the State of Rhode Island.

B. Eligibility

1. Allowable Stormwater Discharges. Subject to compliance with the terms and conditions of this permit, you are authorized to discharge the following:

(a) All new and existing stormwater discharges associated with construction, including, but not limited to, clearing, grading, excavation, and filling, where total land disturbance is equal to or greater than one (1) acres including construction activities involving soil disturbance`s of less than one (1) acre of disturbance if that construction is part of a larger common plan of development or sale that would disturb one (1) or more acre, and the discharge is composed entirely of stormwater. A discharge shall be considered composed entirely of stormwater if there is adequate access to sample the stormwater discharge covered under this permit prior to mixing with a discharge which is authorized and in compliance with an existing RIPDES permit or the discharge is listed in Part I.B.2. below.

(b) Stormwater Discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging areas, material storage areas, excavated material disposal areas, borrow areas) provided:

(i) The support activity is directly related to the construction site required to have a RIPDES permit coverage for discharges of stormwater associated with construction activity; and

(ii) The support activity is not a commercial operation serving multiple unrelated construction projects by different operators, and does not operate beyond the completion of the construction at the last construction project it supports; and

(iii) Appropriate controls and measures are identified in a Soil Erosion and Sediment Control Plan covering the discharges from the support activity areas; and

(c) Discharges composed of allowable discharges listed in Part I.B.2 of this permit commingled with a discharge authorized by a different RIPDES permit and/or discharge that does not require a RIPDES permit authorization.

2. Allowable Non-Stormwater Discharges. Allowable non-stormwater discharges under this permit are limited to discharges from the following:

   (a) washing of vehicles provided chemicals, soaps, detergents, steam, or heated water are not used; cleaning is restricted to the outside of the vehicle (e.g., no engines, transmissions, undercarriages, or truck beds); or washing is not used to remove accumulated industrial materials, paint residues, heavy metals or any other potentially hazardous materials from surfaces;

   (b) the use of water to control dust;

   (c) fire fighting activities;

   (d) fire hydrant flushings;

   (e) natural springs; uncontaminated groundwater;

   (f) lawn watering;

   (g) potable water sources including waterline flushings; irrigation drainage;

   (h) pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled materials have been removed) and where detergents are not used;

   (i) foundation or footing drains where flows are not contaminated with process materials such as solvents or contaminated by contact with soils where spills or leaks of toxic or hazardous materials has occurred.

   If any of these discharges may reasonably be expected to be present and to be mixed with stormwater discharges, they must be specifically identified in the site's Soil Erosion and Sediment Control Plan as described in Part III of this permit.

3. Limitations of Coverage. The following discharges associated with construction are not authorized by this permit.

   (a) Stormwater discharges associated with construction that the Director of the Department of Environmental Management has found to be or may reasonably be expected to be contributing to a violation of water quality standards, or to be a significant contributor of pollutants;

   (b) Stormwater discharges associated with construction, allowable non-stormwater discharges and discharge related activities that adversely affect a listed, or a proposed to be listed, endangered or threatened species or its critical habitat;

   (c) Stormwater associated with construction discharging into any water for which a Total Maximum Daily Load (TMDL) has been either established or approved by the EPA or other water quality determination unless the Stormwater Management Plan incorporates measures or controls that meet the requirements of this permit and are consistent with the assumptions and requirements of the TMDL and Minimum Standard 3: Water Quality of the RIDISM or the project was authorized and has maintained coverage under the 2013 permit (e.g. a RIPDES or a RIDEM Freshwater Wetlands Permit, RIDEM Water Quality Certification, RIDEM UIC/Groundwater Discharge Permit, CRMC Assent or QLP approval remains in effect). If the EPA approved or established TMDL or other water quality determination specifically prohibits the discharges, the discharges are not eligible for coverage under this permit.

(d) Stormwater associated with construction discharging into any Impaired water listed on the latest State of Rhode Island 303(d) List of Impaired Waters, unless the Stormwater Management Plan incorporates measures or controls that meet the requirements of this permit and address the pollutant(s) of concern as required by Standard 3: Water Quality of the RISDISM or if the project was authorized and has maintained coverage under the 2013 permit (e.g. a RIPDES or a RIDEM Freshwater Wetlands Permit, RIDEM Water Quality Certification, RIDEM UIC/Groundwater Discharge Permit, CRMC Assent or QLP approval remains in effect).

(e) Post-construction discharges that originate from the site after construction activities have been completed and the site has achieved final stabilization, including any temporary support activity. Post-construction stormwater from industrial sites may need to be covered by a separate RIPDES individual permit or may need to obtain authorization to discharge under the RIPDES Multi-Sector General Permit for Stormwater Discharge Associated with Industrial Activity. Guidance for managing discharges from industrial sites can be found in Part II.C of this permit.

C. Definition of "Owner" & "Operator":

1. For the purposes of this permit, the "owner" of a property is the person, as defined by Rule 3 of the RIPDES Regulations, holding the title, deed, or legal document to the regulated property, facility, or activity, including a party working under an easement on the property.

2. The "operator" is defined as the person who has operational control over plans and specifications, or the person who has day-to-day supervision and control of activities occurring at the site. Further, for purposes of this permit, the operator is the owner if that person is performing all work related to complying with this permit.

   Where a new operator is selected after the submittal of an NOI and that new operator is directly responsible for performing the work necessary to comply with this permit, prior to performing any work at the site the new operator must sign and certify within the Soil Erosion and Sediment Control Plan document that they are the operator of the site as defined above.

D. Authorization. To be covered under this general permit, owners or operators of stormwater discharges associated with construction activities that disturb one (1) or more acres or less than one (1) acre if that construction is part of a larger common plan of development or sale that would disturb one (1) or more acre, must comply with the applicable sections below.

1. Application Requirements

(a) Sites Previously Authorized under the 2013 Construction Activity General Permit are not required to reapply to maintain authorization.

(b) New Applications – Submittal of an NOI is only required for construction activities that disturb greater than one (1) acre that are not required to obtain a RIDEM Freshwater Wetlands Permit, RIDEM Water Quality Certification, RIDEM UIC/Groundwater Discharge Permit, CRMC Assent or QLP approval. Specific application requirements are as follows:

(i) Construction activities that disturb an area equal to or greater than five (5) acres are required to submit a complete NOI form and supporting documentation required in Part IV of this permit.

(ii) Construction activities that disturb an area equal to or greater than one (1) acre and less than five (5) acres are required to submit a complete NOI form, project narrative and site plan/map showing flow paths, discharges, and receiving waters.

2. Deadlines for Requesting Authorization

   (a) For stormwater discharges associated with construction activities which were authorized under the 2013 Construction Activity General Permit which are expected to continue beyond the effective date of this permit, the owner is not required to reapply, to maintain permit coverage in accordance with Part I.D.3 of this permit.

   (b) For stormwater discharges associated with construction activities which commence after the effective date of this permit, and are required to submit an NOI in accordance with Part I.D.1.b of this permit, an NOI must be submitted at least thirty (30) days prior to the commencement of land disturbing activities.

3. Granting of Authorization

   (a) Owners and operators previously authorized under the 2013 Construction Activity General Permit with an active RIDEM Freshwater Wetlands Permit, RIDEM Water Quality Certification, RIDEM UIC/Groundwater Discharge Permit, CRMC Assent or QLP approval will be authorized upon the effective date of this permit.

   (b) Owners and operators previously authorized under the 2013 Construction Activity General Permit will be authorized upon the effective date of this permit.

   (c) Construction activities that disturb an area equal to or greater than one (1) acre that are required to obtain a RIDEM Freshwater Wetlands permit, RIDEM Water Quality Certification, RIDEM UIC/Groundwater Discharge Permit, CRMC Assent or QLP approval are authorized to discharge stormwater from construction activities under the terms and conditions of this permit upon receipt of all of the applicable permits listed here.

   (d) For construction activities that disturb an area equal to or greater than five (5) acres and are not required to obtain one of the approvals listed above in Part I.D.3.c, authorization to discharge will only be granted upon notification from the Director after review of the NOI and Stormwater Management Plan.

   (e) For construction activities that disturb an area equal to or greater than one (1) acre and less than five (5) acres and are not required to obtain one of the approvals listed in Part I.D.3.c automatic authorization to discharge will be granted upon receipt of the information required in Part I.D.1.b.ii unless notified to the contrary by the Director.

E. Termination of Coverage. Upon achieving final site stabilization, owners and operators of stormwater discharges associated with construction must submit to the DEM a completed Notice of Termination (NOT). At a minimum, the following information is required to terminate coverage under this permit:

   1. The owner's name, mailing address, email address, and telephone number,
   2. The operator's name, mailing address, email address, and telephone number,
   3. The name and location of the facility,
   4. The RIPDES Construction General Permit authorization number,
   5. A signed certification by the owner and operator that the stormwater discharge associated with construction activity no longer exists at the site.

   Upon DEM receipt of the completed NOT coverage under this permit is terminated.

F. Failure to Notify. Owners or operators who fail to notify the Director of their intent to be covered under a general permit, and discharge pollutants to the waters of the State or to a separate storm sewer system without a RIPDES permit, are in violation of Chapter 46-12 of Rhode Island General Laws and the Clean Water Act (CWA).

II. PERMIT LIMITS AND CONDITIONS

To be covered under this permit you must develop a Stormwater Management Plan prior to submitting your NOI or your application for RIDEM Freshwater Wetlands Permit, RIDEM Water Quality Certification, RIDEM UIC/Groundwater Discharge Permit, CRMC Assent or QLP approval. In accordance with the *Rhode Island Stormwater Design and Installation Standards Manual* (RISDISM), the Stormwater Management Plan must include the following major elements, which serve to satisfy the eleven Minimum Standards outlined in the RISDISM, as well as comply with specific criteria for the site planning process, groundwater recharge, water quality, channel protection, and peak flow control requirements:

A. **Stormwater Site Planning, Analysis, and Design** – This element of the Stormwater Management Plan must address the following Minimum Standards and include supporting documentation and calculations:

1. Minimum Standard 1: LID Site Planning and Design Strategies
2. Minimum Standard 2: Groundwater Recharge,
3. Minimum Standard 3: Water Quality,
4. Minimum Standard 4: Conveyance and Natural Channel Protection,
5. Minimum Standard 5: Overbank Flood Protection,
6. Minimum Standard 6: Redevelopment and Infill Projects.
7. Minimum Standard 8: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)
8. Minimum Standard 9: Illicit Discharges

In addition, the following Appendices from the RISDISM provide additional guidance on how to comply with the above listed standards:

9. Appendix B: Vegetation Guidelines and Planting List
10. Appendix C: Guidance for Retrofitting Existing Development for Stormwater Management
11. Appendix F: Guidance on BMP Construction Specifications
12. Appendix I: Rhode Island River and Stream Order
13. Appendix K: Hydrologic and Hydraulic Modeling Guidance

B. **Soil Erosion, Runoff, and Sediment Control** – In order to comply with this permit a component of the Stormwater Management Plan must address two sources of stormwater pollution: (1) pollution caused by soil erosion, runoff, and sedimentation during construction and (2) stormwater pollution generated as a direct result of the construction activity itself (i.e. stormwater contaminated by construction wastes and practices). The Stormwater Management Plan must satisfy Part III of this permit and Minimum Standard 10 of the RISDISM – Construction Erosion and Sedimentation Control. In order to facilitate an expeditious DEM review and make it easier for the site owner and operator to comply with applicable soil erosion and sediment control requirements, it is recommended that a Soil Erosion and Sediment Control Plan be developed as a stand alone document.

C. **Post Construction Operation and Maintenance** – The Stormwater Management Plan must address *Minimum Standard 11*: *Stormwater Management System Operation and Maintenance* of the RISDISM to ensure that the stormwater management system constructed will continue to function as designed. The Plan must address the O&M requirements for each stormwater management practice in Chapter 5 of the RISDISM. Additional guidance on developing O&M plans can be found in Appendix E of the RISDISM. In addition the Plan must address *Minimum Standard 7: Pollution Prevention* of the RISDISM by incorporating source control and pollution prevention measures to minimize the impact that the land use may have on stormwater runoff quality after the construction development activities have been completed and the site is fully stabilized. Additional guidance can be found in Appendix G of the RISDISM. In order to facilitate an expeditious DEM review and make it easier for the site owner(s) to comply with applicable Operation and Maintenance requirements, it is recommended that an Operation and Maintenance Plan be developed as a stand alone document.

The facility may be required to obtain authorization to discharge under the RIPDES Multi-Sector General Permit for Stormwater Discharge Associated with Industrial Activity depending on the Standard Industrial Classification that will be applicable to the site when construction is complete. In these cases the Stormwater Management Plan should address the requirements of the RIPDES Multi-Sector General Permit for Stormwater Discharge Associated with Industrial Activity.

III. SOIL EROSION AND SEDIMENT CONTROL (SESC) PLAN REQUIREMENTS

A. The Soil Erosion and Sediment Control (SESC) Plan shall describe and ensure the implementation of stormwater control measures which are to be used to reduce or eliminate pollutants in stormwater discharge(s) from the site and assure compliance with the terms and conditions of this permit. Control practice selection shall include an evaluation of the effectiveness of available practices and be made with proper references.

B. Soil erosion, runoff, sediment, and pollution prevention control measures must be designed, implemented, and maintained in accordance with the requirements of this permit and in accordance with the design specifications and guidance contained in the *Rhode Island Soil Erosion and Sediment Control (RISESC) Handbook* (as amended) and the *Rhode Island Stormwater Design and Installation Standards Manual (RISDISM)* (as amended).

C. The SESC Plan shall be stamped and signed by a Registered Professional Engineer, a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Stormwater Quality (CPSWQ), or a Registered Landscape Architect certifying that the SESC Plan meets all requirements of this permit. SESC Plans which require the practice of engineering must be stamped and signed by a Registered Professional Engineer.

D. If the SESC Plan is not required to be submitted along with the NOI (see Part I.D of this permit), then the owner, operator, or other designated person under the supervision of the owner or operator shall make it available to the Department upon request.

E. If the SESC Plan is requested and reviewed by the Director, he or she may notify the permittee at any time that it does not meet one or more of the minimum requirements of this permit. After such notification from the Director, the permittee shall amend the SESC Plan and shall submit to the Director, within seven (7) days of the notification, a written certification that the required changes have been made.

F. The owner and operator shall amend the SESC Plan within seven (7) days whenever there is a change in design, construction, operation, maintenance or other procedure which has a significant effect on the potential for the discharge of pollutants, or if the SESC Plan proves to be ineffective in achieving its objectives. In addition, the SESC Plan shall be amended to identify any new operator that will implement a component of the SESC Plan. The amended SESC Plan must be kept on file at the construction site and any SESC Plan modifications must be documented. Any amendments to control measures which involved the practice of engineering, must first be reviewed, signed, and stamped by a Professional Engineer registered in the State of Rhode Island. The DEM reserves the right to review any SESC Plan amendments in the same manner as described in paragraph III.E.

G. A copy of the SESC Plan including site plans, amendments to the SESC Plan and site plans, records of inspections, maintenance, and corrective actions, a copy of the NOI, and any regulatory permits granted must be kept on site at all times during the extent of coverage under this permit. The site operator as defined by Part I.C.2 of this permit must maintain a copy of the SESC Plan at a central location on-site for the use of all those identified as having responsibilities under the SESC Plan whenever they are on the construction site. If an on-site location is unavailable to store the SESC Plan and associated records when no personnel are present, notice of the SESC Plan's location must be posted near the main entrance of the construction site.

H. Each project authorized under this permit must determine if the site is within or directly discharges to a Natural Heritage Area (NHA). DEM Natural Heritage Areas include known occurrences of state and federal rare, threatened and endangered species. Review DEM NHA maps to determine if there are natural heritage areas on or near the construction site.

I. List and provide existing data (if available) on the quality of known discharges from the site. The SESC Plan must identify any stormwater discharge associated with industrial activity other than construction if applicable.

J. Soil Erosion and Sediment Control Plans: Required Contents

1. **Erosion, Runoff, and Sediment Control Requirements –** Owners and Operators must design, install, and maintain effective erosion, runoff, and sediment controls that address the nature of stormwater run-on and runoff at the site, including factors such as expected flow from impervious surfaces, slopes, and site drainage features. If stormwater flow will be channelized at the site, site owners and operators must design temporary stormwater controls that will control peak flow rates and total stormwater volume, to minimize channel and stream bank erosion in the immediate vicinity of discharge points. These controls must be designed to address the range of soil particle sizes expected to be present, site soils, slope, and the expected amount, frequency, intensity, and duration of precipitation. At a minimum the following must be addressed:

(a) Phase Construction Activity – describe the intended construction sequencing and timing of major activities, including grading activities, road and utility installation, and building phases. The estimated timetable and sequence of construction activities must address the following key activities:

(i) Installation of erosion, runoff, and sediment controls and temporary pollution prevention measures.

(ii) Protection of planned infiltration sites and qualifying pervious areas from compaction.

(iii) Inspection and maintenance of erosion, runoff, sediment controls and other temporary pollution prevention measures.

(iv) Final site stabilization and removal of temporary erosion, runoff, and sediment controls and temporary pollution prevention measures.

(b) Control Stormwater Flowing Onto and Through the Project – Describe controls that will be used to divert flows from exposed soils, retain or detain flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. A description of controls, including design specifications and details must be provided.

(c) Stabilize Soils – Describe controls that will be used to stabilize soils throughout the entire duration of the construction project, including phased clearing/grubbing, initiating stabilization practices, and maintaining stabilization practices. Soil stabilization of disturbed areas must, at a minimum be initiated immediately whenever any clearing, grading, excavating or other earth disturbance activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding fourteen (14) calendar days. Stabilization must be completed using vegetative stabilization measures or using alternative measures whenever vegetative measures are deemed impracticable or during periods of drought.

(d) Protect Storm Drain Inlets – Describe controls, including design specifications and details, that will be used to prevent soil and debris from entering storm drain inlets. If stormwater discharges from the construction site have the potential to enter storm drain inlets that then discharge to a surface water, the site owner and operator must:

a. *Installation Requirements:* Install inlet protection practices that remove sediment from the discharge prior to entry into the storm drain inlet.

b. *Maintenance Requirements:* Clean, or remove and replace, the protection practices as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Accumulated sediment adjacent to the inlet protection measures should be removed by the end of the same work day in which it is found or by the end of the following work day if removal by the same work day is not feasible.

(e) Protect Storm Drain Outlets - Describe controls, including design specifications and details, to be used to protect outlets discharging stormwater from the project. Outfall protection must be used to prevent scour or severe erosion at discharge points. The function of the specified controls must be to protect the soil surface, reduce velocity, and promote infiltration.

(f) Establish Perimeter Controls and Sediment Barriers – Describe controls, including selection criteria and details, to be used to prevent soil erosion, filter, and trap sediment before it leaves the construction site.

a. *Installation Requirements*: Sediment controls must be installed along those perimeter areas of the site that will receive stormwater from earth disturbing activities.

b. *Maintenance Requirements*: Maintenance of perimeter controls and sediment barriers must be completed in accordance with the maintenance requirements specified in the RISESC Handbook (as amended).

(g) Establish Temporary Controls For The Protection of Post Construction Stormwater Practices – Identify the temporary practices that will be installed to protect permanent or long-term stormwater practices as they are installed and throughout the construction phase of the project so that they will function properly when they are brought online. Examples of long-term practices that may require protection include: infiltration basins, open vegetated swales and natural depressions, vegetated buffer strips, and permanent detention/retention structures. Examples of temporary control measures that can be used to protect permanent stormwater control measures include: establishing temporary sedimentation barriers around infiltrating practices, ensuring proper material staging areas and equipment routing (i.e. do not allow construction equipment to compact areas where infiltrating practices will be installed), and by conducting final cleaning of structural long-term practices after construction is completed.

(h) Temporary Sediment Trapping and Temporary Stormwater Conveyance Practices – Describe the need for temporary sediment trapping and temporary stormwater conveyance practices, and if required include design specifications and details which demonstrate that they comply with Minimum Standard 10 of the RISDISM.

(i) Utilize Surface Outlets – To the maximum extent practicable, outlet structures must be utilized that withdraw water from the surface of temporary sedimentation basins, in order to minimize the discharge of pollutants. Exceptions may include periods of extended cold weather, where alternate outlets are required during frozen periods. If such a device is infeasible for portions of or the entire construction period justification must be made in the SESC Plan.

(j) Properly Use Treatment Chemicals - If the owner and/or operator plans to utilize polymers, flocculants, or other treatment chemicals at the construction site (e.g. dewatering, temporary sediment traps, stormwater conveyance practices, soil stabilization), the use of such chemicals must be managed in accordance with current best management practices and in accordance with the requirements of the *Rhode Island Soil Erosion and Sediment Control (RISESC) Handbook* (as amended).

2. **Construction Activity Pollution Prevention Requirements –** The purpose of pollution prevention is to prevent daily construction activities from causing pollution. The owner and operator must design, install, implement, and maintain effective pollution prevention practices to minimize the discharge of pollutants. Pollution prevention practices must be described that will serve to control pollutants used at the site. At a minimum pollution prevention measures must address the following:

(a) Prohibited Discharges - The following discharges are prohibited at the construction site:

(i) Contaminated groundwater, unless specifically authorized by the DEM. These types of discharges may only be authorized under a separate DEM RIPDES permit.

(ii) Wastewater from washout of concrete, unless the discharge is contained and managed by appropriate controls.

(iii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials.

(iv) Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance. Proper storage and spill prevention practices must be utilized at all construction sites.

(v) Soaps or solvents used in vehicle and equipment washing.

(vi) Toxic or hazardous substances from a spill or other release.

(b) Minimize Off-Site Tracking of Sediments – Describe the location(s) of vehicle entrance(s) and exit(s), and stabilization practices used to prevent sediment from being tracked off-site. Sediment track-out must be minimized onto off-site streets, other paved areas, and sidewalks from vehicles exiting the construction site. Site owners and operators must:

(i) Restrict vehicle use to properly designated exit points.

(ii) Use properly designed and constructed construction entrances at all points that exit onto paved roads so that sediment removal occurs prior to vehicle exit.

(iii) When and where necessary, use additional controls to remove sediment from vehicle tires prior to exit (i.e. wheel washing racks, rumble strips, and rattle plates).

(iv) Where sediment has been tracked out from the construction site onto the surface of off-site streets, other paved areas, and sidewalks, the deposited sediment must be removed by the end of the same work day in which the trackout occurs. Track-out must be removed by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. Operators are prohibited from hosing or sweeping tracked-out sediment into any stormwater conveyance, storm drain inlet, or surface water.

(c) Proper Waste Disposal – Identify potential building materials and other construction wastes and document how these wastes will be properly managed and disposed of at the construction site. All types of wastes generated at the site must be disposed of in a manner consistent with State Law and/or regulations.

(d) Spill Prevention and Control – All chemicals and/or hazardous waste material must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. All areas where potential spills can occur, and their accompanying drainage points must be described. The owner and operator must establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. The operator must establish and make highly visible location(s) for the storage of spill prevention and control equipment and provide training for personnel responsible for spill prevention and control on the construction site.

(e) Control of Allowable Non-Stormwater Discharges – Allowable non-stormwater discharges as established in Part I.B.2 of this permit should be kept separate from stormwater flow through the use of appropriate control measures. The owner and operator must identify all allowable non-stormwater discharges associated with construction activity and describe the controls and measures that will be implemented at those locations to minimize pollutant contamination where applicable.

(f) Control Dewatering Practices – Describe dewatering practices that will be implemented if water must be removed from an area so that construction activity can continue. Site owners and operators are prohibited from discharging groundwater or accumulated stormwater that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation, unless such waters are first effectively managed by appropriated control measures. Examples of appropriate control measures include, but are not limited to, temporary sediment basins or sediment traps, sediment socks, dewatering tanks and bags, or filtration systems (e.g. bag or sand filters) that are designed to remove sediment. Uncontaminated, non-turbid dewatering water can be discharged without being routed to a control. At a minimum the following discharge requirements must be met for dewatering activities:

(i) Do not discharge visible floating solids or foam.

(ii) To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. In no case will surface waters be considered part of the treatment area.

(iii) At all points where dewatering water is discharged utilize velocity dissipation devices.

(iv) With filter backwash water, either haul it away for disposal or return it to the beginning of the treatment process.

(v) Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer’s specifications.

(vi) Dewatering practices must involve the implementation of appropriate control measures as applicable (i.e. containment areas for dewatering earth materials, portable sediment tanks and bags, pumping settling basins, and pump intake protection).

(g) Establish Proper Building Material Staging Areas - Describe construction materials expected to be stored on-site and procedures for storage of materials to minimize exposure of the materials to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

(h) Control Discharges from Stockpiled Sediment or Soil - Stockpile management consists of procedures and practices designed to minimize or eliminate the discharge of stockpiled material (soil, topsoil, base material, rubble) from entering drainage systems or surface waters. For any stockpiles or land clearing debris composed, in whole or in part, of sediment or soil, you must comply with the following requirements:

(i) Locate piles within the designated limits of disturbance.

(ii) Protect from contact with stormwater (including run-on) using a temporary perimeter sediment barrier.

(iii) Where practicable provide cover or appropriate temporary vegetative or structural stabilization to avoid direct contact with precipitation or to minimize the discharge of sediments.

(iv) Do not hose down or sweep soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or surface water.

(v) To the maximum extent practicable, contain and securely protect from wind.

(i) Minimize Dust – describe dust control procedures and practices that will be used to suppress dust and limit its generation (i.e. applying water, limiting the amount of bare soil exposed at one time etc.)

(j) Designate Washout Areas – describe the controls that will be used to minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, washout areas for concrete mixers, paint, stucco, etc. The recommended location(s) of washout areas should be identified, or at a minimum the locations where these washout areas should not be sited should be called out.

(k) Establish Proper Equipment/Vehicle Fueling and Maintenance Practices – Describe equipment/vehicle fueling and maintenance practices that will be implemented to prevent pollutants from mixing with stormwater (e.g. secondary containment, drip pans, spill kits, etc.). Provide recommended location(s) of fueling/maintenance areas, or, at minimum, locations where fueling/maintenance should be avoided.

3. **Control Practice Installation, Inspection, and Maintenance Requirements**

(a) Installation Requirements - Complete the installation of temporary erosion, runoff, sediment, and pollution prevention control measures by the time each phase of earth-disturbance has begun. All stormwater controls must be installed in accordance with good engineering practices, including applicable design specifications. Design specifications may be found in manufacturer specifications and/or the *Rhode Island Soil Erosion and Sediment Control (RISESC) Handbook* (as amended). Any departures from such specifications must be provided and demonstrated to reflect good engineering practices.

(b) Inspection Requirements

(i) *Minimum Frequency* - Each of the following areas must be inspected by or under the supervision of the owner and operator at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff:

a. All areas that have been cleared, graded, or excavated and that have not yet completed stabilization;

b. All stormwater erosion, runoff, and sediment control measures (including pollution prevention practices) installed at the site to comply with this permit;

c. Construction material, unstabilized soil stockpiles, waste, borrow, or equipment storage, and maintenance areas that are covered by this permit and are exposed to precipitation;

d. All areas where stormwater typically flows within the site, including temporary drainage ways designed to divert, convey, and/or treat stormwater;

e. All points of discharge from the site;

f. All locations where temporary or permanent soil stabilization measures have been implemented;

g. All locations where vehicles enter or exit the site.

(ii) *Qualified Personnel* – The site owner and operator are responsible for designating personnel to conduct inspections and for ensuring that the personnel who are responsible for conducting the inspections are "qualified" to do so. A "qualified person" is a person knowledgeable in the principles and practices of erosion, runoff, sediment, and pollution prevention controls, who possesses the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.

(iii) *Recordkeeping Requirements* - All records of inspections, including records of maintenance and corrective actions must be maintained with the SESC Plan. Inspection records must include the date and time of the inspection, and the inspector's name, signature, and contact information.

(iv) *Reductions in Inspection Frequency* - If earth disturbing activities are suspended due to frozen conditions, inspections may be reduced to a frequency of once per month. The owner and operator must document the beginning and ending dates of these periods in the SESC Plan.

(v) Failure to make and provide documentation of inspections under this part constitutes a violation of this permit and enforcement actions under 46-12 of R.I. General Laws may result.

(c) Maintenance Requirements – Site owners and operators must ensure that all erosion, runoff, sediment, and pollution prevention controls remain in effective operating condition and are protected from activities that would reduce their effectiveness. Site owners and operators must ensure that all erosion, runoff, sediment, and pollution prevention controls are inspected at the frequency established in Part III.J.3.b of this permit. If the designated site inspector finds a problem (i.e. erosion, runoff, sediment or pollution prevention controls require replacement, repair, or maintenance), the owner and operator must ensure that the necessary repairs or modifications are made in accordance with the following:

(i) Initiate work to fix the problem immediately after discovering the problem, and complete such work by the close of the next work day, if the problem does not require significant repair or replacement, or if the problem can be corrected through routine maintenance.

(ii) When installation of a new control or a significant repair is needed, site owners and operators must ensure that the new or modified control practice is installed and made operational by no later than seven (7) calendar days from the time of discovery where feasible. If it is infeasible to complete the installation or repair within seven (7) calendar days, the reasons why it is infeasible must be documented in the SESC Plan along with the schedule for installing the stormwater control(s) and making it operational as soon as practicable after the 7-day timeframe. Where these actions result in changes to any of the stormwater control measures outlined in the SESC Plan, site owners and operators must modify the SESC Plan accordingly within seven (7) calendar days of completing this work in accordance with Part III.F.

(iii) If corrective actions are required, the site owner and operator must ensure that all corrective actions are documented on the inspection report in which the problem was first discovered. These corrective actions must be documented, signed, and dated by the site operator once all necessary repairs have been completed.

4. **Site Plan Requirements –** Site Plans must depict all of the control measures required to meet the SESC Plan requirements of this permit. Depending on the complexity, the SESC Plan may reference the complete construction plan set prepared as part of the overall Stormwater Management Plan, and/or may have a specific SESC Plan Set developed. The SESC Plan should indicate the plan type (General, Drainage & Utility, SESC Plan, etc.) and sheet numbers where the following required information can be found:

   (a) Title & Date of Plan Set(s).

   (b) Total Project Area, including all grading and/or excavation, and a defined Limit of Disturbance.

   (c) Pre- and post-development drainage patterns.

   (d) The location and name of the receiving waters and/or separate storm sewer system and the ultimate receiving waters that may be impacted during construction.

   (e) Location of environmentally sensitive features and areas to be preserved and/or protected.

   (f) Locations where stormwater discharges to a surface water or wetland.

   (g) Location of all existing and proposed impervious surfaces/structures.

   (h) Locations of potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the site (i.e. exposed, unstabilized soil stockpiles and construction material and waste collection areas).

   (i) Locations and timing of stabilization practices including phased clearing and grubbing based on scheduled activities.

   (j) The location of all erosion, runoff, sediment, and pollution prevention control measures, including the location of temporary sediment basins, diversions, or other water quality, peak discharge, and volume control structures.

   (k) Areas within the project limits which are unsuitable for material storage areas, equipment storage areas, designated concrete washout collection areas, dumpsters, stockpiles, fueling locations, etc. (i.e. locations where these activities shall not occur, and recommendations of where they may occur.)

   (l) The location of spill prevention and response equipment.

   (m) The location of all proposed post-construction best management practices including locations of infiltrating practices and prohibited traffic areas.

IV. NOTICE OF INTENT REQUIREMENTS

A. <u>Contents of the Notice of Intent:</u>

1. Site information, including the street address, plat and lot numbers, location description, latitude, longitude and utility pole number.

2. Total site area and site area to be disturbed.

3. Name and class of water body class receiving run off from project or site.

4. Project name.

5. Indication of pre-application meeting and meeting date.

6. Owner/applicant information, including name, organization/company name, contact person, address, email and telephone number.

7. A signed certification by the Owner/Applicant that under penalty of law they've requested and authorized the investigation, compilation, and submission of all the information, in whatever form, contained in the Application; have personally examined and are familiar with the information submitted herein; and based on their inquiry of those individuals immediately responsible for obtaining the information, they believe the information is true, accurate and complete. The Owner/Applicant is aware that it's the owner's responsibility to implement or hire a qualified contractor responsible to implement any required Soil Erosion and Sediment Control Plan, to effectively control stormwater discharges leaving the site during the construction period. The Owner/Applicant authorizes RIDEM personnel access to the property for purposes of observing conditions pertinent to the application and assessing compliance with any permit or determination resulting from the application.

8. Professional information, including name, license type and number, company name, email, phone number and title. The Professional must be a Registered Professional Engineer, if the Stormwater Analysis and Drainage Report requires the practice of engineering; or a Registered Professional Engineer, a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Storm Water Quality (CPSWQ), or a Registered Landscape Architect, if the submission requires the determination of site location within a Natural Heritage Area, or if the project requires submission of a Soil Erosion and Sediment Control Plan.

9. A signed certification by a Professional that under penalty of law the project described in the application and associated materials is in compliance with the RI Stormwater Design and Installation Standards Manual (as amended) and the Rhode Island Soil Erosion and Sediment Control Handbook (as amended) [if required] and that they believe all information presented in the application and the accompanying materials is true, accurate and complete. All engineering designs, plans and specifications [if required] included in the application were done by the certifying Professional or by someone working directly for them. The Natural Heritage Area Information [if required] and the site specific Soil Erosion and Sediment Control Plan [if required] were prepared under their direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on their inquiry of the person or persons who manage the system, or those persons directly responsible for gathering or developing the information, the information submitted is, to the best of their knowledge and belief, true, accurate, and complete at the time the application is made. The certifying Professional is aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

10. Permit History including all other RI Coastal Resources Management Council (CRMC), US Army Corps of Engineers and RIDEM application or file numbers and program names associated with the site.

11. Indicate if there are Freshwater Wetlands on the subject or adjacent property and the project proposes new or increased impervious cover for property other than a single family home; or disturbance of more than 10,000 square feet of existing impervious cover; or to fill in any amount of floodplain or alter storm flowage to a river, stream or wetland on any lot.

12. Indicate if the project requires an application to RI CRMC and proposes a residential development of six (6) units or more; or a project that results in the creation of 10,000 square feet or more of impervious area.

13. Indicate if the project proposes an infiltration system listed in the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM) that receives stormwater from a residential impervious area that is more than 10,000 square feet; or a non-residential roof area greater than 10,000 square feet; or a non-residential road or parking area of any size.

14. Indicate if the treatment system discharges below the ground; or above the ground and infiltrates, but must be reviewed for compliance with the RISDISM to be protective of groundwater.

15. Indicate if the project proposes discharge of stormwater to waters of the State [including a Separate Storm Sewer System (MS4)], and disturbs less than one (1) acre, but the activity is part of a larger common plan resulting in more than 1 acre of disturbance; or disturbs more than 1 acre of property. Provide the name of the larger common plan.

16. Indicate if the site within or directly discharges to a Natural Heritage Area (NHA.)

17. For construction activities that disturb an area greater than or equal to five (5) acres and are not required to obtain a RIDEM Freshwater Wetlands Permit, RIDEM Water Quality Certification, RIDEM UIC/Groundwater Discharge Permit, CRMC Assent or QLP, the NOI must include a completed Stormwater Management Checklist as provided in Appendix A of the *Rhode Island Stormwater Design and Installation Standards Manual* (as amended) and a copy of the Stormwater Management Plan.

18. After review of the NOI, additional information may be required by this office to determine whether or not to authorize the discharge under this permit.

B. <u>Where to Submit.</u> A completed and signed NOI must be submitted to:

R.I. Department of Environmental Management
Permit Application Center
RIPDEM 235 Promenade Street
Providence, RI 02908

C. <u>Additional Notification.</u> Construction sites discharging stormwater must submit a copy of the NOI to the applicable Town or City Department in which the construction activity and the point of discharge is located.

D. <u>Deficient.</u> If the NOI does not meet one or more of the minimum requirements of this permit, then the applicant will be notified as such by a deficiency letter at any point during the review period. It is the responsibility of the applicant to make all required changes in the plan and resubmit the application. The review period will recommence upon the departmental receipt of the revised application.

V. GENERAL REQUIREMENTS

A. <u>Duty to Comply.</u> The permittee must comply with all conditions of this permit and any other applicable State, local and/or federal regulations. Any permit noncompliance constitutes a violation of Chapter 46-12 of the Rhode Island General Laws and the CWA and is grounds for enforcement action which may include, permit termination, revocation and reissuance, modification, or for the denial of a permit renewal application and the imposition of penalties.

1. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or

prohibitions, even if the permit has not yet been modified to incorporate this requirement.

2. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such sections in a permit issued under Section 402 of the CWA. Any person who violates any condition of this permit is subject to a civil penalty of up to $25,000 per day of such violation, as well as any other appropriate sanctions provided by Section 309 of the CWA. Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished by a fine of up to $10,000 or by imprisonment of not more than two (2) years, or by both.

3. Chapter 46-12 of the R.I. General Laws provides that any person who violates a permit condition is subject to a civil penalty of not more than $25,000 per day of such violation. Any person who willfully or negligently violates a permit condition is subject to a criminal penalty of not more than $25,000 per day of such violation and imprisonment for not more than five (5) years, or both. Any person who knowingly makes any false statement in connection with the permit is subject to a criminal penalty of not more than $5,000 for each instance of violation or by imprisonment for not more than thirty (30) days, or both.

B. Continuation of the Expired General Permit. Provided the permittee has reapplied in accordance with paragraph C. below, an expired general permit continues in force and effect until a new general permit is issued. Only those construction sites previously authorized to discharge under the expired permit are covered by the continued permit.

C. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain coverage under a new permit. The permittee shall submit a complete Notice of Intent at least thirty (30) days before the expiration date of the existing permit, unless permission for a later date has been granted by the Director.

D. Need to Halt or Reduce Activity Not a Defense. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information. The permittee shall furnish to the Department, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall furnish to the Director any documents that are required to be kept as part of this permit.

G. Signatory Requirements. All Notices of Intent, Stormwater Management Plans, Soil Erosion and Sediment Control Plans, inspection reports, certifications, or other information submitted to the Director, or that this permit requires be maintained by the permittee shall be signed and certified in accordance with Rule 12 of the RIPDES regulations. R.I. General Laws, Chapter 46-12 provides that any person who knowingly makes any false statements, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $5,000 per violation, or by imprisonment for not more than thirty (30) days per violation, or by both.

H. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the CWA.

I. Release in Excess of Reportable Quantities. If a release in excess of a reportable quantity occurs, this office must be notified immediately. This permit does not relieve the permittee of the reporting requirements of 40 CFR 117 and 40 CFR 302. The discharge of hazardous substances in the stormwater discharge(s) from a facility shall be minimized in accordance with the applicable stormwater management plan for the facility, and in no case, during any twenty four (24) hour period, shall the discharge(s) contain a hazardous substance equal to or in excess of reportable quantities.

J. Property Rights. The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

K. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

L. Transfers. This permit is not transferable to any person except after notice to the Director. The Director may require the owner and operator to apply for and obtain an individual RIPDES permit as stated in Part V.T. of this permit.

M. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law.

N. Proper Operations and Maintenance. The permit shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the requirements of this permit.

O. Record Keeping

1. The permittee shall retain records of all inspections and reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least five (5) years from the date of the report or application. The records must be kept at the construction site at all times. If an on-site location is deemed impractical, notice of the location of the required records must be posted near the main entrance to the construction site. Once the construction project is complete and the permit has been terminated, records must be kept at either the completed project location or the records must be maintained by the owner of record at the time that the construction project was active. This period may be extended by request of the Director at any time.

P. Bypass of Stormwater Control

1. *Anticipated Bypass.* If the permittee knows in advance of the need for a bypass, he or she shall notify this Department in writing at least ten (10) days prior to the date of the bypass. Such notice shall include the anticipated quantity and the anticipated effect of the bypass.

2. *Unanticipated Bypass.* The permittee shall submit notice of an unanticipated bypass. Any information regarding the unanticipated bypass shall be provided orally within twenty four (24) hours from the time the permittee became aware of the circumstances. A written submission shall also be provided within five (5) days of the time the permittee became aware of the bypass. The written submission shall contain a description of the bypass and its cause; the period of the bypass; including exact dates and times, and if the bypass has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate and prevent reoccurrence of the bypass.

3. *Prohibition of Bypass.*

(a) Bypass is prohibited and enforcement action against the permittee may be taken for the bypass unless:

(i) The bypass was unavoidable to prevent loss of life, personal injury or severe property damage;
(ii) The permittee submitted notices as required in paragraphs P.1. and P.2.

(b) The Director may approve an unanticipated bypass after considering its adverse effects, if the Director determines that it will meet the two conditions in paragraph P.3.a. above.

Q. Upset Conditions

1. An upset constitutes an affirmative defense to an action brought for non-compliance with technology based permit limitations if the requirements of paragraph 2 below are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

2. A permittee who wishes to establish an affirmative defense of an upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence, that:

(a) An upset occurred and the permittee can identify the specific causes(s) of the upset;
(b) The permittee facility was at the time being properly operated;
(c) The permittee submitted notice of the upset as required in Rule 14.08 of the RIPDES Regulations; and
(d) The permittee complied with any remedial measures required under Rule 14.05 of the RIPDES Regulations.

3. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

R. Inspection and Entry. The permittee shall allow the Director, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated activity is conducted, or where records must be kept under the conditions of this permit;
2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
3. Inspect at reasonable times any equipment, practices, or operations regulated or required under this permit; and
4. Sample or monitor any substances or parameters at any location, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA or R.I. law.

S. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause, including but not limited to: violation of any terms or conditions of this permit; obtaining this permit by misrepresentation or failure to disclose all relevant facts; or a change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

T. Requiring an Individual Permit or an Alternative General Permit

1. The Director of the Department of Environmental Management (DEM) may require any owner or operator authorized to discharge stormwater under this permit to apply for and obtain either an individual or an alternative RIPDES general permit. Any interested person may petition the Director to take action

under this paragraph. The Director may determine at his or her own discretion that an individual or an alternative general permit is required (see RIPDES Rule 32 for reasons why an alternative permit may be required).

2. Any owner or operator authorized to discharge stormwater by this permit may request to be excluded from coverage of this permit by applying for coverage under an individual permit or an alternative general permit. The request shall be granted by the issuance of an individual permit only if the reasons cited by the owner or operator are adequate to support the request. The Director shall notify the permittee within a timely fashion as to whether or not the request has been granted.

3. If a facility requests or is required to obtain coverage under an individual or an alternative general permit, then authorization to discharge stormwater under this permit shall automatically be terminated on the date of issuance of the individual or the alternative general permit. Until such time as an alternative permit is issued, the existing general permit remains fully in force.

U. Reopener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with construction covered by this permit, the owner or operator of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part V.T. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Permit modification or revocation will be conducted in accordance with 40 CFR 122.62, 122.63, 122.64 and 124.5.

V. Availability of Reports. Except for data determined to be confidential under Part W.1. below, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the DEM at 235 Promenade Street, Providence, Rhode Island. As required by the CWA, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the CWA and under Chapter 46-12-14 of the Rhode Island General Laws.

W. Confidentiality of Information

1. Any information submitted to DEM pursuant to these regulations may be claimed as confidential by the submitter, consistent with Rhode Island General Law 38-2-2. Any such claim must be asserted at the time of the submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, DEM may make the information available to the public without further notice.

2. Claims of confidentiality for the following information will be denied:

(a) The name and address of any permit application or permittee;
(b) Permit applications, permits and any attachments thereto; and
(c) RIPDES effluent data.

X. Right to Appeal. Within thirty (30) days of receipt of notice of final authorization, the permittee or any interested person may submit a request to the Director for an adjudicatory hearing to reconsider or contest that decision. The request for a hearing must conform to the requirements of Rule 49 of the RIPDES Regulations.

RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
235 Promenade Street, Providence, RI 02908-5767 TDD 401-222-4462

Dear Applicant:

Section 46-12-15(b) of the Rhode Island General laws of 1956, Title 46, Chapter 12 entitled Water Pollution, as amended, prohibits the discharge of pollutants into waters of the State. The only exceptions are discharges in compliance with the terms and conditions of a Rhode Island Pollutant Discharge Elimination System (RIPDES) Permit issued in accordance with State Regulations.

Rule 31 of the RIPDES Regulations, requires permit coverage for construction sites disturbing equal to and greater than one acre, as well as sites less than one acre of total land area that are part of a larger common plan of development or sale if the larger common plan will ultimately disturb equal to or greater than one acre.

To request authorization under the General Permit for Stormwater Discharge Associated with Construction Activity, which was reissued and became effective on September 26, 2013, applicants must follow the submission requirements under Part I.D of the permit. Enclosed with this letter is a copy of the Construction General Permit Notice of Intent (NOI) Application Form. Provided all the required information is submitted and it is determined that a general permit is appropriate for the proposed site, authorization will be granted in accordance with Part I.D. of this permit. The 2013 Construction General Permit expires at midnight September 25, 2018.

A non-refundable application fee is due at the time the NOI is submitted to this office in the form of a check or money order, payable to the General Treasurer of the State of Rhode Island (**note: no fee if only an NOI is required to be submitted, $400 fee if a NOI and a Stormwater Management Plan is required to be submitted**). The review for completeness of the application will not be made until the fee is paid. The check of money order and the attached Application(s) Fee Form must be submitted to:

Department of Environmental Management
Office of Management Services
235 Promenade Street
Providence, RI 02908

Return the completed NOI form to:

Department of Environmental Management
Office of Water Resources
RIPDES Program
235 Promenade Street
Providence, RI 02908

Any questions about the General Permit or the NOI Form should be directed to the RIPDES Program Staff, Permitting Section at (401) 222-4700.

Sincerely,

Eric A. Beck, P.E.
Supervising Sanitary Engineer

RHODE ISLAND POLLUTANT DISCHARGE ELIMINATION SYSTEM (RIPDES)
NOTICE OF INTENT (NOI)
STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY
(Revised September 2013)

DEM USE ONLY

Date NOI Received ____________

Date Fee Received ____________

RIPDES# RIR ____________

CHECK ONLY ONE ITEM	☐ New Request for Permit Authorization ☐ Re-Application for RIPDES Authorization No. RIR______________, which expires on September 25, 2013. ☐ Amendment to RIPDES Authorization No. RIR__________________.

I. OWNER

Name:			
Mailing Address:			
City:	State:	Zip:	Phone: ( )
Contact Person:	Title:		
Email Address of Contact Person:			
Billing Address (if different than above):			
City:	State:	Zip:	

II. OPERATOR (if different from Owner)

Name:			
Local Mailing Address:			
City:	State:	Zip:	Phone: ( )
Contact Person:	Title:		
Email Address of Contact Person:			

III. CONSTRUCTION SITE INFORMATION

Site's Official or Legal Name:			
Street Address:			
City:	State:	Zip:	Phone:
Latitude (to nearest 15 sec.) _____Deg. _____Min. _____Sec.	Longitude (to nearest 15 sec.) _____Deg. _____Min. _____Sec.		
Nearest Utility Pole Number:	Assessors Plat:	Lot:	

Is the construction site part of a larger common plan of development or sale? ☐ YES ☐ NO

List Name of Larger Common Plan:______________________ Total Disturbed Acres of Common Plan ______Acres

Projected or Actual Construction Commencement Date __________
MM/DD/YY

Projected Construction Completion Date ___________
MM/DD/YY

Area of Site: Total Acres: __________ Proposed Area of Disturbance in Acres: __________

IV. DISCHARGE LOCATION INFORMATION

Note: If stormwater from the site discharges to a Combined Sewer Overflow a RIPDES authorization for the construction activity is not necessary, please confirm that the discharge will enter a combined sewer system with the appropriate sewer authority.

☐ Separate Storm Sewer System (MS4) Name:__________________________________

☐ Unnamed stream or wetlands connected to named receiving water body. Name:_______________________

☐ Ultimate Receiving Water Body Name:__________________________________ Water Body ID#:______________

Is the receiving water body classified as a Cold or Warm Water Fishery? ☐ Cold Water ☐ Warm Water ☐ Unassessed

Is the receiving water body on the most recent State of RI 303(d) List of Impaired Waters?

☐ YES ☐ NO

If yes, list any applicable impairments:

Is the Receiving Water(s) designated as a Special Resource Protection Water (SRPW)? ☐ YES ☐ NO

Has a TMDL been completed for the receiving water body? ☐ YES ☐ NO

If yes, list any applicable impairments:

Is the project associated with a DEM Office of Waste Management (OWM) site? ☐ YES ☐ NO ;

If yes, please describe and provide a DEM OWM contact:

____

Is the proposed project associated with a previous permit application or enforcement action? ☐ YES ☐ NO ;

If yes, please describe: ____

Does the project meet the criteria for a Land Use with Higher Potential Pollutant Loads (LUHPPL) as defined by the RI Stormwater Design & Installation Standards Manual (as amended)?

☐ YES ☐ NO If yes, describe:

Will the site require a separate permit for the proposed industrial activity under Rule 31(b)15 of the RIPDES Regulations? ☐ YES ☐ NO

If yes, describe:

Is the site within or directly discharging to a Natural Heritage Area (NHA)?

☐ YES ☐ NO

V. OWNER/OPERATOR CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under the direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that if review of the Stormwater Management Plan is performed by the DEM RIPDES Permitting Program, Freshwater Wetlands Section, Water Quality Certification Program, the UIC/Ground Permit Program, Coastal Resources Management Council, or by a city/town which has adopted a DEM approved Soil Erosion and Sediment Control Ordinance, then a Stormwater Permit from this office is contingent upon approval from the reviewing agency. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I am aware that it is the responsibility of the owner/operator to implement and amend the Soil Erosion and Sediment Control Plan as appropriate in accordance with the requirements of the General Permit.

Print Owner Name & Company ____

Print Owner Title ____

Signature ____ Date ______________

Print Operator Name & Company ____

Print Operator Title ____

Signature ____ Date ______________

VI. PROFESSIONAL CERTIFICATION - NATURAL HERITAGE AREAS

I certify under penalty of law that the Natural Heritage Area Information under Section IV of this NOI was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete at the time this application is made. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name of Professional & Company ____

Print Professionals Title* ____

Registration or License Number ____

Signature ____ Date ______________

*Must be signed by a Registered Professional Engineer, a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Storm Water Quality (CPSWQ), or a Registered Landscape Architect.

VII. PROFESSIONAL CERTIFICATION - SOIL EROSION AND SEDIMENT CONTROL PLAN DEVELOPMENT

Note: The purpose of this certification is to document that a site specific Soil Erosion and Sediment Control Plan was prepared consistent with the requirements of the General Permit. This certification by a professional does not alleviate or in any way limit the liability and sole responsibility of the Owner and Operator to properly implement the Soil Erosion and Sediment Control Plan and to amend the Soil Erosion and Sediment Control Plan as site conditions may require, so as to effectively control stormwater discharges leaving the site during the construction period.

I certify under penalty of law that a site specific Soil Erosion and Sediment Control Plan was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for developing the Soil Erosion and Sediment Control Plan, the Soil Erosion and Sediment Control Plan is, to the best of my knowledge and belief, true, accurate, and complete at the time this certification is made and has been developed in accordance to the requirements of the Permit as well as all applicable guidelines in the *Rhode Island Soil Erosion and Sediment Control (RISESC) Handbook* (as amended) and the *Rhode Island Stormwater Design and Installation Standards Manual* (as amended). I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name of Professional & Company ______________________________

Print Professionals Title* ______________________________

Registration or License Number ______________________________

Signature ______________________________ Date ____________

*Must be signed by a Registered Professional Engineer, a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Stormwater Quality (CPSWQ), or a Registered Landscape Architect. If the Stormwater Management Plan requires the practice of engineering, this must be signed by a Registered Professional Engineer.

Note: Upon completion of the permitted project, the DEM must be notified via the submittal of a completed Notice of Termination. In accordance with Construction Activity General Permit Part V.L., this permit is not transferable to any person or group except after due notice to the Director. If no such notice is given, the named owner will be held liable for all fees and expenses levied to this permit.

SESC Plan
Inspection Report Instructions

For all projects subject to the requirements of the *RI Stormwater Design and Installation Standards Manual* or the *RIPDES Construction General Permit* the site owner and operator are required to develop and comply with a site specific Soil Erosion and Sediment Control Plan (SESC Plan) in order to remain in compliance with applicable regulations.

This inspection report template has been provided by RIDEM for use by the site operator and designated inspector to document the adequacy and condition of erosion, runoff, sediment, and pollution prevention control measures specified for use on the construction site. It should be customized for your specific site conditions and consistent with the SESC Plan developed for your site.

Using the Inspection Report

This inspection report is designed to be customized according to the control measures and conditions at the site. On a copy of the applicable SESC Site Plans, number or label all stormwater control measures and areas of the site that will be inspected. Include all control measures (temporary traps, basins, inlet protection measures, etc.) and areas that will be inspected. Also, identify all point source discharges/outfalls, and the priority natural resource areas (i.e. streams, wetlands, mature trees, etc). List each control measure or area to be inspected separately in the site-specific control measure section of the inspection report.

Complete any items that will remain constant, such as the project information and control measure locations and descriptions. Then, print out multiple copies of this customized inspection report to use during the inspections.

When conducting the inspection, walk the site by following the SESC Site Plans and numbered control measure locations for inspection. Also note whether the overall site issues have been addressed. Customize this list according to the conditions at the site.

Minimum Monitoring and Reporting Requirements

Your site must be inspected by or under the supervision of the owner and operator at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff. Read Section 4.2 of your SESC Plan for more information regarding the importance of monitoring weather conditions.

General Notes

- A separate inspection report will be prepared for each inspection.

- The Inspection Reference Number shall be a combination of the RIPDES Permit Authorization Number - consecutively numbered inspections. For example: Inspection reference number for the **4th** inspection of a project would be: RIR101000-**4**

- Each report will be signed and dated by the inspector and forwarded to the site operator within 24 hours of the inspection.

- Each report will be signed and dated by the site operator upon his/her receipt and after completion of all required corrective actions.

- It is the responsibility of the site operator to maintain a copy of the SESC Plan, copies of all completed inspection reports, and amendments as part of the SESC Plan documentation at the site during construction.

Corrective Actions

If the SESC Plan Inspection determines that corrective actions are necessary to install or repair control measures, the resultant actions taken must be documented by the site operator. The actions must be recorded in the Corrective Action Log attached to each SESC Plan inspection form. If the site operator disagrees with the corrective action recommendations, it must be documented, with justifiable reasons, in the Corrective Action Log, as well. **Required timeframes for corrective actions are established by regulation and are discussed in Section 4.5 of your SESC Plan.**

Amendments

All SESC Plan Amendments, except minor non-technical revisions, must be approved by the site owner and site operator. The revision must be recorded in the Record of Amendments Log Sheet within the SESC Plan, and dated red-line drawings and/or a detailed written description of the revision must be appended to the SESC Plan. Inspection forms must be revised to reflect all amendments. Update the *Revision Date* and the *Version #* in the footer of the report to reflect amendments made.

The SESC Plan shall be amended whenever there is a change in design, construction, operation, maintenance or other procedure, which has a significant effect on the potential for the discharge of pollutants, or if the SESC Plan proves to be ineffective in achieving its objectives.

******Remember that the regulations are performance-oriented. Even if all control measures are installed on a site according to the SESC Plan, the site is only in compliance when erosion, runoff, sedimentation, and pollution are effectively controlled. ******

SESC Plan Inspection Report

Project Information			
Name			
Location			
DEM Permit No.			
Site Owner	Name	Phone	Email
Site Operator	Name	Phone	Email

Inspection Information			
Inspector Name	Name	Phone	Email
Inspection Date		**Start/End Time**	

Inspection Type
❑ Weekly ❑ Pre-storm event ❑ During storm event ❑ Post-storm event ❑ Other

Weather Information

Last Rain Event
Date: Duration (hrs): Approximate Rainfall (in):

Rain Gauge Location & Source:

Weather at time of this inspection:

<u>Check statement that applies then sign and date below:</u>

☐ **I, as the designated Inspector, certify that this site has been inspected as required by regulation and I have determined that maintenance and corrective actions are not required at this time.**

☐ **I, as the designated Inspector, certify that this site has been inspected as required by regulation and I have made the determination that the site requires corrective actions. The required corrective actions are noted within this inspection report.**

Inspector:	Print Name	Signature	Date

The Site Operator acknowledges by his/her signature, the receipt of this SESC Plan inspection report and its findings. He/she acknowledges that all recommended corrective actions must be completed and documentation of all such corrective actions must be made in this inspection report per applicable regulations.

Operator:	Print Name	Signature	Date

Site-specific Control Measures

Number the structural and non-structural stormwater control measures identified in the SESC Plan and on the SESC Site Plans and list them below (add as necessary). Bring a copy of this inspection form and any applicable SESC Site Plans with you during your inspections. This list will assist you to inspect all control measures at your site.

FILL THIS TABLE USING THE SESC PLAN TABLES 2.11 & 3.12.

	Location/Station	**Control Measure Description**	**Installed & Operating Properly?**	**Assoc. Photo/ Figure #**	**Corrective Action Needed (Yes or No; if 'Yes', please detail action required)**
1	Example 1: Eastern Parcel – Slope No. 4 Adjacent to I-95. Straw Wattles	Straw Wattle. Section Six, Sediment Control Measures, Straw Wattles, Compost Tubes and Fiber Rolls - *RI SESC Handbook*.	❑Yes ❑No		
2	Example 2: Western Parcel – Green Street Construction Entrance	Stone Stabilized Pad. Section Six: Sediment Control Measures – Construction Entrances –*RI SESC Handbook*.	❑Yes ❑No		
3	Example 3: Hospital Main Footings – Excavation Area – SESC Site Plan Sheet No. 3.	Pump Intake Protection Using Stone Filled Sump with Standpipe. Section Six: Sediment Control Measures, Pump Intake Protection, *RI SESC Handbook.*	❑Yes ❑No		
4	Example 4: Bridge Abutment Construction Southbound Bridge Abutment, Bridge No. 244 – SESC Site Plan Sheet No. 18.	Prefabricated Concrete Washout Container with Ramp. Used to contain concrete washout during concrete pouring operations. Section Three: Pollution Prevention and Good Housekeeping, Concrete Washouts, *RI SESC Handbook*.	❑Yes ❑No		
5	INSERT TEXT	INSERT TEXT	❑Yes ❑No		
6	**Attention Operator:**	**You must modify this inspection form as the project progresses, control measure locations change, and amendments to the SESC Plan are instituted in the field.**	❑Yes ❑No		
7			❑Yes ❑No		
8			❑Yes ❑No		

	Location/Station	Control Measure Description	Installed & Operating Properly?	Assoc. Photo/ Figure #	Corrective Action Needed (Yes or No; if 'Yes', please detail action required)
9			❑Yes ❑No		
10			❑Yes ❑No		
11			❑Yes ❑No		
12			❑Yes ❑No		
13			❑Yes ❑No		
14			❑Yes ❑No		
15			❑Yes ❑No		
16			❑Yes ❑No		
17			❑Yes ❑No		
18			❑Yes ❑No		
19			❑Yes ❑No		
20			❑Yes ❑No		
21			❑Yes ❑No		
22			❑Yes ❑No		
23			❑Yes ❑No		
24			❑Yes ❑No		

	Location/Station	Control Measure Description	Installed & Operating Properly?	Assoc. Photo/ Figure #	Corrective Action Needed (Yes or No; if 'Yes', please detail action required)
25			❑Yes ❑No		
26			❑Yes ❑No		
27			❑Yes ❑No		
28			❑Yes ❑No		
29			❑Yes ❑No		
30			❑Yes ❑No		

(add more as necessary)

General Site Issues

Below are some general site issues that should be assessed during inspections. Please ***customize*** *this list as needed for conditions at the site.*

	Compliance Question		Assoc. Photo/ Figure #	Corrective Action Needed (If 'Yes', please detail action required and include location/station)
1	Have all control measures been installed as specified in the RISESC Handbook and prior to any earth disturbing activities?	❑Yes ❑No ❑ N/A		
2	Are appropriate limits of disturbance (LOD) established?	❑Yes ❑No ❑ N/A		
3	Are controls that limit runoff from exposed soils by diverting, retaining, or detaining flows (such as check dams, sediment basins, etc.) in place?	❑Yes ❑No ❑ N/A		
4	Are all temporary conveyance practices installed correctly and functioning as designed?	❑Yes ❑No ❑ N/A		
5	Has maintenance been performed as required to ensure continued proper function of all temporary conveyances practices?	❑Yes ❑No ❑ N/A		
6	Were all exposed soils seeded by October 15th?	❑Yes ❑No ❑ N/A		
7	Have soils been stabilized where earth disturbance activities have permanently or temporarily ceased on any portion of the site and will not resume for more than 14 days?	❑Yes ❑No ❑ N/A		
8	In instances where adequate vegetative stabilization was not established by November 15th, have non-vegetative erosion control measures must be employed?	❑Yes ❑No ❑ N/A		
9	If work is to continue from October 15th through April 15th, are steps taken to ensure that only the day's work area will be exposed and all erodible soil is stabilized within 5 working days?	❑Yes ❑No ❑ N/A		
10	Have inlet protection measures (such as fabric drop inlet protection, curb drop inlet protection, etc.) been properly installed?	❑Yes ❑No ❑ N/A		
11	Has the operator cleaned and maintained inlet protection measures when needed?	❑Yes ❑No ❑ N/A		
12	Has the operator removed accumulated sediment adjacent to inlet protection measures within 24 hours of detection?	❑Yes ❑No ❑ N/A		

	Compliance Question		Assoc. Photo/ Figure #	Corrective Action Needed (If 'Yes', please detail action required and include location/station)
13	Has the operator properly installed outlet protection (such as riprap, turf mats, etc.) at all temporary and permanent discharge points?	❑Yes ❑No ❑ N/A		
14	Are all outlet protection measures functioning properly in order to reduce discharge velocity, promote infiltration, and eliminate scour?	❑Yes ❑No ❑ N/A		
15	Have all discharge points been inspected to ensure the prevention of scouring and channel erosion?	❑Yes ❑No ❑ N/A		
16	Have sediment controls been installed along perimeter areas that will receive stormwater from earth disturbing activities?	❑Yes ❑No ❑ N/A		
17	Is the operator maintaining sediment controls in accordance with the requirements in the *RI SESC Handbook*?	❑Yes ❑No ❑ N/A		
18	Have temporary sediment barriers been installed around permanent infiltration areas (such as bioretention areas, infiltration basins, etc.)?	❑Yes ❑No ❑ N/A		
19	Have staging areas and equipment routing been implemented to avoid compaction where permanent infiltration areas will be located?	❑Yes ❑No ❑ N/A		
20	Are surface outlet structures (such as skimmers, siphons, etc.) installed for each temporary sediment basin? [Exception: frozen conditions]	❑Yes ❑No ❑ N/A		
21	Have all temporary sediment basins or traps been inspected and maintained as required to ensure proper function?	❑Yes ❑No ❑ N/A		
22	Does the project include the use of polymers, flocculants, or other chemicals to control erosion, sedimentation, or runoff from the site?	❑Yes ❑No ❑ N/A		
23	Are all chemicals being managed in accordance with Appendix J of the *RISESC Handbook* and current best management practices?	❑Yes ❑No ❑ N/A		
24	Has the site operator taken steps to **prohibit** the following pollutant discharges on the site?			
a	Contaminated groundwater.	❑Yes ❑No ❑ N/A		

	Compliance Question		Assoc. Photo/ Figure #	Corrective Action Needed (If 'Yes', please detail action required and include location/station)
b	Wastewater from washout of concrete; unless properly contained, managed, and disposed of.	❑Yes ❑No ❑ N/A		
c	Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction products.	❑Yes ❑No ❑ N/A		
d	Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance.	❑Yes ❑No ❑ N/A		
e	Soaps or solvents used in vehicle and equipment washing.	❑Yes ❑No ❑ N/A		
f	Toxic or hazardous substances from a spill or other release.	❑Yes ❑No ❑ N/A		
25	Is the operator using properly constructed entrances/exits to the site so sediment removal occurs prior to vehicles exiting?	❑Yes ❑No ❑ N/A		
26	If needed, are additional controls (such as rumble strips, rattle plates, etc.) in place to remove sediment from tires prior to exiting?	❑Yes ❑No ❑ N/A		
27	Is sediment track-out being removed by the end of the same workday in which it occurs (via sweeping, shoveling, or vacuuming)?	❑Yes ❑No ❑ N/A		
28	Are all wastes generated at the site being managed and properly disposed of by the end of each workday?	❑Yes ❑No ❑ N/A		
29	Are all chemicals and hazardous waste materials stored properly in covered areas and surrounded by containment control systems?	❑Yes ❑No ❑ N/A		
30	Has the operator established highly visible locations for the storage of spill prevention and control equipment on the construction site?	❑Yes ❑No ❑ N/A		
31	Are allowable non-stormwater discharges being managed properly with adequate controls?	❑Yes ❑No ❑ N/A		
32	Is the site operator properly managing groundwater or stormwater that is removed from excavations, trenches, or similar points of accumulation?	❑Yes ❑No ❑ N/A		
33	Are proper procedures and controls in place for the storage of materials that may discharge pollutants if	❑Yes ❑No ❑ N/A		

	Compliance Question		**Assoc. Photo/ Figure #**	**Corrective Action Needed (If 'Yes', please detail action required and include location/station)**
	exposed to stormwater?			
	Are stockpiles located within the limits of disturbance?	❑Yes ❑No ❑ N/A		
	Are stockpiles being protected from contact with stormwater using a temporary sediment barrier?	❑Yes ❑No ❑ N/A		
	Where needed, has cover or appropriate temporary vegetative or structural stabilization been utilized for stockpiles?	❑Yes ❑No ❑ N/A		
	Is the operator effectively managing the generation of dust through the use of water, chemicals, or minimization of exposed soil?	❑Yes ❑No ❑ N/A		
	Are designated washout areas (such as wheel washing stations, washout for concrete, paint, stucco, etc.) clearly marked on the site?	❑Yes ❑No ❑ N/A		
	Are vehicle fueling and maintenance areas properly located to prevent pollutants from impacting stormwater and sensitive receptors?	❑Yes ❑No ❑ N/A		
	(Other)			

(add more as necessary)

General Field Comments:

Photos:

(Associated photos – each photo should be dated and have a unique identification # and written description indicating where it is located within the project area. If a close up photo is required, it should be preceded with a photo including both the detail area and some type of visible fixed reference point. Photos should be annotated with Station numbers and other identifying information where needed.)

Photo #:	Station:
(insert Photo here)	Description:

Photo #:	Station:
(insert Photo here)	Description:

Photo #:	Station:
(insert Photo here)	Description:

Photo #:	Station:
(insert Photo here)	Description:

Photo #:	Station:
(insert Photo here)	Description:

Photo #:	Station:
(insert Photo here)	Description:

(add more as necessary)

Corrective Action Log

TO BE FILLED OUT BY SITE OPERATOR

Describe repair, replacement, and maintenance of control measures, actions taken, date completed, and note the person that completed the work.

	Location/Station	Corrective Action	Date Completed	Person Responsible

Operator Signature:		**Date:**

PROJECT:

Amendment Log

TO BE FILLED OUT BY SITE OPERATOR

Describe amendment(s) to be made to the SESC Plan, the date, and the person/title making the amendment. ALL amendments must be approved by the Site Owner.

#	Date	Description of Amendment	Amended by: Person/Title	Site Owner Must Initial
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Add more lines/pages as necessary

APPENDIX H

Computations

Project:	Revolution Wind	Project #	73032.01
Location:	North Kingstown, RI	Sheet	1 of 3
Calculated by:	AEC	Date:	3/23/2021
Checked by:	KC	Date:	3/23/2021
Title	Temporary Sediment Trap		TST-1

Temporary Sediment Trap Design Criteria

Rhode Island Soil Erosion and Sediment Control Handbook
Section Six: Sediment Control Measures

Contributing Drainage Area: 1.03 acres

Required Trap Capacity = 134 cy/ac = 134 x 1.03 = 139 cy = 3727 cf

Required Wet Storage = 3727/2 = 1864 cf
Required Dry Storage = 3727/2 = 1864 cf

Trap Dimensions:

Trap Length = 30 ft
Trap Wdith = 25 ft
Wet Trap Area (Aw) = 750 sf
Dry Trap Area (Ad) = 1254 sf
Wet Storage Depth (Dw) = 3 ft
Dry Storage Depth (Dd) = 2 ft

Provided Volume:

Wet Storage = 0.85 x Aw x Dw = 1913 cf
Dry Storage = ((Aw + Ad)/2) x Dd = 2004 cf

Storage Check:

Wet Storage = 1913 cf (>1864 cf required)
Dry Storage = 2004 cf (>1864 cf required)

Computations

Project:	Revolution Wind	Project #	73032.01
Location:	North Kingstown, RI	Sheet	2 of 3
Calculated by:	AEC	Date:	3/23/2021
Checked by:	KC	Date:	3/23/2021
Title	Temporary Sediment Trap		TST-2

Temporary Sediment Trap Design Criteria

Rhode Island Soil Erosion and Sediment Control Handbook
Section Six: Sediment Control Measures

Contributing Drainage Area: 1.3 acres

Required Trap Capacity = 134 cy/ac = 134 x 1.3 = 175 cy = 4704 cf

Required Wet Storage = 4704/2 = 2352 cf
Required Dry Storage = 4704/2 = 2352 cf

Trap Dimensions:
Trap Length = 50 ft
Trap Wdith = 25 ft
Wet Trap Area (Aw) = 1250 sf
Dry Trap Area (Ad) = 1914 sf
Wet Storage Depth (Dw) = 3 ft
Dry Storage Depth (Dd) = 2 ft

Provided Volume:
Wet Storage = 0.85 x Aw x Dw = 3188 cf
Dry Storage = ((Aw + Ad)/2) x Dd = 3164 cf

Storage Check:
Wet Storage = 3188 cf (>2352 cf required)
Dry Storage = 3164 cf (>2352 cf required)

VHB

Computations

Project:	Revolution Wind	Project #	73032.01
Location:	North Kingstown, RI	Sheet	1 of 1
Calculated by:	AEC	Date:	3/23/2021
Checked by:	KC	Date:	3/23/2021
Title	Temporary Sediment Trap		TST-3

Temporary Sediment Trap Design Criteria

Rhode Island Soil Erosion and Sediment Control Handbook
Section Six: Sediment Control Measures

Contributing Drainage Area: 1.98 acres

Required Trap Capacity = 134 cy/ac = 134 x 1.98 = 266 cy = 7164 cf

Required Wet Storage = 7164/2 = 3582 cf
Required Dry Storage = 7164/2 = 3582 cf

Trap Dimensions:

Trap Length = 50 ft
Trap Wdith = 30 ft
Wet Trap Area (Aw) = 1500 sf
Dry Trap Area (Ad) = 2204 sf
Wet Storage Depth (Dw) = 3 ft
Dry Storage Depth (Dd) = 2 ft

Provided Volume:

Wet Storage = 0.85 x Aw x Dw = 3825 cf
Dry Storage = ((Aw + Ad)/2) x Dd = 3704 cf

Storage Check:

Wet Storage = 3825 cf (>3582 cf required)
Dry Storage = 3704 cf (>3582 cf required)

Computations

Project:	Revolution Wind	Project #	73032.01
Location:	North Kingstown, RI	Sheet	1 of 3
Calculated by:	AEC	Date:	3/23/2021
Checked by:	KC	Date:	3/23/2021
Title	Temporary Sediment Trap		TST-1

Temporary Sediment Trap Design Criteria

Rhode Island Soil Erosion and Sediment Control Handbook
Section Six: Sediment Control Measures

Contributing Drainage Area: 1.03 acres

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Required Wet Storage = 3727/2 = 1864 cf
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Trap Wdith = 25 ft
Wet Trap Area (Aw) = 750 sf
Dry Trap Area (Ad) = 1254 sf
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Provided Volume:
Wet Storage = 0.85 x Aw x Dw = 1913 cf
Dry Storage = ((Aw + Ad)/2) x Dd = 2004 cf

Storage Check:
Wet Storage = 1913 cf (>1864 cf required)
Dry Storage = 2004 cf (>1864 cf required)

Computations

Project:	Revolution Wind	Project #	73032.01
Location:	North Kingstown, RI	Sheet	2 of 3
Calculated by:	AEC	Date:	3/23/2021
Checked by:	KC	Date:	3/23/2021
Title	Temporary Sediment Trap		TST-2

Temporary Sediment Trap Design Criteria

Rhode Island Soil Erosion and Sediment Control Handbook
Section Six: Sediment Control Measures

Contributing Drainage Area: 1.3 acres

Required Trap Capacity = 134 cy/ac = 134 x 1.3 = 175 cy = 4704 cf

Required Wet Storage = 4704/2 = 2352 cf
Required Dry Storage = 4704/2 = 2352 cf

Trap Dimensions:
Trap Length = 50 ft
Trap Wdith = 25 ft
Wet Trap Area (Aw) = 1250 sf
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Provided Volume:
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Storage Check:
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VHB

Computations

Project:	Revolution Wind	Project #	73032.01
Location:	North Kingstown, RI	Sheet	1 of 1
Calculated by:	AEC	Date:	3/23/2021
Checked by:	KC	Date:	3/23/2021
Title	Temporary Sediment Trap		TST-3

Temporary Sediment Trap Design Criteria

Rhode Island Soil Erosion and Sediment Control Handbook
Section Six: Sediment Control Measures

Contributing Drainage Area: 1.98 acres

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Required Wet Storage = 7164/2 = 3582 cf
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Wet Storage = 0.85 x Aw x Dw = 3825 cf
Dry Storage = ((Aw + Ad)/2) x Dd = 3704 cf

Storage Check:

Wet Storage = 3825 cf (>3582 cf required)
Dry Storage = 3704 cf (>3582 cf required)

Appendix F: Onshore Transmission Facilities Soil Erosion and Sediment Control Plan Report

Soil Erosion and Sediment Control Plan

For:

Revolution Wind Proposed Onshore Transmission Facilities

Soil Erosion and Sediment Control Plans

North Kingstown, RI

Owner:	Revolution Wind, LLC c/o Kenneth Bowes 56 Exchange Terrace, Suite 300 Providence, RI 02903 860.883.5830 Kenneth.bowes@eversource.com
Operator: *TO BE DETERMINED UPON CONTRACT AWARD*	Company Name Name Address City, State, Zip Code Telephone Number
Estimated Project Dates:	Start Date: January 2023
	Completion Date: February 2024
SESC Plan Prepared By:	VHB 1 Cedar Street, Suite 400 Providence, RI 02903 401.272.8100 rcodega@vhb.com Renee Codega, PE RI No. 6517
SESC Plan Preparation Date:	June 30, 2021
SESC Plan Revision Date:	

OPERATOR CERTIFICATION

Upon contract award, the OPERATOR must sign this certification statement before construction may begin.

I certify under penalty of law that this document and all attachments were prepared under the direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I am aware that it is the responsibility of the owner/operator to implement and amend the Soil Erosion and Sediment Control Plan as appropriate in accordance with the requirements of the RIPDES Construction General Permit.

Operator Signature: Date

Contractor Representative: Name

Contractor Title: Title

Contractor Company Name: Company Name (if applicable)

Address: Mailing Address

Phone Number: Phone Number

Email Address: Email

TABLE OF CONTENTS

INTRODUCTION

This Construction Site Soil Erosion and Sediment Control Plan (SESC Plan) has been prepared for the Applicant, Revolution Wind, LLC for the Proposed Onshore Transmission Facilities. In accordance with the RIDEM Rhode Island Pollutant Discharge Elimination System (RIPDES) General Permit for Stormwater Discharge Associated with Construction Activity (RIPDES Construction General Permit ("CGP")), projects that disturb one (1) or more acres require the preparation of a SESC Plan. This SESC Plan provides guidance for complying with the terms and conditions of the RIPDES Construction General Permit and Minimum Standard 10 of the RI Stormwater Design and Installation Standards Manual. In addition, this SESC Plan is also consistent with Part D of the *RI SESC Handbook* entitled "Soil Erosion and Sediment Control Plans". This document does not negate or eliminate the need to understand and adhere to all applicable RIPDES regulations.

The purpose of erosion, runoff, and sedimentation control measures is to prevent pollutants from leaving the construction site and entering waterways or environmentally sensitive areas during and after construction. This SESC Plan has been prepared prior to the initiation of construction activities to address anticipated worksite conditions. The control measures depicted on the site plan and described in this narrative should be considered the minimum measures required to control erosion, sedimentation, and stormwater runoff at the site. Since construction is a dynamic process with changing site conditions, it is the operator's responsibility to manage the site during each construction phase so as to prevent pollutants from leaving the site. This may require the operator to revise and amend the SESC Plan during construction to address varying site and/or weather conditions, such as by adding or realigning erosion or sediment controls to ensure the SESC Plan remains compliant with the RIPDES Construction General Permit. Records of these changes must be added to the amendment log attached to the SESC Plan, and to the site plans as "red-lined" drawings. Please Note: **Even if practices are correctly installed on a site according to the approved plan, the site is only in compliance when erosion, runoff, and sedimentation are effectively controlled throughout the entire site.**

It is the responsibility of the site owner and the site operator to maintain the SESC Plan at the site, including all attachments, amendments and inspection records, and to make all records available for inspection by RIDEM during and after construction. (RIPDES CGP - Part III.G)

The site owner, the site operator, and the designated site inspector are required to review the SESC Plan and sign the Party Certification pages (Section 8). The primary contractor (if different) and all subcontractors (if applicable) involved in earthwork or exterior construction activities are also required to review the SESC Plan and sign the certification pages before construction begins.

Any questions regarding the SESC Plan, control measures, inspection requirements, or any other facet of this document may be addressed to the RIDEM Office of Water Resources, at 401-222-4700 or via email: water@dem.ri.gov.

ADDITIONAL RESOURCES

Rhode Island Department of Environmental Management
Office of Water Resources
235 Promenade Street
Providence, RI 02908-5767
phone: 401-222-4700
email: water@dem.ri.gov

RIDEM *RI Stormwater Design and Installation Standards Manual* (RISDISM) (as amended)
http://www.dem.ri.gov/pubs/regs/regs/water/swmanual15.pdf

RI Soil Erosion and Sediment Control Handbook http://www.dem.ri.gov/soilerosion2014final.pdfRIDEM 2013 RIPDES Construction General Permit
http://www.dem.ri.gov/pubs/regs/regs/water/ripdesca.pdfRhode Island Department of Transportation *Standard Specifications for Road and Bridge Design and Other Specifications* and *Standard Details*
http://www.dot.ri.gov/business/bluebook.php

RIDEM Office of Water Resources Coordinated Stormwater Permitting website
http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/coordinated-stormwater-permitting.phpRIDEM RIPDES Stormwater website
http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/RIDEM Water Quality website (for 303(d) and TMDL listings)
http://www.dem.ri.gov/programs/water/quality/

RIDEM Rhode Island Natural Heritage Program mailto:plan@dem.ri.gov

RIDEM Geographic Data Viewer – Environmental Resource Map
http://www.dem.ri.gov/maps/

Natural Resources Conservation Service - Rhode Island Soil Survey Program
http://www.ri.nrcs.usda.gov/technical/soils.html

Note:

The *Soil Survey of Rhode Island*, issued in 1980 is no longer available or supported. More information on site-specific soil data and maps for Rhode Island is available from the Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture through the Web Soil Survey. This information is available online at: http://websoilsurvey.nrcs.usda.gov.

EPA NPDES – Stormwater Discharges from Construction Activities webpage:
http://water.epa.gov/polwaste/npdes/stormwater/Stormwater-Discharges-From-Construction-Activities.cfm

EPA Construction Site Stormwater Runoff Control BMP Menu
http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-Stormwater-Run-Off-Control.

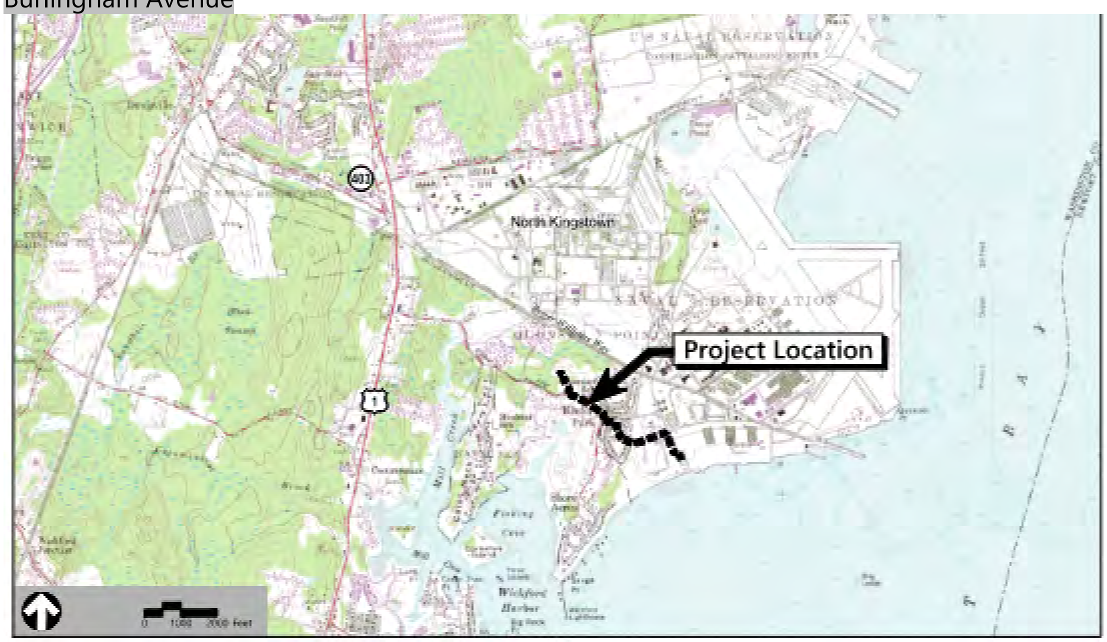
SECTION 1: SITE DESCRIPTION

1.1 Project/Site Information

- Proposed Onshore Transmission Facilities
- The Project consists of constructing 4,300 approximately linear feet of onshore transmission cable with associated manhole structures and splice vaults from the proposed Revolution Wind Onshore Substation at Camp Avenue to the Landfall Work Area within AP 185 Lots 001 and 004. The proposed transmission cable follows Camp Avenue within the existing pavement to its intersection with Shore Acres Avenue and then follows the grassed north shoulder of a private Access Drive to Circuit Drive where it then follows Circuit Drive within its existing pavement to Burlingham Avenue, then follows Burlingham within existing pavement to the Landfall Work Area. The proposed work is located within existing improved areas. The project is a linear project and will therefore not disturb all areas at once.

Project Street/Location:

- Camp Avenue, Shore Acres Avenue and then follows private Access Drive, Circuit Drive and Burlingham Avenue



The following are estimates of the construction site area:

- Total Project Area 2.2 acres
- Total Project Area to be Disturbed 2.2 acres

1.3 Natural Heritage Area Information

RIPDES CGP - Part III.H

Are there any Natural Heritage Areas being disturbed by the construction activity or will discharges be directed to the Natural Heritage Area as a result of the construction activity?

☐ Yes ☒ No

1.4 Historic Preservation/Cultural Resources

Are there any historic properties, historic cemeteries or cultural resources on or near the construction site?

☐ Yes ☒ No

Describe how this determination was made and summarize state or tribal review comments:

- Based on a desktop review of the Rhode Island Environmental Resource Map and the National Register of Historic Places.

SECTION 2: EROSION, RUNOFF, AND SEDIMENT CONTROL

RIPDES Construction General Permit – Part III.J.1

The purpose of erosion controls is to prevent sediment from being detached and moved by wind or the action of raindrop, sheet, rill, gully, and channel erosion. Properly installed and maintained erosion controls are the primary defense against sediment pollution.

Runoff controls are used to slow the velocity of concentrated water flows. By intercepting and diverting stormwater runoff to a stabilized outlet or treatment practice or by converting concentrated flows to sheet flow erosion and sedimentation are reduced.

Sediment controls are the last line of defense against moving sediment. The purpose is to prevent sediment from leaving the construction site and entering environmentally sensitive areas.

This section describes the set of control measures that will be installed before and during the construction project to avoid, mitigate, and reduce impacts associated with construction activity. Specific control measures and their applicability are contained in Section Four: Erosion Control Measures, Section Five: Runoff Control Measures, and Section Six: Sediment Control Measures of the *RI SESC Handbook*. The *RI SESC Handbook* can be found at the following address:

http://www.dem.ri.gov/soilerosion2014final.pdf

2.1 Avoid and Protect Sensitive Areas and Natural Features

Areas of existing and remaining vegetation and areas that are to be protected as identified in the Section 1.6 of the SESC Plan must be clearly identified on the SESC Site Plans for each Phase of Construction. Prior to any land disturbance activities commencing on the site, the Contractor shall physically mark limits of disturbance (LOD) on the site and any areas to be protected within the site, so that workers can clearly identify the areas to be protected.

Note:

The *Soil Survey of Rhode Island*, issued in 1980 is no longer available or supported. More information on site-specific soil data and maps for Rhode Island is available from the Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture through the Web Soil Survey. This information is available online at: http://websoilsurvey.nrcs.usda.gov.

Feature Requiring Protection	Construction Phase #	Method of Protection	Sheet #
Freshwater Wetland 1	1	compost filter sock	10

2.2 Minimize Area of Disturbance

Will >5 acres be disturbed in order to complete this project?

☐ Yes ☒ No

Will <5 acres be disturbed or will disturbance activities be completed within a six (6) month window?

☒ Yes ☐ No

The project proposes to install approximately 4,300 linear feet of underground cabling mostly within existing paved roadways. Therefore, it is a linear project that will be constructed in sections so there will be minimal land disturbance at any time during construction.

Based on the answers to the above questions will phasing be required for this project?

☐ Yes ☒ No

See above response.

PHASING PLAN

The following are estimates of each phase of the construction project:

Phase No. or Identifier	1
Total Area of Phase	2.2 acres
Area to be Disturbed	2.2 acres

Description of Construction Sequencing for Phase 1

1. Installation of control measures identifying limits of disturbance and areas internal to the site that require protection before start of land disturbance.
2. Installation of all erosion, runoff, and sediment controls and temporary pollution prevention measures that are required to be in place and functional before any earthwork begins. This shall be done in accordance with the RI SESC Handbook and/or the RI Department of Transportation Standard Specifications for Road and Bridge Construction (as amended). Upon acceptable completion of site preparation and installation of erosion, runoff, and sediment controls and temporary pollution prevention measures, site construction activities may commence.

3. Upon commencement of site construction activities, the operator shall initiate appropriate stabilization practices on all disturbed areas as soon as possible, but not more than fourteen (14) days after the construction activity in that area has temporarily or permanently ceased. Such temporary or permanent soil stabilization measures must be installed prior to initiating land disturbance in subsequent phases.
4. Routine inspection and maintenance and/or modification of erosion, runoff, and sediment controls and temporary pollution prevention measures while earthwork is ongoing is required.
5. Final site stabilization of any disturbed areas after earthwork has been completed and removal of temporary erosion, runoff, and sediment controls and temporary pollution prevention measures.

2.3 Minimize the Disturbance of Steep Slopes

Are steep slopes (>15%) present within the proposed project area?

☐ Yes ☒ No

2.4 Preserve Topsoil

Site owners and operators must preserve existing topsoil on the construction site to the maximum extent feasible and as necessary to support healthy vegetation, promote soil stabilization, and increase stormwater infiltration rates in the post-construction phase of the project.

Will existing topsoil be preserved at the site?

☒ Yes ☐ No

Most of the construction is within existing paved roadways so there will not be topsoil to stockpile. In existing grassed areas to be disturbed, topsoil will be removed, preserved on site, and then put back in place.

Soil compaction must be minimized by maintaining limits of disturbance throughout construction. In instances where site soils are compacted the site owner and operator must restore infiltration capacity of the compacted soils by tilling or scarifying compacted soils and amending soils as necessary to ensure a minimum depth of topsoil is available in these areas. In areas where infiltrating stormwater treatment practices are located compacted soils must be amended such that they will comply the design infiltration rates established in the *RI Stormwater Design and Installation Standards Manual*.

2.5 Stabilize Soils

Upon completion and acceptance of site preparation and initial installation of erosion, runoff, and sediment controls and temporary pollution prevention measures, the operator shall initiate appropriate temporary or permanent stabilization practices during all phases of construction on all disturbed areas as soon as possible, but not more than fourteen (14) days after the construction activity in that area has temporarily or permanently ceased.

Any disturbed areas that will not have active construction activity occurring within 14 days must be stabilized using the control measures depicted in the SESC Site Plans, in accordance with the *RI SESC Handbook*, and per manufacturer product specifications.

Only areas that can be reasonably expected to have active construction work being performed within 14 days of disturbance will be cleared/grubbed at any one time. It is NOT acceptable to clear and grub the entire construction site if portions will not be active within the 14-day time frame. Proper phasing of clearing and grubbing activities shall include temporary stabilization techniques for areas cleared and grubbed that will not be active within the 14-day time frame.

All disturbed soils exposed prior to October 15 of any calendar year shall be seeded by that date if vegetative measures are the intended soil stabilization method. Any such areas that do not have adequate vegetative stabilization, as determined by the site operator or designated inspector, by November 15, must be stabilized through the use of non-vegetative erosion control measures. If work continues within any of these areas during the period from October 15 through April 15, care must be taken to ensure that only the area required for that day's work is exposed, and all erodible soil must be restabilized within 5 working days. In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed (i.e. construction of a motocross track).

Temporary Vegetative Control Measures

- Seed for quick growing grasses such as wheat, rye or oats shall be planted when exposed areas are not active for 14 days. All permanent grass areas planted with temporary erosion control seed shall be over seeded with permanent seed mix. Apply seed mixture at a rate of 100 pounds per acre.

Seed	**% Weight**	**% Germination Minimum**
Winter Rye	80 Minimum	85
Red Fescue (Creeping)	4 Minimum	80
Perennial Rye Grass	3 Minimum	90
Red Clover	3 Minimum	90
Other Crop Grass	0.5 Maximum	
Noxious Weed Seed	0.5 Maximum	
Inert Matter	1.0 Maximum	

Temporary Non-Vegetative Control Measures

- See SESC-05 to SESC-14 plans for locations of siltsock.

Permanent Vegetative Control Measures

- Areas disturbed during construction and not restored to with impervious surface shall receive 4 inches of loam and seed.

Permanent Non-Vegetative Control Measures

- Permenant control measures are not required for this project beucase there is no change in ground cover or grading between existing and proposed conditions.

2.6 Protect Storm Drain Outlets

Temporary or permanent outlet protection must be used to prevent scour and erosion at discharge points through the protection of the soil surface, reduction in discharge velocities, and through the promotion of infiltration. Outlets often have high velocity, high volume flows, and require strong materials that will withstand the forces of stormwater. Storm drain outlet control measures also offer a last line of protection against sediment entering environmentally sensitive areas.

All stormwater outlets that may discharge sediment-laden stormwater flow from the construction site must be protected using the control practices depicted on the approved plan set and in accordance with the *RI SESC Handbook*.

Will temporary or permanent point source discharges be generated at the site as the result of construction of sediment traps or basins, diversions, and conveyance channels?

☐ Yes ☒ No

The project proposes to install approximately 4,300 linear feet of underground cabling mostly within existing paved roadways and does not require temporary or permanent stormwater outlets.

2.7 Establish Temporary Controls for the Protection of Post-Construction Stormwater Treatment Practices

Temporary measures shall be installed to protect permanent or long-term stormwater control and treatment measures as they are installed and throughout the construction phase of the project so that they will function properly when they are brought online.

Will long-term stormwater treatment practices be installed at the site?

☐ Yes ☒ No

- The project proposes to install approximately 4,300 linear feet of underground cabling mostly within existing paved roadways. There is no change in ground cover or grading between existing and proposed conditions. Therefore, the project does not required stormwater management.

2.8 Divert or Manage Run-on from Up-gradient Areas

Is stormwater from off-site areas anticipated to flow onto the project area or onto areas where soils will be disturbed?

☐ Yes ☒ No

Stormwater from off-site areas are not anticipated to flow thru the construction project.

2.9 Retain Sediment Onsite through Structural and Non-Structural Practices

SEDIMENT BARRIERS must be installed along the perimeter areas of the site that will receive stormwater from disturbed areas. This also may include the use of sediment barriers along the contour of disturbed slopes to maintain sheet flow and minimize rill and gully erosion during construction. Installation and maintenance of sediment barriers must be completed in accordance with the maintenance requirements specified by the product manufacturer or the *RI SESC Handbook*.

Will sediment barriers be utilized at the toe of slopes and other downgradient areas subject to stormwater impacts and erosion during construction?

☒ Yes ☐ No

Sediment barriers such as compost filter socks will be used downgradient of the utility trench.

Will sediment barriers be utilized along the contour of slopes to maintain sheet flow and minimize rill and gully erosion during construction?

☐ Yes ☒ No

The project proposes to install approximately 4,300 linear feet of underground cabling mostly within existing paved roadways. Therefore, there is no proposed disturbance on slopes that would require sediment barriers along the contour.

INLET PROTECTION will be utilized to prevent soil and debris from entering storm drain inlets. These measures are usually temporary and are implemented before a site is disturbed. ALL stormwater inlets &/or catch basins that are operational during construction and have the potential to receive sediment-laden stormwater flow from the construction site must be protected using control measures outlined in the *RI SESC Handbook*.

For more information on inlet protection refer to the *RI SESC Handbook*, Inlet Protection control measure.

Maintenance

The operator must clean, or remove and replace the inlet protection measures as sediment accumulates, the filter becomes clogged, and/or as performance is compromised. Accumulated sediment adjacent to the inlet protection measures should be removed by the end of the same work day in which it is found or by the end of the following work day if removal by the same work day is not feasible.

Do inlets exist adjacent to or within the project area that require temporary protection?

☒ Yes ☐ No

The following lists the proposed storm drain inlet types selected from Section Six of the *RI SESC Handbook*. Each row is unique for each phase and inlet protection type.

INLET PROTECTION			
Construction Phase #	Inlet Protection Type	Inlet Protection is labeled on Sheet #	Detail(s) is/are on Sheet #
1	Silt Sack, curb/drop inlet catch basin protection	05 of 14	04

CONSTRUCTION ENTRANCES

Will construction entrances be utilized at the proposed construction site?

☐ Yes ☒ No

The project proposes to install approximately 4,300 linear feet of underground cabling mostly within existing paved roadways therefore construction entrances will not be needed.

STOCKPILE CONTAINMENT will be used onsite to minimize or eliminate the discharge of soil, topsoil, base material or rubble, from entering drainage systems or surface waters. All stockpiles must be located within the limit of disturbance, protected from run-on with the use of temporary sediment barriers and provided with cover or stabilization to avoid contact with precipitation and wind where and when practical.

Stock pile management consists of procedures and practices designed to minimize or eliminate the discharge of stockpiled material (soil, topsoil, base material, rubble) from entering drainage systems or surface waters.

For any stockpiles or land clearing debris composed, in whole or in part, of sediment or soil, you must comply with the following requirements:

1. Locate piles within the designated limits of disturbance.
2. Protect from contact with stormwater (including run-on) using a temporary perimeter sediment barrier.
3. Where practicable, provide cover or appropriate temporary vegetative or structural stabilization to avoid direct contact with precipitation or to minimize sediment discharge.
4. NEVER hose down or sweep soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or surface water.
5. To the maximum extent practicable, contain and securely protect from wind.

STOCKPILE CONTAINMENT				
Construction Phase #	Run-on measures necessary? (yes/no)	Stabilization or Cover Type	Stockpile Containment Measure	Sheet #
1	No	Plastic	Compost filter sock	Contractor to add to plans

CONSTRUCTED SEDIMENT STRUCTURES

TEMPORARY SEDIMENT TRAPS will NOT be utilized onsite. There will be no disturbed drainage areas greater than one acre that will be exposed for longer than six months.

Are temporary sediment traps required at the site?

☐ Yes ☒ No

The project proposes to install approximately 4,300 linear feet of underground cabling mostly within existing paved roadways therefore traps are not required.

2.10 Properly Design Constructed Stormwater Conveyance Channels

Are temporary stormwater conveyance practices required in order to properly manage runoff within the proposed construction project?

☐ Yes ☒ No

The project proposes to install approximately 4,300 linear feet of underground cabling mostly within existing paved roadways temporary stormwater conveyance practices are not required.

2.11 Erosion, Runoff, and Sediment Control Measure List

It is expected that this table and corresponding Inspection Reports will be amended as needed throughout the construction project as control measures are added or modified.

Phase No. #		
Location/Station	**Control Measure Description/Reference**	**Maintenance Requirement**
Downgradient of utility trench Compost filter sock	Compost Tube. Section Six, Sediment Control Measures, Straw Wattles, Compost Tubes and Fiber Rolls - *RI SESC Handbook*.	Inspection should be made after each storm event or 1/week and repair or replacement should be made promptly as needed. Cleanout of accumulated sediment behind the wattle if sediment accumulates to at least ½ the distance between the top of wattle and ground surface.
Downgradient Existing Catch Basins Silt Sack /Curb Inlet/Drop Inlet Catch Basin Protection	Stone Stabilized Pad. Section Six: Sediment Control Measures – Construction Entrances –*RI SESC Handbook*.	The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto pave surfaces. Provide periodic top dressing with additional stone or additional length as conditions demand. Roads adjacent to entrance shall be clean at the end of each day. If maintenance alone is not enough to prevent excessive track out, increase length of entrance, modify construction access road surface, or install washrack or mudrack.

SECTION 3: CONSTRUCTION ACTIVITY POLLUTION PREVENTION

The purpose of construction activity pollution prevention is to prevent day to day construction activities from causing pollution.

This section describes the key pollution prevention measures that must be implemented to avoid and reduce the discharge of pollutants in stormwater. Example control measures include the proper management of waste, material handling and storage, and equipment/vehicle fueling/washing/maintenance operations.

Where applicable, include *RI SESC Handbook* or the *RI Department of Transportation Standard Specifications for Road and Bridge Construction* (as amended) specifications.

3.1 Existing Data of Known Discharges from Site

Are there known discharges from the project area?

☐ Yes ☒ No

Describe how this determination was made:

The project proposes to install approximately 4,300 linear feet of underground cabling mostly within existing paved roadways therefore there are no discharges from the project area.

Is there existing data on the quality of the known discharges?

☐ Yes ☒ No

3.2 *Prohibited Discharges*

The following discharges are prohibited at the construction site:

- Contaminated groundwater, unless specifically authorized by the DEM. These types of discharges may only be authorized under a separate DEM RIPDES permit.
- Wastewater from washout of concrete, unless the discharge is contained and managed by appropriate control measures.
- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials.
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance. Proper storage and spill prevention practices must be utilized at all construction sites.
- Soaps or solvents used in vehicle and equipment washing.
- Toxic or hazardous substances from a spill or other release.

All types of waste generated at the site shall be disposed of in a manner consistent with State Law and/or regulations.

Will any of the above listed prohibited discharges be generated at the site?

☒ Yes ☐ No

Waste water from concrete washout will be contained and properly store. Spill prevention practices will be implemented onsite. Dewatering is anticipated in areas of deep excavations and high groundwater. Groundwater is contaminated and will be treated by the project’s Remediation General Permit

3.3 *Proper Waste Disposal*

Building materials and other construction site wastes must be properly managed and disposed of in a manner consistent with State Law and/or regulations.

- A waste collection area shall be designated on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a waterbody or storm drain.
- All waste containers shall be covered to avoid contact with wind and precipitation.
- Waste collection shall be scheduled frequently enough to prevent containers from overfilling.
- All construction site wastes shall be collected, removed, and disposed of in accordance with applicable regulatory requirements and only at authorized disposal sites.
- Equipment and containers shall be checked for leaks, corrosion, support or foundation failure, or other signs of deterioration. Those that are found to be defective shall be immediately repaired or replaced.

Is waste disposal a significant element of the proposed project?

☐ Yes ☒ No

The project proposes to install approximately 4,300 linear feet of underground cabling mostly within existing paved roadways therefore waste disposal will not be a significant element of the project.

3.4 Spill Prevention and Control

All chemicals and/or hazardous waste material must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. All areas where potential spills can occur and their accompanying drainage points must be described. The owner and operator must establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. The operator must establish and make highly visible location(s) for the storage of spill prevention and control equipment and provide training for personnel responsible for spill prevention and control on the construction site.

Are spill prevention and control measures required for this particular project?

☐ Yes ☒ No

The project proposes to install approximately 4,300 linear feet of underground cabling mostly within existing paved roadways therefore spill prevention and control measures are required for this project.

3.5 Control of Allowable Non-Stormwater Discharges

Are there allowable non-Stormwater discharges present on or near the project area?

☐ Yes ☒ No

Allowable non-storm water discharges, which are described in the General Permit, that may reasonably be expected to be present and to be mixed with storm water discharges include water for control of dust, discharge of clean groundwater from excavations after treatment, and firefighting activities. Contractor to provide additional discharges and control measures if applicable.

Are there any known or proposed contaminated discharges, including anticipated contaminated dewatering operations, planned on or near the project area?

☐ Yes ☒ No

3.6 Control Dewatering Practices

Site owners and operators are prohibited from discharging groundwater or accumulated stormwater that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation, unless such waters are first effectively managed by appropriate control measures.

Examples of appropriate control measures include, but are not limited to, temporary sediment basins or sediment traps, sediment socks, dewatering tanks and bags, or filtration systems (e.g. bag or sand filters) that are designed to remove sediment. Uncontaminated, non-turbid dewatering water can be discharged without being routed to a control.

At a minimum the following discharge requirements must be met for dewatering activities:

1. Do not discharge visible floating solids or foam.

2. To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. In no case will surface waters be considered part of the treatment area.

3. At all points where dewatering water is discharged, utilize velocity dissipation devices.

4. With filter backwash water, either haul it away for disposal or return it to the beginning of the treatment process.

5. Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.

6. Dewatering practices must involve the implementation of appropriate control measures as applicable (i.e. containment areas for dewatering earth materials, portable sediment tanks and bags, pumping settling basins, and pump intake protection.)

Is it at all likely that the site operator will need to implement construction dewatering in order to complete the proposed project?

☒ Yes ☐ No

Dewatering is anticipated in areas of deep excavations and high groundwater. Groundwater is contaminated and will be treated by the projects Remediation General Permit.

3.7 Establish Proper Building Material Staging Areas

All construction materials that have the potential to contaminate stormwater must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. Designated areas shall be approved by the site owner/engineer. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in the discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

The project proposes to install approximately 4,300 linear feet of underground cabling. Anticipated materials stored on site are conduit pipe and spacers. The contractor shall mark up the SESC plans where they expect to stockpile materials.

3.8 Minimize Dust

Dust control procedures and practices shall be used to suppress dust on a construction site during the construction process, as applicable. Precipitation, temperature, humidity, wind velocity and direction will determine amount and frequency of applications. However, the best method of controlling dust is to prevent dust production. This can best be accomplished by limiting the amount of bare soil exposed at one time. Dust Control measures outlined in the *RI SESC Handbook* shall be followed. Other dust control methods include watering, chemical application, surface roughening, wind barriers, walls, and covers.

Fugitive dust will be controlled by applying water using a water truck with a rear sprayer or other similar device in a manner which does not result in the creation of runoff.

3.9 Designate Washout Areas

At no time shall any material (concrete, paint, chemicals) be washed into storm drains, open ditches, streets, streams, wetlands, or any environmentally sensitive area. The site operator must ensure that construction waste is properly disposed of, to avoid exposure to precipitation, at the end of each working day.

Will washout areas be required for the proposed project?

☒ Yes ☐ No

Concrete wash outs shall be used for management of concrete waste. Concrete and concrete washout water shall not be deposited or discharged directly on the ground, or in catch basins or other drainage structures. The contractor shall locate concrete washouts areas as shown on the SESC Site Plans. Following the completion of concrete pouring operations, the wash outs shall be disposed of off-site with other construction debris.

3.10 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices

Vehicle fueling shall not take place within regulated wetlands or buffer zone areas, or within 50-feet of the storm drain system. Designated areas shall be depicted on the SESC Site Plans, or shall be approved by the site owner.

Vehicle maintenance and washing shall occur off-site, or in designated areas depicted on the SESC Site Plans or approved of by the site owner. Maintenance or washing areas shall not be within regulated wetlands or buffer zone areas, or within 50-feet of the storm drain system. Maintenance areas shall be clearly designated, and barriers shall be used around the perimeter of the maintenance area to prevent stormwater contamination.

Construction vehicles shall be inspected frequently for leaks. Repairs shall take place immediately. Disposal of all used oil, antifreeze, solvents and other automotive-related chemicals shall be according to applicable regulations; at no time shall any material be washed down the storm drain or in to any environmentally sensitive area.

- When refueling vehicles, Company personnel or contractors at field locations shall bring vehicles or equipment (except for fixed equipment such as drill rigs) to an access area outside of environmentally sensitive areas (such as waterways, wetlands, buffer zones or drinking water sources), or as specified in permit conditions. A paved area such as a parking lot or roadway is preferred, to minimize the possibility of spill or release to the environment. The driver shall take all usual and reasonable environmental and safety precautions during refueling, such as connecting a safety grounding strap between the fuel tank and vehicle or equipment being refueled. The driver shall frequently check for fuel spills, drips, or seeps during the refueling operation. Small equipment such as pumps and generators shall be placed in small swimming pools or on absorbent blankets/pads, to contain any accidental fuel spills.
- Routine vehicle maintenance shall not be conducted on project sites.
- When other vehicle or equipment maintenance operations (such as emergency repairs) occur, company personnel or contractors at field locations shall bring vehicles or equipment to an access location a minimum of 100 feet away from catch basins. A paved area, such as a parking lot or roadway, is a preferred field maintenance location to minimize the possibility of spills or releases to the environment. Crews shall take all usual and reasonable environmental precautions during repair or maintenance operations. Precautions shall be taken to prevent oil or hazardous material release to the environment. These precautions include (but are not limited to) deployment of portable basins or similar secondary containment devices, use of ground covers, such as plastic tarpaulins, etc.
- Cleaning of tools and equipment shall be conducted away from drainage catchments to the maximum extent possible. A paved area such as a parking lot or roadway is preferred, to minimize the possibility of spill or release to the environment. Crews shall wipe up all minor drips or spills of grease and oil at field locations.

- The Contractor shall designate areas on the SESC Site Plans at least 100 feet away from drainage catchments.

3.11 Chemical Treatment for Erosion and Sediment Control

Chemical stabilizers, polymers, and flocculants are readily available on the market and can be easily applied to construction sites for the purposes of enhancing the control of erosion, runoff, and sedimentation. The following guidelines should be adhered to for construction sites that plan to use treatment chemicals as part of their overall erosion, runoff, and sedimentation control strategy.

The U.S. Environmental Protection Agency has conducted research into the relative toxicity of chemicals commonly used for the treatment of construction stormwater discharges. The research conducted by the EPA focused on different formulations of chitosan, a cationic compound, and both cationic and anionic polyacrylamide (PAM). In summary, the studies found significant toxicity resulting from the use of chitosan and cationic PAM in laboratory conditions, and significantly less toxicity associated with using anionic PAM. EPA's research has led to the conclusion that the use of treatment chemicals for erosion, runoff, and sedimentation control requires proper operator training and appropriate usage to avoid risk to aquatic species. In the case of cationic treatment chemicals additional safeguards may be necessary.

Application/Installation Minimum Requirements

If a site operator plans to use polymers, flocculants, or other treatment chemicals during construction the SESC plan must address the following:

1. Treatment chemicals shall not be applied directly to or within 100 feet of any surface water body, wetland, or storm drain inlet.

2. Use conventional erosion, runoff, and sedimentation controls prior to and after the application of treatment chemicals. Use conventional erosion, runoff, and sedimentation controls prior to chemical addition to ensure effective treatment. Chemicals may only be applied where treated stormwater is directed to a sediment control (e.g. temporary sediment basin, temporary sediment trap or sediment barrier) prior to discharge.
3. Sites shall be stabilized as soon as possible using conventional measures to minimize the need to use chemical treatment.

4. Select appropriate treatment chemicals. Chemicals must be selected that are appropriately suited to the types of soils likely to be exposed during construction and to the expected turbidity, pH, and flow rate of stormwater flowing into the chemical treatment system or treatment area. **Soil testing is essential. Using the wrong form of chemical treatment will result in some form of performance failure and unnecessary environmental risk.**

5. Minimize discharge risk from stored chemicals. Store all treatment chemicals in leak-proof containers that are kept under storm-resistant cover and surrounded by secondary containment structures (e.g., spill berms, decks, spill containment pallets), or provide equivalent measures, designed and maintained to minimize the potential discharge of treatment chemicals in stormwater or by any other means (e.g., storing chemicals in covered areas or having a spill kit available on site).

6. Use chemicals in accordance with good engineering practices and specifications of the chemical provider/supplier. You must also use treatment chemicals and chemical treatment systems in accordance with good engineering practices, and with dosing specifications and sediment removal design specifications provided by the supplier of the applicable chemicals, or document specific departures from these practices or specifications and how they reflect good engineering practice.

Will chemical stabilizers, polymers, flocculants or other treatment chemicals be utilized on the proposed construction project?

☐ Yes ☒ No

3.12 Construction Activity Pollution Prevention Control Measure List

It is expected that this table will be amended as needed throughout the construction project.

Phase No. 1		
Location/Station	**Control Measure Description/Reference**	**Maintenance Requirement**
Concrete duct bank pouring SESC 05 to 14	Prefabricated Concrete Washout Container with Ramp. Used to contain concrete washout during concrete pouring operations. Section Three: Pollution Prevention and Good Housekeeping, Concrete Washouts, *RI SESC Handbook*.	Verify that concrete washout container(s) are in place prior to pouring concrete. Inspect daily to verify continued proper performance. Check remaining capacity during pouring operations. Check for leaks periodically.

SECTION 4: CONTROL MEASURE INSTALLATION, INSPECTION, and MAINTENANCE

1.1 Installation

Complete the installation of temporary erosion, runoff, sediment, and pollution prevention control measures by the time each phase of earth-disturbance has begun. All stormwater control measures must be installed in accordance with good judgment, including applicable design and manufacturer specifications. Installation techniques and maintenance requirements may be found in manufacturer specifications and/or the *RI SESC Handbook*.

See SECS-05thru SESC-14.

1.2 Monitoring Weather Conditions

Anticipating Weather Events - Care will be taken to the best of the operator's ability to avoid disturbing large areas prior to anticipated precipitation events. Weather forecasts must be routinely checked, and in the case of an expected precipitation event of over 0.25-inches over a 24-hour period, it is highly recommended that all control measures should be evaluated and maintained as necessary, prior to the weather event. In the case of an extreme weather forecast (greater than one-inch of rain over a 24-hour period), additional erosion/sediment controls may need to be installed.

Storm Event Monitoring For Inspections - At a minimum, storm events must be monitored and tracked in order to determine when post-storm event inspections must be conducted. Inspections must be conducted and documented at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event, which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff or snowmelt.

The weather gauge station and website that will be utilized to monitor weather conditions on the construction site is as follows:

www.wunderground.com
Station ID: KRINORTH87
Location: North Kingstown, RI
Lat: 41° 32' 60" N (41.55), Long: 71° 27' 36" E (71.46)
Elevation: (41.55), (71.46)

1.3 Inspections

Minimum Frequency - Each of the following areas must be inspected by or under the supervision of the owner and operator at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event, which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff or snowmelt:

a. All areas that have been cleared, graded, or excavated and where permanent stabilization has not been achieved;

b. All stormwater erosion, runoff, and sediment control measures (including pollution prevention control measures) installed at the site;

c. Construction material, unstabilized soil stockpiles, waste, borrow, or equipment storage, and maintenance areas that are covered by this permit and are exposed to precipitation;

d. All areas where stormwater typically flows within the site, including temporary drainage ways designed to divert, convey, and/or treat stormwater;

e. All points of discharge from the site;

f. All locations where temporary soil stabilization measures have been implemented;

g. All locations where vehicles enter or exit the site.

Reductions in Inspection Frequency - If earth disturbing activities are suspended due to frozen conditions, inspections may be reduced to a frequency of once per month. The owner and operator must document the beginning and ending dates of these periods in an inspection report.

Qualified Personnel – The site owner and operator are responsible for designating personnel to conduct inspections and for ensuring that the personnel who are responsible for conducting the inspections are "qualified" to do so. A "qualified person" is a person knowledgeable in the principles and practices of erosion, runoff, sediment, and pollution prevention controls, who possesses the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of the permit.

Recordkeeping Requirements - All records of inspections, including records of maintenance and corrective actions must be maintained with the SESC Plan. Inspection records must include the date and time of the inspection, and the inspector's name, signature, and contact information.

General Notes

- A separate inspection report will be prepared for each inspection.

- The Inspection Reference Number shall be a combination of the RIPDES Construction General Permit No - consecutively numbered inspections. ex/ Inspection reference number for the **4**th inspection of a project would be: RIR10####-**4**

- Each report will be signed and dated by the Inspector and must be kept onsite.

- Each report will be signed and dated by the Site Operator.

- The corrective action log contained in each inspection report must be completed, signed, and dated by the site operator once all necessary repairs have been completed.

- It is the responsibility of the site operator to maintain a copy of the SESC Plan, copies of all completed inspection reports, and amendments as part of the SESC Plan documentation at the site during construction.

Failure to make and provide documentation of inspections and corrective actions under this part constitutes a violation of your permit and enforcement actions under 46-12 of R.I. General Laws may result.

1.4 Maintenance

Maintenance procedures for erosion and sedimentation controls and stormwater management structures/facilities are described on the SESC Site Plans and in the *RI SESC Handbook*.

Site owners and operators must ensure that all erosion, runoff, sediment, and pollution prevention controls remain in effective operating condition and are protected from activities that would reduce their effectiveness. Erosion, runoff, sedimentation, and pollution prevention control measures must be maintained throughout the course of the project.

Note: It is recommended that the site operator designates a full-time, on-site contact person responsible for working with the site owner to resolve SESC Plan-related issues.

1.5 Corrective Actions

If, in the opinion of the designated site inspector, corrective action is required, the inspector shall note it on the inspection report and shall inform the site operator that corrective action is necessary. The site operator must make all necessary repairs whenever maintenance of any of the control measures instituted at the site is required.

In accordance with the *RI SESC Handbook*, the site operator shall initiate work to fix the problem immediately after its discovery, and complete such work by the close of the next work day, if the problem does not require significant repair or replacement, or if the problem can be corrected through routine maintenance.

When installation of a new control or a significant repair is needed, site owners and operators must ensure that the new or modified control measure is installed and made operational by no later than seven (7) calendar days from the time of discovery where feasible. If it is infeasible to complete the installation or repair within seven (7) calendar days, the reasons why it is infeasible must be documented in the SESC Plan along with the schedule for installing the control measures and making it operational as soon as practicable after the 7-day timeframe. Such documentation of these maintenance procedures and timeframes should be described in the inspection report in which the issue was first documented. If these actions result in changes to any of the control measures outlined in the SESC Plan, site owners and operators must also modify the SESC Plan accordingly within seven (7) calendar days of completing this work.

SECTION 5: AMENDMENTS

This SESC Plan is intended to be a working document. It is expected that amendments will be required throughout the active construction phase of the project. **Even if practices are installed on a site according to the approved plan, the site is only in compliance when erosion, runoff, and sedimentation are effectively controlled throughout the entire site for the entire duration of the project.**

The SESC Plan shall be amended within seven (7) days whenever there is a change in design, construction, operation, maintenance or other procedure which has a significant effect on the potential for the discharge of pollutants, or if the SESC Plan proves to be ineffective in achieving its objectives (i.e. the selected control measures are not effective in controlling erosion or sedimentation).

In addition, the SESC Plan shall be amended to identify any new operator that will implement a component of the SESC Plan.

All revisions must be recorded in the Record of Amendments Log Sheet, which is contained in Attachment G of this SESC Plan, and dated red-lined drawings and/or a detailed written description must be appended to the SESC Plan. Inspection Forms must be revised to reflect all amendments. Update the Revision Date and the Version # in the footer of the Report to reflect amendments made.

All SESC Plan Amendments, except minor non-technical revisions, must be approved by the site owner and operator. Any amendments to control measures that involve the practice of engineering must be reviewed, signed, and stamped by a Professional Engineer registered in the State of RI.

The amended SESC plan must be kept on file at the site while construction is ongoing and any modifications must be documented.

Attach a copy of the Amendment Log.

Reference RI Model SESC Plan ATTACHMENT G

SECTION 6: RECORDKEEPING

RIPDES Construction General Permit – Parts III.D, III.G, III.J.3.b.iii, & V.O

It is the site owner and site operator's responsibility to have the following documents available at the construction site and immediately available for RIDEM review upon request:

- A copy of the fully signed and dated SESC Plan, which includes:
    - A copy of the General Location Map
      INCLUDED AS ATTACHMENT A
    - A copy of all SESC Site Plans
      INCLUDED AS ATTACHMENT B

- A copy of the RIPDES Construction General Permit *(To save paper and file space, do not include in DEM/CRMC submittal, for operator copy only)*
  INCLUDED AS ATTACHMENT C
- A copy of any regulatory permits (RIDEM Freshwater Wetlands Permit, CRMC Assent, RIDEM Water Quality Certification, RIDEM Groundwater Discharge Permit, RIDEM RIPDES Construction General Permit authorization letter, etc.)
  INCLUDED AS ATTACHMENT D
- The signed and certified NOI form or permit application form *(if required as part of the application, see RIPDES Construction General Permit for applicability)*
  INCLUDED AS ATTACHMENT E
- Completed Inspection Reports w/Completed Corrective Action Logs
  INCLUDED AS ATTACHMENT F
- SESC Plan Amendment Log
  INCLUDED AS ATTACHMENT G

SECTION 7: PARTY CERTIFICATIONS

RIPDES Construction General Permit – Part V.G

All parties working at the project site are required to comply with the Soil Erosion and Sediment Control Plan (SESC Plan including SESC Site Plans) for any work that is performed on-site. The site owner, site operator, contractors and sub-contractors are encouraged to advise all employees working on this project of the requirements of the SESC Plan. A copy of the SESC Plan is available for your review at the following location: Contractor to Insert Onsite Location Here, or may be obtained by contacting the site owner or site operator.

The site owner and site operator and each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement.

I acknowledge that I have read and understand the terms and conditions of the Soil Erosion and Sediment Control (SESC) Plan for the above designated project and agree to follow the control measures described in the SESC Plan and SESC Site Plans.

Site Owner:

Revolution Wind, LLC
c/o Kenneth Bowes
56 Exchange Terrace, Suite 300
Providence, RI 02903
860.883.5830, Kenneth.bowes@eversource.com

____
signature/date

Site Operator:

Insert Company or Organization Name
Insert Name & Title
Insert Address
Insert City, State, Zip Code
Insert Telephone Number, Insert Fax/Email

____
signature/date

Designated Site Inspector:

Insert Company or Organization Name
Insert Name & Title
Insert Address
Insert City, State, Zip Code
Insert Telephone Number, Insert Fax/Email

____
signature/date

SubContractor SESC Plan Contact:

Insert Company or Organization Name
Insert Name & Title
Insert Address
Insert City, State, Zip Code
Insert Telephone Number, Insert Fax/Email

____
signature/date

LIST OF ATTACHMENTS

SESC Plan Inspection Report

Project Information			
Name	Onshore Transmission Facilities		
Location	Camp Avenue, North Kingstown RI		
DEM Permit No.			
Site Owner	Name	Phone	Email
Site Operator	Name	Phone	Email
Inspection Information			
Inspector Name	Name	Phone	Email
Inspection Date		Start/End Time	
Inspection Type ❑ Weekly ❑ Pre-storm event ❑ During storm event ❑ Post-storm event ❑ Other			
Weather Information			
Last Rain Event Date: Duration (hrs): Approximate Rainfall (in):			
Rain Gauge Location & Source:			
Weather at time of this inspection:			

Check statement that applies then sign and date below:

☐ I, as the designated Inspector, certify that this site has been inspected as required by regulation and I have determined that maintenance and corrective actions are not required at this time.

☐ I, as the designated Inspector, certify that this site has been inspected as required by regulation and I have made the determination that the site requires corrective actions. The required corrective actions are noted within this inspection report.

Inspector:	Print Name	Signature	Date

The Site Operator acknowledges by his/her signature, the receipt of this SESC Plan inspection report and its findings. He/she acknowledges that all recommended corrective actions must be completed and documentation of all such corrective actions must be made in this inspection report per applicable regulations.

Operator:	Print Name	Signature	Date

Site-specific Control Measures

Number the structural and non-structural stormwater control measures identified in the SESC Plan and on the SESC Site Plans and list them below (add as necessary). Bring a copy of this inspection form and any applicable SESC Site Plans with you during your inspections. This list will assist you to inspect all control measures at your site.

FILL THIS TABLE USING THE SESC PLAN TABLES 2.11 & 3.12.

	Location/Station	**Control Measure Description**	**Installed & Operating Properly?**	**Assoc. Photo/ Figure #**	**Corrective Action Needed (Yes or No; if 'Yes', please detail action required)**
1	Downgradient of utility trench Compost filter sock	Compost Tube. Section Six, Sediment Control Measures, Straw Wattles, Compost Tubes and Fiber Rolls - *RI SESC Handbook*.	❑Yes ❑No		
2	Downgradient Existing Catch Basins Silt Sack /Curb Inlet/Drop Inlet Catch Basin Protection	Stone Stabilized Pad. Section Six: Sediment Control Measures – Construction Entrances –*RI SESC Handbook*.	❑Yes ❑No		
3	Concrete duct bank pouring SESC X to Y	Prefabricated Concrete Washout Container with Ramp. Used to contain concrete washout during concrete pouring operations. Section Three: Pollution Prevention and Good Housekeeping, Concrete Washouts, *RI SESC Handbook*.	❑Yes ❑No		
4			❑Yes ❑No		
5			❑Yes ❑No		
6	**Attention Operator:**	**You must modify this inspection form as the project progresses, control measure locations change, and amendments to the SESC Plan are instituted in the field.**	❑Yes ❑No		
7			❑Yes ❑No		
8			❑Yes ❑No		
9			❑Yes ❑No		

	Location/Station	**Control Measure Description**	**Installed & Operating Properly?**	**Assoc. Photo/ Figure #**	**Corrective Action Needed (Yes or No; if 'Yes', please detail action required)**
10			❑Yes ❑No		
11			❑Yes ❑No		
12			❑Yes ❑No		
13			❑Yes ❑No		
14			❑Yes ❑No		
15			❑Yes ❑No		
16			❑Yes ❑No		
17			❑Yes ❑No		
18			❑Yes ❑No		
19			❑Yes ❑No		
20			❑Yes ❑No		
21			❑Yes ❑No		
22			❑Yes ❑No		
23			❑Yes ❑No		
24			❑Yes ❑No		
25			❑Yes ❑No		

	Location/Station	**Control Measure Description**	**Installed & Operating Properly?**	**Assoc. Photo/ Figure #**	**Corrective Action Needed (Yes or No; if 'Yes', please detail action required)**
26			❑Yes ❑No		
27			❑Yes ❑No		
28			❑Yes ❑No		
29			❑Yes ❑No		
30			❑Yes ❑No		

(add more as necessary)

General Site Issues

Below are some general site issues that should be assessed during inspections. Please ***customize*** *this list as needed for conditions at the site.*

	Compliance Question		Assoc. Photo/ Figure #	Corrective Action Needed (If 'Yes', please detail action required and include location/station)
1	Have all control measures been installed as specified in the RISESC Handbook and prior to any earth disturbing activities?	❑Yes ❑No ❑ N/A		
2	Are appropriate limits of disturbance (LOD) established?	❑Yes ❑No ❑ N/A		
3	Are controls that limit runoff from exposed soils by diverting, retaining, or detaining flows (such as check dams, sediment basins, etc.) in place?	❑Yes ❑No ❑ N/A		
4	Are all temporary conveyance practices installed correctly and functioning as designed?	❑Yes ❑No ❑ N/A		
5	Has maintenance been performed as required to ensure continued proper function of all temporary conveyances practices?	❑Yes ❑No ❑ N/A		
6	Were all exposed soils seeded by October 15th?	❑Yes ❑No ❑ N/A		
7	Have soils been stabilized where earth disturbance activities have permanently or temporarily ceased on any portion of the site and will not resume for more than 14 days?	❑Yes ❑No ❑ N/A		
8	In instances where adequate vegetative stabilization was not established by November 15th, have non-vegetative erosion control measures must be employed?	❑Yes ❑No ❑ N/A		
9	If work is to continue from October 15th through April 15th, are steps taken to ensure that only the day's work area will be exposed and all erodible soil is stabilized within 5 working days?	❑Yes ❑No ❑ N/A		
10	Have inlet protection measures (such as fabric drop inlet protection, curb drop inlet protection, etc.) been properly installed?	❑Yes ❑No ❑ N/A		
11	Has the operator cleaned and maintained inlet protection measures when needed?	❑Yes ❑No ❑ N/A		
12	Has the operator removed accumulated sediment adjacent to inlet protection measures within 24 hours of detection?	❑Yes ❑No ❑ N/A		

	Compliance Question		**Assoc. Photo/ Figure #**	**Corrective Action Needed (If 'Yes', please detail action required and include location/station)**
13	Has the operator properly installed outlet protection (such as riprap, turf mats, etc.) at all temporary and permanent discharge points?	❑Yes ❑No ❑ N/A		
14	Are all outlet protection measures functioning properly in order to reduce discharge velocity, promote infiltration, and eliminate scour?	❑Yes ❑No ❑ N/A		
15	Have all discharge points been inspected to ensure the prevention of scouring and channel erosion?	❑Yes ❑No ❑ N/A		
16	Have sediment controls been installed along perimeter areas that will receive stormwater from earth disturbing activities?	❑Yes ❑No ❑ N/A		
17	Is the operator maintaining sediment controls in accordance with the requirements in the *RI SESC Handbook*?	❑Yes ❑No ❑ N/A		
18	Have temporary sediment barriers been installed around permanent infiltration areas (such as bioretention areas, infiltration basins, etc.)?	❑Yes ❑No ❑ N/A		
19	Have staging areas and equipment routing been implemented to avoid compaction where permanent infiltration areas will be located?	❑Yes ❑No ❑ N/A		
20	Are surface outlet structures (such as skimmers, siphons, etc.) installed for each temporary sediment basin? [Exception: frozen conditions]	❑Yes ❑No ❑ N/A		
21	Have all temporary sediment basins or traps been inspected and maintained as required to ensure proper function?	❑Yes ❑No ❑ N/A		
22	Does the project include the use of polymers, flocculants, or other chemicals to control erosion, sedimentation, or runoff from the site?	❑Yes ❑No ❑ N/A		
23	Are all chemicals being managed in accordance with Appendix J of the *RISESC Handbook* and current best management practices?	❑Yes ❑No ❑ N/A		
24	Has the site operator taken steps to **prohibit** the following pollutant discharges on the site?			
a	Contaminated groundwater.	❑Yes ❑No ❑ N/A		

	Compliance Question		Assoc. Photo/ Figure #	Corrective Action Needed (If 'Yes', please detail action required and include location/station)
b	Wastewater from washout of concrete; unless properly contained, managed, and disposed of.	❑Yes ❑No ❑ N/A		
c	Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction products.	❑Yes ❑No ❑ N/A		
d	Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance.	❑Yes ❑No ❑ N/A		
e	Soaps or solvents used in vehicle and equipment washing.	❑Yes ❑No ❑ N/A		
f	Toxic or hazardous substances from a spill or other release.	❑Yes ❑No ❑ N/A		
25	Is the operator using properly constructed entrances/exits to the site so sediment removal occurs prior to vehicles exiting?	❑Yes ❑No ❑ N/A		
26	If needed, are additional controls (such as rumble strips, rattle plates, etc.) in place to remove sediment from tires prior to exiting?	❑Yes ❑No ❑ N/A		
27	Is sediment track-out being removed by the end of the same workday in which it occurs (via sweeping, shoveling, or vacuuming)?	❑Yes ❑No ❑ N/A		
28	Are all wastes generated at the site being managed and properly disposed of by the end of each workday?	❑Yes ❑No ❑ N/A		
29	Are all chemicals and hazardous waste materials stored properly in covered areas and surrounded by containment control systems?	❑Yes ❑No ❑ N/A		
30	Has the operator established highly visible locations for the storage of spill prevention and control equipment on the construction site?	❑Yes ❑No ❑ N/A		
31	Are allowable non-stormwater discharges being managed properly with adequate controls?	❑Yes ❑No ❑ N/A		
32	Is the site operator properly managing groundwater or stormwater that is removed from excavations, trenches, or similar points of accumulation?	❑Yes ❑No ❑ N/A		
33	Are proper procedures and controls in place for the storage of materials that may discharge pollutants if	❑Yes ❑No ❑ N/A		

	Compliance Question		Assoc. Photo/ Figure #	Corrective Action Needed (If 'Yes', please detail action required and include location/station)
	exposed to stormwater?			
	Are stockpiles located within the limits of disturbance?	❑Yes ❑No ❑ N/A		
	Are stockpiles being protected from contact with stormwater using a temporary sediment barrier?	❑Yes ❑No ❑ N/A		
	Where needed, has cover or appropriate temporary vegetative or structural stabilization been utilized for stockpiles?	❑Yes ❑No ❑ N/A		
	Is the operator effectively managing the generation of dust through the use of water, chemicals, or minimization of exposed soil?	❑Yes ❑No ❑ N/A		
	Are designated washout areas (such as wheel washing stations, washout for concrete, paint, stucco, etc.) clearly marked on the site?	❑Yes ❑No ❑ N/A		
	Are vehicle fueling and maintenance areas properly located to prevent pollutants from impacting stormwater and sensitive receptors?	❑Yes ❑No ❑ N/A		
	(Other)			

(add more as necessary)

General Field Comments:

Photos:

(Associated photos – each photo should be dated and have a unique identification # and written description indicating where it is located within the project area. If a close up photo is required, it should be preceded with a photo including both the detail area and some type of visible fixed reference point. Photos should be annotated with Station numbers and other identifying information where needed.)

Photo #:	Station:
(insert Photo here)	Description:

Photo #:	Station:
(insert Photo here)	Description:

Photo #:	Station:
(insert Photo here)	Description:

Photo #:	Station:
(insert Photo here)	Description:

Photo #:	Station:
(insert Photo here)	Description:

Photo #:	Station:
(insert Photo here)	Description:

(add more as necessary)

Corrective Action Log

TO BE FILLED OUT BY SITE OPERATOR

Describe repair, replacement, and maintenance of control measures, actions taken, date completed, and note the person that completed the work.

	Location/Station	Corrective Action	Date Completed	Person Responsible

Operator Signature:		**Date:**

Amendment Log

TO BE FILLED OUT BY SITE OPERATOR

Describe amendment(s) to be made to the SESC Plan, the date, and the person/title making the amendment. ALL amendments must be approved by the Site Owner.

#	Date	Description of Amendment	Amended by: Person/Title	Site Owner Must Initial
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

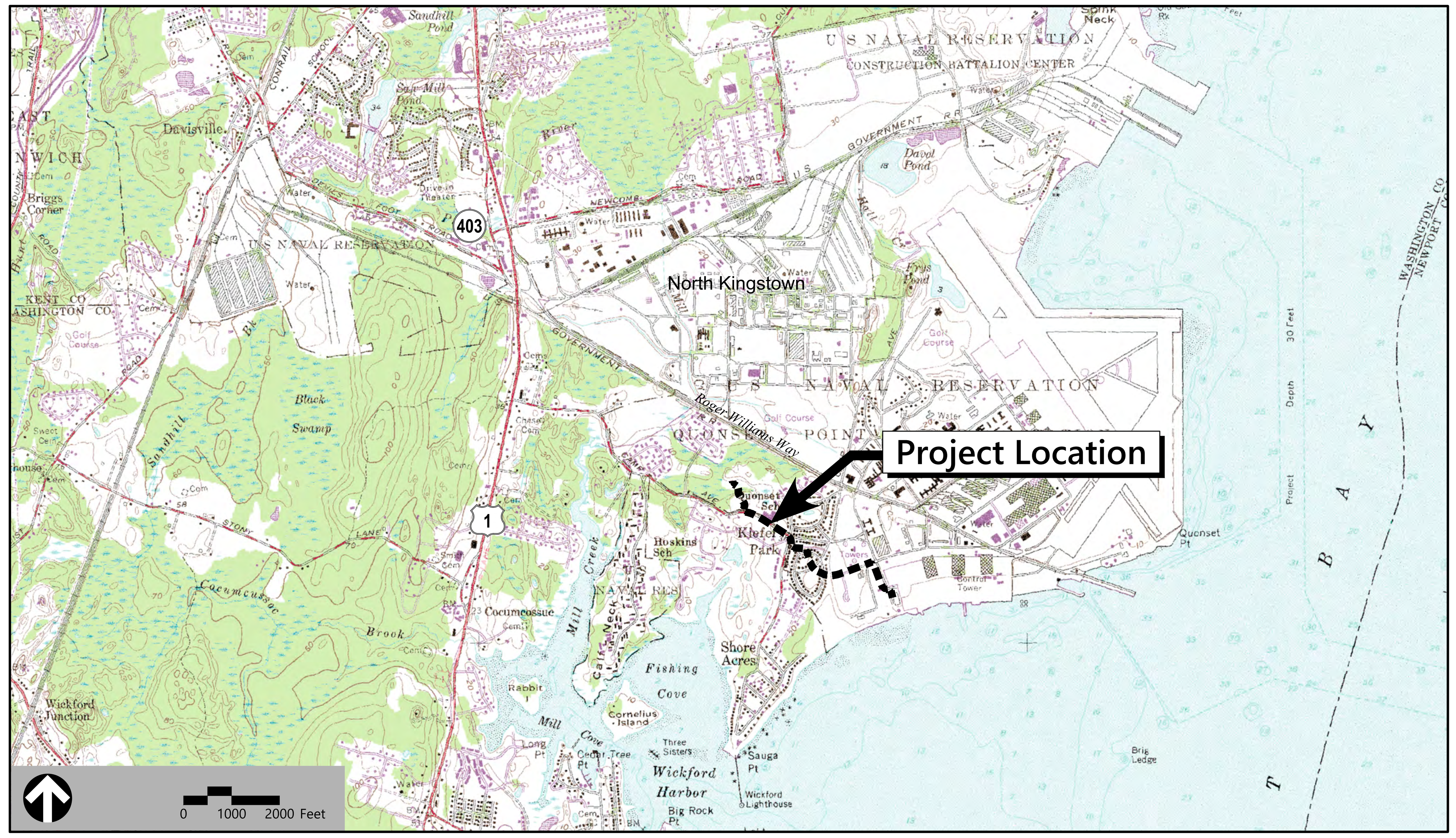
Add more lines/pages as necessary

SESC Plans

Issued for	RIPDES Permitting
Date Issued	June 30, 2021
Latest Issue	June 30, 2021

Revolution Wind Proposed Onshore Cable Transmission Route

North Kingstown, RI



Revolution Wind
Powered by Ørsted & Eversource

vhb.com
vhb
1 Cedar Street
Suite 400
Providence, RI 02903
401.272.8100

Owner/Applicant

Revolution Wind, LLC
56 Exchange Terrace
Suite 300
Providence, RI 02903

Assessor's Map: 179
Lots: 001, 030

Sheet Index

For more information see plans titled:
275-KV and 115-KV Transmission Line Onshore Cable Route
Underground Transmission Line Construction Contract Drawings
by Burns & McDonnell
9400 Ward Parkway
Kansas City, MO 64114

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

Legend

Exist. Prop.

- PROPERTY LINE
- PROJECT LIMIT LINE
- RIGHT-OF-WAY/PROPERTY LINE
- EASEMENT
- BUILDING SETBACK
- PARKING SETBACK
- BASELINE (10+00)
- CONSTRUCTION LAYOUT
- ZONING LINE
- TOWN LINE
- LIMIT OF DISTURBANCE
- WETLAND LINE WITH FLAG
- FLOODPLAIN
- AREA OF LAND WITHIN 50' FEET
- 100' FOOT RIVERBANK WETLAND
- BORDERING LAND SUBJECT TO FLOODING (BLSF)
- WETLAND BUFFER ZONE (BZ)
- NO DISTURB ZONE (NDZ)
- 200' RIVERFRONT AREA (200'RA)
- GRAVEL ROAD
- EDGE OF PAVEMENT (EOP)
- BITUMINOUS BERM (BB)
- BITUMINOUS CURB (BC)
- CONCRETE CURB (CC)
- CURB AND GUTTER (CG)
- EXTRUDED CONCRETE CURB (ECC)
- MONOLITHIC CONCRETE CURB (MCC)
- PRECAST CONC. CURB (PCC)
- SLOPED GRAN. EDGING (SGE)
- VERT. GRAN. CURB (VGC)
- LIMIT OF CURB TYPE
- SAWCUT
- BUILDING
- BUILDING ENTRANCE
- LOADING DOCK (LD)
- BOLLARD
- SIGN
- DOUBLE SIGN
- STEEL GUARDRAIL
- WOOD GUARDRAIL
- PATH
- TREE LINE
- WIRE FENCE
- FENCE
- STOCKADE FENCE
- STONE WALL
- RETAINING WALL
- STREAM / POND / WATER COURSE
- DETENTION BASIN
- HAY BALES
- SILT FENCE
- SILT SOCK / STRAW WATTLE
- MINOR CONTOUR (4)
- MAJOR CONTOUR (20)

Exist. Prop.

- CONCRETE
- HEAVY DUTY PAVEMENT
- BUILDINGS
- RIPRAP
- CONSTRUCTION EXIT
- WASHED CRUSHED STONE YARD
- TOP OF CURB ELEVATION (27.35 TC×)
- BOTTOM OF CURB ELEVATION (26.85 BC×)
- SPOT ELEVATION (132.75×)
- TOP & BOTTOM OF WALL ELEVATION (45.0 TW, 38.5 BW)
- BORING LOCATION
- TEST PIT LOCATION
- MONITORING WELL (MW)
- UNDERDRAIN (UD)
- DRAIN (12"D)
- ROOF DRAIN (6"RD)
- SEWER (12"S)
- FORCE MAIN (FM)
- OVERHEAD WIRE (OHW)
- WATER (6"W)
- FIRE PROTECTION (4"FP)
- DOMESTIC WATER (2"DW)
- GAS (3"G)
- ELECTRIC (E)
- STEAM (STM)
- TELEPHONE (T)
- FIRE ALARM (FA)
- CABLE TV (CATV)
- CATCH BASIN CONCENTRIC
- CATCH BASIN ECCENTRIC
- DOUBLE CATCH BASIN CONCENTRIC
- DOUBLE CATCH BASIN ECCENTRIC
- GUTTER INLET
- DRAIN MANHOLE CONCENTRIC
- DRAIN MANHOLE ECCENTRIC
- TRENCH DRAIN (TD)
- PLUG OR CAP
- CLEANOUT (CO)
- FLARED END SECTION
- HEADWALL
- SEWER MANHOLE CONCENTRIC
- SEWER MANHOLE ECCENTRIC
- CURB STOP & BOX (CS)
- WATER VALVE & BOX (WV)
- TAPPING SLEEVE, VALVE & BOX (TSV)
- SIAMESE CONNECTION
- FIRE HYDRANT (HYD)
- WATER METER (WM)
- POST INDICATOR VALVE (PIV)
- WATER WELL
- GAS GATE (GG)
- GAS METER (GM)
- ELECTRIC MANHOLE (EMH)
- ELECTRIC METER (EM)
- LIGHT POLE
- TELEPHONE MANHOLE (TMH)
- TRANSFORMER PAD (T)
- UTILITY POLE
- GUY POLE
- GUY WIRE & ANCHOR
- HAND HOLE (HH)
- PULL BOX (PB)

Abbreviations

General

ABAN	ABANDON
ACR	ACCESSIBLE CURB RAMP
ADJ	ADJUST
APPROX	APPROXIMATE
BIT	BITUMINOUS
BS	BOTTOM OF SLOPE
BWLL	BROKEN WHITE LANE LINE
CONC	CONCRETE
DYCL	DOUBLE YELLOW CENTER LINE
EL	ELEVATION
ELEV	ELEVATION
EX	EXISTING
FDN	FOUNDATION
FFE	FIRST FLOOR ELEVATION
GRAN	GRANITE
GTD	GRADE TO DRAIN
LA	LANDSCAPE AREA
LOD	LIMIT OF DISTURBANCE
MAX	MAXIMUM
MIN	MINIMUM
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
PERF	PERFORATED
PROP	PROPOSED
REM	REMOVE
RET	RETAIN
R&D	REMOVE AND DISPOSE
R&R	REMOVE AND RESET
SWEL	SOLID WHITE EDGE LINE
SWLL	SOLID WHITE LANE LINE
TS	TOP OF SLOPE
TYP	TYPICAL

Utility

CB	CATCH BASIN
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
DCB	DOUBLE CATCH BASIN
DMH	DRAIN MANHOLE
CIP	CAST IRON PIPE
COND	CONDUIT
DIP	DUCTILE IRON PIPE
FES	FLARED END SECTION
FM	FORCE MAIN
F&G	FRAME AND GRATE
F&C	FRAME AND COVER
GI	GUTTER INLET
GT	GREASE TRAP
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HH	HANDHOLE
HW	HEADWALL
HYD	HYDRANT
INV	INVERT ELEVATION
I=	INVERT ELEVATION
LP	LIGHT POLE
MES	METAL END SECTION
PIV	POST INDICATOR VALVE
PWW	PAVED WATER WAY
PVC	POLYVINYLCHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
R=	RIM ELEVATION
RIM=	RIM ELEVATION
SMH	SEWER MANHOLE
TSV	TAPPING SLEEVE, VALVE AND BOX
UG	UNDERGROUND
UP	UTILITY POLE

Notes

General

1. CONTRACTOR SHALL NOTIFY "DIG-SAFE" (1-888-344-7233) AT LEAST 72 HOURS BEFORE EXCAVATING.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SECURITY AND JOB SAFETY. CONSTRUCTION ACTIVITIES SHALL BE IN ACCORDANCE WITH OSHA STANDARDS AND LOCAL REQUIREMENTS.
3. AREAS DISTURBED DURING CONSTRUCTION AND NOT RESTORED WITH IMPERVIOUS SURFACES (BUILDINGS, PAVEMENTS, WALKS, ETC.) SHALL RECEIVE 6 INCHES LOAM AND SEED.
4. WORK WITHIN THE LOCAL RIGHTS-OF-WAY SHALL CONFORM TO LOCAL MUNICIPAL STANDARDS. WORK WITHIN STATE RIGHTS-OF-WAY SHALL CONFORM TO THE LATEST EDITION OF THE STATE HIGHWAY DEPARTMENTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES.
5. UPON AWARD OF CONTRACT, CONTRACTOR SHALL MAKE NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN NECESSARY PERMITS, PAY FEES, AND POST BONDS ASSOCIATED WITH THE WORK INDICATED ON THE DRAWINGS, IN THE SPECIFICATIONS, AND IN THE CONTRACT DOCUMENTS. DO NOT CLOSE OR OBSTRUCT ROADWAYS, SIDEWALKS, AND FIRE HYDRANTS, WITHOUT APPROPRIATE PERMITS.
6. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
7. IN THE EVENT THAT SUSPECTED CONTAMINATED SOIL, GROUNDWATER, AND OTHER MEDIA ARE ENCOUNTERED DURING EXCAVATION AND CONSTRUCTION ACTIVITIES BASED ON VISUAL, OLFACTORY, OR OTHER EVIDENCE, THE CONTRACTOR SHALL STOP WORK IN THE VICINITY OF THE SUSPECT MATERIAL TO AVOID FURTHER SPREADING OF THE MATERIAL, AND SHALL NOTIFY THE OWNER IMMEDIATELY SO THAT THE APPROPRIATE TESTING AND SUBSEQUENT ACTION CAN BE TAKEN.
8. CONTRACTOR SHALL PREVENT DUST, SEDIMENT, AND DEBRIS FROM EXITING THE SITE AND SHALL BE RESPONSIBLE FOR CLEANUP, REPAIRS AND CORRECTIVE ACTION IF SUCH OCCURS.
9. DAMAGE RESULTING FROM CONSTRUCTION LOADS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO OWNER.
10. CONTRACTOR SHALL CONTROL STORMWATER RUNOFF DURING CONSTRUCTION TO PREVENT ADVERSE IMPACTS TO OFF SITE AREAS, AND SHALL BE RESPONSIBLE TO REPAIR RESULTING DAMAGES, IF ANY, AT NO COST TO OWNER.
11. THIS PROJECT DISTURBS MORE THAN ONE ACRE OF LAND AND FALLS WITHIN THE RIPDES CONSTRUCTION GENERAL PERMIT (CGP) PROGRAM AND RIDEM JURISDICTION. PRIOR TO THE START OF CONSTRUCTION CONTRACTOR IS TO FILE A NOTICE OF INTENT WITH THE RIDEM IN ACCORDANCE WITH THE RIPDES REGULATIONS.
12. STAGING AND STOCKPILE AREAS SHALL NOT BE LOCATED WITHIN ANY WETLAND AND ABUTTING RESOURCE AREA AND SHALL BE LOCATED WITHIN THE LOD.

11. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND INSTALLING THE FOLLOWING ITEMS ON SITE AND REDLINING THE PLAN FOR RECORD KEEPING PURPOSES AS REQUIRED BY THE RIPDES PERMIT:
    a. BUILDING MATERIALS STAGING AREAS
    b. STOCKPILE AREAS. EROSION CONTROLS SHALL BE PLACED AT THE BASE OF ALL STOCKPILES
    c. DESIGNATED WASHOUT AND REFUELING AREAS.
    d. TEMPORARY SEDIMENT BASIN AREAS.

Existing Conditions Information

1. BASE PLAN: THE PROPERTY LINES SHOWN WERE DETERMINED BY AN ACTUAL FIELD SURVEY CONDUCTED BY VHB,INC. THE TOPOGRAPHY AND PHYSICAL FEATURES ARE FROM AERIAL MAPPING COMPILED BY WSP FROM IMAGERY ACQUIRED IN 2010 AND SUPPLEMENTED BY A FIELD SURVEY CONDUCTED BY VHB, INC. BETWEEN OCTOBER, 2019 AND JANUARY 2021.
    A. DELINEATION OF THE WETLANDS AND PLACEMENT OF THE FLAGS WAS PERFORMED BY: VHB.
    B. FLAGS MARKING THE WETLANDS WERE LOCATED BY: VHB, SURVEY.
2. TOPOGRAPHY: ELEVATIONS ARE BASED ON NAVD 88.

Document Use

1. THESE PLANS AND CORRESPONDING CADD DOCUMENTS ARE INSTRUMENTS OF PROFESSIONAL SERVICE, AND SHALL NOT BE USED, IN WHOLE OR IN PART, FOR ANY PURPOSE OTHER THAN FOR WHICH IT WAS CREATED WITHOUT THE EXPRESSED, WRITTEN CONSENT OF VHB. ANY UNAUTHORIZED USE, REUSE, MODIFICATION OR ALTERATION, INCLUDING AUTOMATED CONVERSION OF THIS DOCUMENT SHALL BE AT THE USER'S SOLE RISK WITHOUT LIABILITY OR LEGAL EXPOSURE TO VHB.
2. CONTRACTOR SHALL NOT RELY SOLELY ON ELECTRONIC VERSIONS OF PLANS, SPECIFICATIONS, AND DATA FILES THAT ARE OBTAINED FROM THE DESIGNERS, BUT SHALL VERIFY LOCATION OF PROJECT FEATURES IN ACCORDANCE WITH THE PAPER COPIES OF THE PLANS AND SPECIFICATIONS THAT ARE SUPPLIED AS PART OF THE CONTRACT DOCUMENTS.
3. SYMBOLS AND LEGENDS OF PROJECT FEATURES ARE GRAPHIC REPRESENTATIONS AND ARE NOT NECESSARILY SCALED TO THEIR ACTUAL DIMENSIONS OR LOCATIONS ON THE DRAWINGS. THE CONTRACTOR SHALL REFER TO THE DETAIL SHEET DIMENSIONS, MANUFACTURERS' LITERATURE, SHOP DRAWINGS AND FIELD MEASUREMENTS OF SUPPLIED PRODUCTS FOR LAYOUT OF THE PROJECT FEATURES.

Erosion Control

1. PRIOR TO STARTING ANY OTHER WORK ON THE SITE, THE CONTRACTOR SHALL NOTIFY APPROPRIATE AGENCIES AND SHALL INSTALL EROSION CONTROL MEASURES AS SHOWN ON THE PLANS AND AS IDENTIFIED IN FEDERAL, STATE, AND LOCAL APPROVAL DOCUMENTS PERTAINING TO THIS PROJECT.
2. CONTRACTOR SHALL INSPECT AND MAINTAIN EROSION CONTROL MEASURES DAILY, AND REMOVE SEDIMENT THEREFROM ON A WEEKLY BASIS AND WITHIN TWELVE HOURS AFTER EACH STORM EVENT AND DISPOSE OF SEDIMENTS IN AN UPLAND AREA SUCH THAT THEY DO NOT ENCUMBER OTHER DRAINAGE STRUCTURES AND PROTECTED AREAS.
3. CONTRACTOR SHALL BE FULLY RESPONSIBLE TO CONTROL CONSTRUCTION SUCH THAT SEDIMENTATION SHALL NOT AFFECT REGULATORY PROTECTED AREAS, WHETHER SUCH SEDIMENTATION IS CAUSED BY WATER, WIND, OR DIRECT DEPOSIT.
4. CONTRACTOR SHALL PERFORM CONSTRUCTION SEQUENCING SUCH THAT EARTH MATERIALS ARE EXPOSED FOR A MINIMUM OF TIME BEFORE THEY ARE COVERED, SEEDED, OR OTHERWISE STABILIZED TO PREVENT EROSION.
5. UPON COMPLETION OF CONSTRUCTION AND ESTABLISHMENT OF PERMANENT GROUND COVER, CONTRACTOR SHALL REMOVE AND DISPOSE OF EROSION CONTROL MEASURES AND CLEAN SEDIMENT AND DEBRIS FROM ENTIRE DRAINAGE AND SEWER SYSTEMS.
6. A CROSS SLOPE SHALL BE PLACED ON THE STABILIZED CONSTRUCTION EXIT TO DIRECT RUNOFF TO AN ONSITE SETTLING AREA. IF DEEMED NECESSARY AFTER CONSTRUCTION BEGINS, A WASH PAD MAY BE INCLUDED TO WASH OFF VEHICLE WHEELS BEFORE LEAVING THE PROJECT SITE.
7. TEMPORARY SEDIMENT BASINS WILL BE DESIGNED EITHER AS EXCAVATIONS OR BERMED STORMWATER DETENTION STRUCTURES THAT WILL RETAIN RUNOFF FOR A SUFFICIENT PERIOD OF TIME TO ALLOW SUSPENDED SOIL PARTICLES TO SETTLE OUT PRIOR TO DISCHARGE. BASINS WILL BE LOCATED AS DETERMINED BY THE CONTRACTOR BASED ON CONSTRUCTION NEEDS. POINT OF DISCHARGE FROM SEDIMENT BASINS WILL BE STABILIZED TO MINIMIZE EROSION.
8. VEGETATIVE SLOPE STABILIZATION WILL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. VEGETATIVE SLOPE STABILIZATION WILL BE USED TO MINIMIZE EROSION ON SLOPES OF 3:1 OR STEEPER. ESTABLISHMENT OF TEMPORARY AND PERMANENT VEGETATIVE COVER MAY BE ESTABLISHED BY HYDRO-SEEDING OR SODDING. A SUITABLE TOPSOIL, GOOD SEEDBED PREPARATION, AND ADEQUATE LIME, FERTILIZER AND WATER WILL BE PROVIDED FOR EFFECTIVE ESTABLISHMENT OF THESE VEGETATIVE STABILIZATION METHODS. MULCH WILL ALSO BE USED AFTER PERMANENT SEEDING TO PROTECT SOIL FROM THE IMPACT OF FALLING RAIN AND TO INCREASE THE CAPACITY OF THE SOIL TO ABSORB WATER.
9. STABILIZATION OF DISTURBED AREAS MUST BE INITIATED IMMEDIATELY WHENEVER CLEARING, GRADING, EXCAVATION OR OTHER EARTH DISTURBANCE ACTIVITIES ARE PERMANENTLY CEASED ON ANY PORTION OF THE SITE, OR TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT BE RESUMED FOR A PERIOD EXCEEDING FOURTEEN (14) CALENDAR DAYS. STABILIZATION MUST BE COMPLETED USING VEGETATIVE STABILIZATION MEASURES WHERE POSSIBLE.
10. ALL DISTURBED SOILS EXPOSED PRIOR TO OCTOBER 15TH SHALL BE SEEDED BY THAT DATE. ANY SUCH AREAS WHICH DO NOT HAVE ADEQUATE VEGETATIVE STABILIZATION BY NOVEMBER 15TH MUST BE STABILIZED THROUGH THE USE OF NON-VEGETATIVE EROSION CONTROL MEASURES. IF WORK CONTINUES WITHIN ANY OF THESE AREAS DURING THE PERIOD FROM OCTOBER 15TH TO APRIL 15TH CARE MUST BE TAKEN TO ENSURE THAT ONLY THE AREA REQUIRED FOR THE DAY'S WORK IS EXPOSED, AND ALL ERODIBLE SOIL MUST BE STABILIZED WITHIN FIVE (5) WORKING DAYS.

Erosion Control Maintenance Requirements

SITE OWNERS AND OPERATORS MUST ENSURE THAT ALL EROSION, RUNOFF, SEDIMENT, AND POLLUTION PREVENTION CONTROLS REMAIN IN EFFECTIVE OPERATING CONDITION AND ARE PROTECTED FROM ACTIVITIES THAT WOULD REDUCE THEIR EFFECTIVENESS. SITE OWNERS AND OPERATORS MUST ALSO ENSURE THAT ALL EROSION, RUNOFF, SEDIMENT, AND POLLUTION PREVENTION CONTROLS ARE INSPECTED AT THE REQUIRED FREQUENCY REQUIREMENTS LISTED BELOW. IF THE DESIGNATED SITE INSPECTOR FINDS A PROBLEM (I.E. EROSION, RUNOFF, SEDIMENT OR POLLUTION PREVENTION CONTROLS REQUIRE REPLACEMENT, REPAIR, OR MAINTENANCE), THE OWNER AND OPERATOR MUST ENSURE THAT THE NECESSARY REPAIRS OR MODIFICATIONS ARE MADE IN ACCORDANCE WITH THE FOLLOWING:

1. INITIATE WORK TO FIX THE PROBLEM IMMEDIATELY AFTER DISCOVERING THE PROBLEM, AND COMPLETE SUCH WORK BY THE CLOSE OF THE NEXT WORK DAY, IF THE PROBLEM DOES NOT REQUIRE SIGNIFICANT REPAIR OR REPLACEMENT, OR IF THE PROBLEM CAN BE CORRECTED THROUGH ROUTINE MAINTENANCE.
2. WHEN INSTALLATION OF A NEW CONTROL OR A SIGNIFICANT REPAIR IS NEEDED, SITE OWNERS AND OPERATORS MUST ENSURE THAT THE NEW OR MODIFIED CONTROL PRACTICE IS INSTALLED AND MADE OPERATIONAL BY NO LATER THAN SEVEN (7) CALENDAR DAYS FROM THE TIME OF DISCOVERY WHERE FEASIBLE. IF IT IS INFEASIBLE TO COMPLETE THE INSTALLATION OR REPAIR WITHIN SEVEN (7) CALENDAR DAYS, THE REASONS WHY IT IS INFEASIBLE MUST BE DOCUMENTED IN THE SESC PLAN ALONG WITH THE SCHEDULE FOR INSTALLING THE STORMWATER CONTROL(S) AND MAKING IT OPERATIONAL AS SOON AS PRACTICABLE AFTER THE 7-DAY TIMEFRAME. WHERE THESE ACTIONS RESULT IN CHANGES TO ANY OF THE STORMWATER CONTROL MEASURES OUTLINED IN THE SESC PLAN, SITE OWNERS AND OPERATORS MUST MODIFY THE SESC PLAN ACCORDINGLY WITHIN SEVEN (7) CALENDAR DAYS OF COMPLETING THIS WORK IN ACCORDANCE WITH THE FOLLOWING:
    a. THE OWNER AND OPERATOR SHALL AMEND THE SESC PLAN WITHIN SEVEN (7) DAYS WHENEVER THERE IS A CHANGE IN DESIGN, CONSTRUCTION, OPERATION, MAINTENANCE OR OTHER PROCEDURE WHICH HAS A SIGNIFICANT EFFECT ON THE POTENTIAL FOR THE DISCHARGE OF POLLUTANTS, OR IF THE SESC PLAN PROVES TO BE INEFFECTIVE IN ACHIEVING ITS OBJECTIVES. IN ADDITION, THE SESC PLAN SHALL BE AMENDED TO IDENTIFY ANY NEW OPERATOR THAT WILL IMPLEMENT A COMPONENT OF THE SESC PLAN. THE AMENDED SESC PLAN MUST BE KEPT ON FILE AT THE CONSTRUCTION SITE AND ANY SESC PLAN MODIFICATIONS MUST BE DOCUMENTED. ANY AMENDMENTS TO CONTROL MEASURES WHICH INVOLVED THE PRACTICE OF ENGINEERING, MUST FIRST BE REVIEWED, SIGNED, AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF RHODE ISLAND.
3. IF CORRECTIVE ACTIONS ARE REQUIRED, THE SITE OWNER AND OPERATOR MUST ENSURE THAT ALL CORRECTIVE ACTIONS ARE DOCUMENTED ON THE INSPECTION REPORT IN WHICH THE PROBLEM WAS FIRST DISCOVERED. THESE CORRECTIVE ACTIONS MUST BE DOCUMENTED, SIGNED, AND DATED BY THE SITE OPERATOR ONCE ALL NECESSARY REPAIRS HAVE BEEN COMPLETED.
4. SOIL EROSION AND SEDIMENT CONTROL INSPECTION REQUIREMENTS
   MINIMUM FREQUENCY - EACH OF THE FOLLOWING AREAS MUST BE INSPECTED BY OR UNDER THE SUPERVISION OF THE OWNER AND OPERATOR AT LEAST ONCE EVERY SEVEN (7) CALENDAR DAYS AND WITHIN TWENTY FOUR (24) HOURS AFTER ANY STORM EVENT WHICH GENERATES AT LEAST 0.25 INCHES OF RAINFALL PER TWENTY-FOUR (24) HOUR PERIOD AND/OR AFTER A SIGNIFICANT AMOUNT OF RUNOFF:
    a. ALL AREAS THAT HAVE BEEN CLEARED, GRADED, OR EXCAVATED AND THAT HAVE NOT YET COMPLETED STABILIZATION;
    b. ALL STORMWATER EROSION, RUNOFF, AND SEDIMENT CONTROL MEASURES (INCLUDING POLLUTION PREVENTION PRACTICES) INSTALLED AT THE SITE TO COMPLY WITH THIS PERMIT;
    c. CONSTRUCTION MATERIAL, UNSTABILIZED SOIL STOCKPILES, WASTE, BORROW, OR EQUIPMENT STORAGE, AND MAINTENANCE AREAS THAT ARE COVERED BY THIS PERMIT AND ARE EXPOSED TO PRECIPITATION;
    d. ALL AREAS WHERE STORMWATER TYPICALLY FLOWS WITHIN THE SITE, INCLUDING TEMPORARY DRAINAGE WAYS DESIGNED TO DIVERT, CONVEY, AND/OR TREAT STORMWATER;
    e. ALL POINTS OF DISCHARGE FROM THE SITE;
    f. ALL LOCATIONS WHERE TEMPORARY OR PERMANENT SOIL STABILIZATION MEASURES HAVE BEEN IMPLEMENTED.
    g. ALL LOCATIONS WHERE VEHICLES ENTER OR EXIT THE SITE.

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

vhb

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

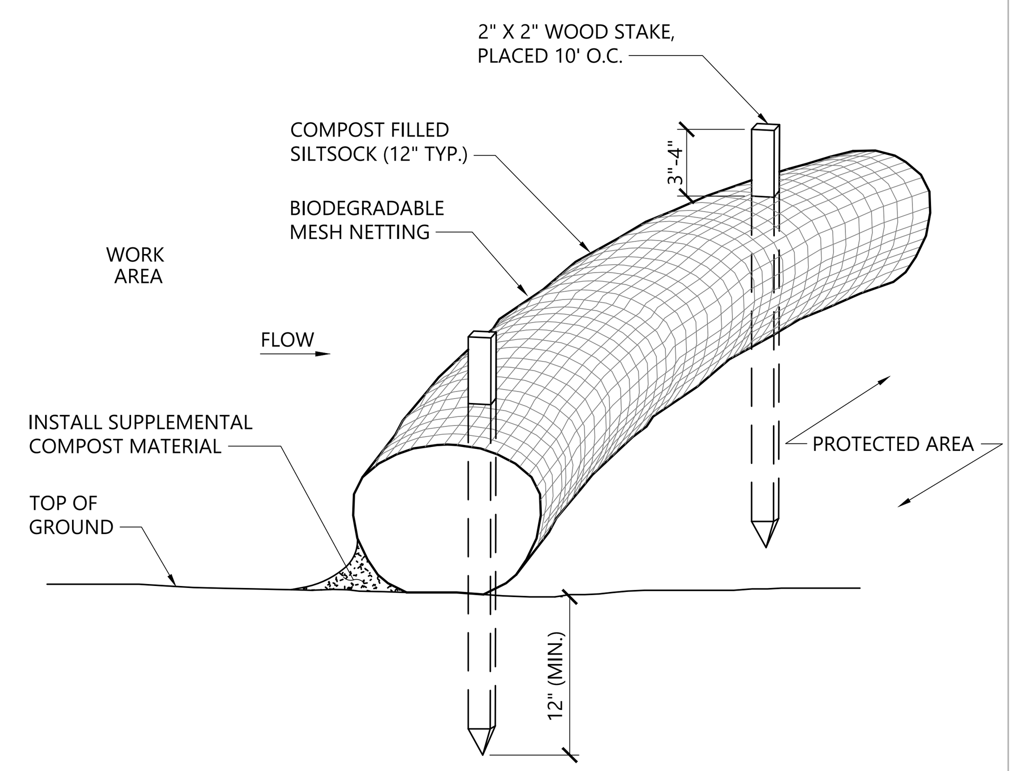
Revolution Wind | Powered by Ørsted & Eversource

TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
LEGEND & GENERAL NOTES
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-02	

Curb Inlet or Drop Inlet Catch Basin Protection 06/2021

N.T.S. Source: VHB

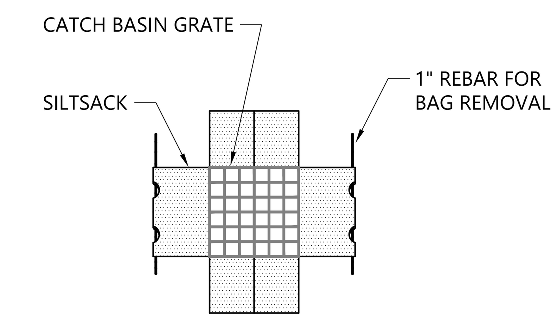


NOTES

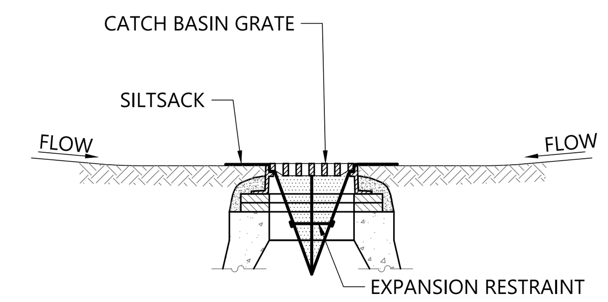
1. SILTSOCK SHALL BE FILTREXX SILTSOXX, OR APPROVED EQUAL.
2. SILTSOCKS SHALL OVERLAP A MINIMUM OF 12 INCHES.
3. SILTSOCK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS, AND REPAIR OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.
4. COMPOST MATERIAL SHALL BE DISPERSED ON SITE, AS DETERMINED BY THE ENGINEER.
5. IF NON BIODEGRADABLE NETTING IS USED THE NETTING SHALL BE COLLECTED AND DISPOSED OF OFFSITE.

Siltsock - Erosion Control Barrier 1/16

N.T.S. Source: VHB LD_658



PLAN VIEW



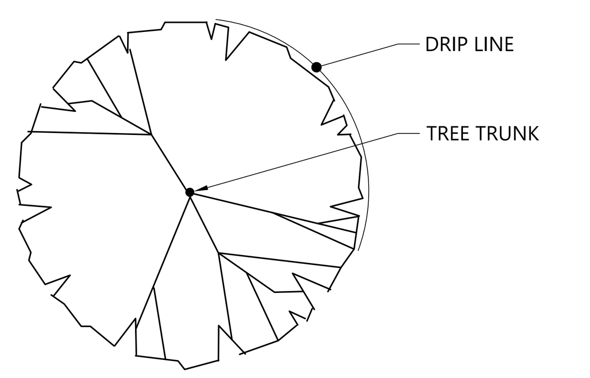
SECTION VIEW

NOTES

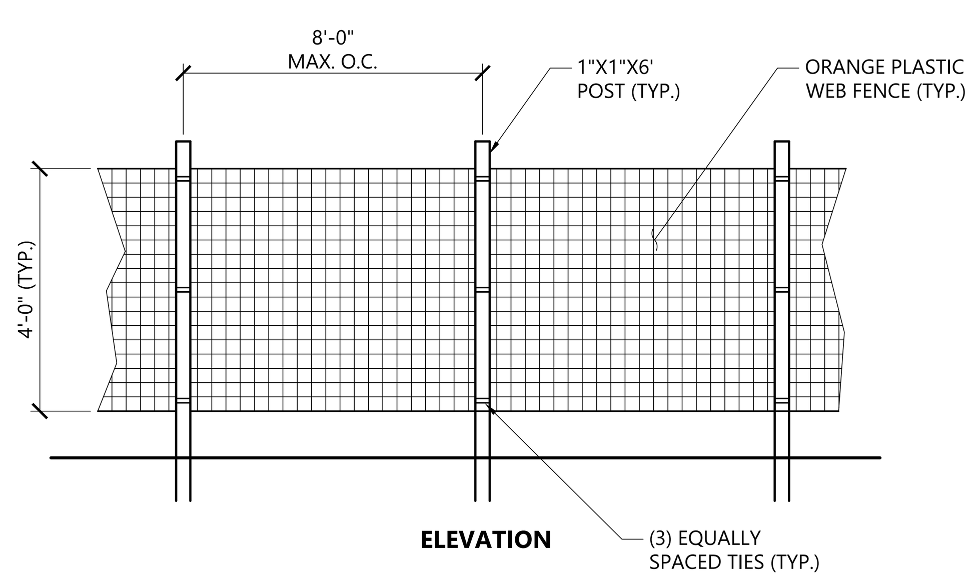
1. INSTALL SILTSACK IN ALL CATCH BASINS WHERE INDICATED ON THE PLAN BEFORE COMMENCING WORK OR IN PAVED AREAS AFTER BINDER COURSE IS PLACED AND HAY BALES HAVE BEEN REMOVED.
2. GRATE TO BE PLACED OVER SILTSACK.
3. SILTSACK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS AND CLEANING OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED. MAINTAIN UNTIL UPSTREAM AREAS HAVE BEEN PERMANENTLY STABILIZED

Siltsack Sediment Trap 1/16

N.T.S. Source: VHB LD_674



PLAN



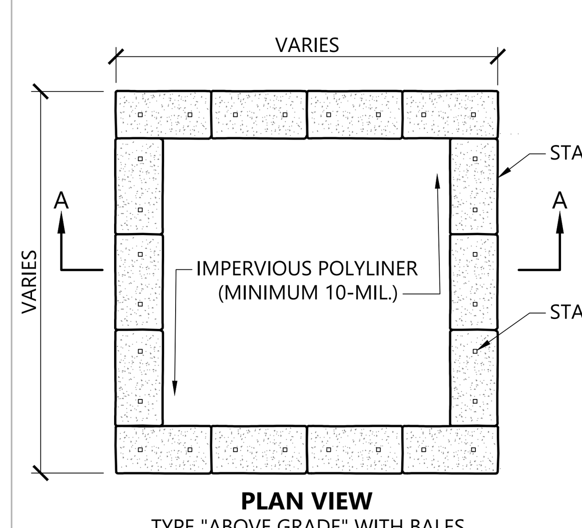
ELEVATION

NOTES

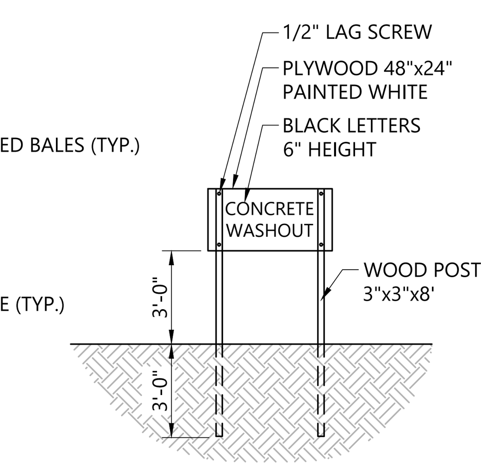
1. INSTALL TREE PROTECTION FENCE AT THE DRIP LINE OF EXISTING TREES TO REMAIN.

Tree Protection Fence 1/16

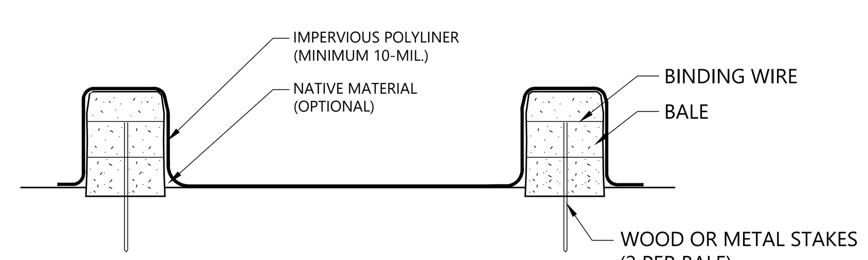
N.T.S. Source: VHB LD_610



PLAN VIEW
TYPE "ABOVE GRADE" WITH BALES



CONCRETE WASHOUT SIGN DETAIL
(OR EQUIVALENT)



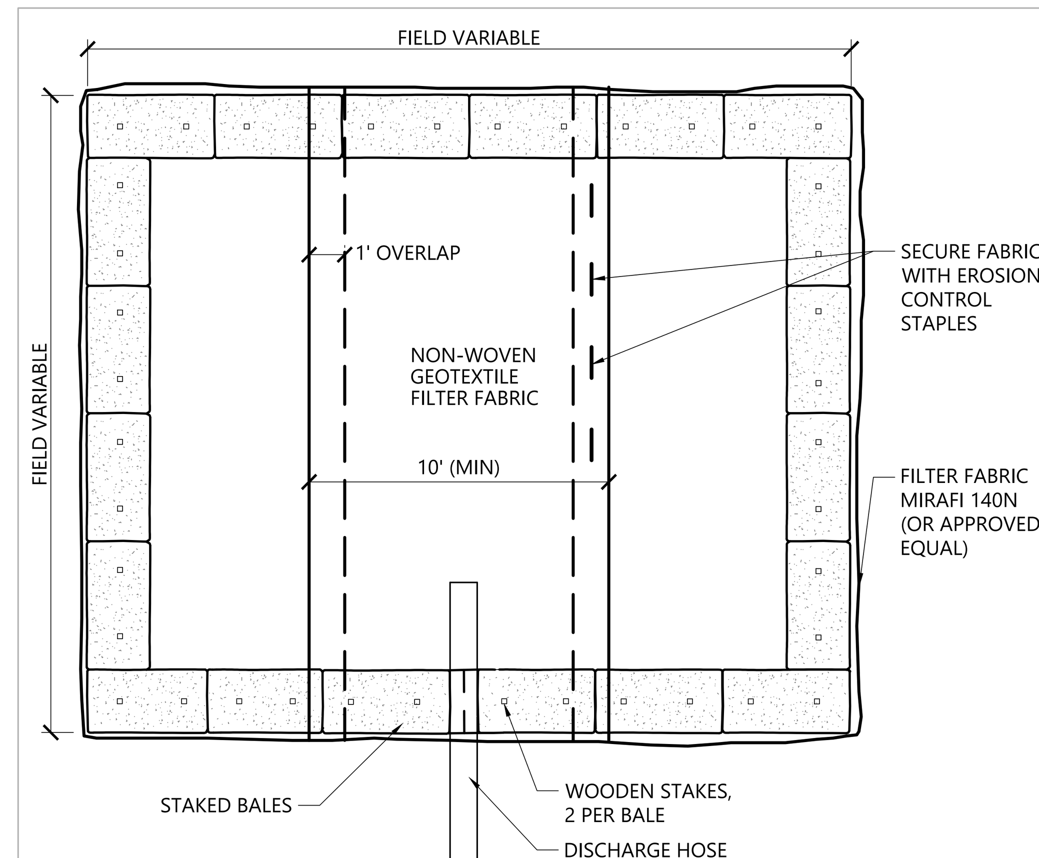
CROSS-SECTION A-A

NOTES

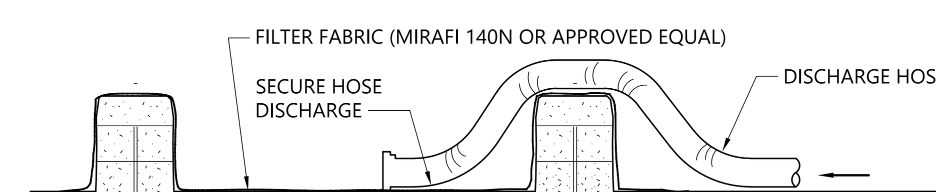
1. FINAL LOCATION TO BE DETERMINED BY CONTRACTOR BASED ON SITE CONDITIONS.
2. KEEP AS FAR FROM DRAINAGE CHANNELS AND WETLAND AREAS AS PRACTICAL.
3. SUMPS TO BE CLEANED AND WASTE CONCRETE REMOVED AND PROPERLY DISPOSED OF UPON COMPLETION OF WORK.

Concrete Washout 12/17

N.T.S. Source: VHB



PLAN VIEW



CROSS-SECTION

NOTES

1. NUMBER OF BALES MAY VARY DEPENDING ON SITE CONDITIONS.
2. THE BASIN TO BE SIZED TO PREVENT DISCHARGE WATER FROM OVERTOPPING BASIN.

Dewatering Straw Bale Basin 1/16

N.T.S. Source: VHB LD_690

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RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

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REVISIONS DURING CONSTRUCTION

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
DETAILS
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	SESC-03

ES VER: 05/2015

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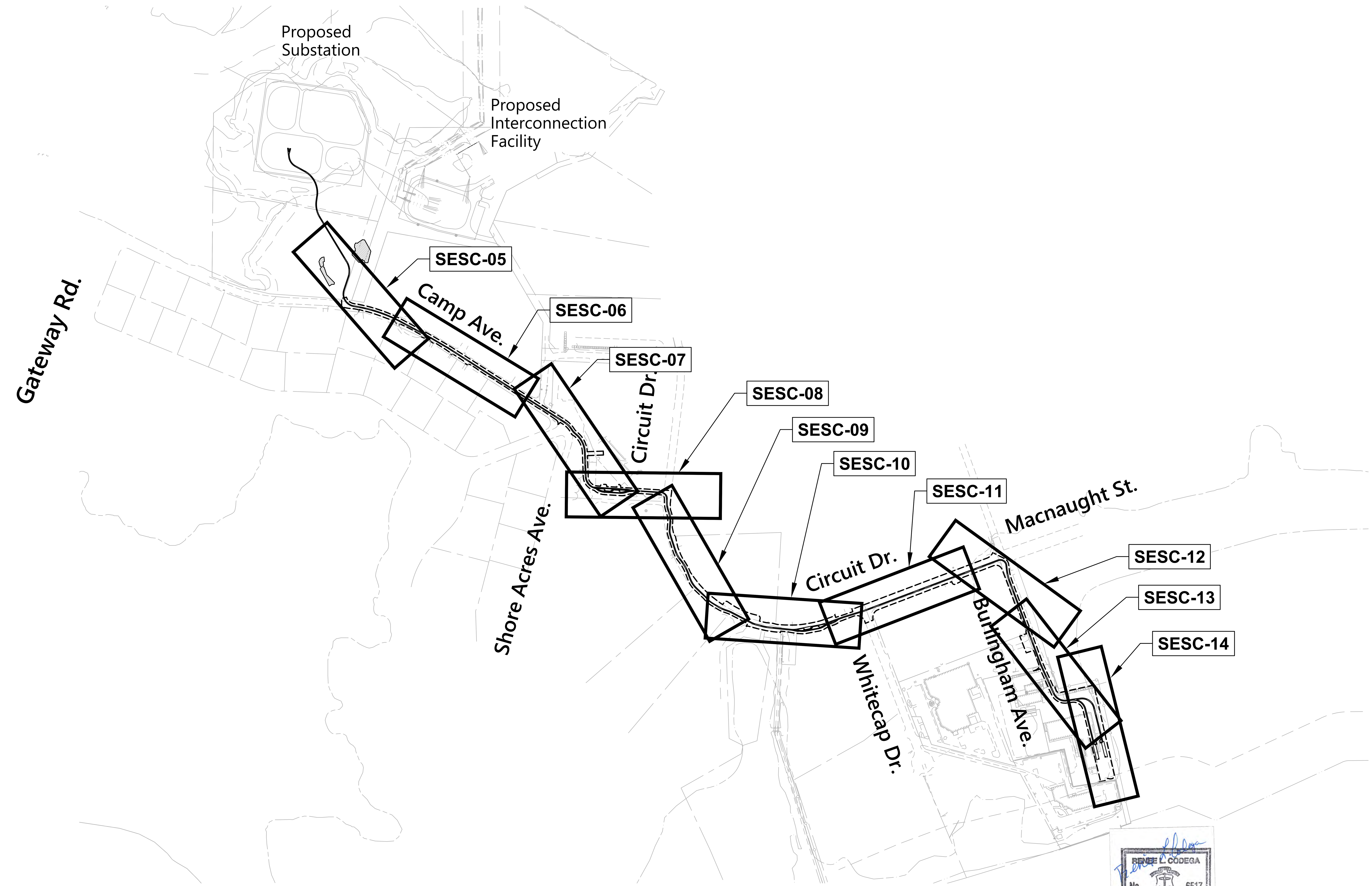

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

NORTH

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SCALE IN FEET

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NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

REVISIONS DURING CONSTRUCTION

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
KEY MAP
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-04	

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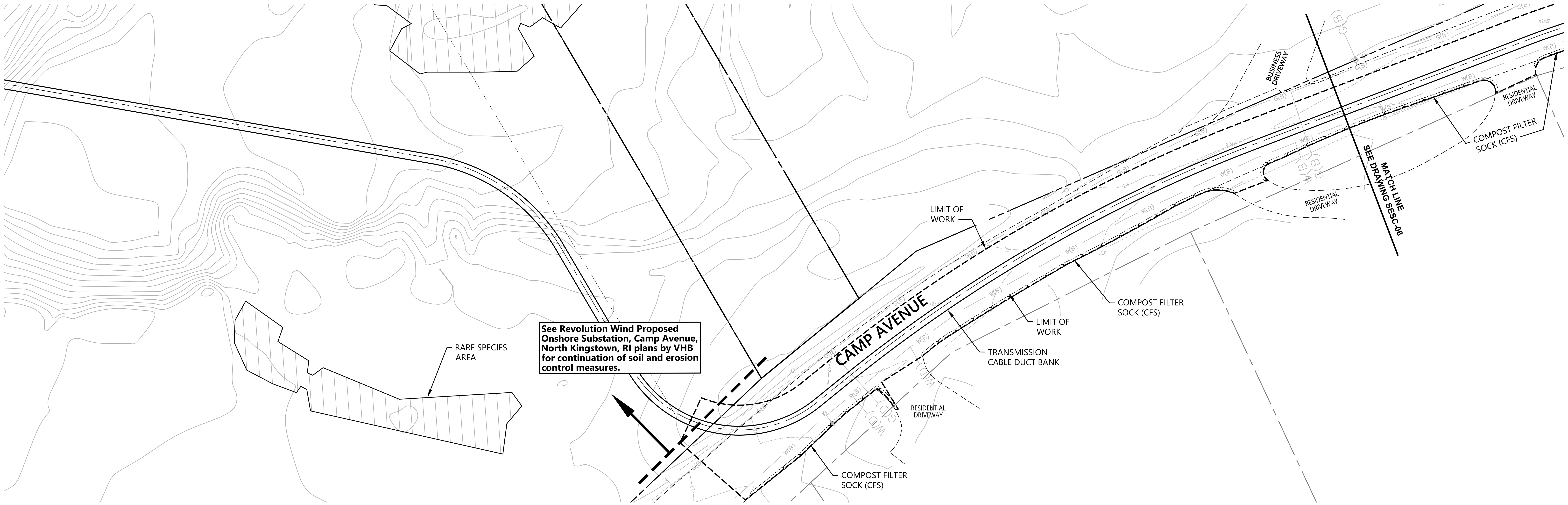

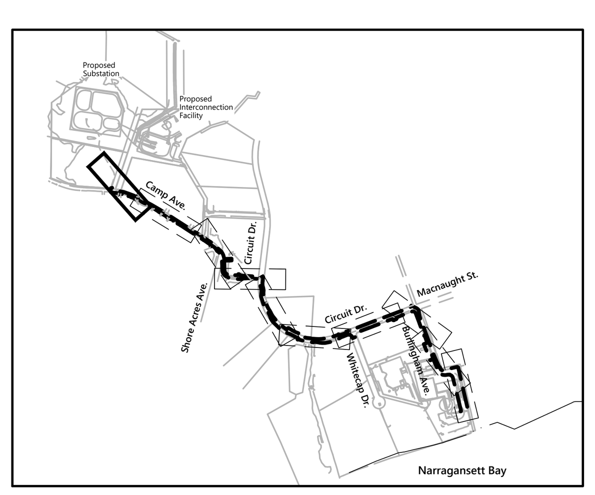

Key

Not To Scale

LEGEND

- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

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NORTH

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SCALE IN FEET

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RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

REVISIONS DURING CONSTRUCTION

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 1
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-05	

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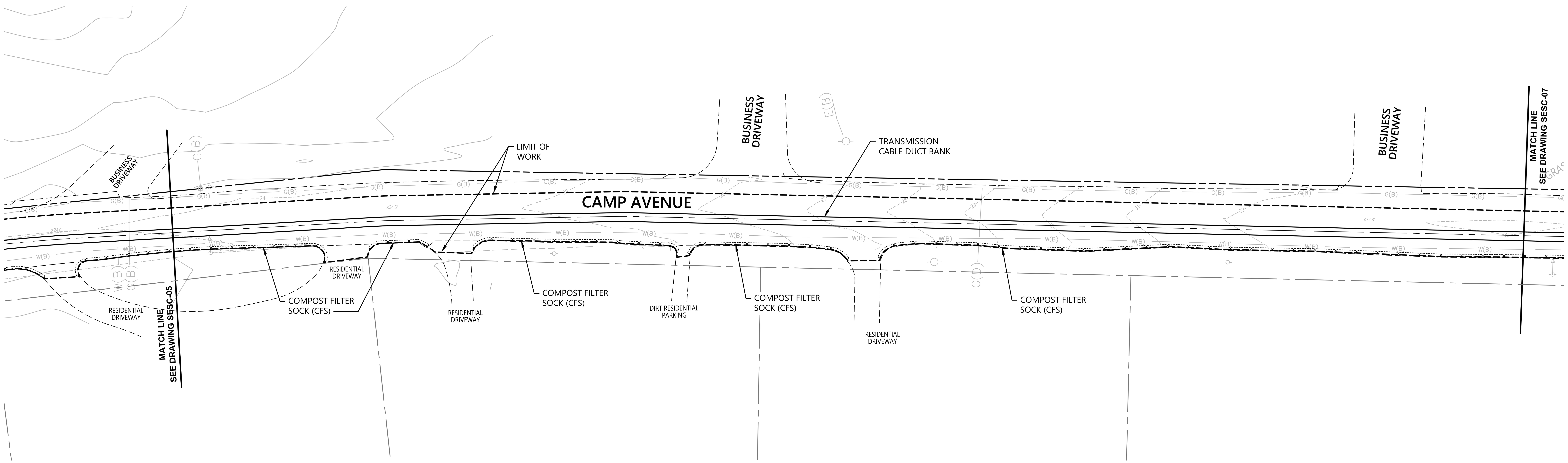

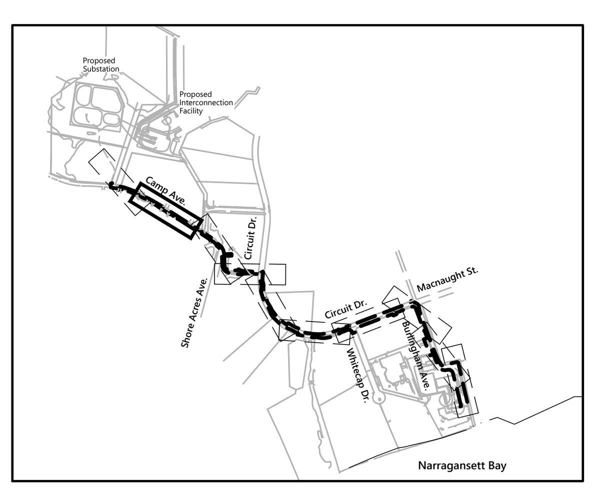

Key
Not To Scale

LEGEND

- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

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SCALE IN FEET

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

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REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 2
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-06	

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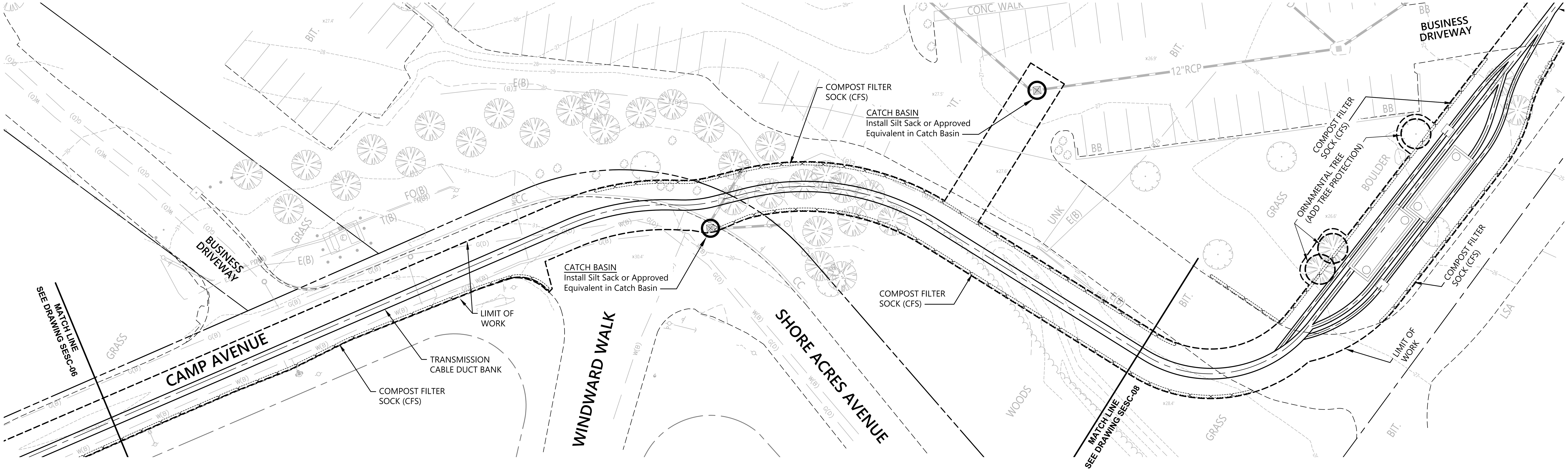

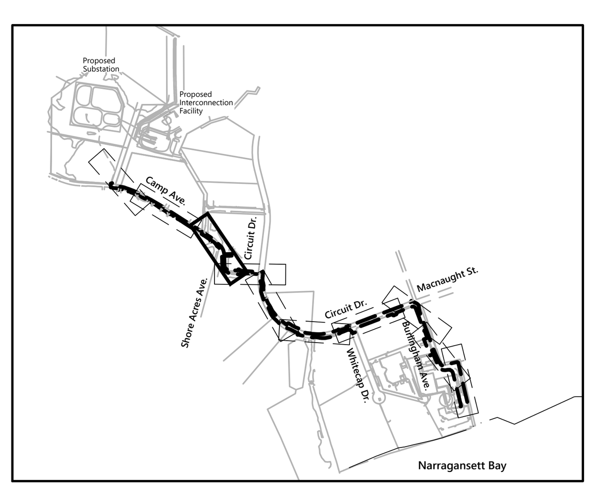

Key
Not To Scale

LEGEND

PROPERTY LINE	PROPOSED TRANSMISSION CABLE DUCT BANK
ROADWAY TLO	LIMIT OF DISTURBANCE
WETLAND EDGE WITH FLAG	COMPOST FILTER SOCK (CFS)
WETLAND AREA	CONSTRUCTION FENCE
COASTAL FEATURE	CATCH BASIN PROTECTION
50' PERIMETER WETLAND	
200' CONTIGUOUS AREA	
100-YEAR FLOODPLAIN	
FLOODPLAIN (ZONE VE)	

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PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 20 40
SCALE IN FEET

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RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 3
NORTH KINGSTOWN, RHODE ISLAND

BY	CHK'D	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	SESC-07

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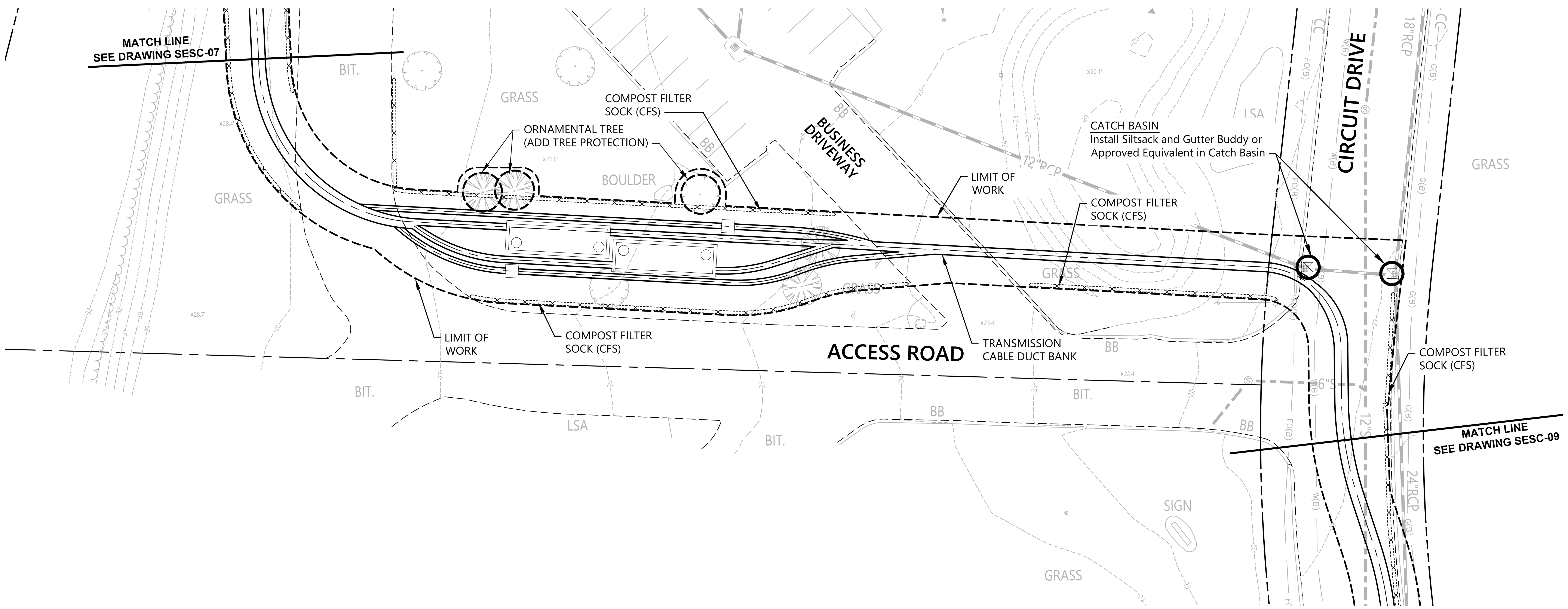

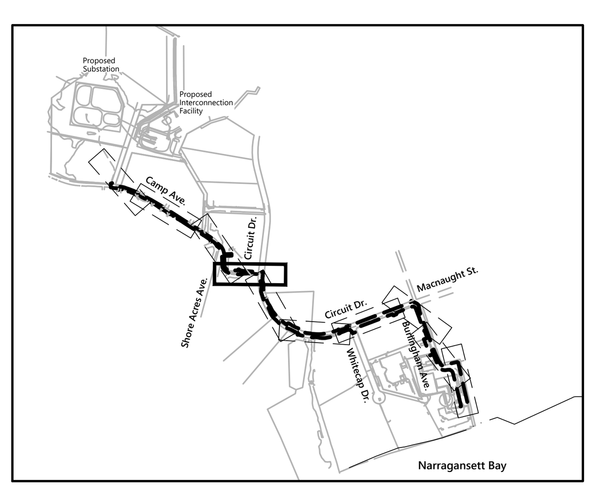

Key

Not To Scale

LEGEND

- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 20 40
SCALE IN FEET

vhb

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

REVISIONS DURING CONSTRUCTION

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 4
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO. SESC-08	

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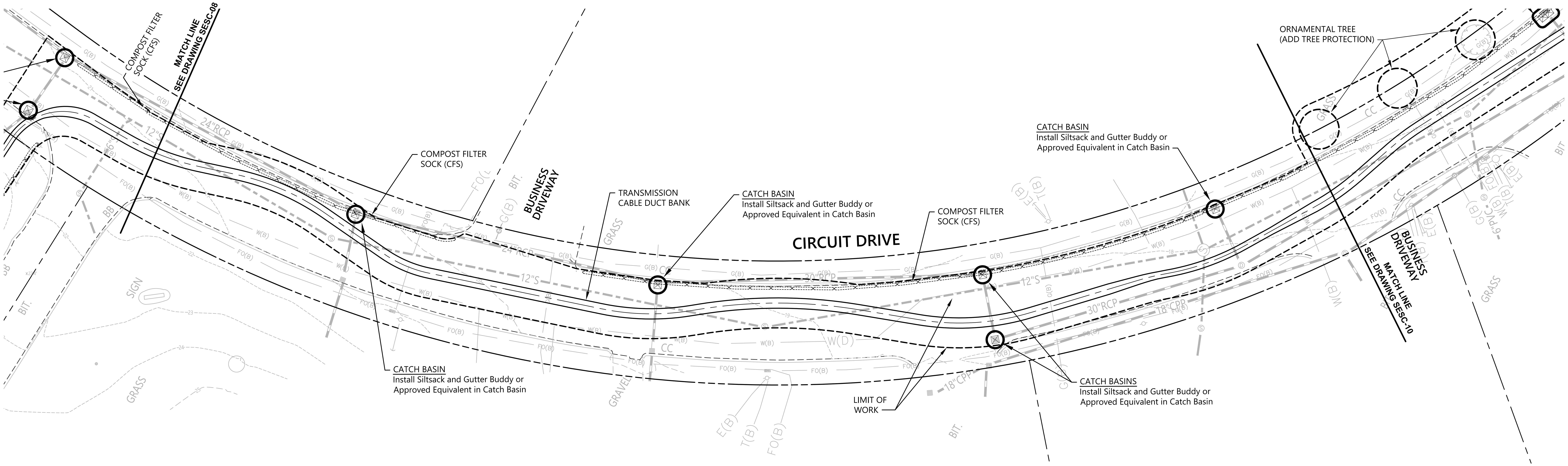
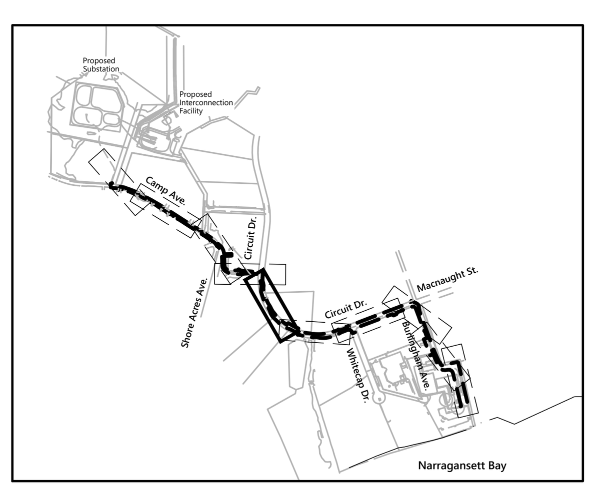




Key
Not To Scale

LEGEND

- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 20 40
SCALE IN FEET

vhb

RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

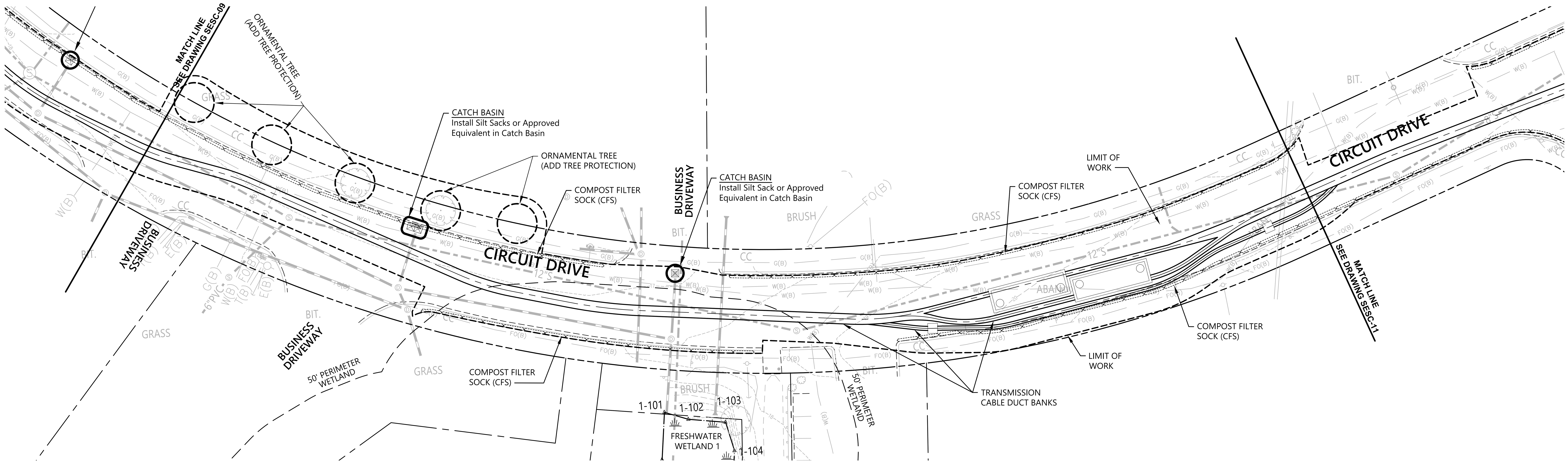
REVISIONS DURING CONSTRUCTION

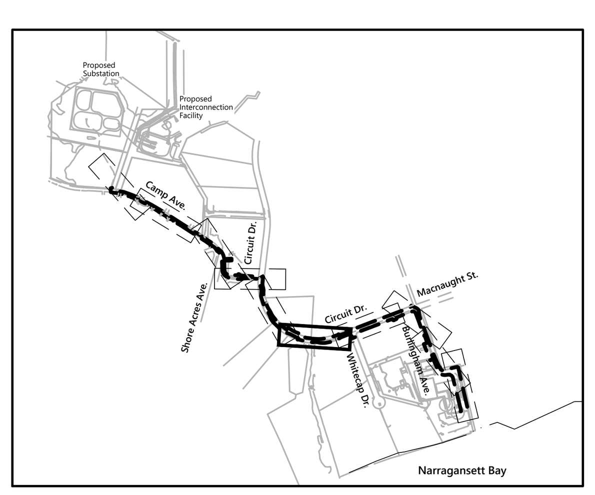
NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

Revolution Wind | Powered by Ørsted & Eversource

TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 5
NORTH KINGSTOWN, RHODE ISLAND

BY	CHKD	APP	APP
DATE 06/30/21	DATE	DATE	DATE
H-SCALE AS NOTED	SIZE ARCH D	FIELD BOOK & PAGES	
V-SCALE	V.S.	R.E.DWG.	
R.E. PROJ. NUMBER		DWG NO.	SESC-09





Key

Not To Scale

LEGEND

- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

0 20 40
SCALE IN FEET

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RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
6/30/2021

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Revolution Wind
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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 6
NORTH KINGSTOWN, RHODE ISLAND

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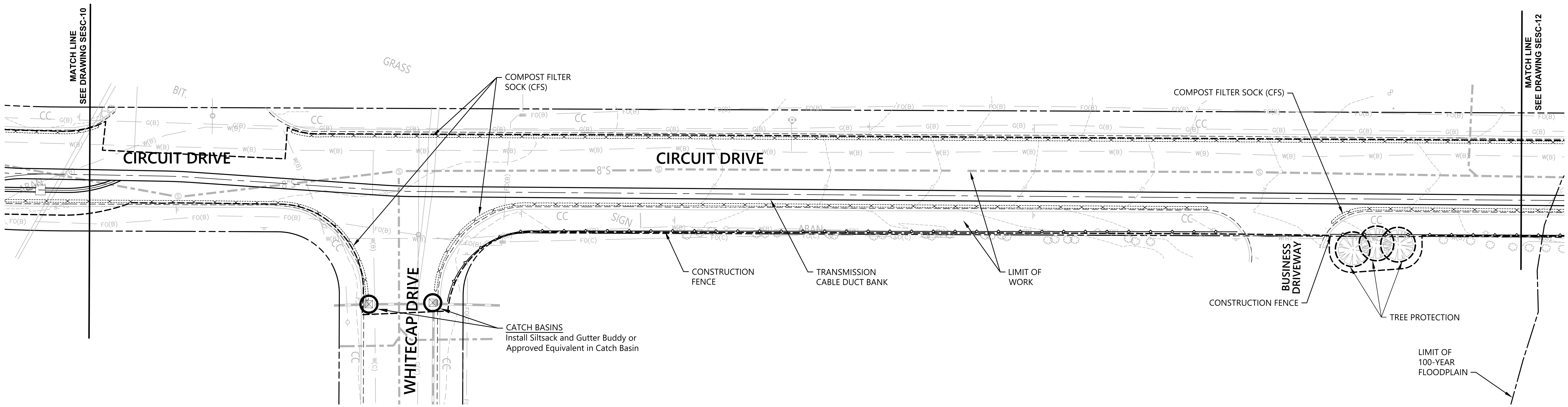

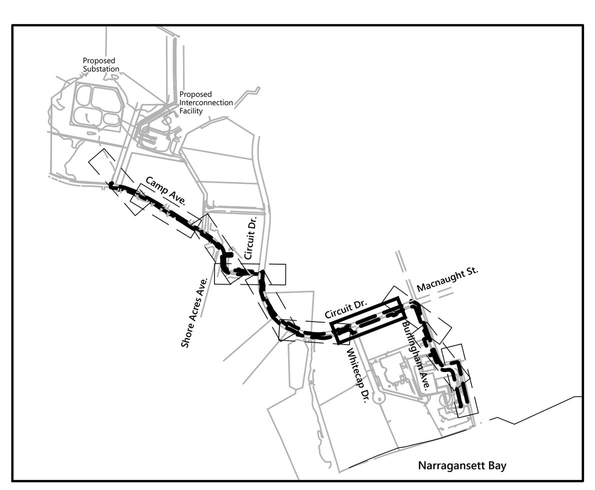

Key
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LEGEND

PROPERTY LINE	PROPOSED TRANSMISSION CABLE DUCT BANK
ROADWAY TLO	LIMIT OF DISTURBANCE
WETLAND EDGE WITH FLAG	COMPOST FILTER SOCK (CFS)
WETLAND AREA	CONSTRUCTION FENCE
COASTAL FEATURE	CATCH BASIN PROTECTION
50' PERIMETER WETLAND	
200' CONTIGUOUS AREA	
100-YEAR FLOODPLAIN	
FLOODPLAIN (ZONE VE)	

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6/30/2021

REVISIONS DURING CONSTRUCTION

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REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 7
NORTH KINGSTOWN, RHODE ISLAND

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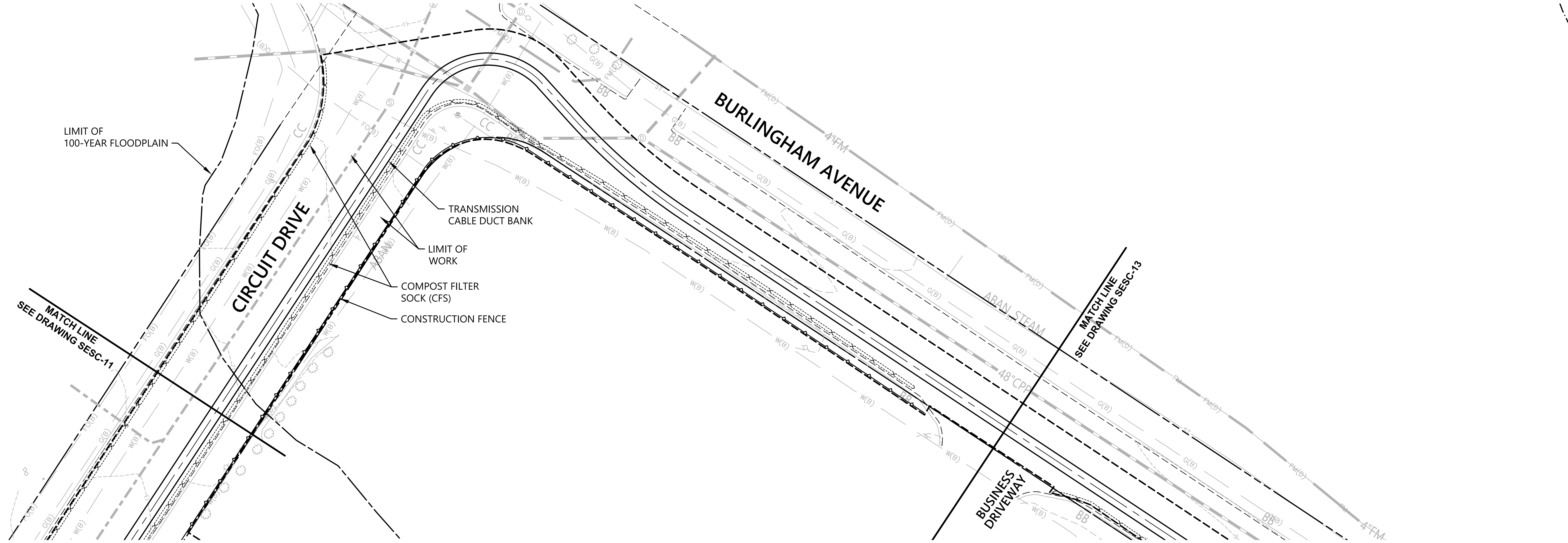

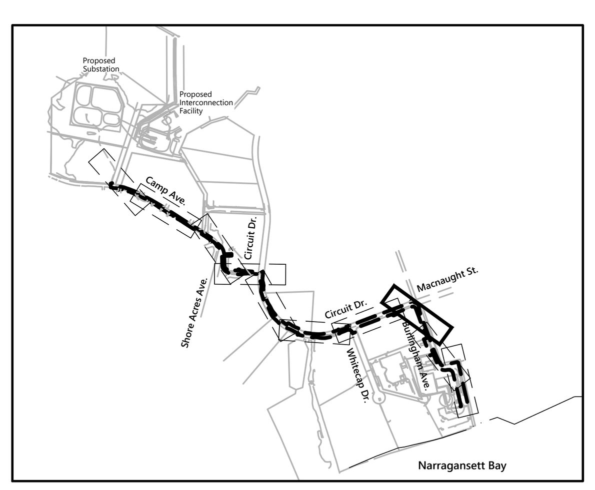

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- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

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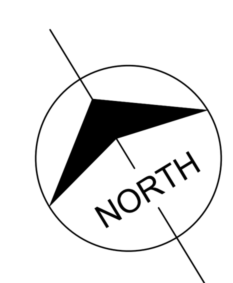

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 8
NORTH KINGSTOWN, RHODE ISLAND

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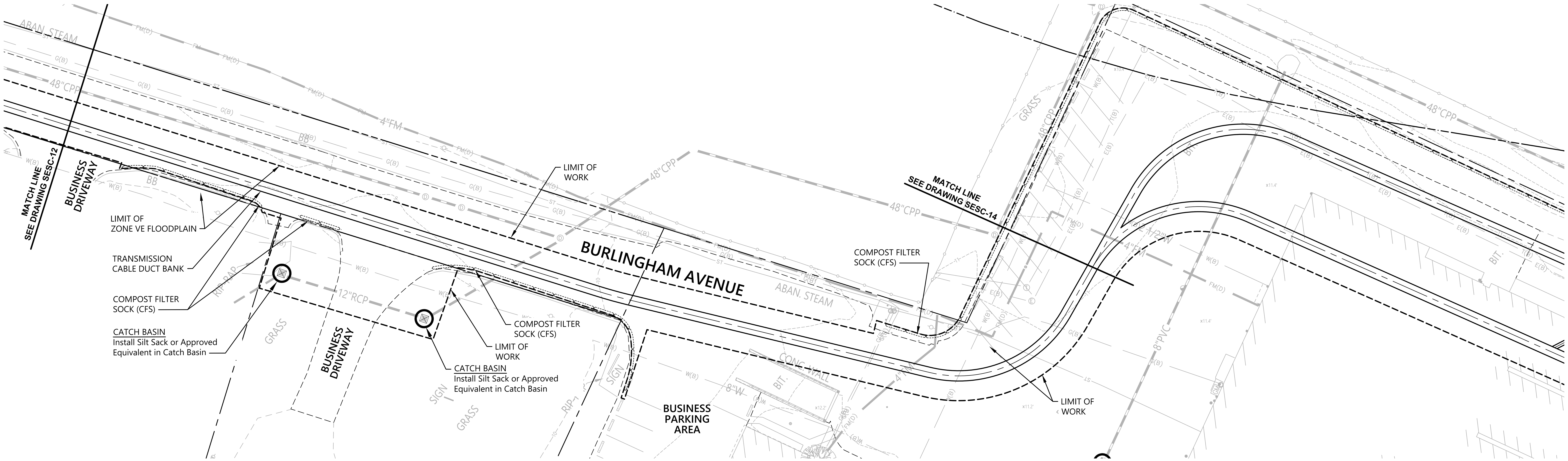

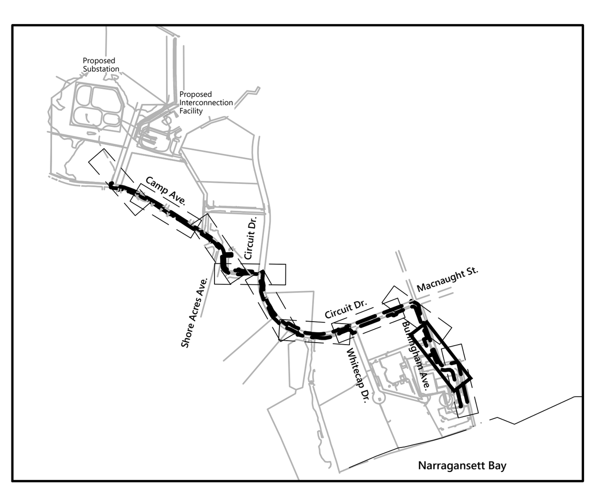

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LEGEND

PROPERTY LINE	PROPOSED TRANSMISSION CABLE DUCT BANK
ROADWAY TLO	LIMIT OF DISTURBANCE
WETLAND EDGE WITH FLAG	COMPOST FILTER SOCK (CFS)
WETLAND AREA	CONSTRUCTION FENCE
COASTAL FEATURE	CATCH BASIN PROTECTION
50' PERIMETER WETLAND	
200' CONTIGUOUS AREA	
100-YEAR FLOODPLAIN	
FLOODPLAIN (ZONE VE)	

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REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 9
NORTH KINGSTOWN, RHODE ISLAND

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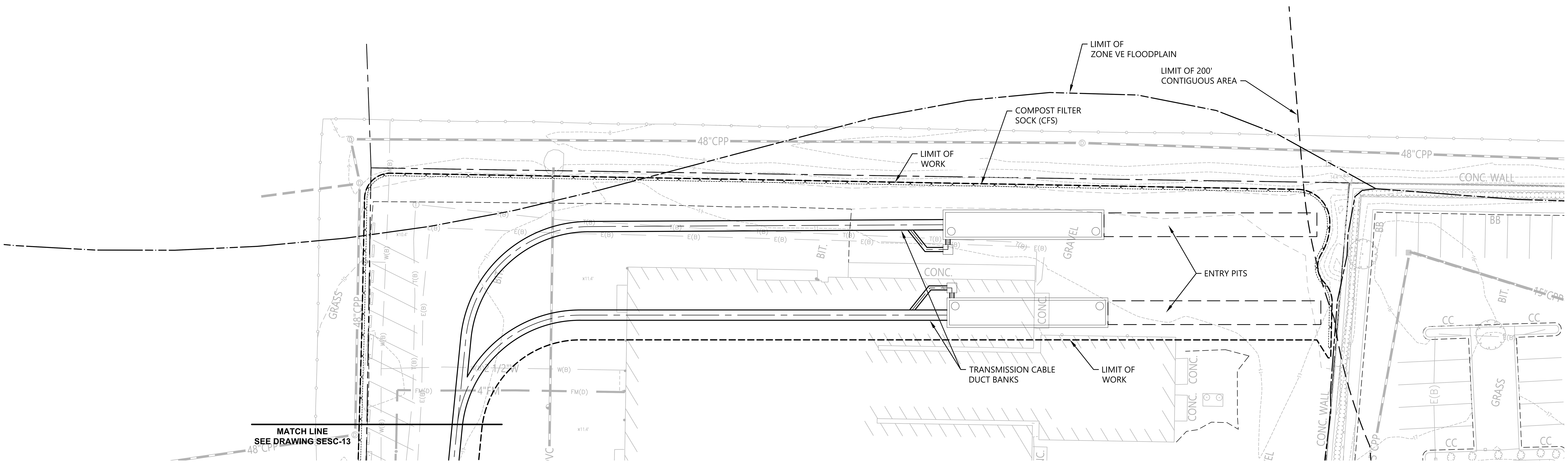

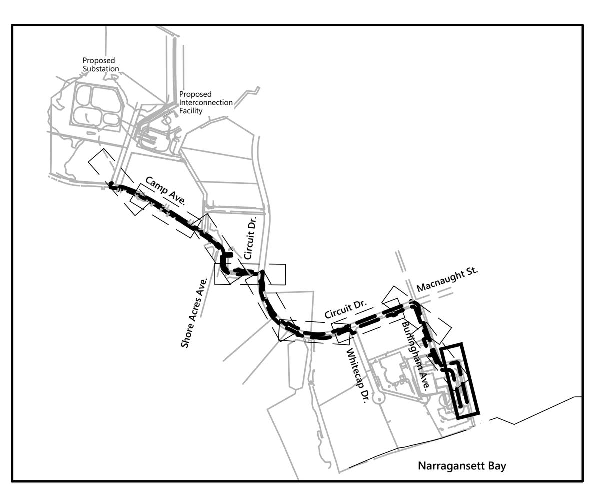

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LEGEND

- PROPERTY LINE
- ROADWAY TLO
- WETLAND EDGE WITH FLAG
- WETLAND AREA
- COASTAL FEATURE
- 50' PERIMETER WETLAND
- 200' CONTIGUOUS AREA
- 100-YEAR FLOODPLAIN
- FLOODPLAIN (ZONE VE)
- PROPOSED TRANSMISSION CABLE DUCT BANK
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK (CFS)
- CONSTRUCTION FENCE
- CATCH BASIN PROTECTION

ISSUED FOR REVIEW

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RENEE L. CODEGA
No. 6517
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
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REVISIONS DURING CONSTRUCTION

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TITLE
REVOLUTION WIND
PROPOSED ONSHORE TRANSMISSION FACILITIES
SESC PLAN 10
NORTH KINGSTOWN, RHODE ISLAND

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Appendix G: Emergency Response Plan/Oil Spill Response Plan

CONFIDENTIAL: Contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552)

Appendix H: Site Photos

Photo 1: Coastal beach at the landfall work area. The riprap shoreline protection is placed in front of a cast in place seawall at the landward side of the revetment and forms the Shoreline Feature. Photo date: May 20, 2021

Photo 2: A view of the Coastal Buffer Zone landward of the revetment. This area has been planted with native shrubs and grasses including switchgrass (*Panicum virgatum*) and shrubs such as inkberry (*Ilex opaca*) and bayberry (*Morella pensyllvanica*). Photo date: May 20, 2021

Photo 3: A view of the seawall (manmade shoreline) along the proposed Landfall Work Area south of Burlingham Avenue, North Kingstown. Photo date: January 5, 2021

Photo 4: A view of the vegetated coastal buffer zone between the seawall and the business/industrial development at the proposed Landfall Work Area. Photo date: January 5, 2021

Photo 5: A view of existing development within the proposed Landfall Work Area.
Photo date: January 5, 2021

Photo 6: An example of a parcel with managed lawn within the Quonset Business Park along Circuit Drive. The Onshore Transmission Cable Route will pass lots with managed lawn. Photo date: August 14, 2019

Photo 7: View of the Freshwater Wetland 3, a Swamp, which partially lies within the OnSS parcel.
Photo date: August 14, 2019

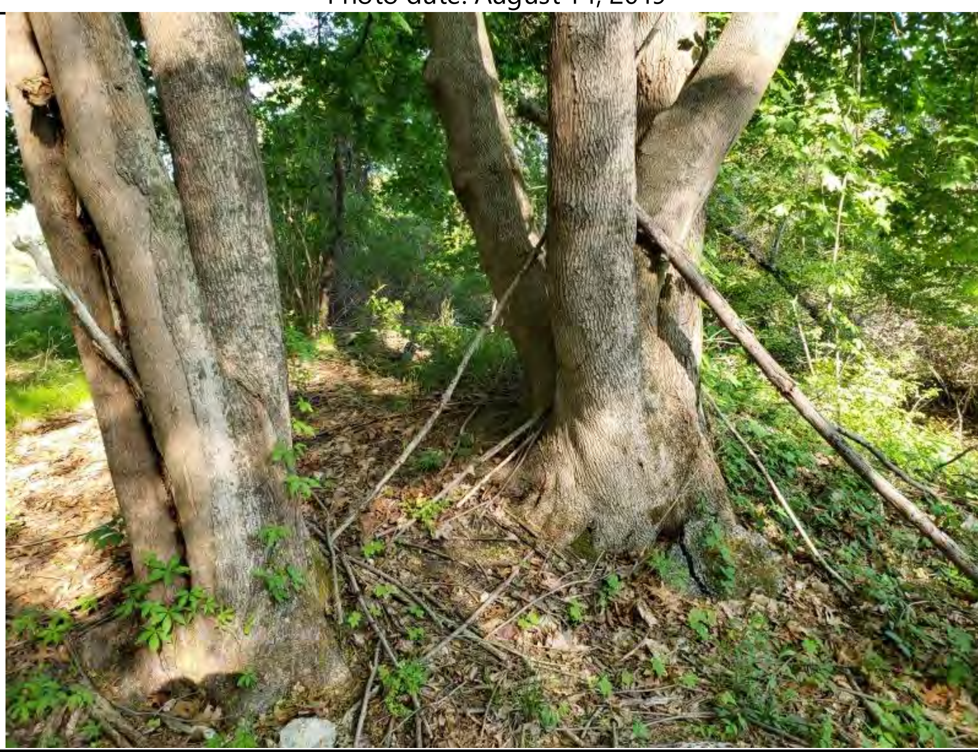

Photo 8: The Area of Land within 50 feet of Wetland 4 includes places where concrete demolition is visible at the ground surface such as at the base of these two Norway maples (*Acer platanoides*). Photo date: May 20, 2021

Photo 9: A view of the small pine barren habitat within the southeastern corner of the OnSS site. This habitat was created by mining sand and gravel and not reclaiming the pit with topsoil. Photo date: July 30, 2019

Photo 10: A view of the closed landfill maintained in cool season grasses. The OnSS will be partially sited on this feature providing a productive reuse of this brownfield area. Photo date: July 30, 2019

Photo 11: View of sickle-leaved golden aster (*Pityopsis falcata*) flowering in the pine barren area. This species is listed as state concern by the Rhode Island Natural Heritage Program. Photo date: July 30, 2019

Appendix I: Visual Resources Assessment Revolution Wind Onshore Facilities

Technical Report

Visual Resource Assessment

Revolution Wind Onshore Facilities

Prepared for:

Revolution Wind, LLC
56 Exchange Terrace, Suite 300
Providence, RI 02903

Prepared by:

Environmental Design & Research, Landscape Architecture,
Engineering & Environmental Services, D.P.C.
217 Montgomery Street, Suite 1100
Syracuse, New York 13202

December 2020

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Figures

Tables

1.0 INTRODUCTION

1.1 Purpose of the Investigation

Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR) was retained by Revolution Wind, LLC (the Applicant) to prepare a Visual Resource Assessment for the proposed Onshore Facilities associated with the Revolution Wind Farm Project. The Onshore Facilities include the following components:

- A landfall location located at Quonset Point in North Kingstown, Rhode Island.
- Up to two underground transmission circuits.
- A new Onshore Substation (OnSS) located adjacent to the existing Davisville Substation with up to two interconnection circuits (overhead or underground) connecting the OnSS to the existing substation.
- A new Interconnection Facility (ICF) also adjacent to the existing Davisville Substation.

This report addresses the potential impacts to visually sensitive resources associated with the visible components of the Onshore Facilities, which include the proposed OnSS and ICF, collectively referred to in this Visual Resource Assessment (VRA) as the "Project". The Onshore Facilities proposed to be buried underground may involve temporary visual impacts associated with the construction and decommissioning phase of the Project. However, long term operational impacts will not result from these underground circuits, and are therefore, not addressed in this VRA. The location of the proposed Onshore Facilities are shown on Figure 1.1-1.

The purpose of this VRA is to:

- Define the visual character of the Project visual study area (VSA).
- Inventory and evaluate existing visual resources and viewer groups within the VSA.
- Describe the appearance of the visible components of the proposed Project.
- Document existing views within the VSA.
- Evaluate potential Project visibility within the VSA.
- Assess the potential effects on visual resources associated with the proposed Project.

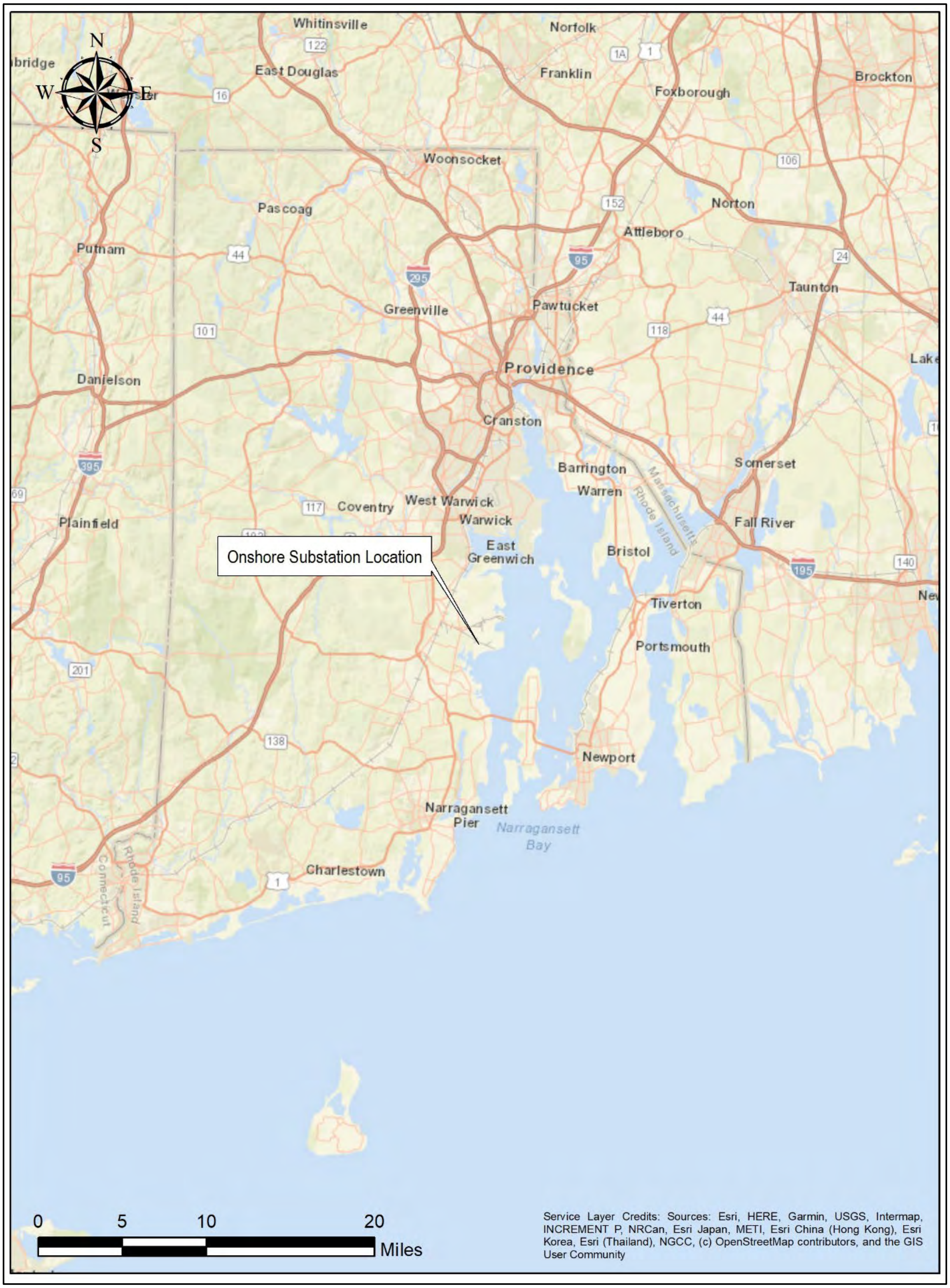

Figure 1.1-1. Regional Project Location

1.2 Project Location and Description

The Project is located in the Town of North Kingstown, Washington County, Rhode Island. The OnSS and ICF collectively occupy approximately 12 acres of currently forested land in the Quonset Business Park, adjacent to the existing Davisville Substation. Equipment within the OnSS and ICF will include transformers, switchgear, up to two control houses, and transmission structures required to facilitate interconnection with the existing electrical grid. The tallest components within the OnSS and ICF are the overhead transmission structures, which measure approximately 80 feet (24 m) above ground level (AGL).

1.2.1 Visual Study Area

In order to define the maximum area of potential visual effect associated with the Project, EDR defined the VSA as all areas within 3 miles of the Project's limit of disturbance. The VSA includes approximately 30.5 square miles within the Town of North Kingstown and small portions of Warwick and East Greenwich, Rhode Island. In addition, the VSA includes a portion of Narragansett Bay. The VSA was used to characterize the landscape, assess potential Project visibility, and identify visually sensitive resources of national, regional, and statewide significance.

Figure 1.2-1. Visual Study Area

1.2.2 Existing Landscape Character

Definition of landscape character within a given VSA provides a useful framework for the analysis of a facility's potential visual effects. Landscape types (LTs) within the VSA were categorized based on the similarity of various features, including landform, vegetation, water, and/or land use patterns, in accordance with established visual resource assessment methodologies (Smardon et al., 1988; USDA Forest Service, 1995; USDOT Federal Highway Administration, 1981; USDI Bureau of Land Management, 1980). The USGS National Land Cover Dataset (NLCD) was used to help define the character and location of various LTs within the VSA (see Figure 1.2-1). The landscape types defined within the VSA are presented in Table 1.2-1.

Table 1.2-1 Landscape Types Within the VSA

Landscape Type	Acres Within VSA	Percent of VSA
Open Water	6848.4	35.1
Developed Land	5801.5	29.7
Forest	5001.7	25.6
Open Space	1545.0	7.9
Wetlands	193.4	1.0
Beach	67.2	0.3
Agricultural Land	50.9	0.3
Total	**19,508.2**	**100**

Open water is the most prevalent LT within the VSA due to the presence of Narragansett Bay. Narragansett Bay makes up approximately 35% of the VSA and includes portions of West Passage, Mill Creek, Fishing Cove, Wickford Harbor, and Bissel Cove. The Open Water LT is generally defined by broad expanses of open water including coves, harbors, and river estuaries prevalent along this portion of the bay. Both Prudence and Conanicut Islands define the West Passage and land is typically visible in all directions from any given point on the bay. Views over the water are generally longer distance than in other LTs within the VSA due to the lack of foreground screening features.

Developed Land comprises the second largest proportion of the VSA, making up approximately 30% of the total area. This LT is primarily comprised of industrial land associated with the Quonset Business Park, Quonset Point Naval Air Station, the Quonset Davisville Business Park, and other commercial and industrial areas within the Town of North Kingstown. Developed areas also include dense suburban residential developments located north and west of the business parks along the State Route 403, Interstate Route 1, and Davisville Road corridors within the VSA. Open views within this LT are generally limited by the presence of foreground buildings and vegetation.

The Forest LT occurs in small pockets around and including the Project site, but collectively makes up almost 26% of the VSA. Larger contiguous areas of forest land occur in the southern and western portions of the VSA and are associated with Cocumcussoc State Park, Black Swamp, and Calf Pasture Beach. Forest land also occurs between suburban residential developments in the northern portion of the VSA and include several wetlands unsuitable for residential development. Views within the Forest LT are generally restricted by the dense forest canopy and understory vegetation.

Open Space occurs throughout approximately 8% of the VSA and includes areas that are developed for the purpose of recreation, stormwater management, or managed vacant land. The largest representative example in this VSA is the North Kingstown Golf Course, located adjacent to and north of the Project site. Open space areas have a greater potential for outward, long-distance views than other terrestrial LTs within the VSA.

The remaining LTs collectively make up approximately 1.6% of the entire VSA and are scattered throughout in non-contiguous areas, thus making them a minor and inconsequential constituent of the VSA.

1.2.3 Distance Zones

Distance zones are typically defined in visual studies to divide the VSA into distinct classifications based on the various levels of landscape detail that can be perceived by a viewer. Three distinct distance zones were developed for this purpose. To define these zones, EDR consulted several well-established agency protocols, including those published by the U.S. Forest Service (USFS), Bureau of Land Management (BLM), and U.S. Department of Transportation (USDOT), to determine the appropriate extent of each distance zone. It is important to note that the distance zones recommended by each of these protocols were considered in the context of this VSA. For example, the BLM recommends a combined foreground-middle ground zone extending from 0 to 5 miles. While this may be appropriate in a western landscape with frequent, unscreened views over very long distances, it does not translate to eastern landscapes where views are often contained within 1.0 mile of the viewer. Conversely, the USFS (1995) suggests the foreground be defined as an area extending 0.5 mile from the viewer. Due to the characteristics of the specific landscape being evaluated in this VRA, EDR defined distance zones within the VSA (as measured from the proposed Project) as follows:

- Near-Foreground: 0 to 0.5 mile. At this distance, a viewer is able to perceive details of an object with clarity. Surface textures, small features, and the full intensity and value of color can be seen on foreground objects.
- Foreground: 0.5 to 1.5 miles. At this distance, elements in the landscape tend to retain visual prominence, but detailed textures become less distinct. Larger scale landscape elements remain as a series of recognizable and distinguishable landscape patterns, colors, and textures.
- Middle Ground: 1.5 to 3.0 miles. The middle ground is usually the predominant distance at which landscapes are seen. At these distances, a viewer can perceive individual structures and trees but not in great detail. This is the zone where the parts of the landscape start to join together; individual hills become a range, individual trees merge into a forest, and buildings appear as simple geometric forms. Colors will be distinguishable but subdued by a bluish cast and softer tones than those in the foreground. Contrast in texture between landscape elements will also be reduced.

The area of each LT falling within each distance zone in the VSA is summarized in Table 1.2-2. As shown in this table, the distribution of LTs within the individual distance zones varies significantly. Due to the presence of Narragansett Bay, the Open Water LS makes up between 27% and 39% of the Foreground and Middle Ground zones, respectively. However, Open Water makes up only 1% of the Near Foreground. Developed land makes up the greatest percentage of the Near Foreground and Foreground zones, at 64% and 46% respectively. This is largely due to the presence of existing commercial and industrial facilities located within the Quonset Business Park. Forest also makes up a significant portion of each distance zone with 29% in the Middle Ground, 17% in the Foreground, and 18% in the Near Foreground.

Table 1.2-2 Landscape Types Occurring in Each Distance Zone

Landscape Type	Percent of LS with the Near Foreground	Percent of LS with the Foreground	Percent of LS with the Middle Ground
Open Water	1.0	27.2	39.4
Forest	18.2	17.0	28.7
Developed Land	64.0	46.4	22.7
Open Space	15.2	7.3	7.7
Wetlands	1.5	1.7	0.7
Beach	0.0	0.4	0.4
Agricultural	0.1	0.0	0.3
Total	100	100	100

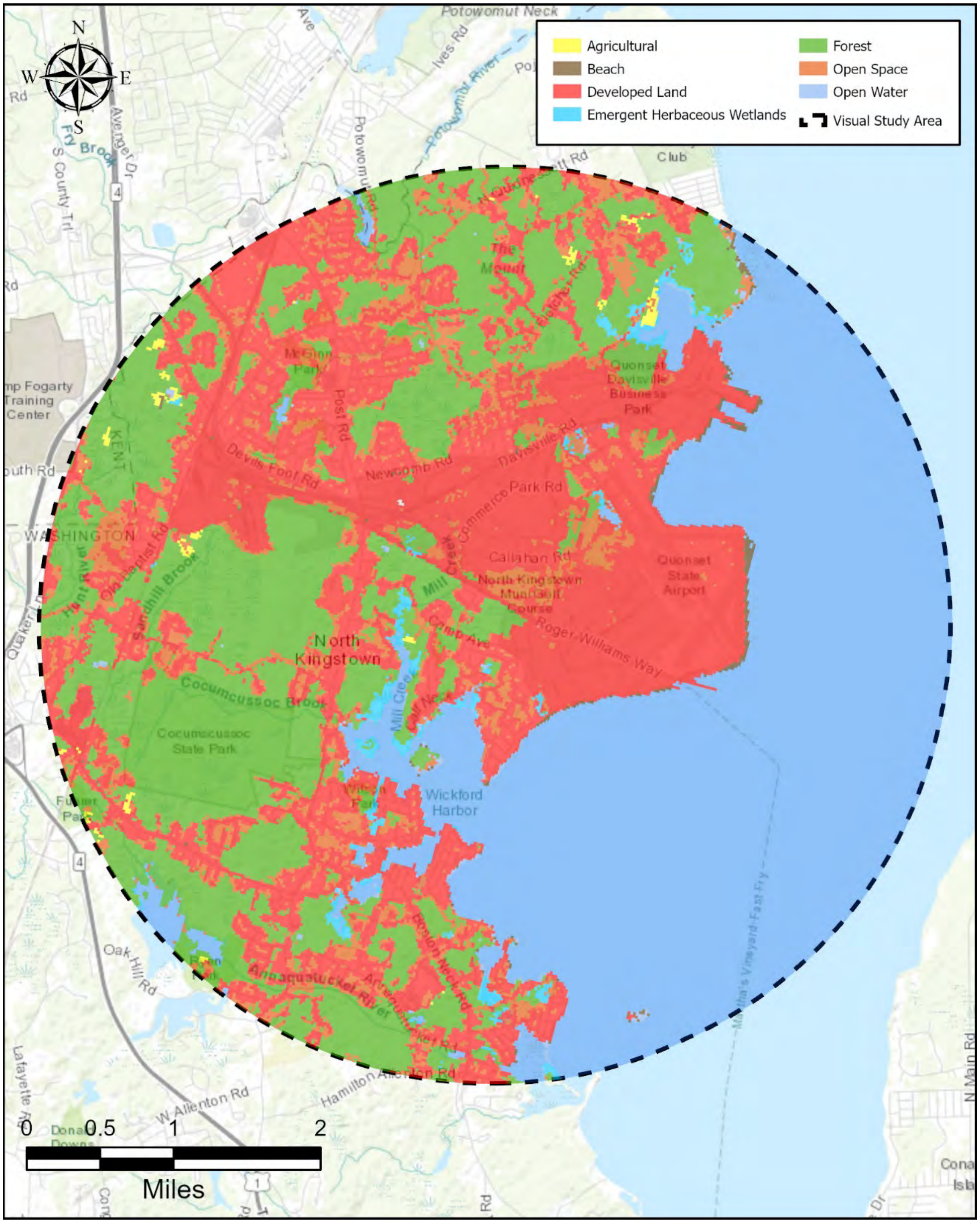

Figure 1.2-2. NLCD Cover Types within the Visual Study Area

1.2.4 Visually Sensitive Resources

The identification of visually sensitive resources is an important step in determining locations which may be particularly sensitive to visual change. These resources have generally been identified by national, state, or local governments, organizations, and/or Native American tribes as important sites which are afforded some level of recognition or protection. Avoiding or minimizing impacts to these resources is an important consideration in the planning stages of a project. For this VRA, an inventory of visually sensitive resources within the VSA was prepared. This inventory determined that the VSA includes 95 visually sensitive resources (VSRs), which are listed by category in Table 1.2-2 and depicted in Figure 1.2-2, below. Appendix A includes a complete list of individual resources.

Table 1.2-2 Visually Sensitive Resources within the VSA

Type of Resource	Number of Resources within the VSA
Historic Resources (State or National Register of Historic Places)	17
Rhode Island Historical Cemeteries	63
State Parks	1
Rhode Island State Scenic Areas	4
State Nature Preserve	1
Public Boat Launch and Fishing Access	5
State Lands	2
Ferry Ports	1
Major Waterbodies	1
Total	**95**

In addition to the publicly assessable resources identified within the VSA, the residential areas directly adjacent to the proposed Project are also considered visually sensitive resources in this visual analysis. These resources include approximately 10 residences along the south side of Camp Avenue. While these resources are not formally designated as VSRs, the residents in this location are as little as 150 feet from the Project site and are likely sensitive to any changes in the views available from their homes. As such, the construction and operation of the OnSS and ICF may result in visual effects to these users.

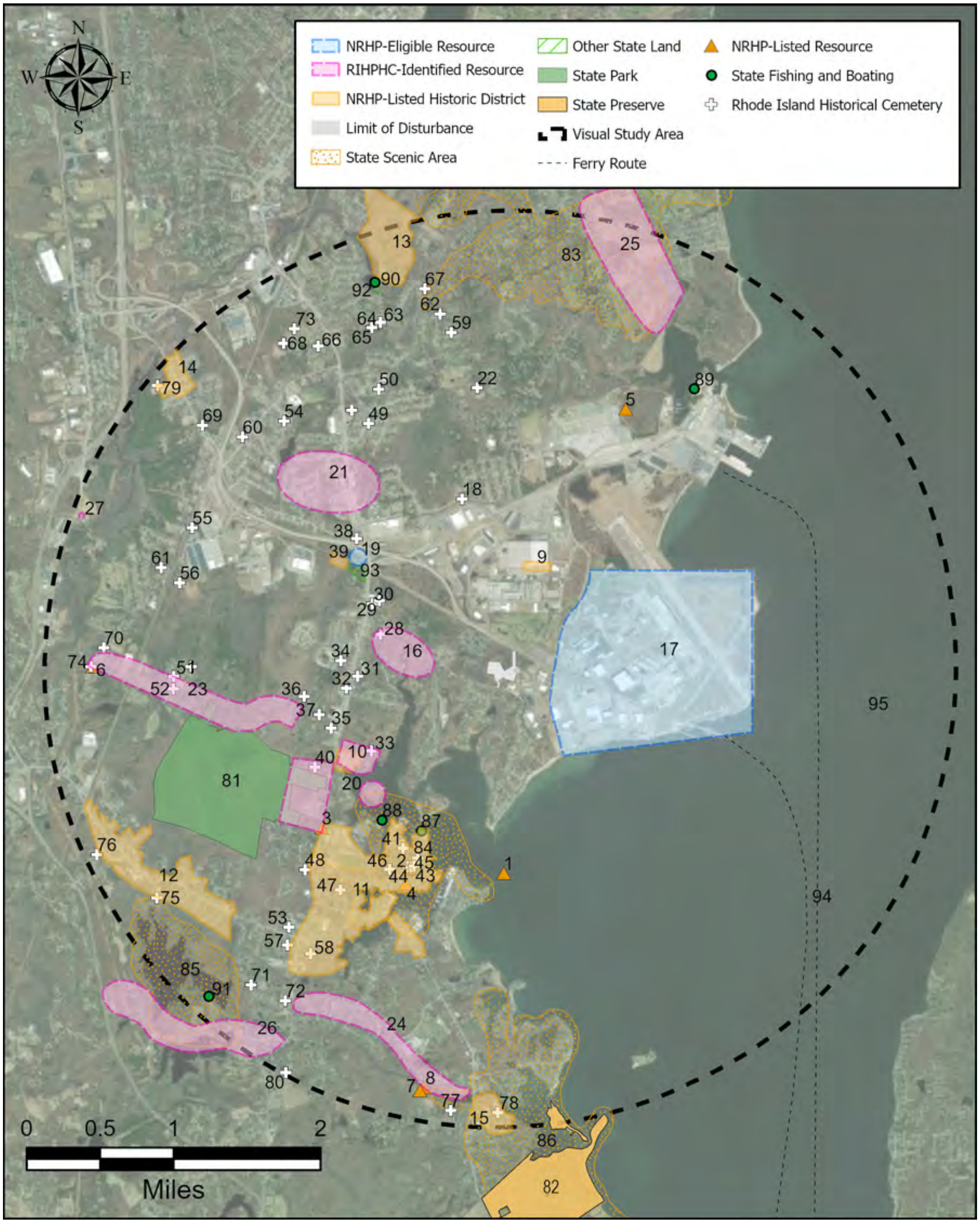

Figure 1.2-3. Visually Sensitive Resources Within the Visual Study Area

2.0 VISUAL RESOURCE ASSESSMENT

The specific techniques used to assess potential Project visibility and visual effects, along with the results of those assessments are described below.

2.1 Viewshed Analysis

2.1.1 Viewshed Analysis Methodology

To determine the geographic areas of potential visibility of the Project, EDR used a lidar-based viewshed analysis. This analysis considers the height of proposed above-ground Project components, along with a digital surface model (DSM) representing ground level elevations, vegetation, and structures present in the VSA. The DSM was derived from the 2011 American Recovery and Reinvestment Act lidar dataset with a horizontal resolution of one meter. A geographic information systems (GIS) analysis of these data was conducted to determine whether a direct line of sight would be available from ground level vantage points to the Project. If a direct line of sight is available, the position is coded as visible. Heights used in the viewshed calculations were based on 35 sample points within the OnSS ranging in height from 20 feet to 80 feet which represents the lightning masts, overhead transmission structures (the tallest facility structures), and the major enclosed structures (see Figure 2.1-1). The resulting geographic areas of potential Project visibility are referred to the Project zone of visual influence (ZVI) and will be the focus of the VRA.

To assure an accurate assessment of potential Project visibility, a few modifications were made to the lidar-derived DSM prior to analysis. Transmission lines and road-side utility lines that are reflected in the lidar data are mis-represented in the DSM as solid walls/screening features. In order to correct this inaccuracy, DSM elevation values within transmission line corridors and within 50 feet of road centerlines were replaced with bare earth elevation values. Additionally, all areas within the Project limit of disturbance were modeled with an assumption of no vegetation to reflect the bare-earth elevation in these locations. This modified DSM was then used as a base layer for the viewshed analysis. Once the viewshed analysis was completed, a conditional statement was used within ArcGIS® to set Project visibility to zero in locations where the DSM elevation exceeded the bare earth elevation by 6 feet or more, indicating the presence of vegetation or structures that exceed viewer height. This was done for two reasons; 1) in locations where trees or structures are present in the DSM, the viewshed would reflect visibility from the vantage point of standing on the tree top or building roof, which is not the intent of this analysis, and 2) to reflect the fact that ground-level vantage points within buildings or areas of vegetation exceeding 6 feet in height generally will be screened from views of the Project.

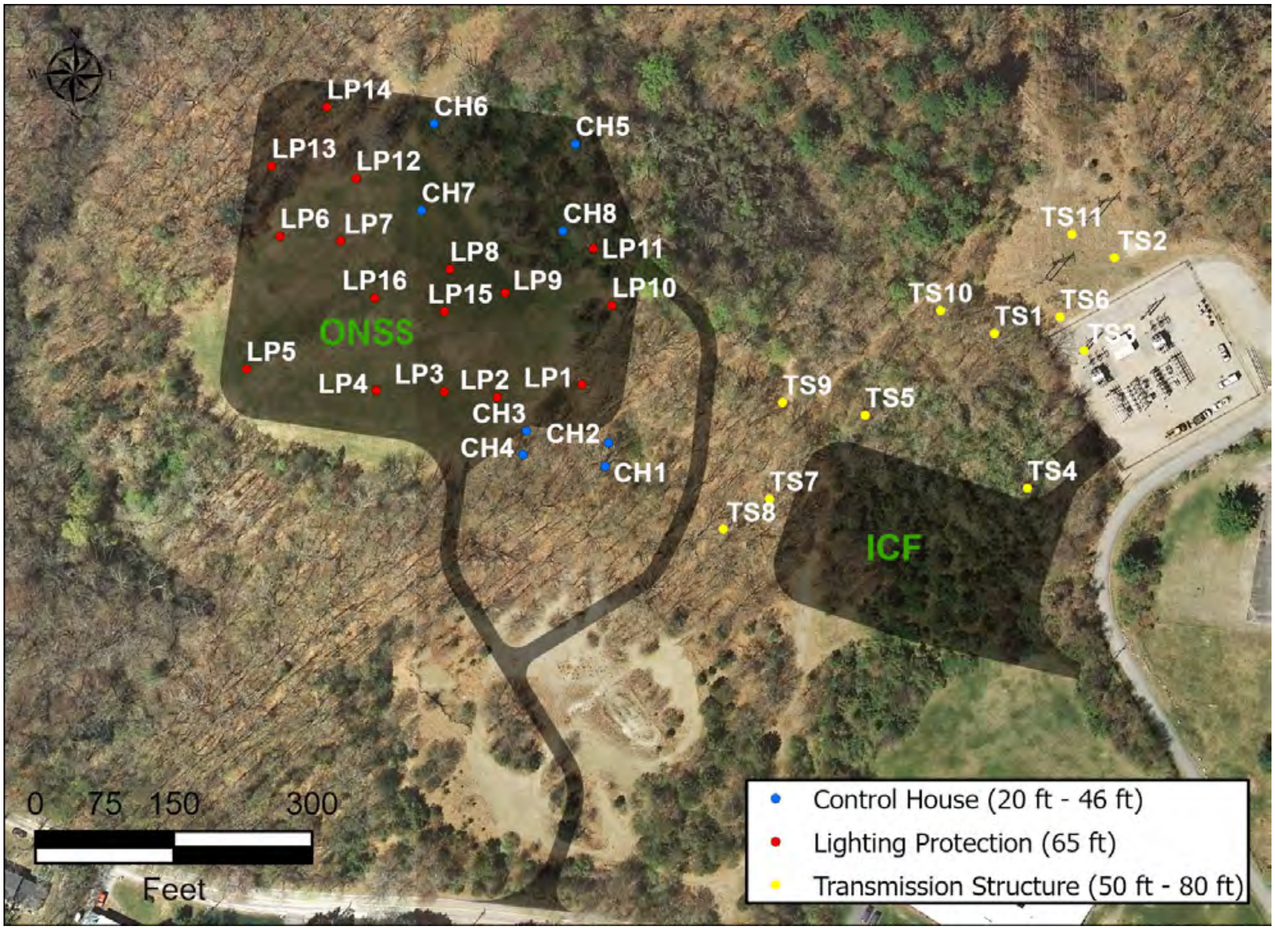

Figure 2.1-1. Viewshed Sample Points and Height Assumptions

2.1.2 Viewshed Analysis Results

The viewshed analysis results suggest that approximately 15% of the VSA could have some level of Project visibility. The greatest potential for Project visibility within the VSA occurs on portions of Narragansett Bay in the Foreground and Middle Ground zones. This visibility is largely the result of available long-distance views over open water, unincumbered by foreground features such as vegetation and buildings. The viewshed analysis also indicates potential visibility the immediate vicinity of the Project (within the Near Foreground zone). This generally includes discrete views between buildings and along portions of private and public roads within the Quonset Point Business Park. However, as noted in Section 2.1.2 the viewshed analysis assumes a 50-foot clearing zone along these roads suggesting the viewshed analysis result may present a conservative assessment of visibility that ignores roadside screening vegetation. Small areas of visibility were also indicated in the vicinity of Callahan Road, north of the Project site and along the immediate shoreline of Wickford Harbor and the Village of Wickford. In the western portion of the VSA, the viewshed analysis indicated no potential visibility beyond the limits of the Project site.

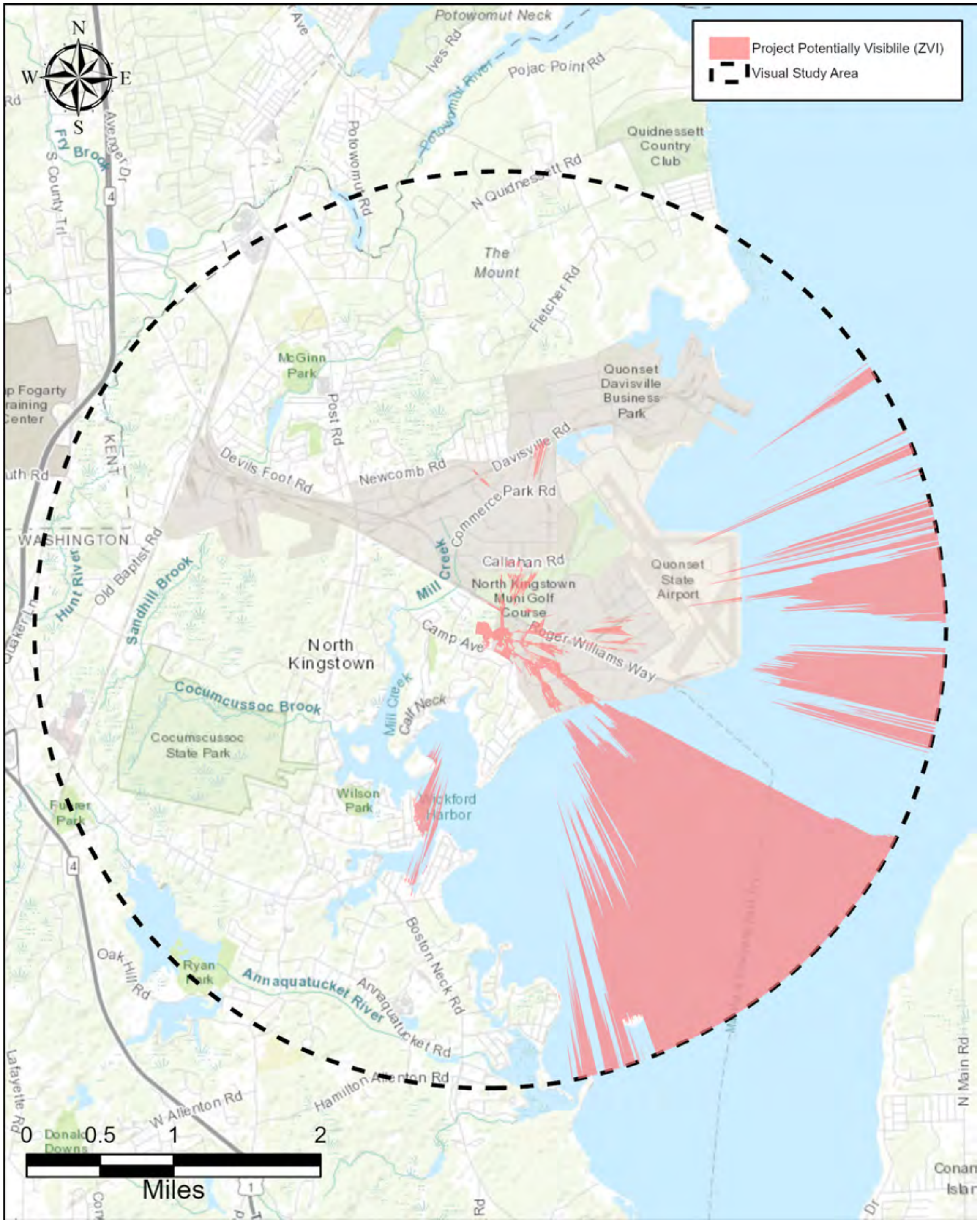

Figure 2.1-2. Viewshed Analysis Results

2.1.3 Visibility Results from Visually Sensitive Resources

Five of the 95 VSRs occurring within the 3-mile radius VSA were indicated as having potential visibility of the Project. A description of these resources, their distance from the Project, and the nature and degree of potential visibility as indicated by the viewshed analysis is provided in Table 2.1-1 and Figure 2.1-3, below. Appendix A contains a full list of VSRs keyed to Figure 2.1-3, their distance to the Project, and potential visibility.

Table 2.1-1 Visually Sensitive Resources with Project Visibility

Map ID	Resource Name	Distance from the Project (mi.)	Description of Resource	Description of Potential Visibility
11	Wickford Historic District	1.1	This historic district encompasses approximately 389.7 acres and is roughly bounded by Tower Hill Road, Wickford Cove, Mill Cove, and Fishing Cove.	An area of visibility occurs along the shoreline measuring approximately 0.3 miles long and includes residential properties along Pleasant Street as well as a small portion of the harbor. Generally, landscape vegetation limits outward views to the water and the immediate shoreline and inland visibility does not occur.
17	Quonset Point Naval Air Station	0.25	This NRHP-eligible site is an approximately 974-acre former US Navy training facility, built according to typical World War II-era design and construction concepts. The Quonset Point Naval Air Station was completed in 1941 in response to the new threats posed by military submarines and aircraft at the outbreak of World War II.	Visibility from within this VSR generally restricted to small discrete corridors occurring between existing buildings associated with the facility. Additionally, two large warehouse buildings were erected after the collection of lidar data. Based on the areas indicated as visible by the viewshed analysis, Project visibility could be significantly reduced with the addition of these buildings near the perimeter of the facility.
84	Wickford Harbor/Wickford Village State Scenic Area	1.0	The Rhode Island Landscape Inventory of State Scenic Areas lists this area as a "Historic Fishing Village with water views" and includes Mill Cove, Wickford Cove, the Village of Wickford, and portions of Main Street and Post Road.	See description for VSR 11
94	Quonset to Martha's Vineyard Ferry	1.5	This ferry departs from Quonset Point and sails down Narragansett Bay to Vineyard Sound before arriving at Oak Bluffs on Martha's Vineyard. The ferry service is only available during the summer season.	See description for VSR 95

Map ID	Resource Name	Distance from the Project (mi.)	Description of Resource	Description of Potential Visibility
95	Narragansett Bay	0.6	Narragansett Bay covers approximately 147 square miles. It is New England's largest estuary hosting a large number of ports, harbors, and marinas (some of which occur in the VSA).	Narragansett Bay has the largest areas of contiguous Project visibility within the VSA and is the only resource that could potentially have visibility out to the full extent of the VSA. However, the viewshed analysis considers the tallest portions of the Project which generally have a narrow profile. Visibility of the lightning mast and transmission structures is likely to be minimal given their narrow profile and the presence of buildings and vegetation between the Project and this resource.

In addition, to the VSR's described above, if construction of the Project requires vegetative clearing to the edge of Camp Avenue, a number of the residents on the south side of Camp Avenue could experience view of the Project. Vegetative clearing can result in changes to the lighting and shading of adjacent properties, and may reveal views of the Project, which can be characterized as a large, industrial installation.

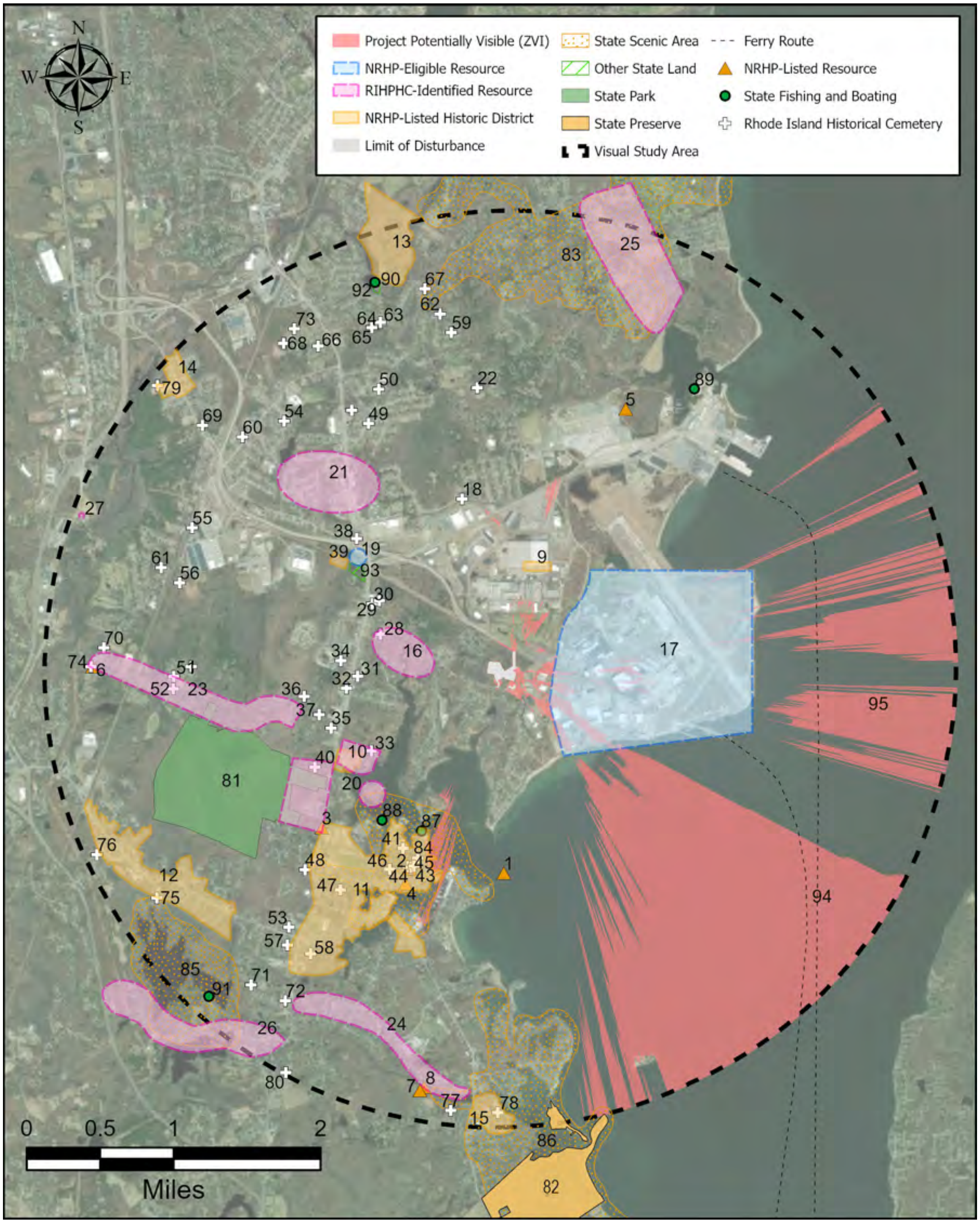

Figure 2.1-3. Visibility from Visually Sensitive Resources

2.1.4 Field Verification Methodology

EDR conducted site visits to the VSA on September 16, 2020 and October 16, 2020. The purpose of this field review was to verify potential visibility of the Project (as suggested by the viewshed analysis), to document the visual character within the VSA, and to identify the type and extent of existing visual screening.

During the site visit, EDR staff members drove public roads and visited public vantage points within the VSA, and obtained photographs from 21 individual viewpoints utilizing a digital SLR camera with a lens setting of 50 mm. Viewpoint locations were selected to document views from Camp Avenue, and within the Quonset Point Business Park. These locations were recorded using an in-camera global positioning system (GPS) unit, and all field notes, GPS points, focal length parameters, times, and dates were documented electronically. The viewpoint photographs are illustrated in Appendix B and the viewpoint locations are illustrated in Figure 2.1-4, below.

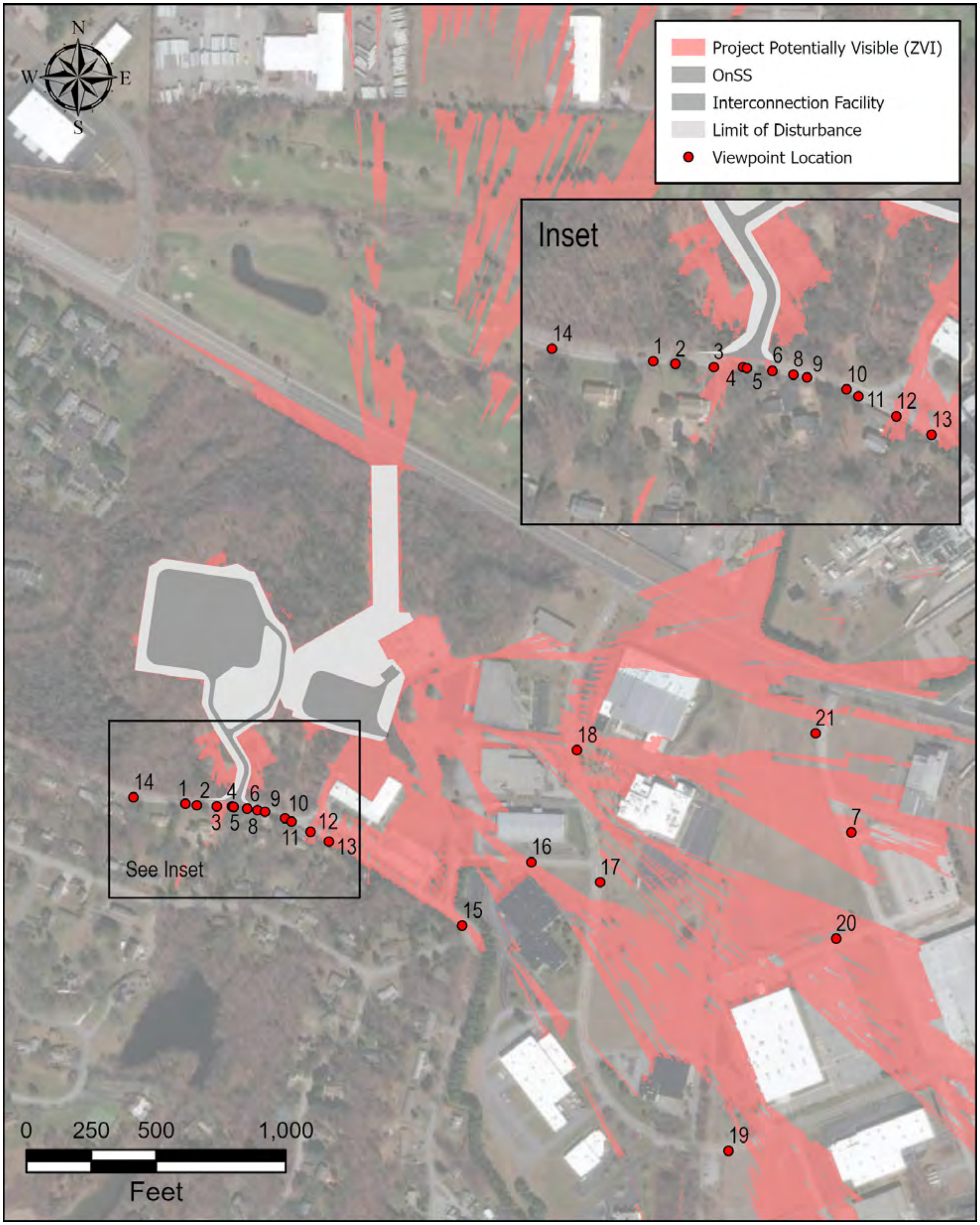

Figure 2.1-4. Viewpoint Locations

2.1.5 Field Verification Results

Field review suggests that visibility of the Project will be more limited than suggested by the viewshed analysis due to the presence of roadside vegetation. As mentioned previously, in order to avoid misinterpretation of overhead utility lines in the lidar data, the road corridors in the VSA were modeled with an assumption of no vegetation to a distance of 50 feet from the road centerline. This in effect eliminated the effect of any vegetative screening along public roads. Field photography was completed along Camp Avenue which runs adjacent to the Project site. In this location, the existing vegetative buffer completely screens views into the Project site. However, some changes to this buffer will be apparent to the adjacent residences due to a thinning of the buffer and changes in light quality. Visibility from within the adjacent Quonset Point Business Park will also be minimal and will likely only include the upper portions of the tallest components of the Project. In a number of locations (Camp Avenue, Circuit Drive, and Burlingham Avenue, visibility was limited by the presence of landscape vegetation combined with the presence of multiple structures.

2.1.6 Line of Sight Cross Section Methodology

The viewshed analysis identifies those locations where any portion of the OnSS or ICF facilities could potentially be seen from ground-level vantage points. This visibility may include only the top few feet of the tallest structures associated with the Project. In order to determine which facility components may be visible, EDR completed line of sight cross sections (LOS) from two visually sensitive resources indicated as having potential Project visibility by the viewshed analysis. In addition to illustrating the degree of Project visibility, the LOS also provide an opportunity to identify any additional screening features not included in the 2011 lidar data. To accomplish this, each LOS was overlaid on a recent (2018) aerial photograph of the VSA and the lidar data were used to create a specific cross sectional “cut” of the site topography, vegetation, and structures along a line specifically placed in the areas of the viewshed indicated as having Project visibility. Section A-A’ illustrates potential visibility from the Wickford Historic District and Wickford Harbor/Wickford Village State Scenic Area. Section B-B’ illustrates potential visibility from Narragansett Bay and Quonset Point Naval Air Station. The results of these analyses are provided in Section 2.1.7.

2.1.7 Line of Sight Cross Section Results

Line of Sight A-A’ (see Appendix C) begins near Main Street in Wickford Village and runs in a north-northeasterly direction across Wickford Harbor and Fishing Cove before making landfall near Fishing Cove Road in South Kingstown. The LOS crosses the residential neighborhoods along Windward Walk Road and Camp Avenue before entering the forested area leading up to the Project Site where it intersects the OnSS facility. As illustrated in the LOS, the OnSS is substantially screened from view and the only potentially visible Project component is the proposed interconnection transmission structures associated with the ICF. All of the lightning mast and lower level Project features are completely screened by existing structures and vegetation. It is likely that the visibility of the transmission structure will be imperceptible from the Village of Wickford at a distance of 1.5 miles do to the fact that the structures will have a relatively narrow profile and because only the upper 10 feet of the proposed structures are indicated as having potential visibility.

Line of Sight B-B’ begins in Narragansett Bay and runs northwest to the Quonset Point Business Park. From there it runs across two sections of Circuit Drive, intersecting two large warehouse structures and a portion of the Quonset Point Naval Air Station before entering the Project site where the LOS intersects the ICF and OnSS. As was the case with LOS A-A’, only a small portion of the top of the proposed transmission structures are likely to have potential visibility from the VSRs included along this section line due to screening provided by the structures and vegetation adjacent to the Project site. As discussed previously, at a distance of approximately 1.5 miles, the potentially visible portions of the Project will likely be imperceptible due to their narrow profile.

3.0 CONCLUSIONS

Based on results of the viewshed analysis, it is anticipated that the Project may be potentially visible from approximately 15% of the entire VSA and five of the 95 (5%) identified VSRs within the VSA. However, field review suggested that Project visibility would likely be significantly less than suggested by the viewshed analysis due to the presence of landscape vegetation present along roadways, which was not considered in the viewshed analysis.

As illustrated in the line of sight cross sections, being within the Project viewshed does not necessarily indicate that the Project will result in visual impacts to the VSR present within the VSA. In fact, for the majority of these resources, Project Visibility will only include the upper portions of a few proposed transmission structures. As the LOSs indicate from Wickford Historic District and Wickford Harbor/Wickford Village State Scenic Area, Narragansett Bay and the Quonset Point Naval Air Station, the Project will be barely perceptible amongst the buildings and vegetation present in the Quonset Point Business Park. This is particularly the case for viewpoints and viewers located greater than 1 mile from the Project.

However, where visible at near foreground distances, the proposed Project would introduce new industrial/utility structures into the landscape. At a maximum height of 80 feet, the proposed Project will not be out of scale or character with the existing types of development currently present in the vicinity, such as the existing Davisville Substation, or the structures at nearby Quonset Point Business Park. As such, it is anticipated that the Project will result in negligible visual impacts to the public resources present in the VSA. As mentioned previously, some Camp Avenue residences are likely to experience limited visual impacts as a result of the vegetative clearing associated with the ICF, OnSS and the Project access road. While these impacts are expected to alter the existing views experienced by the residents directly adjacent to the Project, they are generally localized and can be minimized through the use of mitigation, such as visual screening (see Section 3.1).

3.1 Mitigation

Options for mitigating the visual impacts of the Project are limited, given the nature of the Project and its siting criteria. However, various mitigation measures that were considered to minimize the Project's potential visual impacts are listed below:

- Siting. The proposed Project has been located near an existing substation which will limit perceived changes in land use and scenic quality. Given the lack of interconnection options close to the proposed landfall, relocation of the Project to another site would likely only relocate the potential visual impacts to a different part of the state. Given that the Project has been proposed in an area intended for industrial development, the Project is generally in keeping with this intended use. Additionally, the Project layout has been designed to accommodate various set-backs from roads, residences, private properties, wetlands and cultural resources, thus limiting options for relocation of individual Project components.

- Screening. Screening could be an effective treatment for the mitigation of views toward the proposed OnSS and ICF along portions of Camp Road. Additionally, the Project access road could benefit from a landscape treatment that is consistent with residential landscape vegetation and materials. This type of treatment is recommended to make the facility entrance appear similar to existing residential driveways in the area.

- Camouflage. Given the nature of the technology, camouflage is not under consideration for the proposed ICF and OnSS.

- Low Profile. The height of the lightning masts and transmission structures associated with the OnSS and ICF substations cannot be reduced due to safety considerations.

- Downsizing. The Project design responds to the on-site environmental constraints and limited space available around an existing substation. As such, the design already includes technology with the specific purpose of reducing the facility footprint and limiting the horizontal and vertical extent of the proposed equipment.

- Alternate Technologies. Alternate technologies for interconnection to the electric power grid are not available.

- Non-specular Materials. The Project will likely utilize galvanized materials that, although shiny at the time of installation, become dull over time.

- Lighting at the OnSS and ICF will be kept to a minimum, and turned on only as needed, either by switch or timer. Where possible lights will be directed downward and will utilize full cut-off fixtures to minimize off-site light trespasses

- Maintenance. The Project components and site will be maintained to assure a clean and orderly appearance.

As indicated above, the most effective mitigation measure will include supplemental vegetative screening and landscape treatment in order to address very localized visual impacts to the adjacent residents along Camp Avenue. With these mitigation measures effectively applied to the Project, it is anticipated that the Project will result in minimal impacts to sensitive resources and viewers within the VSA.

4.0 REFERENCES

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Appendix A - Visually Sensitive Resources

* Blue Text Indicates Resources with Potential Project Visibility

Map ID	Resource Name	Distance From Project (mi.)	Distance Zone	Visibility Indicated in Viewshed Analysis
NRHP-Listed Resource				
1	Poplar Point Lighthouse	1.3	Foreground	No
2	Old Narragansett Church	1.4	Foreground	No
3	Palmer-Northrup House	1.4	Foreground	No
4	Saint Paul's Church	1.5	Foreground	No
5	Allen-Madison House	1.9	Middle Ground	No
6	Six Principle Baptist Church	2.7	Middle Ground	No
7	Esbon Sanford House	2.8	Middle Ground	No
8	Steven Northrup House	2.8	Middle Ground	No
NRHP-Listed Historic District				
9	Camp Endicott Davisville	0.7	Foreground	No
10	Smith's Castle	1.1	Foreground	No
11	**Wickford Historic District**	**1.5**	**Foreground**	**Yes**
12	Lafayette Village Historic District	2.5	Middle Ground	No
13	Forge Road Historic District	2.9	Middle Ground	No
14	Davisville Historic District	2.9	Middle Ground	No
15	Hamilton Mill Historic District	2.9	Middle Ground	No
16	Tourgee "Tidemill" Cottage	0.6	Foreground	No
Rhode Island Historical Preservation & Heritage Commission Resource				
17	**Quonset Point Naval Air Station**	**1.1**	**Foreground**	**Yes**
19	Devil's Foot Rock	1.2	Foreground	No
20	Wickford Historic District Expansion	1.5	Foreground	No
21	Nike Housing	1.7	Middle Ground	No
22	Aylesworth	1.9	Middle Ground	No
23	D. Larston Farm/1633 Stony Lane House	2	Middle Ground	No
24	360 Annaquatuckett Road	2.4	Middle Ground	No
25	Quidnesset Agricultural District	2.7	Middle Ground	No
26	Old Bellevue School	2.9	Middle Ground	No
27	Silas Jones House	3	Middle Ground	No
Rhode Island Historical Cemetery				
18	Peleg Card Lot	1.2	Foreground	No
28	Chase and Wheeden Cemetery	0.8	Foreground	No
29	Pearce - Watson	0.9	Foreground	No
30	Pierce and Phillips	0.9	Foreground	No
31	Carpenter	0.9	Foreground	No
32	Brown and Briggs	0.9	Foreground	No
33	Ayrrault Condon Updike	0.9	Foreground	No
34	Reynolds	1	Foreground	No
35	Hall	1.1	Foreground	No
36	Sedgefield Road Lot	1.2	Foreground	No
37	Smith	1.2	Foreground	No
38	Vaughn and Arnold	1.3	Foreground	No
39	Devil's Foot Cemetery	1.3	Foreground	No
40	Hall and Carpenter	1.3	Foreground	No
41	Constantino Lot	1.3	Foreground	No
42	Quaker Graveyard	1.3	Foreground	No
43	Young	1.3	Foreground	No
44	St Paul - Updike	1.4	Foreground	No

* Blue Text Indicates Resources with Potential Project Visibility

Map ID	Resource Name	Distance From Project (mi.)	Distance Zone	Visibility Indicated in Viewshed Analysis
45	Wightman Lot	1.4	Foreground	No
46	Whitford Lot	1.4	Foreground	No
47	Kimath-Tennant	1.7	Middle Ground	No
48	Smith Cemetery	1.8	Middle Ground	No
49	Gardiner	1.9	Middle Ground	No
50	Reynolds lot	2.1	Middle Ground	No
51	Reynolds	2.1	Middle Ground	No
52	Jacoy	2.1	Middle Ground	No
53	Thomas Lot	2.1	Middle Ground	No
54	Capt Ebenezer Slocum	2.2	Middle Ground	No
55	Hunt Cemetery	2.2	Middle Ground	No
56	Burdick Farm Graveyards	2.2	Middle Ground	No
57	Peckham	2.2	Middle Ground	No
58	Boone Cemetery	2.2	Middle Ground	No
59	Old Tanner Cemetery	2.3	Middle Ground	No
60	Chadsey-Gardiner	2.3	Middle Ground	No
61	Hunt and Hall	2.3	Middle Ground	No
62	Old Tanner	2.4	Middle Ground	No
63	Warner Lot	2.5	Middle Ground	No
64	Very Lot	2.5	Middle Ground	No
65	Joseph Phillips	2.5	Middle Ground	No
66	Quidnesset Memorial Cemetery	2.5	Middle Ground	No
67	William Reynolds Lot	2.6	Middle Ground	No
68	H. Austin	2.6	Middle Ground	No
69	Tourgee	2.6	Middle Ground	No
70	Sweet	2.6	Middle Ground	No
71	Phillips-Gardiner Cemetery	2.6	Middle Ground	No
72	Lawton Lot	2.6	Middle Ground	No
73	Hall Cemetery	2.7	Middle Ground	No
74	Old Baptist Meeting House	2.7	Middle Ground	No
75	Carr Lot	2.7	Middle Ground	No
76	Phillips	2.9	Middle Ground	No
77	Hiscox	2.9	Middle Ground	No
78	Ayrault	2.9	Middle Ground	No
79	Davis	3	Middle Ground	No
80	Eldred	3	Middle Ground	No
State Park				
81	Cocumcussoc State Park	1.3	Foreground	No
State Forest Preserve				
82	John H. Chafee Rome Point Preserve, Rome Point	2.8	Middle Ground	No
Rhode Island State Scenic Area				
83	Quidnessett Farm Lands	2.5	Middle Ground	No
84	**Wickford Harbor/Wickford Village**	**1**	**Foreground**	**Yes**
85	Belleville Pond	2.5	Middle Ground	No
86	Bissel Cove/Rome Point	2	Middle Ground	No
Public Boating & Fishing Access				
87	Pleasant Street Boat Ramp	1.1	Foreground	No
88	North Kingstown Boat Ramp	1.2	Foreground	No

* Blue Text Indicates Resources
with Potential Project Visibility

Map ID	Resource Name	Distance From Project (mi.)	Distance Zone	Visibility Indicated in Viewshed Analysis
89	Allen Harbor Fishing/Boating Access	2.3	Middle Ground	No
90	Potowomut Pond Fishing/Boating Access	2.8	Middle Ground	No
91	Belleville Pond Fishing/Boating Access	2.9	Middle Ground	No
92	Potowomut Pond Access Park	2.7	Middle Ground	No
Local Park				
93	Devils Foot Rock Park	1	Foreground	No
Ferry Terminal				
94	**Quonset - Martha's Vineyard Ferry**	**1.5**	**Foreground**	**Yes**
Major Body of Water				
95	**Narraganset Bay**	**0.6**	**Foreground**	**Yes**

Appendix B: Viewpoint Photolog

Viewpoint: 1

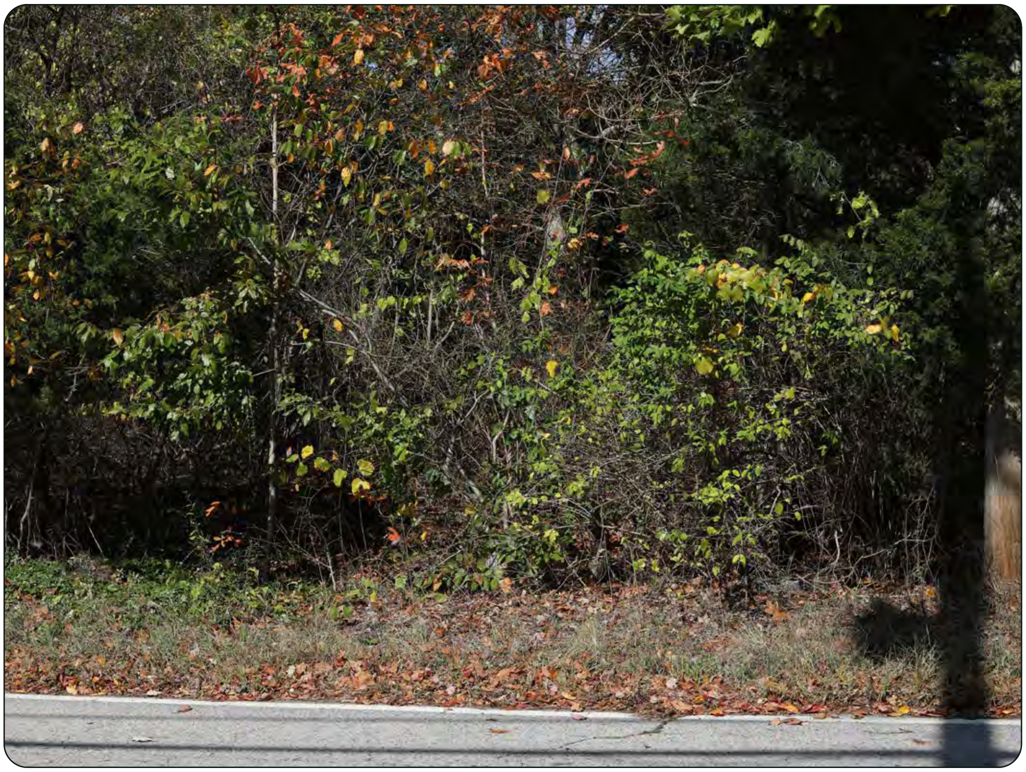
Location:
41.59092102° N,
71.43838761° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking North

Viewpoint: 2

Location:
41.59090652° N,
71.43822558° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking North



Viewpoint: 3

Location:
41.59089000° N,
71.43794833° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking North

Viewpoint: 4

Location:
41.59089000° N,
71.43773333° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking North

Viewpoint: 5

Location:
41.59088380° N,
71.43770656° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking North

Viewpoint: 6

Location:
41.59086980° N,
71.43752141° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking North-Northwest

Viewpoint: 7

Location:
41.59061161° N,
71.42900400° W

View from Burlingham Ave, in the Town of North Kingstown, Washington County, looking West

Viewpoint: 8

Location:
41.59084911° N,
71.43737048° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking North-Northwest

Viewpoint: 9

Location:
41.59083402° N,
71.43727003° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking Northwest

Viewpoint: 10

Location:
41.59076664° N,
71.43698285° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking Northwest

Viewpoint: 11

Location:
41.59073041° N,
71.43689662° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking Northwest

Viewpoint: 12

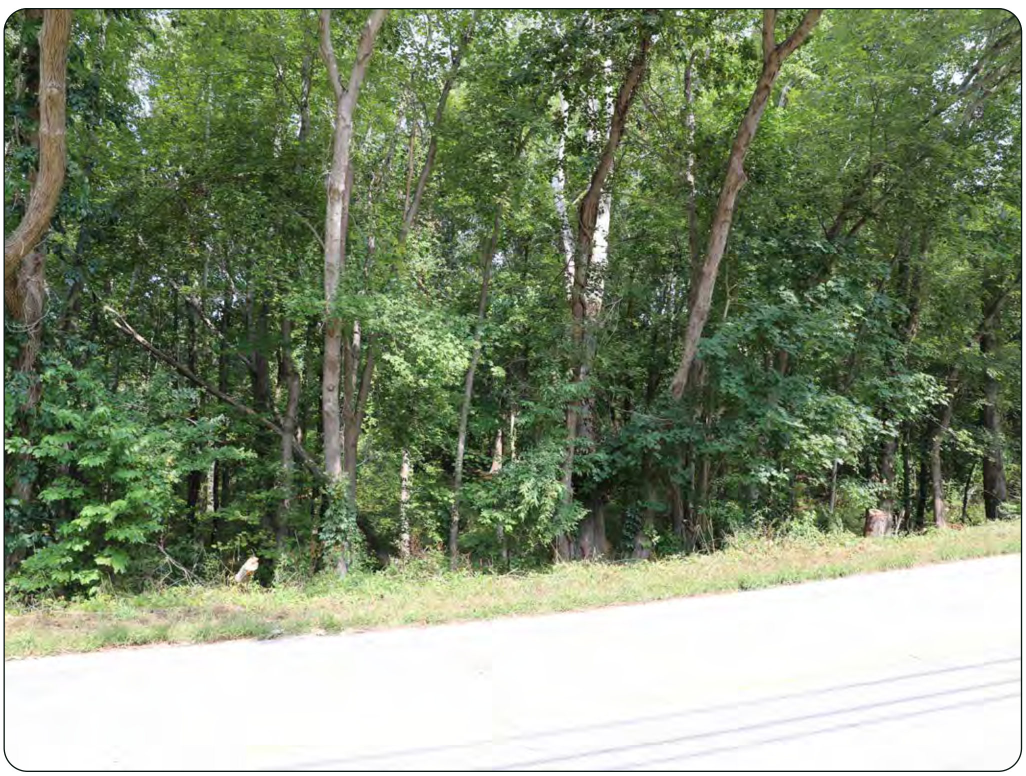
Location:
41.59062155° N,
71.43662434° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking Northwest

Viewpoint: 13

Location:
41.59052014° N,
71.43636785° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking Northwest



Viewpoint: 14

Location:
41.59098986° N,
71.43911872° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking North-Northeast

Viewpoint: 15

Location:
41.58963000° N,
71.43448833° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking West

Viewpoint: 16

Location:
41.59030167° N,
71.43351333° W

View from Camp Ave, in the Town of North Kingstown, Washington County, looking West

Viewpoint: 17

Location:
41.59008667° N,
71.43254440° W

View from Circuit Dr., in the Town of North Kingstown, Washington County, looking West

Viewpoint: 18

Location:
41.59148500° N,
71.43286833° W

View from Circuit Dr., in the Town of North Kingstown, Washington County, looking West

Viewpoint: 19

Location:
41.58724667° N,
71.43073833° W

View from Circuit Dr., in the Town of North Kingstown, Washington County, looking North-Northwest

Viewpoint: 20

Location:
41.58949000° N,
71.42921667° W

View from Burlingham Ave, in the Town of North Kingstown, Washington County, looking West

Viewpoint: 21

Location:
41.59166167° N,
71.42950667° W

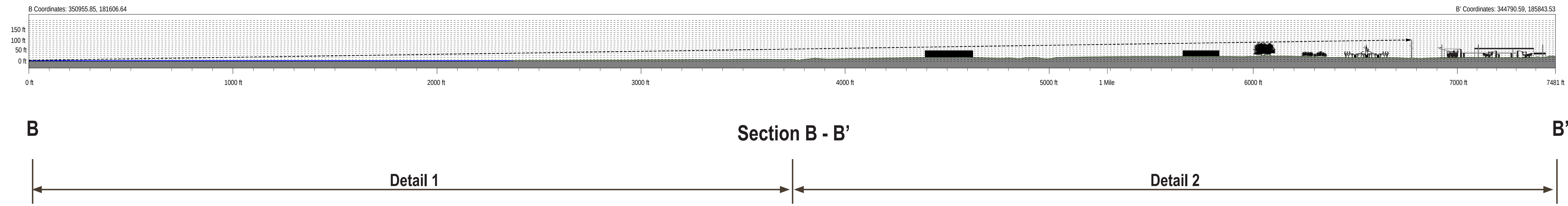
View from Burlingham Ave, in the Town of North Kingstown, Washington County, looking West

Appendix C: Line of Sight Cross Sections

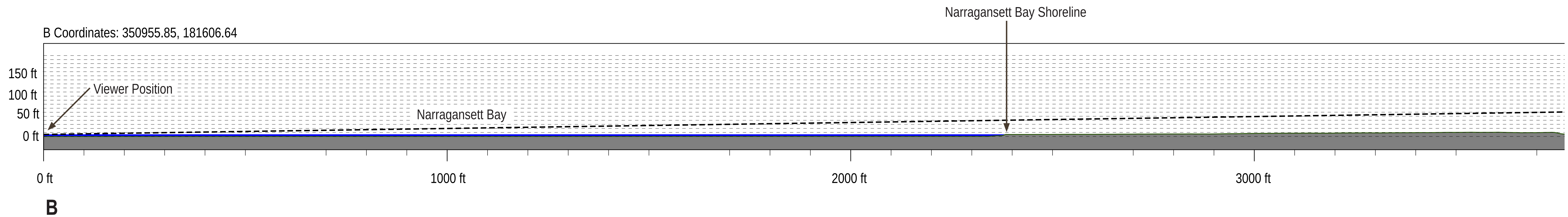
Revolution Wind Onshore Facilities

North Kingstown, Rhode Island

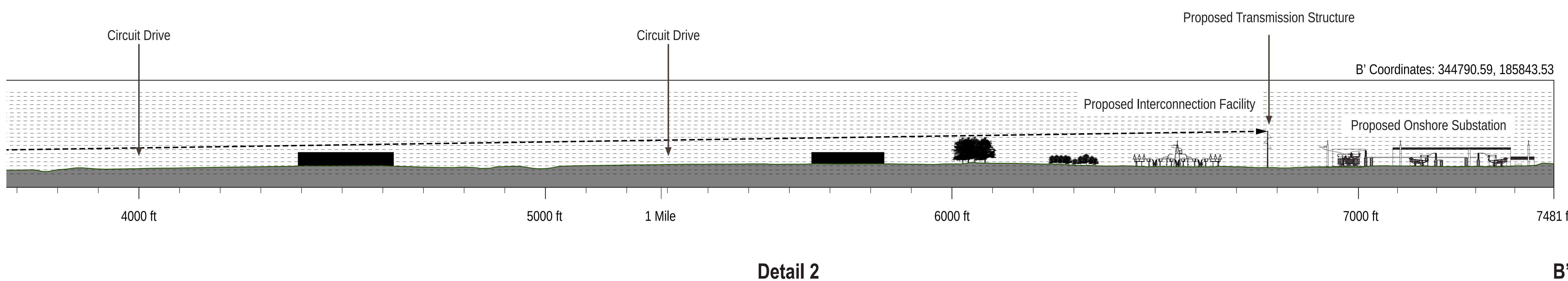
Appendix C - Line of Sight Cross Sections



Section B - B'

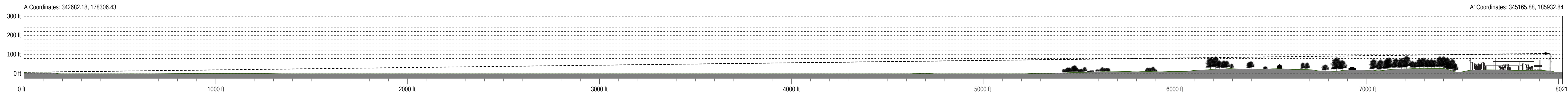


Detail 1



Detail 2

B'



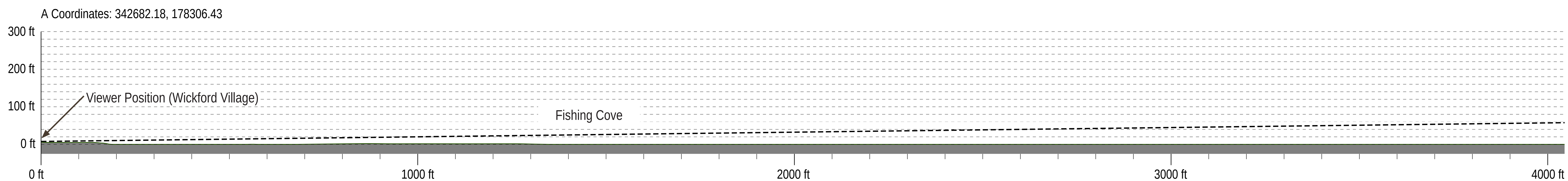
A

Section A - A'

A'

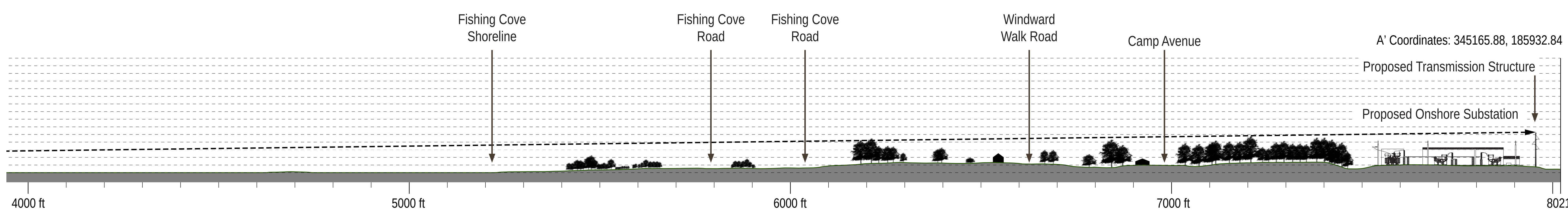
Detail 1

Detail 2



A

Detail 1



Detail 2

A'

Appendix J: Vernal Pool Survey Memorandum for Revolution Wind Onshore Facilities

Memorandum

To:	Mark Roll Senior Project Lead Revolution Wind, LLC	Date:	September 21, 2020
		Project #:	73030.00
From:	Chelsea Glinka ENV SP	Re:	Vernal Pool Survey Memorandum for Revolution Wind Onshore Facilities Parcel ID 179-030 & 179-001 Camp Avenue, North Kingstown, Rhode Island

Proposed Project and Site Description

This Vernal Pool Survey Memorandum has been developed to supplement the Onshore Natural Resources & Biological Assessment Technical Report (**Appendix K** of the Construction and Operations Plan) for the Revolution Wind Project (Revolution Wind, LLC). The Onshore Facilities of the Revolution Wind Project include the Landfall Envelope Area (LEA), Onshore Export Cable, Alternative Cable Route Segment, the Onshore Substation (OnSS) and the transmission interconnection, collectively the Project Site. The OnSS is proposed to be located within two parcels identified by the North Kingstown Tax Assessor as 179-030 and 179-001. The transmission interconnection will be partially located within the adjacent parcel 179-005.

The Project Site occurs within Quonset Point in North Kingstown, Rhode Island which was developed by the United States Department of Defense as the Naval Air Station Quonset Point, commissioned in 1941 and decommissioned in 1974. Today, most of the land is owned and managed by the Quonset Development Corporation and has been developed as a business park. The two areas within the Project Site that are undeveloped include the western limits of the LEA and the parcels proposed for the OnSS.

Wetlands and Vernal Pool Resources

Freshwater wetlands were delineated within the Project Site between July 2019 and August 2019 by VHB wetland scientists, and by LEC Environmental Consultants, Inc. (LEC) on December 10, 2019. There are five wetlands within the Project Site. Four of the wetlands were investigated for vernal pool indicators by VHB biologists on March 27, 2020, and the fifth wetland within parcel 179-005 was surveyed by LEC on July 13, 2020 (refer to **Figures 1** and **2** in **Attachment A**).

Vernal Pool Identification Criteria

The Rhode Island Department of Environmental Management (RI DEM) does not provide a definition of vernal pools on its website (RI DEM, 2020). However, vernal pools are regulated in Rhode Island under the Freshwater Wetland Rules (650-RICR-20-00-2) as part of the larger Freshwater Wetland which envelops them or as Special Aquatic Sites if they are isolated from other wetlands. Special Aquatic Sites are defined as:

"…a body of open standing water, either natural or artificial, which does not meet the definition of pond, but which is capable of supporting and providing habitat for aquatic life forms, as documented by the:

> *a. Presence of standing water during most years, as documented on site or by aerial photographs; and*
>
> *b. Presence of habitat features necessary to support aquatic life forms of [wetland] obligate wildlife species, or the presence of or evidence of, or use by aquatic life forms of [wetland] obligate wildlife species (excluding biting flies)."*

1 Cedar Street
Suite 400
Providence, RI 02903-1023
P 401.272.8100

Vernal pools are seasonal water bodies that pond water continuously for a minimum period beginning in the winter or early spring and typically extending into the early summer. They may be situated within larger wetland systems or occur as hydrologically isolated features situated in uplands. In the northeastern United States, they are characterized by vernal-pool-dependent fauna, certain amphibian and invertebrate species (indicator species) that require the pools to complete at least a portion of their life cycles (Colburn, 2004).

The common and scientific names for Rhode Island species considered by Calhoun and Klemens (2002) to be obligate biological indicators of vernal pool habitat are listed within Table 1.

Table 1. Vernal Pool Obligate Species

Common Name	Scientific name
Jefferson Salamander	*Ambystoma jeffersonianum*
Blue-spotted Salamander complex	*Ambystoma laterale*
Spotted Salamander	*Ambystoma maculatum*
Marbled Salamander	*Ambystoma opacum*
Wood Frog	*Lithobates sylvaticus*
Fairy Shrimp	*Eubranchipus sp.*

Vernal Pool Survey Methodology

Vernal pools were surveyed by VHB biologists on March 27, 2020 by traversing the wetlands to find potentially suitable pools. Once potential vernal pools were identified, VHB biologists logged any auditory cues (e.g., wood frog chorusing) and searched the pools for egg masses while wearing waders and polarized sunglasses. Biologists used dipnets to search for wood frog and spotted salamander adults, egg masses and larvae, and fairy shrimp. Discretion was used during dipnet sweeps, such that small, shallow areas containing obligate vernal pool indicators were disrupted as little as possible (i.e., mucking-up of cryptic pools was avoided). Field notes were recorded on the Connecticut Association of Westland Scientists (CAWS[1]) Vernal Pool Observation Forms (**Attachment B**) and supporting photographs were taken at vernal pools (**Attachment C**). Biologists hung flagging around the perimeter of vernal pool and located flags using a global positioning device.

On behalf of the property owner, parcel 179-005 was investigated by LEC on July 13, 2020 for potential vernal pools. LEC concluded that a vernal pool survey is required during the active breeding season in 2021 to determine if this resource meets the criteria of a vernal pool. A vernal pool survey for wetlands within this parcel will be conducted at a later date.

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[1] RI DEM does has not published a comparable vernal pool documentation form.

Findings

VHB biologists identified one vernal pool within the Project Site that meets the vernal pool criteria described above. The vernal pool was contained entirely within Wetland 4 which is classified as a Marsh[2] under the RI DEM Freshwater Wetland Rules. Wetland 4 has a forested perimeter along the northern boundary of the OnSS parcels (see **Figure 2 – Attachment A** for the location of the vernal pool). Obligate species identified within the pool included adult wood frogs, wood frog egg masses, salamander egg masses, and fairy shrimp. A description of the vernal pool is provided below.

Vernal Pool 1

Vernal Pool 1 is a cryptic Vernal Pool within Wetland 4 along the northeastern boundary of parcel 179-030. Based on existing topography and aerial photos, Wetland 4 may have originated as a kettle hole, however, due to anthropogenic disturbance including filling and cutting, the natural form of this feature has been obscured.

No watercourse enters or leaves this wetland. Water depth within Vernal Pool 1 ranged from six inches to two feet in its deepest points at the time of the field survey. The bottom is semi-firm with a leaf litter and muck substrate. Filamentous algae were present near the surface of the pool at the time of the investigation and impaired the search for vernal pool fauna in some areas. Dense shrubs and tannin-stained waters also impaired the ability to observe egg masses in some portions of the pool. The wetland is forested and dominated by red maple (*Acer rubrum*) and cottonwood (*Populus deltoides*). Canopy closure was estimated to be 80 percent.

During the investigation, adult wood frogs were heard chorusing within the pool along with spring peepers (*Pseudacris c. crucifer*) across the wider wetland. The survey yielded estimated counts of 50-75 wood frog egg masses and 20 spotted salamander egg masses. Adult wood frogs were also observed in the pool. Fairy shrimp were captured with a dip net. Facultative vernal pool species include backswimmers (*Notonectidae*).

Conclusions

In March 2020, VHB biologists identified one vernal pool within the Project Site. Vernal Pool 1 is a cryptic vernal pool within Wetland 4. A summary of findings is presented in Table 3 below. The appended CAWS Vernal Pool Observation Forms provide further data on each of the pools (**Attachment B**). Photos of the pool are also appended (**Attachment C**).

Table 3. Summary of Findings

Pond ID	Area (SF)	Inlet/Outlet Flowing	Obligate Indicators	Fish Present	Vernal Pool Classification
Vernal Pool 1	1,300	No	WFC, WFEM, SSEM, FS	No	Cryptic

WFC: Wood frog chorusing; WFEM: Wood frog egg masses; WFL: Wood frog larvae; SSEM: Spotted salamander egg masses; FS fairy shrimp

[2] The Freshwater Wetland Rules define a Marsh as a wetland feature not less than 1 ac (0.40 ha) in size that has standing or running water during the growing season and is made up of herbaceous vegetation such as grasses and sedges and/or shrubs.

References

Calhoun, A. J. K. and M. W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

Colburn E. A. 2004. Vernal pools: Natural history and conservation. Blacksburg, VA: McDonald and Woodward.

Rhode Island Department of Environmental Management vernal pool brochure: http://www.dem.ri.gov/programs/benviron/water/wetlands/pdfs/vernbroc.pdf

Rhode Island Department of Environmental Management. Vernal Pools. http://www.dem.ri.gov/programs/water/wetlands/vernal-pools.php. Accessed September 9, 2020.

Attachments

Attachment A: Figure 1: USGS Overview Map and Figure 2: Vernal Pool Resources

Attachment B: CAWS Vernal Pool Observation Form

Attachment C: Representative Site Photographs

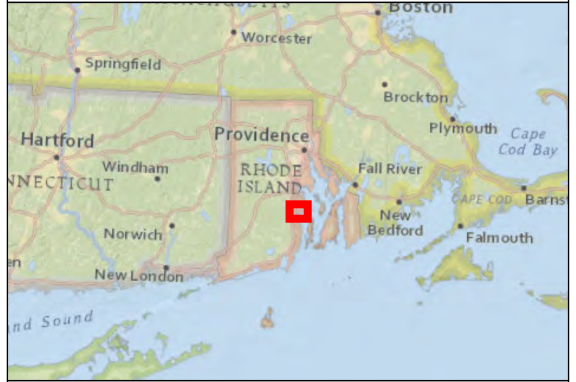
Revolution Wind

Figure 1
USGS Overview
NORTH KINGSTOWN, RI

Legend

- Parcel ID 179-030 & 179-001
- Parcel ID 179-005

Service Layer Credits: National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
USGS Historical Topographic Maps: Source: Historical Topographic Map Collection courtesy of the U.S. Geological Survey, Esri



Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 270 540 810 Meters

0 790 1,580 2,370 Feet

Date: 05/19/2020
Document no:

Created by: S. PELLETIER
Checked by: S. MOBERG
Approved by: STEPW

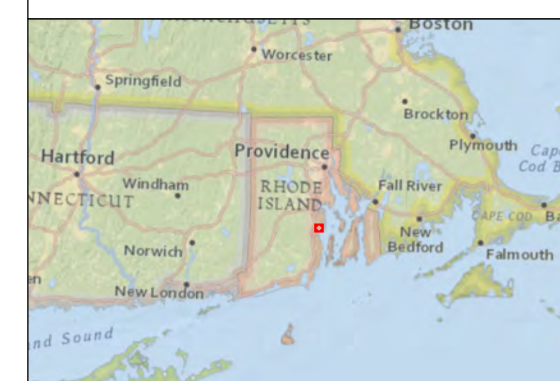
Revolution Wind | Powered by Ørsted & Eversource

Revolution Wind

Figure 2
Vernal Pool Resources
NORTH KINGSTOWN, RI

Legend
- Onshore Transmission Cable
- Alternative Cable Route Segment
- Substation Limit of Work
- Parcel ID 179-030 & 179-001
- Parcel ID 179-005
- Parcel Boundary
- One-Percent Annual Chance Flood Hazard Area
- Potential Vernal Pool
- Delineated Wetland Edge
- Approximate Wetland Edge
- LEC Delineated ASSF
- Approximate Stream
- Delineated Wetland Resources
- Interpolated Wetland
- Vernal Pool
- Wetland (NWI)

Service Layer Credits: RIDEM/Tax_Parcels: RI State, 37 Towns
National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
Rhode Island Aerial Photographs (Spring 2018; State Plane):



Reference system: NAD83 (2011)
Projection: UTM Zone 19N

0 20 40 60 Meters

0 60 120 180 Feet

Date: 05/19/2020
Document no:

Created by: S. PELLETIER
Checked by: S. MOBERG
Approved by: STEPW

Revolution Wind
Powered by Ørsted & Eversource

VERNAL POOL DATA SHEET

Survey Date: 3/27/2020	Investigator(s): C. Glinka, E. Deluski	Town: North Kingstown	CAWS Pool #:	VP1 - Wetland 4	CAWS Project #:
Town Staff Contacted? Yes ☐ No ☑	Project/property name: Revolution Wind On-Shore Substation			Pool Type:	Development: ☐ Reference: ☐
Address/location (*or include annotated map*): north of Camp Ave		Investigator's Contact information: cglinka@vhb.com			

SEARCH CONDITIONS AND METHODS *(required)*

WEATHER:

Precipitation:

Current	Within last 24 hours
0"	0"

Cloud Cover:
- clear ☐
- partly cloudy ☑
- mostly cloudy ☐
- full cloud cover ☐

Start time: 1030
End time: 1215

Methods used:
- Visual ☑
- Dipnetting ☑

Type of Inspection:
- baseline ☑
- during construction ☐
- post construction ☐

Polarized sunglasses used? Yes ☑ No ☐

Comments:
GPS location was taken of one egg mass.

Temporary flagging used to mark egg masses? Yes ☐ No ☑

AMPHIBIAN EGG MASS COUNTS *(required)*

Wood frogs: ☑ 1-25 ☐ 26-49 ~~<50~~

condition
If condition mixed, note "some", "many" or "most"
intact: All
breaking up:
hatching:

Abundance categories

~~<50~~	☐	250-300	☐
50-75	☑	300-400	☐
75-100	☐	400-500	☐
100-150	☐	500-750	☐
150-200	☐	750-1000	☐
200-250	☐	1000-1250	☐
		>1250	☐

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
intact: All
breaking up:
hatching:

Total Number: 20

ADDITIONAL NOTES: *(optional)*

VP 1 is a cryptic vernal pool within Wetland 4. The vernal pool is large and takes up nearly the entire footprint of Wetland 4, which further extends to the National Grid property line.

Wood frogs and spring peepers were heard chorusing within Wetland 4.

CONDITIONS/OBSERVATIONS WITHIN POOL

(required data)

	No	Yes	Flowing	Not flowing
Inlet observed?	☑	☐	☐	☐
Outlet observed?	☑	☐	☐	☐
finfish observed?	☑	☐		

Estimated water depth range? 6 inches to 2 feet

Optional Data (see also back of sheet)

Other Vernal Pool Species:
fairy shrimp present? Yes ☑ No ☐
marbled salmander larvae present? Yes ☐ No ☑

Vegetation (within or overhanging pool):
Trees/Saplings: red maple, cottonwood
Shrubs/Vines: speckled alder
Herbs:
Percent tree canopy closure? 80%
Woody debris content? High ☑ Med. ☐ Low ☐

Pool Substrate: (top three)
- Mud/muck ☑
- Sand/Silt ☐
- Peat ☐
- Bedrock ☐
- Leaf Litter ☑
- Silt/clay ☐
- Gravel/cobbles ☐

Water Quality:
ph ☐ conductivity(uS/cm) ☐ temperature (°C) ☐
Nitrate-N (mg/l) ☐ Total P (ug/l) ☐ DO(mg/l) ☐
turbidity(NTU's) ☐ Sulphidic odor? No ☐ Yes ☐
Approximate % cover by algal mat or duckweed? 0%
GPS coordinates:

CONDITIONS IN ENVELOPE WITHIN 100 FT OF POOL

(required data)

Landuses/conditions — *Give approximate percentage or show on sketch on back*

forest	100%	shrubland		meadow	
pasture		lawn		building	
exposed soil		grading		ag. field	
road	X	busy (>1 car/10 min.)	yes ☐		no ☐
parking lot					

Comments:
Road noise is audible from the vernal pool. The road is located >500 feet north of the pool.

Leaf Litter: *If variable, note location (e.g. "N. shore")*

none/low:	
moderate:	
high:	X

Cover Objects:	Logs	Rocks
none:		X
low:		
moderate:		
high:	X	

Dominant vegetation *(optional)*
Trees/saplings: red maple, cottonwood
Shrubs/Vines: speckled alder
Herbs:

VERNAL POOL DATA SHEET, *p. 2*

Survey Date: 3/27/2020	Investigator(s): C. Glinka, E. Deluski	Town: North Kingstown	**CAWS Pool #:**	VP1	CAWS Project #:
Project/property name: Revolution Wind On-Shore Substation				Pool Type:	Development: ☐ Reference ☐

SKETCH OF POOL ***(required)***

Draw a ***rough, quick*** *sketch of the pool showing* ***approximate locations of egg mass rafts & clusters*** *in relation to pool features, like logs, algal mats, and islands. Show inlet/outlet if present. Include north arrow and approxImate scale.*

WILDLIFE OBSERVATIONS: *(optional)*

Checklist of Facultative Herptile Fauna (Pool & Fringe):

Green Frog	☐	Spring Peeper	☑
Pickerel Frog	☐	Gray Tree Frog	☐
Bull Frog	☐	Pickerel Frog	☐
Eastern Toad	☐	Painted Turtle	☐
Spotted Turtle	☐	Snapping Turtle	☐
N. Water Snake	☐	Blue-spot. salam.	☐

Other Observed Fauna (Pool & Fringe):

fairy shrimp, backswimmer, wood frog

SKETCH OF TERRESTRIAL ENVELOPE AROUND POOL ***(required)***

Draw a ***rough, quick*** *sketch of the pool's* ***terrestrial envelope,*** *extending at least 200' from pool in all directions. Provide* ***detail on conditions & landuses within 100 feet of edge of pool.*** *Include north arrow and approxImate scale.*

Circle any of the following factors that impaired your ability to observe egg masses, and indicate severity of impairment.

Factor		Severity (Low/Mod./High)
1. Surface algae	☑	Low, higher in some areas
2. Surface pollen	☐	
3. Dark, tannin-colored water	☑	Low to moderate
4. Deep water	☐	
5. Turbidity	☐	
6. Dense shrubs	☑	
7. Other (specify)	☐	

ADDITIONAL NOTES: *(optional)*

Vernal Pool 1 Photos

Vernal Pool 1 - Photo 1	**Description:**
	View of Vernal Pool 1, a cryptic vernal pool within the larger Wetland 4. No watercourse enters or leaves this wetland. Water depth within Vernal Pool 1 ranged from six inches to two feet and the bottom is semi-firm with a leaf litter and muck substrate.
Vernal Pool 1 - Photo 2	**Description:**
	Dense shrubs in Vernal Pool 1 made some areas of the pool difficult to investigate.

Vernal Pool 1 - Photo 3	Description:
	A cluster of spotted salamander egg masses on a submerged branch. On March 27, 2020 VHB biologists inventoried an estimated 20 spotted salamander egg masses within Vernal Pool 1.
Vernal Pool 1 - Photo 4	**Description:**
	A raft of wood frog egg masses, some attached to submerged branches. VHB biologists counted approximately 50-75 egg masses on March 27, 2020.

Appendix K: Terrestrial Archaeological Resources Assessment

CONFIDENTIAL: Contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552)

Appendix L: Observed and Potential Wildlife in the Project Area

Observed and Potential Wildlife in the Project Area

Observed and Potential Bird Species

	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Bald Eagle (BCC)						**P**	**P**
Great egret(S-C)						**P**	**P**
Snowy egret(S-C)						**P**	**O**
American oystercatcher(S-C) (BCC)						**P**	
Glossy ibis(S-C)						**P**	**P**
Great blue heron[B]	**P**						**P**
Black-crowned night heron(S-C)						**P**	**P**
Yellow-crowned night heron(S-C)						**P**	**P**
Green heron[B]		**P**				**P**	**P**
Tricolored heron						**P**	**P**
Herring gull (BCC)						**O**	
Ring-billed gull (BCC)						**O**	
Great Black-Backed Gull (BCC)						**P**	
Northern Gannet (BCC)						**P**	
Double-crested cormorant[B] (BCC)						**O**	

P = Potential to occur O = observed by VHB during Summer 2019 **P/O** = GCN Species in the 2015 RIWAP. B = breeding in Rhode Island M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-C = State Concern F-E = Federally endangered F-T = Federally Threatened BCC = Bird of Conservation Concern
Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
RIDEM, The Rhode Island Nature Conservancy, University of Rhode Island. 2015. Rhode Island Wildlife Action Plan. http://www.dem.ri.gov/programs/fish-wildlife/wildlifehuntered/swap15.php

	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Great cormorant^{M}						**O**	
Common tern $^{(BCC)}$						**P**	
Roseate Tern $^{(F-E)}$						**P**	
Least tern$^{(S-T) (BCC)}$						**P**	
Ruddy turnstone						**P**	
Sanderling						**P**	
Dunlin						**P**	
Buff-Breasted Sandpiper $^{(BCC)}$							
White-rumped sandpiper						**P**	
Purple sandpiper						**P**	
Least sandpiper						**P**	
Semipalmated sandpiper $^{(BCC)}$						**P**	
Semipalmated plover						**P**	
Piping plover$^{(F-E; S-E)M}$						**P**	
Short-billed dowitcher $^{(BCC)}$						**P**	
Black-bellied plover						**P**	
Greater yellowlegs						**P**	**P**
Nelson's sparrow^{M}							**P**
Saltmarsh sparrow							**P**

P = Potential to occur O = observed by VHB during Summer 2019 **P/O** = GCN Species in the 2015 RIWAP. B = breeding in Rhode Island M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-C = State Concern F-E = Federally endangered F-T = Federally Threatened BCC = Bird of Conservation Concern
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RIDEM, The Rhode Island Nature Conservancy, University of Rhode Island. 2015. Rhode Island Wildlife Action Plan. http://www.dem.ri.gov/programs/fish-wildlife/wildlifehuntered/swap15.php

	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Seaside sparrow (S-C)							**P**
American black duck							**P**
Clapper rail (S-C)							**P**
Willet (S-C)							**P**
Osprey (S-C)						**O**	**O**
Turkey vulture B	**P**	**P**	**P**	**P**	**P**		
Canada Goose B	**P**					**O**	**O**
Mallard B						**O**	
Lesser scaup						**P**	
Greater scaup						**P**	
Canvasback						**P**	
Atlantic brant						**P**	
Bufflehead						**P**	
Common goldeneye						**P**	
Common Loon						**P**	
Red-throated Loon (BCC)						**P**	
Black scoter						**P**	
White-winged scoter (BCC)						**P**	
Surf scoter (BCC)						**P**	

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	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Red-breasted merganser (BCC)						**P**	
Horned grebe						**P**	
Common eider (BCC)						**P**	
Sharp-shinned Hawk M (S-E)	**P**	**P**	**P**	**P**	**P**		
Cooper's Hawk B	**P**	**P**	**P**	**P**	**P**		
Northern Goshawk M (S-C)	**P**	**P**	**P**	**P**	**P**		
Red-shouldered Hawk B	**P**	**O**	**O**	**O**	**P**		
Broad-winged Hawk B	**P**	**P**	**P**	**P**	**P**		
Red-tailed Hawk B	**P**	**O**	**O**	**P**	**P**		
Rough-legged Hawk M	**P**	**P**	**P**	**P**	**P**		
American Kestrel B	**P**	**P**	**P**	**P**	**P**		
Ring-necked Pheasant B	**P**	**P**	**P**	**P**	**P**		
Wild Turkey B	**P**	**P**	**P**	**P**	**P**		
Northern Bobwhite B	**P**	**P**	**P**	**P**	**P**		
Killdeer B	**P**					**O**	
Spotted Sandpiper B						**P**	
American Woodcock B	**P**	**P**	**P**	**P**	**P**		
Rock Pigeon B	**P**					**O**	
Mourning Dove B	**P**	**P**	**P**	**P**	**P**	**P**	

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S-E = State-endangered S-T= State-threatened S-C = State Concern F-E = Federally endangered F-T = Federally Threatened BCC = Bird of Conservation Concern
Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
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	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Black-billed Cuckoo[B (BCC)]	**P**	**P**	**P**	**P**	**P**	**P**	
Yellow-billed Cuckoo[B]	**P**	**P**	**P**	**P**	**P**		
Eastern Screech-Owl[B]	**P**	**P**	**P**	**P**	**P**		
Great Horned Owl[B]	**P**	**P**	**P**	**P**	**P**		
Barred Owl[B]	**P**	**O**	**P**		**P**		
Northern Saw-whet Owl[B]	**P**	**P**					
Common Nighthawk[B]	**P**	**P**	**P**	**P**	**P**		
Eastern whip-poor-will[B]	**P**	**P**	**P**	**P**	**P**		
Chimney Swift[B]	**P**	**P**	**P**	**P**	**P**		
Ruby-throated Hummingbird[B]	**P**	**P**	**P**	**P**	**P**		**P**
Belted Kingfisher[B]							**P**
Red-bellied Woodpecker[B]		**O**	**P**	**P**	**P**		
Pileated Woodpecker[B(S-C)]		**P**	**P**	**P**	**P**		
Yellow-bellied Sapsucker[B]		**P**	**P**	**P**	**P**		
Downy Woodpecker[B]		**O**	**O**	**P**	**P**		
Hairy Woodpecker[B]		**P**	**P**	**P**	**P**		
Northern Flicker[B]	**P**	**P**	**P**	**P**	**P**		
Eastern Wood-Pewee[B]		**O**	**O**	**P**	**P**		
Acadian Flycatcher[B(S-C)]		**P**	**P**	**P**	**P**		

P = Potential to occur O = observed by VHB during Summer 2019 **P/O** = GCN Species in the 2015 RIWAP. B = breeding in Rhode Island M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-C = State Concern F-E = Federally endangered F-T = Federally Threatened BCC = Bird of Conservation Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.

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	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Willow Flycatcher[B]	**P**	**P**	**P**	**P**	**P**		
Least Flycatcher[B]		**P**	**P**	**P**	**P**		
Eastern Phoebe[B]	**P**	**O**	**O**	**P**	**P**		
Great Crested Flycatcher[B]		**P**	**P**	**P**	**P**		
Eastern Kingbird[B]	**P**	**P**	**P**	**P**	**P**		
Northern Shrike[M]	**P**	**P**	**P**	**P**	**P**		
White-eyed Vireo[B]		**P**	**P**	**P**	**P**		
Yellow-throated Vireo[B]		**P**	**P**	**P**	**P**		
Warbling Vireo[B]		**O**	**O**	**O**	**P**		
Red-eyed Vireo[B]	**P**	**O**	**O**				
Blue-headed vireo		**P**	**P**	**P**	**P**		
Blue Jay[B]	**P**	**O**	**O**	**P**	**P**		
American Crow[B]	**P**	**O**	**O**	**O**	**P**		
Fish Crow[B]						**O**	**O**
Horned Lark[B (S-C)]	**P**						
Purple Martin[B]	**P**		**P**	**P**	**P**	**O**	**P**
Tree Swallow[B]	**P**	**P**	**P**	**P**	**P**	**O**	**P**
Northern Rough-winged Swallow[B]	**P**	**P**	**P**	**P**	**P**		**P**
Bank Swallow[B]	**P**					**P**	**P**

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Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.

RIDEM, The Rhode Island Nature Conservancy, University of Rhode Island. 2015. Rhode Island Wildlife Action Plan. http://www.dem.ri.gov/programs/fish-wildlife/wildlifehuntered/swap15.php

	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Barn Swallow[B]	P					O	O
Black-capped Chickadee[B]	P	O	O	P	P		
Tufted Titmouse[B]		O	O	P	P		
Red-breasted Nuthatch[B]		P	P	P	P		
White-breasted Nuthatch[B]		P	P	P	P		
Brown Creeper[B]		P	P	P	P		
Carolina Wren[B]	O	O	O	O	O		
House Wren[B]	P	P	P	P	P		
Winter Wren[B]	P	P	P	P	P	P	
Golden-crowned Kinglet[B]		P	P	P	P		
Ruby-crowned Kinglet[M]		P	P	P	P		
Blue-gray Gnatcatcher[B]		P	P	P	P		
Eastern Bluebird[B]	P	P	P	P	P		
Veery[B]		P	P	P	P		
Hermit Thrush[B]		P	P	P	P		
Wood Thrush[B (BCC)]		P	P	P	P		
American Robin[B]	P	O	O	O	P		
Gray Catbird[B]	P	O	O	P	P		
Northern Mockingbird[B]	P	O	O	P	P	O	O

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	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Brown Thrasher[B]	**P**	**P**	**P**	**P**	**P**		
European Starling[B]	**P**	**P**	**P**	**P**	**P**	**O**	**O**
Cedar Waxwing[B]		**P**	**P**	**P**	**P**		
Blue-winged Warbler[B]	**P**						
Northern parula[M(S-T)]		**P**	**P**	**P**	**P**		
Black-and-white warbler[B]		**P**	**P**	**P**	**P**		
Golden-winged Warbler[B]		**P**	**P**	**P**	**P**		
Nashville Warbler[B]	**P**	**P**	**P**	**P**	**P**		
Yellow Warbler[B]	**O**	**P**	**O**	**O**	**P**		
Yellow-rumped warbler[M]		**O**	**P**	**P**	**P**		
Chestnut-sided Warbler[B]	**P**	**P**	**P**	**P**	**P**		
Black-throated Green Warbler[B]		**P**	**P**	**P**	**P**		
Black-throated blue warbler[B(S-T)]		**P**	**P**	**P**	**P**		
Blackburnian warbler[M(S-T)]		**P**	**P**	**P**	**P**		
Pine Warbler[B]		**P**	**P**	**P**	**O**		
Prairie Warbler[B (BCC)]	**P**				**P**		
American Redstart[B]	**P**	**O**	**O**	**P**	**P**		
Worm-eating Warbler[B]	**P**	**O**	**P**	**P**	**P**		
Ovenbird[B]	**P**	**P**	**P**	**P**	**P**		

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	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Northern Waterthrush[B]		**P**					
Louisiana Waterthrush[B]		**P**					
Common Yellowthroat[B]	**P**	**O**	**O**	**P**	**P**		
Hooded Warbler[B]		**P**	**P**	**P**	**P**		
Canada Warbler[B (BCC)]		**P**	**P**	**P**	**P**		
Cerulean warbler[B(S-E)]		**P**	**P**	**P**	**P**		
Scarlet Tanager[B]		**P**	**P**	**P**	**P**		
Eastern Towhee[B]	**P**	**P**	**P**	**P**	**P**		
American Tree Sparrow[M]	**P**	**P**	**P**	**P**	**P**		
Chipping Sparrow[B]	**P**	**P**	**P**	**P**	**P**		
Field Sparrow[B]	**P**						
Savannah Sparrow[B]	**P**						
Fox Sparrow[M]	**P**	**P**	**P**	**P**	**P**		
Song Sparrow[B]	**P**	**O**	**O**	**O**	**P**	**O**	**O**
Swamp Sparrow[B]	**P**	**P**					
White-throated Sparrow[M]	**P**	**P**	**P**	**P**	**P**		
Dark-eyed Junco[M]	**P**	**P**	**P**	**P**	**P**		
Lapland Longspur[M]	**P**						
Snow Bunting[M]						**P**	

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	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Northern Cardinal[B]	**P**	**O**	**O**	**P**	**P**		
Rose-breasted Grosbeak[B]		**P**	**P**	**P**	**P**		
Indigo Bunting[B]	**P**						
Bobolink[B (S-SC)]	**P**						
Red-winged Blackbird[B]	**P**						**O**
Rusty Blackbird [(BCC)]	**P**	**P**	**P**	**P**			
Eastern Meadowlark[B]	**P**						
Common Grackle[B]	**P**	**P**	**O**	**O**	**P**	**P**	**P**
Brown-headed Cowbird[B]	**P**	**P**	**P**	**P**	**P**		**O**
Orchard Oriole		**P**	**P**	**P**	**P**		
Baltimore Oriole[B]		**P**	**P**	**P**	**P**		
Pine Grosbeak[M]		**P**	**P**	**P**			
Purple Finch[M]		**P**	**P**	**P**	**P**		
House Finch[B]	**P**	**O**	**P**	**O**	**P**		
Common Redpoll[M]	**P**	**P**	**P**	**P**	**P**		
Pine Siskin[M]	**P**	**P**	**P**	**P**	**P**		
American Goldfinch[B]	**P**	**O**	**O**	**P**	**P**	**O**	**P**
Evening Grosbeak[M]	**P**	**P**	**P**	**P**	**P**		
House Sparrow[B]	**O**	**P**	**P**	**O**	**P**	**P**	**P**

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Observed and Potential Amphibian and Reptile Species

	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Marbled Salamander[B]		**P**	**P**	**P**	**P**		
Spotted Salamander[B]		**P**	**P**	**P**	**P**		
Red Spotted Newt[B]		**P**	**P**	**P**	**P**		
Northern Dusky Salamander[B]		**P**	**P**	**P**	**P**		
Northern Redback Salamander[B]		**P**	**P**	**P**	**P**		
Four-toed Salamander[B]		**P**	**P**	**P**	**P**		
Northern Two-Lined Salamander[B]		**P**	**P**	**P**	**P**		
American Toad[B]	**P**	**P**	**P**	**P**	**P**		
Fowler's Toad[B]	**P**	**P**	**P**	**P**	**P**		
Northern Spring Peeper[B]	**P**	**P**	**P**	**P**	**P**		
Gray Treefrog[B]		**P**	**P**	**P**	**P**		
American Bullfrog[B]							
Green Frog[B]		**P**					
Wood Frog[B]	**P**	**P**	**P**	**P**			
Pickerel Frog[B]	**P**	**P**	**P**	**P**			
Common Snapping Turtle[B]	**P**	**P**	**P**	**P**			

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	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Painted Turtle[B]	**P**	**P**					
Spotted Turtle[B]	**P**	**P**	**P**	**P**			
Wood Turtle[B (S-C)]	**P**	**P**	**P**	**P**	**P**		
Eastern Box Turtle[B]	**P**	**P**	**P**	**P**	**P**		
Common Musk Turtle[B]	**P**	**P**	**P**	**P**	**P**		
Diamondback Terrapin[B(S-E)]						**P**	**P**
Northern Water Snake[B]	**P**	**P**	**P**	**P**	**P**		
Northern Red-bellied Snake[B]	**P**	**P**	**P**	**P**	**P**		
Common Garter Snake[B]	**P**	**P**	**P**	**P**	**P**		
Eastern Ribbon Snake[B (S-SC)]	**P**	**P**	**P**	**P**	**P**		
Eastern Hognose Snake[B]	**P**	**P**	**P**	**P**	**P**		
Northern Ringneck Snake[B]	**P**	**P**	**P**	**P**	**P**		
Eastern Worm Snake[B]	**P**	**P**	**P**	**P**	**P**		
Northern Black Racer[B]	**P**	**P**	**P**	**P**	**P**		
Eastern Smooth Green Snake[B]	**P**	**P**	**P**	**P**	**P**		
Northern Brownsnake[B]	**P**	**P**	**P**	**P**	**P**		
Black Rat Snake[B]	**P**	**P**	**P**	**P**	**P**		
Eastern Milk Snake[B]	**P**	**P**	**P**	**P**	**P**		

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Observed and Potential Mammal Species

	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Virginia Opossum[B]	**P**	**P**	**P**	**P**	**P**	**P**	**P**
Masked Shrew[B]	**P**	**P**	**P**	**P**	**P**		**P**
Water Shrew[B(S-C)]	**P**	**P**	**P**	**P**	**P**	**P**	**P**
Northern Short-tailed Shrew[B]		**P**	**P**	**P**	**P**		
Smoky Shrew[B(S-C)]	**P**	**P**	**P**	**P**	**P**		
Star-nosed Mole[B]	**P**	**P**	**P**	**P**	**P**		
Little Brown Bat[B]	**P**	**P**	**P**	**P**	**P**		**P**
Silver-haired Bat[B]	**P**	**P**	**P**	**P**	**P**		**P**
Tricolored bat[B]	**P**	**P**	**P**	**P**	**P**		**P**
Big Brown Bat[B]	**P**	**P**	**P**	**P**	**P**		**P**
Eastern Red Bat[B]	**P**	**P**	**P**	**P**	**P**		**P**
Hoary Bat[M (S-SC)]	**P**	**P**	**P**	**P**	**P**		**P**
Northern Long-eared Bat[B (F-T)]	**P**	**P**	**P**	**P**	**P**		**P**
Eastern Cottontail[B]	**P**	**P**	**P**	**P**	**P**	**P**	**P**
New England Cottontail[B(S-C)]	**P**	**P**	**P**	**P**	**P**		

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	Inland Key Habitats					Coastal Key Habitats	
	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Snowshoe Hare[B]	P	P	P	P	P	P	
Eastern Chipmunk[B]	O	O	O	O	O		
Woodchuck[B]	P	P	P	P	P		
Gray Squirrel[B]	O	O	O	O	O		
Red Squirrel[B]	P	P	P	P	P		
Southern Flying Squirrel[B]		P	P	P	P		
White-footed Mouse[B]	P	P	P	P	P		P
Southern Red-backed Vole[B]	P	P	P	P	P		P
Meadow Vole[B]	P	P	P	P	P		P
Woodland Vole[B]	P	P	P	p	P		
Muskrat[B]		P	P	P	P	P	P
Southern Bog Lemming[B]	P	P	P	P	P		
Norway Rat[B]	P	P	P	P	P	P	P
House Mouse	P	P	P	P	P	P	P
Meadow Jumping Mouse[B]	P	P	P	P	P		
Coyote[B]	P	P	P	P	P	P	P
Red Fox[B]	P	P	P	P	P	P	P

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	Ruderal Grassland/ Shrubland	Ruderal Forested Swamp	Mixed Oak/White Pine Forest	Oak Forest	Pitch Pine Woodland/ Barren	Coastal Beach	Tidal Salt Marsh
Gray Fox[B]	**P**	**P**	**P**	**P**	**P**	**P**	**P**
Raccoon[B]	**P**	**P**	**P**	**P**	**P**	**P**	**P**
Ermine (Short-tailed weasel)[B]	**P**	**P**	**P**	**P**	**P**	**P**	**P**
Fisher[B]	**P**	**P**	**O**				
Long-tailed Weasel[B]	**P**	**P**	**P**	**P**	**P**	**P**	**P**
Mink[B]	**P**	**P**	**P**	**P**	**P**	**P**	**P**
Striped Skunk[B]	**P**	**P**	**P**	**P**	**P**	**P**	**O**
White-tailed Deer[B]	**P**	**O**	**O**	**P**	**P**	**P**	**P**
Black Bear[B]	**P**	**P**	**P**	**P**	**P**	**P**	
Bobcat[B(S-T)]	**P**	**P**	**P**	**P**	**P**	**P**	

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Appendix M: USFWS Official Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

In Reply Refer To: December 28, 2020
Consultation Code: 05E1NE00-2021-SLI-0836
Event Code: 05E1NE00-2021-E-02498
Project Name: Revolution Wind LLC, Onshore Facilities

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2021-SLI-0836

Event Code: 05E1NE00-2021-E-02498

Project Name: Revolution Wind LLC, Onshore Facilities

Project Type: DEVELOPMENT

Project Description: The Onshore Facilities will include an up to 500 foot (ft) (150 meter (m)) segment of the RWEC, the Landfall Work Area, the Onshore Transmission Cable and an Onshore Substation (OnSS) adjacent to the existing Davisville Substation with up to two interconnection circuits (overhead or underground) connecting the OnSS with the existing substation, referred to as the Interconnection Cable Route.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/41.58583829058749N71.42881666964098W

Counties: Washington, RI

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Appendix N: Marine Archaeological Resources Report

CONFIDENTIAL: Contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552)

Appendix O: Technical Report Hydrodynamic and Sediment Transport Modeling Report – Rhode Island State Waters

Final Technical Report

Hydrodynamic and Sediment Transport Modeling Report – Rhode Island State Waters

Revolution Wind Offshore Wind Farm

Prepared for:

Revolution Wind, LLC
56 Exchange Terrace, Suite 300
Providence, RI 02903

Prepared by:

RPS
55 Village Square Drive
South Kingstown, RI 02879

Submitted June 2021

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List of Abbreviations

CFE	Controlled Flow Excavator
CFL	Courant-Friedrichs-Lewis
cm	Centimeter
COP	Construction and Operations Plan
CT	Connecticut
cy	Cubic Yard
DOER	Dredging Operations and Environmental Research
ENC	Electronic Navigational Chart
ERDC	Environmental Research and Development Center
ESRI	Environmental Systems Research Institute
ft	Foot
GEBCO	General Bathymetric Chart of the Oceans
HDD	Horizontal Directional Drilling
hr	Hour
in	Inch
km	Kilometer
L	Liter
m	Meter
m/s	Meter/Second
MA	Massachusetts
mg	Milligram
mi	Mile
mm	Millimeter
NDBC	National Data Buoy Center
NOAA	National Oceanic and Atmospheric Administration
NY	New York
OCS	Outer Continental Shelf
OSAMP	Ocean Special Management Plan
OSS	Offshore Substation
OSU	Oregon State University
ppm	Parts per Million
RI	Rhode Island
RWEC	Revolution Wind Export Cable
SCVR	Step-Wise-Continuous-Variable Rectangular
SSFATE	Suspended Sediment FATE
SSH	Sea Surface Height
TSHD	Trailing Suction Hopper Dredge
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
WDPA	World Database on Protected Areas
WTG	Wind Turbine Generator

EXECUTIVE SUMMARY

This technical report provides details of the sediment effects from the offshore cable burial activities associated with the construction phase of the Revolution Wind Farm Project (Project). The details of the Project are described in Section 3.0 of the Construction and Operations Plan (COP). A description of the Project components is briefly reiterated in this document as they are vital to the cable burial assessment. The Project will include buried cables for the offshore components:

- Up to two high-voltage alternating current submarine cables, located within an approximate 23 mi (37 km)-long corridor within Rhode Island (RI) state waters, to convey power to shore (herein referred to as the Revolution Wind Export Cable [RWEC])

The RWEC will traverse both federal waters and RI state waters, and the modeling of this project was done for activities in both regions. However, this report is specific to state waters and some model results for the sediment-disturbing activities within federal waters are shown in figures but not discussed in this report.

The RWEC will be buried beneath the seabed to the extent feasible as determined necessary by the Cable Burial Risk Assessment and other supporting engineering documents. Burial of the cables may be accomplished using a variety of installation methods (e.g., jet plow, controlled flow excavation [CFE], trailing suction hopper dredge [TSHD]). The resuspension of sediments from the various construction activities may cause a localized sediment plume. A sediment plume is a portion of the water column that experiences a temporary increase in the total suspended solids (TSS) concentration above ambient levels. Over time the plume settles and deposits sediment on the seabed, a process referred to as sedimentation, which is estimated as excess (i.e., above ambient) thickness of sediment accumulated on the seabed.

The objective of this assessment is to characterize the effects of the anticipated sediment-disturbing construction activities proposed to install the Project components. Based on the potential installation methods, conservative assumptions were made to complete this modeling assessment. In support of this objective, RPS performed a hydrodynamic and sediment transport modeling study to simulate the installation activities. The modeling was designed to provide results that characterize the effects of the cable burial in terms of the suspended sediment plume in the water column and the eventual seabed deposition associated with the construction methods. At the time of the modeling study, an export cable route, within the RWEC corridor, and the nearshore landing location were selected as representative locations to be evaluated.

This study assessed the installation of cables which are presented as three distinct study components: (1) the RWEC seabed preparation alternatives, (2) the RWEC installation, and (3) the RWEC landfall. This report is focused on the RI state waters portion of the project, and as such will not discuss the construction activities conducted in federal waters. The modeling associated with the activities in federal waters will be discussed in detail in the COP. A brief description of each study component is provided below.

1. RWEC seabed preparation alternatives – The Project anticipates the potential need for seabed preparation of deeper sediment areas along the RWEC. The evaluation included two different methods: CFE and TSHD. For the TSHD, two disposal methods were evaluated: split bottom barge and continuous overflow.

2. Installation of the RWEC – The RWEC modeling included simulation of installation of one cable (referred to as “circuit”) from the landfall to OSS 1 (Circuit 1). While there is another cable planned from the landfall to OSS 2, the routes follow a similar path and are in proximity to one another. Therefore, the modeled route (Circuit 1) and associated results are considered representative of both routes. Within RI state waters, a 21.4 mi (34.4 km)-long cable was modeled.

3. RWEC landfall – The Project is considering the use of horizontal directional drilling (HDD) for the last segment of the RWEC for its onshore landfall. While two HDD exit pits are anticipated, it is expected that the excavation of each will occur on the order of days apart. Therefore, due to the timing of the excavation, the modeled HDD exit pit is considered representative of both exit pits. The evaluation included two different

landfall equipment types to excavate the HDD exit pit, which are anticipated to be implemented consecutively: a backhoe excavator and a Venturi eductor device.

This assessment was carried out using hydrodynamic and sediment transport models. Specifically, the analysis included two related modeling tasks:

1. Hydrodynamic Model – Using the HYDROMAP modeling system, develop a three-dimensional hydrodynamic model application for the southern New England OCS. The present study focused on validation of model predictions local to the RWEC and Lease Area. Current fields developed using the HYDROMAP model were used as the primary forcing for the sediment transport and dispersion model.

2. Sediment Transport Model – Using the SSFATE modeling system, model the suspended sediment fate and transport. SSFATE was applied to simulate cable burial construction activities to predict the potential sediment plumes and subsequent sedimentation. The resulting effects were presented in terms of excess TSS or sedimentation introduced from the construction activities. Therefore, the effects are associated only with the modeled construction actives and would be in addition to the natural conditions.

The hydrodynamic model produced spatially- and time-varying predictions of currents across the study area and vertically in the water column throughout the modeling domain. Currents along the RWEC are primarily dominated by tides, particularly near the seabed. The tidal currents continuously change speed and direction, with speeds ramping up and down in magnitude, as it cycles through the flood (move offshore to onshore), slack (minimal movement as currents shift direction) and ebb (move onshore to offshore) stages.

The sediment transport model scenarios were designed to reflect each respective construction method and installation activity. The model input parameters included scenario-specific values for the location of the sediment resuspension in the water column, the rate of resuspension, and the sediment types being resuspended. The sediment transport was simulated for an extended period to evaluate the cumulative impacts throughout the duration of the activity and to ensure sufficient time for sedimentation. The burial depth was based on an assumption which conservatively estimated the volume of sediment resuspended. The simulations produced spatially- and time-varying predictions of water column TSS and seabed deposition for each scenario. The output was post-processed to provide (1) a map of instantaneous concentration, (2) a map of the maximum concentration experienced throughout the entire simulation, (3) a map of the cumulative seabed deposition from the entire simulation, (4) tables that summarized volumes resuspended, (5) tables that summarized the area of deposition over specific thresholds, (6) tables that summarized the maximum extent of deposition thickness over specific thresholds, (7) tables that summarized the maximum extent of TSS above specific thresholds, and (8) the duration of plume exposure over specific thresholds.

The modeling predicted that the cable burial activities will result in plumes of excess TSS in the water column and seabed deposition. The term "excess" refers to above background levels. The TSS plumes are limited to the bottom of the water column for the CFE seabed preparation method and RWEC Circuit 1 burial. The TSS plumes for TSHD seabed preparation and landfall are present throughout the majority of the water column due to the location of sediment introduction and, for the landfall, shallow depths. Each plume is temporary in any given location and will change based on the sediment-disturbing activities and environmental conditions present at the time of construction.

Parameters influencing seabed deposition and TSS water column concentrations include volume and grain size distribution of disturbed sediment, local currents, installation rate, local depth, and location of sediment introduction into the water column. The bullets below describe the summary tables and key results.

Seabed Deposition

- For the seabed preparation segments within RI state waters, deposition exceeding 10 mm is predicted to remain within 688.8 ft (210 m), 1033.2 ft (315 m), and 852.8 ft (260 m) from the route centerline for CFE, TSHD split bottom, and TSHD continuous overflow seabed preparation activities, respectively.

- For jet plow installation along the RWEC within RI state waters, deposition thickness is not predicted to reach 10 mm. Deposition exceeding 1.0 mm is predicted to remain within 787.2 ft (240 m) from the route centerline.
- Evaluation of the landfall showed that deposition exceeding 10 mm may extend up to 738 ft (225 m) from the exit pit location.

Water Column Concentrations

- For the seabed preparation segments within RI state waters, the predicted concentrations above background (> 0 mg/L) do not persist in any given location (grid cell) for greater than 3.5 hours, 47.8 hours, and 46 hours for CFE, TSHD split bottom, and TSHD continuous overflow seabed preparation activities, respectively. In most locations (> 75% of the affected area within RI state waters) concentrations return to ambient within approximately 2.5 hours for CFE and approximately 16 hours for both TSHD methods. Predicted concentrations greater than 100 mg/L do not persist in RI state waters for greater than 2.3 hours, 13.5 hours, and 13.8 hours for CFE, TSHD split bottom, and TSHD continuous overflow seabed preparation activities, respectively.
- For jet plow installation along the RWEC within RI state waters, predicted concentrations above background (> 0 mg/L) do not persist in any given location (grid cell) for greater than 69.7 hours. In most locations (> 75% of the affected area within RI state waters) concentrations return to ambient within approximately 26 hours. Predicted concentrations greater than 100 mg/L do not persist in RI state waters for greater than 4.5 hours.
- Evaluation of the landfall showed that predicted concentrations above background (> 0 mg/L) do not persist in any given location (grid cell) for greater than 70.3 hours. In most locations (> 75% of the affected area within RI state waters) concentrations return to ambient within approximately 6 hours. Predicted concentrations greater than 100 mg/L do not persist in RI state waters for greater than 70.2 hours.

SSFATE was used to effectively simulate three representative study components of the types of activities that are expected with the Project. The modeling predicted the potential TSS concentrations, deposition thicknesses, exposure durations, and corresponding areas and distances associated with each Project-related construction activity.

1.0 INTRODUCTION

This technical report provides the details of the sediment effects from offshore cable burial activities associated with the construction phase of the Revolution Wind Farm Project (Project). The details of the Project are described in Section 3.0 of the Construction and Operations Plan (COP). A brief description of the Project components is presented here as they are vital to the cable burial assessment. The Project will include the following components:

- Up to two high-voltage alternating current submarine cables, located within an approximate 23 mi (37 km)-long corridor within Rhode Island (RI) state waters, to convey power to shore (herein referred to as the Revolution Wind Export Cable [RWEC])

The RWEC will traverse both federal waters and RI state waters, and the modeling of this project was done for activities in both regions. However, this report is specific to state waters and some model results for the sediment-disturbing activities within federal waters are shown in figures but not discussed in this report.

The RWEC will be buried beneath the seabed to the extent feasible as determined necessary by the Cable Burial Risk Assessment and other supporting engineering documentation. Burial of the cables may be accomplished using a variety of installation methods (e.g., jet plow, controlled flow excavation [CFE], trailing suction hopper dredge [TSHD]). The resuspension of sediments from the various construction activities may cause a localized sediment plume. A sediment plume is a portion of the water column that experiences a temporary increase in the total suspended solids (TSS) concentration above ambient levels. Over time the plume settles and deposits sediment on the seabed, a process referred to as sedimentation, which is estimated as excess (i.e., above ambient) thickness of sediment accumulated on the seabed.

The objective of this assessment is to characterize the effects of the anticipated sediment-disturbing construction activities proposed to install the Project components. Based on the potential installation methods, conservative assumptions were made to complete this modeling assessment. In support of this objective, RPS performed a hydrodynamic and sediment transport modeling study to simulate the installation activities. The modeling was designed to provide results that characterize the effects of the cable burial in terms of the suspended sediment plume in the water column and the eventual seabed deposition associated with the construction methods.

This study assessed the installation of cables which are presented as three distinct study components: (1) the RWEC seabed preparation alternatives, (2) the RWEC installation, and (3) the RWEC landfall. This report is focused on the RI state waters portion of the project, and as such will not discuss the construction activities in federal waters. The modeling associated with the activities in federal waters will be discussed in detail in the COP. A brief description of each study component is provided below.

1. RWEC seabed preparation alternatives – The Project anticipates the potential need for seabed preparation of deeper sediment areas along the RWEC. The evaluation included two different methods: CFE and TSHD. For the TSHD, two disposal methods were evaluated: split bottom barge and continuous overflow.
2. Installation of the RWEC – The RWEC modeling included simulation of installation of one cable (referred to as "circuit") from the landfall to OSS 1 (Circuit 1). While there is another cable planned from the landfall to OSS 2, the routes follow a similar path and are in proximity to one another. Therefore, the modeled route (Circuit 1) and associated results are considered representative of both routes. Within RI state waters, 21.4 mi (34.4 km) of Circuit 1 was modeled.
3. RWEC landfall – The Project is considering the use of horizontal directional drilling (HDD) for the last segment of the RWEC for its onshore landfall. While two HDD exit pits are anticipated, it is expected that the excavation of each will occur on the order of days apart. Therefore, due to the timing of the excavation, the modeled HDD exit pit is considered representative of both exit pits. The evaluation included two different

landfall equipment types to excavate the HDD exit pit, which are anticipated to be implemented consecutively: a backhoe excavator and a Venturi eductor device.

At the time of the modeling study, an export cable route, within the RWEC corridor, and the nearshore landing location were selected as representative locations to be evaluated. The indicative route is within the RWEC corridor as can be seen in Figure 1.1-1, which gives an overview of the RWEC areas within RI state waters. The map shows the RWEC corridor in yellow and the modeled RWEC route in black.

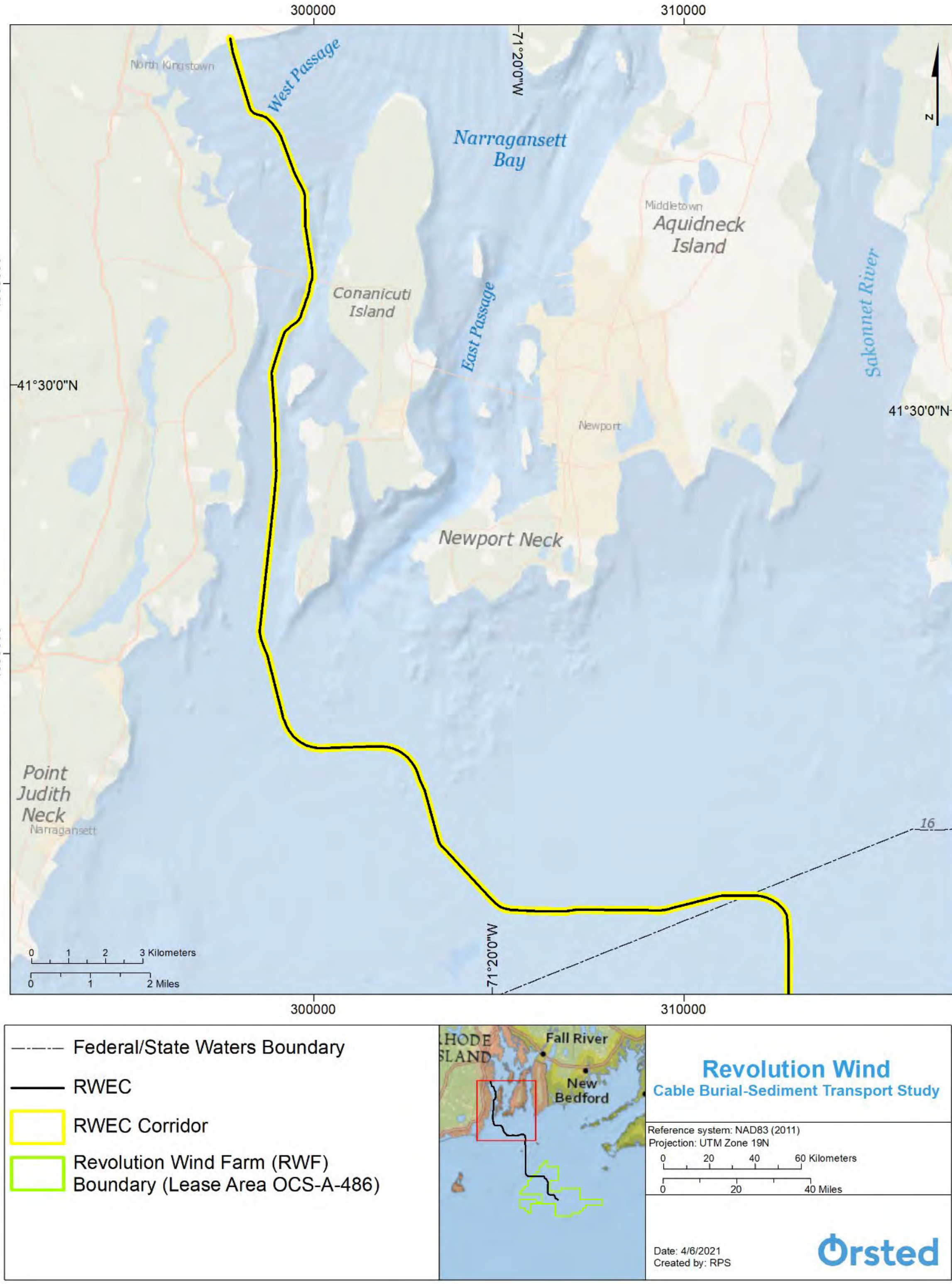

Figure 1.1-1 Location of the Indicative Export Cable Route in the RWEC Corridor within RI State Waters.

1.1 Study Area

While this report focuses on activities within RI state waters, due to the complex nature of the regional hydrodynamics and its influence on RI state waters, the model domain included the southern New England Outer Continental Shelf (OCS), which lies south of Massachusetts, Rhode Island, and Long Island, New York, and extends from the Hudson Shelf Canyon in the west to Nantucket Shoals in the east. Components of the Project that have potential for sediment disturbance span a relatively large distance, with the RWEC route extending from the Lease Area, which is located between approximately 16 – 28 mi (26 – 46 km) offshore, to a proposed landfall at Quonset Point in North Kingstown, Rhode Island. The currents vary spatially and temporally throughout the domain. The general ocean circulation (currents) across the study area is complex and influenced to some extent by wind-driven processes, tides, and density gradients that arise from combined interaction with adjacent estuaries, solar effects, and heat flux through the air-sea interface (Codiga and Ullman, 2010). Yet, over most of the region, tidal currents are the dominant form of circulation (Spaulding and Gordon, 1982), with wind and density variations playing a smaller role.

Tides in the study area are predominately semi-diurnal (twice per day) with influences from diurnal (once per day) constituents. This results in approximately two high tides and two low tides daily, which cause the ocean currents to flood and ebb in response to the changing water levels. The current direction changes as it floods (moves offshore to onshore) and ebbs (moves onshore to offshore), with a semidiurnal tide resulting in approximately four changes in direction per day in response to the tides. While tidal currents are always present, at some locations they may be overcome by wind or density driven currents. However, tidal circulation dominates in nearshore environments and in Narraganset Bay. Sediments in the study area are characterized by modern marine deposits and reworked glacial and post-glacial outwash deposits. Marine deposits in this region are typically comprised of silty fine sand and are typically up to 6.6 – 9.8 ft (2 – 3 m) thick.

1.2 Regulatory Context and Resource Definition

This assessment has been performed to provide a characterization of the physical effects of the cable burial in terms of the associated suspended sediment plume in the water column and the seabed deposition of sediments disturbed during construction. This study has been performed to provide information that describes impacting factors with respect to activities that disturb the sea bottom and increase turbidity, as required by BOEM guidelines (30 CFR § 585.626(a), (2), and (4) and 30 CFR § 585.627(a), (1), and (2)) for inclusion within the Project's COP.

1.3 Significance Threshold

There are no thresholds of significance for which the effects were evaluated to determine compliance or impact. The results are presented in a manner that allows the reader to view the order of magnitude of the predicted effects. The sediment transport modeling produced predictions of excess TSS and cumulative seabed deposition. The term "excess" refers to above background levels. From this point herein all concentrations refer to excess concentrations. The term "cumulative" with respect to deposition refers to the fact that the deposition in any location may build over time during the cable installation and is the sum of deposition from the modeled activity. The thresholds used to demonstrate the results for TSS and seabed deposition are presented in Table 1.3-1 and Table 1.3-2, respectively.

Table 1.3-1. TSS Concentration Thresholds used for Presentation of Modeling Results.

Concentration Bin Ranges		
Threshold Bin	Parts per Million (ppm)	Milligram/Liter (mg/L)
1	10 - 50	10 - 50
2	50 - 100	50 - 100
3	100 - 200	100 - 200
4	200 - 500	200 - 500
5	> 500	> 500

Table 1.3-2. Seabed Deposition Thresholds used for Presentation of Modeling Results.

Deposition Bin Ranges		
Threshold Bin	Inches (in)	Millimeter (mm)
1	0.0039 – 0.039	0.1 - 1
2	0.039 – 0.39	1 - 10
3	0.39 – 3.14	10-80
4	> 3.14	> 80

1.4 Regulatory Coordination and Required Permits

This study did not include considerations of regulatory coordination or required permits. It is a stand-alone study characterizing the physical effects of the cable burial activities. The results may be referenced by other components of the Project, which may have regulatory coordination and required permits.

This study has been performed to provide information on impact-producing activities that may disturb the seabed and increase turbidity for consideration in the regulatory process.

1.5 Note on Units and Figures

The text and supporting tables and graphics are presented primarily in Imperial units (e.g., inches, feet, miles, knots) and secondarily in Metric units (e.g., meters, kilometers, meters per second) with the following exceptions:

- In figures where a parameter is presented at a set of round monotonically increasing levels that were established with respect to metric increments.
- Figures and reference to the TSS plume have been made with respect to metric units of mg/L due to this being the most widely use measurement to evaluate TSS plumes.
- Figures and reference to the sediment deposition have been made with respect to metric units of mm due to this being the most widely use measurement to evaluate sedimentation.

Map-based figures in this report have been made primarily using the Environmental Systems Research Institute (ESRI) ArcMap software and incorporate a basemap provided through the application. The map service layer credits do not easily fit on the images and are provided below.

- Main figures use the World Ocean Basemap; the service layer credits are listed below.
    - General Bathymetric Chart of the Oceans (GEBCO) GEBCO_08 Grid version 20100927 and IHO-IOC GEBCO Gazetteer of Undersea Feature Names August 2010 version (https://www.gebco.net), National Oceanic and Atmospheric Administration (NOAA) and National Geographic for the oceans; and DeLorme, HERE, and Esri for topographic content
- Main figures and insets showing figure location use the National Geographic World Map; the service layer credits are bulleted below.
    - Reference Data: National Geographic, ESRI, Garmin, HERE, INCREMENT P, NRCAN, METI
    - Land Cover Imagery: NASA Blue Marble, ESA GlobCover 2009 (Copyright notice: © ESA 2010 and UCLouvain)
    - Protected Areas: IUCN and UNEP-WCMC (2011), The World Database on Protected Areas (WDPA) Annual Release. Cambridge, UK: UNEP-WCMC. Available at: www.protectedplanet.net.
    - Ocean Data: GEBCO, NOAA

2.0 METHODOLOGY

RPS applied customized hydrodynamic and sediment transport and dispersion models to assess potential effects from sediment resuspension related to cable burial activities expected to take place during the construction phase of the Project. Specifically, the analysis included two interconnected modeling tasks:

- Develop a three-dimensional hydrodynamic model application for the southern New England OCS using the HYDROMAP modeling system. The present study focused on validation of model predictions local to the RWEC and Lease Area. Current fields developed using the HYDROMAP model were used as the primary forcing for the sediment transport and dispersion model.

- Model the suspended sediment fate and transport using the SSFATE modeling system. SSFATE was applied to simulate cable burial construction activities to produce predictions of sediment plumes and sedimentation.

This study was performed in a manner such that the results were produced in terms of the effects as excess, referring to in excess of natural conditions. Therefore, the effects are presented as isolated effects of the construction that occur which would be added to the natural conditions.

2.1 Hydrodynamic Modeling Approach

The Project will include construction activities that disturb the seabed and result in sediment resuspension. In order to evaluate potential sediment resuspension, circulation patterns in the bottom waters were modeled using a three-dimensional hydrodynamic model application. RPS's HYDROMAP hydrodynamic model system (Isaji et al., 2001) was used to develop the model application for the southern New England OCS. The model was used to simulate water levels, circulation patterns, and water volume flux through the study area and to provide the hydrodynamic input (spatially- and temporally-varying currents) for the sediment transport model.

The hydrodynamic modeling included gathering and analyzing environmental data, development of the model grid and boundary conditions, validation of model performance for a period coincident with observations of water levels and currents, and development of currents for scenario timeframes relevant to the sediment transport simulations.

2.1.1 HYDROMAP Model Description

HYDROMAP is a globally re-locatable hydrodynamic model capable of simulating complex circulation patterns due to tidal forcing, wind stress, and freshwater flows, quickly and efficiently, anywhere on the globe. HYDROMAP employs a novel step-wise-continuous-variable rectangular (SCVR) gridding strategy with up to six levels of resolution. The term "step-wise-continuous" implies that the boundaries between successively smaller and larger grids are managed in a consistent integer step. The advantage of this approach is that large areas of widely differing spatial scales can be addressed within one consistent model application. Grids constructed by the SCVR are still "structured," so that arbitrary locations can be easily located to corresponding computational cells. This mapping facility is particularly advantageous when outputs of the hydrodynamic model are used in subsequent application programs (e.g., Lagrangian particle transport model) that use another grid or grid structure.

The hydrodynamic model solves the three-dimensional conservation equations in spherical coordinates for water mass, density, and momentum, with the Boussinesq and hydrostatic assumptions applied. These equations are solved subject to the following boundary conditions:

- At land boundaries, the normal component of velocity is set to zero;

- At the open boundaries, the sea surface elevation is specified by the dominant tidal constituents, each with its own amplitude and phase from a reference time zone, or as a time series of total surface elevation defined relative to the local surface elevation;

- At the sea surface, the applied stress due to the wind is matched to the local stress in the water column and the kinematic boundary condition is satisfied; and

- At the sea floor, a quadratic stress law, based on the local bottom velocity, is used to represent frictional dissipation and a friction coefficient parameterizes the loss rate.

The numerical solution methodology follows that of Davies (1977) and Owen (1980). The vertical variations in horizontal velocity are described by an expansion of Legendre polynomials. The resulting equations are then solved by a Galerkin-weighted residual method in the vertical and by an explicit finite difference algorithm in the horizontal. A space staggered grid scheme in the horizontal plane is used to define the study area. Sea surface elevation and vertical velocity are specified in the center of each cell, while the horizontal velocities are given on the cell face. To increase computational efficiency, a "split-mode" or "two mode" formulation is used (Owen, 1980; Gordon, 1982). In the split-mode, the free-surface elevation is treated separately from the internal, three-dimensional flow variables. The free-surface elevation and vertically integrated equations of motion (external mode), for which the Courant-Friedrichs-Lewis ("CFL") limit must be met, is solved first. The vertical structure of the horizontal components of the current then may be calculated such that the effects of surface gravity waves are separated from the three-dimensional equations of motion (internal mode). Therefore, surface gravity waves no longer limit the internal mode calculations and much longer time steps are possible. Isaji et al. (2001), and Isaji and Spaulding (1984) provide a detailed description of the model physics and numerical implementation.

HYDROMAP output includes spatially- and temporally-varying fields of current speed and direction. This output is seamlessly integrated as input in RPS' transport models, including SSFATE (sediment transport and fates model).

2.2 Sediment Transport Modeling Approach

Sediment transport associated with the cable burial activities was simulated using RPS's Suspended Sediment FATE (SSFATE) model. The model requires inputs defining the environment (e.g., water depths, currents) and the construction activity loading (e.g., sediment grain size, resuspended volume) to predict the associated sediment plume and seabed deposition. Details of the model and theory are provided in the following sections.

2.2.1 SSFATE Model Description

The Suspended Sediment FATE model (SSFATE) is a three-dimensional Lagrangian (particle) model developed jointly by the U.S. Army Corps of Engineers (USACE) Environmental Research and Development Center (ERDC) and Applied Science Associates (now part of the RPS Group) to simulate sediment resuspension and deposition from marine dredging operations. Model development was documented in a series of USACE Dredging Operations and Environmental Research (DOER) Program technical notes (Johnson et al., 2000; Swanson et al., 2000); at previous World Dredging Conferences (Anderson et al., 2001) and a series of Western Dredging Association Conferences (Swanson and Isaji, 2004). Following dozens of technical studies which demonstrated successful application to dredging, SSFATE was further developed to include the simulation of cable and pipeline burial operations using water jet trenchers (Swanson et al., 2007), and mechanical plows, as well as sediment dumping and dewatering operations. The current modeling system includes a GIS-based interface for visualization and analysis of model output.

SSFATE computes TSS concentrations and sedimentation patterns resulting from sediment disturbing activities. The model requires a spatial- and time-varying circulation field (typically from hydrodynamic model output), definition of the water column bathymetry, and parameterization of the sediment disturbance (source), and predicts the transport, dispersion, and settling of suspended sediment released to the water column. The focus of the model is on the far-field (i.e., beyond the initial disturbance) processes affecting the fate of suspended sediment. The model uses specifications for the suspended sediment source strengths (i.e., mass flux), vertical distributions of sediments and sediment grain-size distributions to represent losses (loads) to the water column from different types of mechanical or hydraulic dredges, sediment dumping practices, or other sediment disturbing activities such as jetting or mechanical plowing for cable or pipeline burial. Multiple sediment types or fractions can be simulated simultaneously; as can discharges from moving sources.

2.2.2 SSFATE Model Theory

SSFATE addresses the short-term movement of sediments that are disturbed during processes (e.g., mechanical plowing, hydraulic jetting, dredging) where sediment is resuspended into the water column. The model predicts the path and fate of the sediment particles based on sediment properties, sediment loading characteristics and environmental conditions (bathymetry and currents). The computational model utilizes a Lagrangian (or particle-based) scheme to represent the total mass of sediments suspended over time. The particle-based approach provides a method to track suspended sediment without any loss of mass as compared to Eulerian (continuous) models due to the nature of the numerical approximation used for the conservation equations. Thus, the method is not subject to artificial diffusion near sharp concentration gradients and can easily simulate all types of sediment sources.

The model uses Lagrangian particles to represent the resuspended sediments. Sediment particles in SSFATE are divided into five size classes (Table 2.2-1) based on grain size, each having unique behaviors for transport, dispersion, and settling. The model releases a minimum of one particle per time step per sediment class, though a particle multiplier can be used to release multiple particles per sediment class per time step. The total mass of sediment in each particle reflects the operations and sediment grain size distribution. The mass reflects the amount of sediment that is expected to be resuspended for a given time interval based on sediment production rate and resuspension rate of the equipment, and this mass is further proportioned within each sediment size class based on the characterization of the sediment data at a given location.

Table 2.2-1. Sediment Size Classes used in SSFATE.

Sediment Size Classes in SSFATE			
Class	Type	Size Range Imperial Units (thou)	Size Range Metric Units (microns)
1	Clay	0 – 0.3	0-7
2	Fine silt	0.3 – 1.4	7-35
3	Coarse silt	1.4 – 2.9	35-74
4	Fine sand	2.9 – 5.1	74-130
5	Coarse sand	> 5.1	>130

Horizontal transport, settling, and turbulence-induced suspension of each particle is computed independently by the model for each time step. Particle advection is based on the relationship that a particle moves linearly (in three-dimensions) with a local velocity obtained from the hydrodynamic field for a specified model time step. Diffusion is assumed to follow a simple random walk process. The diffusion distance is defined as the square root of the product of an input diffusion coefficient and the time step is decomposed into X and Y displacements via a random direction function. The vertical Z diffusion distance is scaled by a random positive or negative direction.

Particle settling rates are calculated using Stokes equations based on the size and density of each particle class. Settling of particles mixtures is a complex process due to interaction of the different size classes, some of which tend to be cohesive and thus clump together to form larger particles that have different settling rates than would be expected from their individual sizes. Enhanced settlement rates due to flocculation and scavenging are particularly important for clay and fine-silt sized particles (Swanson et al., 2007; Teeter, 2000) and these processes have been implemented in SSFATE. These processes are bound by upper and lower concentrations limits, defined through empirical studies, which contribute to flocculation for each size class of particles. Outside these limits, particle collisions are either too infrequent to promote aggregation, or so numerous that the interactions hinder settling.

Deposition is calculated as a probability function of the prevailing bottom stress and local sediment concentration and size class. The bottom shear stress is based on the combined velocity due to waves (if used) and currents using the parametric approximation (Soulsby,1998). Matter that is deposited may be subsequently resuspended into the lower water column if critical levels of bottom stress are exceeded, and the model employs two different resuspension algorithms. The first applies to material deposited in the last tidal cycle (Lin et al., 2003). This accounts for the fact that newly deposited material will not have had time to consolidate and will be resuspended with less effort (lower shear force) than consolidated bottom material. The second algorithm is the established Van Rijn method (Van Rijn, 1989) and applies to all other material that has been deposited prior to the start of the last tidal cycle. Swanson et al. (2007) summarizes the justifications and tests for each of these resuspension schemes. Particles initially released by operations are continuously tracked for the length of the simulation, whether suspended or deposited.

For each model time step the suspended concentration of each sediment class as well as the total concentration is computed on a concentration grid. The concentration grid is a uniform rectangular grid with user-specified cell size that is independent of the resolution of the hydrodynamic data used to calculate transport, thus supporting finer spatial differentiation of plume concentrations and avoiding underestimation of concentrations caused by spatial averaging over larger volumes/areas. Model outputs include water-column concentrations in both horizontal and vertical planes, time-series plots of suspended sediment concentrations at points of interest, and thickness contours of sediment deposited on the sea floor. Deposition is calculated as the mass of sediment particles that accumulate over a unit area. Because the amount of water in the sediment deposited is not known, SSFATE by default converts deposition mass to thickness by assuming no water content.

For detailed description of the SSFATE model equations governing sediment transport, settling, deposition, and resuspension, the reader is directed to Swanson et al. (2007).

3.0 HYDRODYNAMIC MODELING

This section describes the environmental data used to develop the hydrodynamic model application and details of the hydrodynamic model application including model setup, the validation of the hydrodynamic model performance, and the use of the hydrodynamic model application to generate current fields for use in the sediment dispersion modeling.

3.1 Environmental Data

Environmental data including shoreline, bathymetry, winds, tidal elevations, and currents were acquired in order to understand and characterize the circulation local to the Project components in marine waters. The data were used both in developing model forcing as well as for validating the model predictions. The locations of various data sources in relation to the Project components are shown in Figure 3.1-1. Further details on the data sources are provided below. Analysis and presentation of the data used for the study are presented in subsequent sections as appropriate.

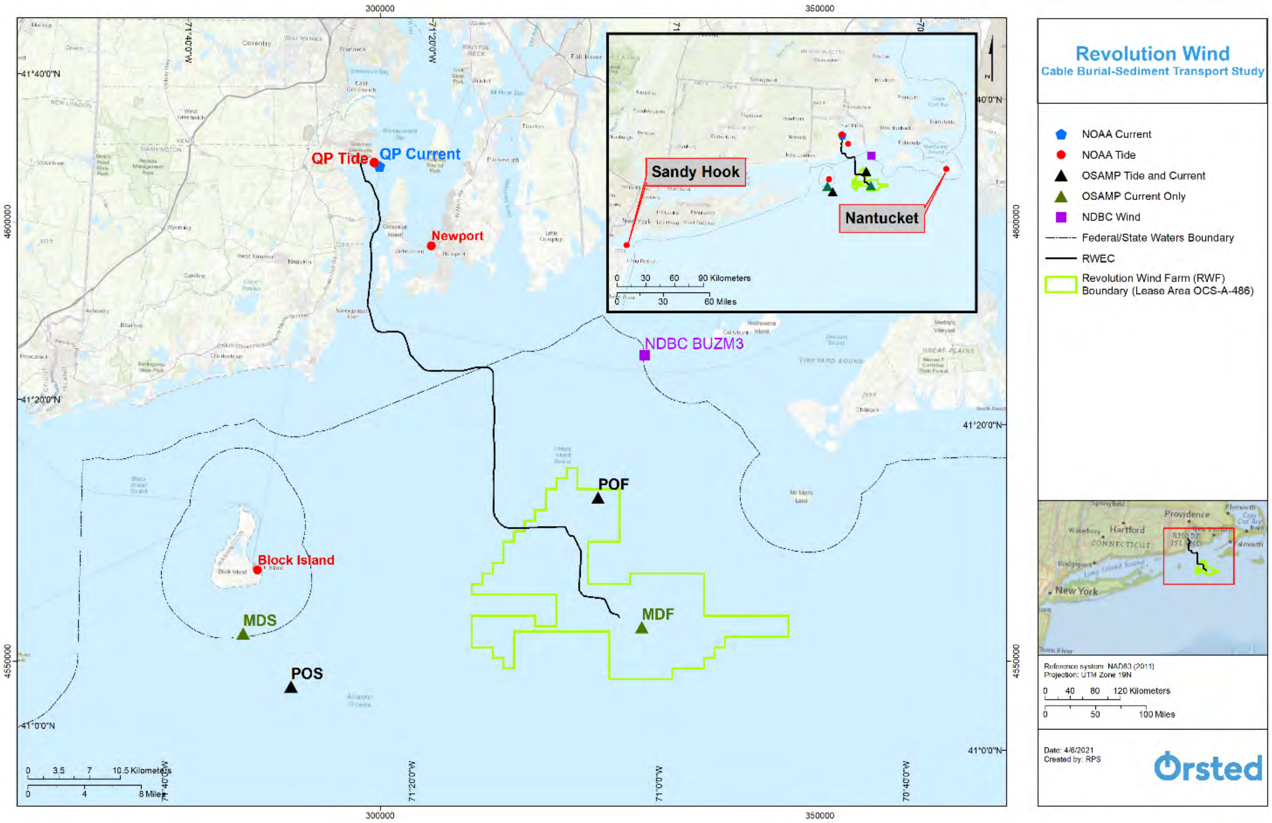

Figure 3.1-1. Location of Environmental Data Observations and Project Components.

3.1.1 Shoreline and Bathymetry

The hydrodynamic model domain extends from New York Harbor to Cape Cod and is significantly larger than the Project footprint. This extent was necessary to accurately locate and define open boundary conditions. The shoreline for the domain was developed based on merging shoreline data from each of the relevant states (Massachusetts [MA; MassGIS, 2017], RI [RIGIS, 2010], Connecticut [CT; CT DEEP, 2017], and New York [NY; NY GIS, 2017]). Bathymetry data was gathered from publicly available data provided by the National Oceanic and Atmospheric Administration (NOAA) for coastal and offshore waters of MA, CT, RI, and NY. NOAA soundings (water depth measurements) were downloaded from the NOAA's Electronic Navigational Chart (ENC) Direct to GIS portal (NOAA, 2019a) and were obtained for the harbor, coastal, and approach ENC band levels. Soundings are available from their native positioning, which is irregular in spacing. The irregular spaced soundings were interpolated to the hydrodynamic grid to provide a complete coverage of water depths within the study area.

3.1.2 Sea Surface Height (Tide) and Current Data

Sea surface height (SSH) and current data were gathered and analyzed for this study. SSH data was used for both developing model forcing and for verification of the hydrodynamic model predictions. Current data was used solely to validate the model predictions.

Sea Surface Height

Multiple sources of SSH data were used in this study. The data were available either as time histories of observations of water surface elevation or in the form of harmonic constituents from either a global model or analysis of observational data. Harmonic constituents represent the amplitude and phase of defined periodic constituents of the tidal signal (sine waves with different wave lengths), where the tidal signal is the sum of all constituents added together by superposition. The amplitude describes the difference between a mean sea level datum and the peak water level for a constituent, and the phase describes the timing of the signal relative to a time datum. The constituent period determines the time for one full oscillation of the signal. Tidal harmonic constituents' names indicate the approximate period (e.g., M2 is approximately twice daily and O1 is approximately once daily).

Output from the TPXO7 global tidal model developed by Oregon State University (OSU) was used to characterize the tides at the hydrodynamic model open boundaries. The TPX07 model output contains tidal harmonic constituent data on a ¼ degree resolution across the globe. The model is based on data from the TOPEX/Poseidon and Jason satellites, and the model methodology is documented in Egbert et al. (1994) and Egbert and Erofeeva (2002). A summary of the constituents obtained, and their specific periods, is provided in Table 3.1-1. Details on the spatially-varying amplitude and phase used as boundary forcing are provided in Section 3.2.2.

Table 3.1-1. Tidal Constituents Used at Hydrodynamic Model Boundaries.

Tidal Boundary Characteristics			
Name	Constituent	Speed (Degrees/Hour)	Period (Hours)
M2	Principal lunar semidiurnal constituent	28.98	12.42
S2	Principal solar semidiurnal constituent	30.00	12.00
N2	Larger lunar elliptic semidiurnal constituent	28.44	12.66
K1	Lunar diurnal constituent	15.04	23.93
O1	Lunar diurnal constituent	13.94	25.82

Observational based tide data was obtained from NOAA Center for Operational Oceanographic Products and Services (CO-OPS) or from activities associated with the Rhode Island Ocean Special Management Plan (OSAMP). The location of observation stations used in this study are shown in Figure 3.1-1.The NOAA CO-OPS program provides historical observations of water level, along with published harmonic constituents of the tides based on their analysis of the observations. The OSAMP included a temporary field program during which four buoys (POF, POS, MDS, MDF) were deployed to collect metocean observation data. Two of those buoys (POF and POS) included observations of pressure which was converted to water depth; the oscillating water depth was used to determine the tidal characteristics at these locations. The harmonic constituents of these stations were published in Grilli et al. (2010). The time history of observations from the OSAMP stations had also been previously provided to RPS through the researches working on the OSAMP. The observations of water levels were used to evaluate the model predictions (Section 3.2.3.1).

Current Data

Observations of currents were obtained from four OSAMP stations (MDF, MDS, POF, POS) and from one NOAA CO-OPS station (NOAA station nb0301 located offshore Quonset Point [QP]). The location of these stations are shown in Figure 3.1-1. The OSAMP buoys included observations at multiple depths throughout the water column processed to provide a value in discrete bins. The NOAA CO-OPS station has only one point of measurement in the upper water column (12 ft [3.6 m] below the surface). A summary of metrics for each station is provided in Table 3.1-2. Further details and discussions on the OSAMP oceanographic instrumentation and observations can be found in Codiga and Ullman (2010). The current observations were used for verification of model predictions. These are presented in Section 3.2.3.1.

Table 3.1-2. Current Observations.

Current Observation Data				
Source	Location	Point or Profile	Bin Resolution, Feet (ft) (Meters [m])	Time Step (Hours)
NOAA	Quonset Point, RI	Point – Upper Water Column	NA	0.10
OSAMP	POS	Profile	2.46 (0.75)	2.00
OSAMP	POF	Profile	2.46 (0.75)	2.00
OSAMP	MDF	Profile	3.28 (1.00)	1.00
OSAMP	MDS	Profile	3.28 (1.00)	1.00

Wind Data

The hydrodynamic model forcing also includes surface winds, and thus a record describing the wind speed and direction during the simulation period was needed. Additionally, wind data was used to select representative timeframes with typical wind characteristics for running the model to develop currents for use in the sediment transport modeling. Winds observed at the National Data Buoy Center (NDBC) Buzzards Bay station BUZM3 were obtained and used in this study. This data was available at an hourly time step and the most recent ten years of data (2009 – 2018) was obtained for analysis (NDBC, 2019).

3.2 HYDROMAP Hydrodynamic Model Application

A model application of the study area was developed using the HYDROMAP hydrodynamic model system. This included development of a model grid and grid bathymetry, development of boundary forcing (tides and wind), and selection of numerical parameters. The model set-up allows for three-dimensional simulations, which were utilized for this study. The vertical structure is represented by Legendre polynomials; in this instance four polynomials were used to represent the vertical variability in the currents from tidal and wind forcing. The model application was first verified against observations for a period of November 25 – December 25, 2009 and then subsequently run for a period of time identified as having typical winds that was sufficient for model simulations of cable installation (April 1 – May 15, 2016).

3.2.1 Model Grid

The complete model domain extends from New York Harbor at the westernmost extent, to Cape Cod at the eastern extent. Although this domain is significantly larger than the study area, the extent was chosen to best locate and define open boundary conditions. The computational grid for the entire domain, consisting of 24,506 active water cells, is shown in Figure 3.2-1. The hydrodynamic model grid was mapped to the shoreline with grid cell resolution ranging from approximately 3,281 – 820 ft. (1.0 km – 250 m); the resolution is coarse further from the shore and becomes finer in the areas closest to the shore to capture the physical characteristics of the shoreline/bathymetry. The model grid bathymetry was assigned by interpolating a set of individual data points onto the model grid. For grid cells that contain multiple soundings, the values are averaged; grid cells without soundings are interpolated based on the closest soundings. The final gridded bathymetry is shown in Figure 3.2-2 and a zoomed-in view of the grid is presented in Figure 3.2-3.

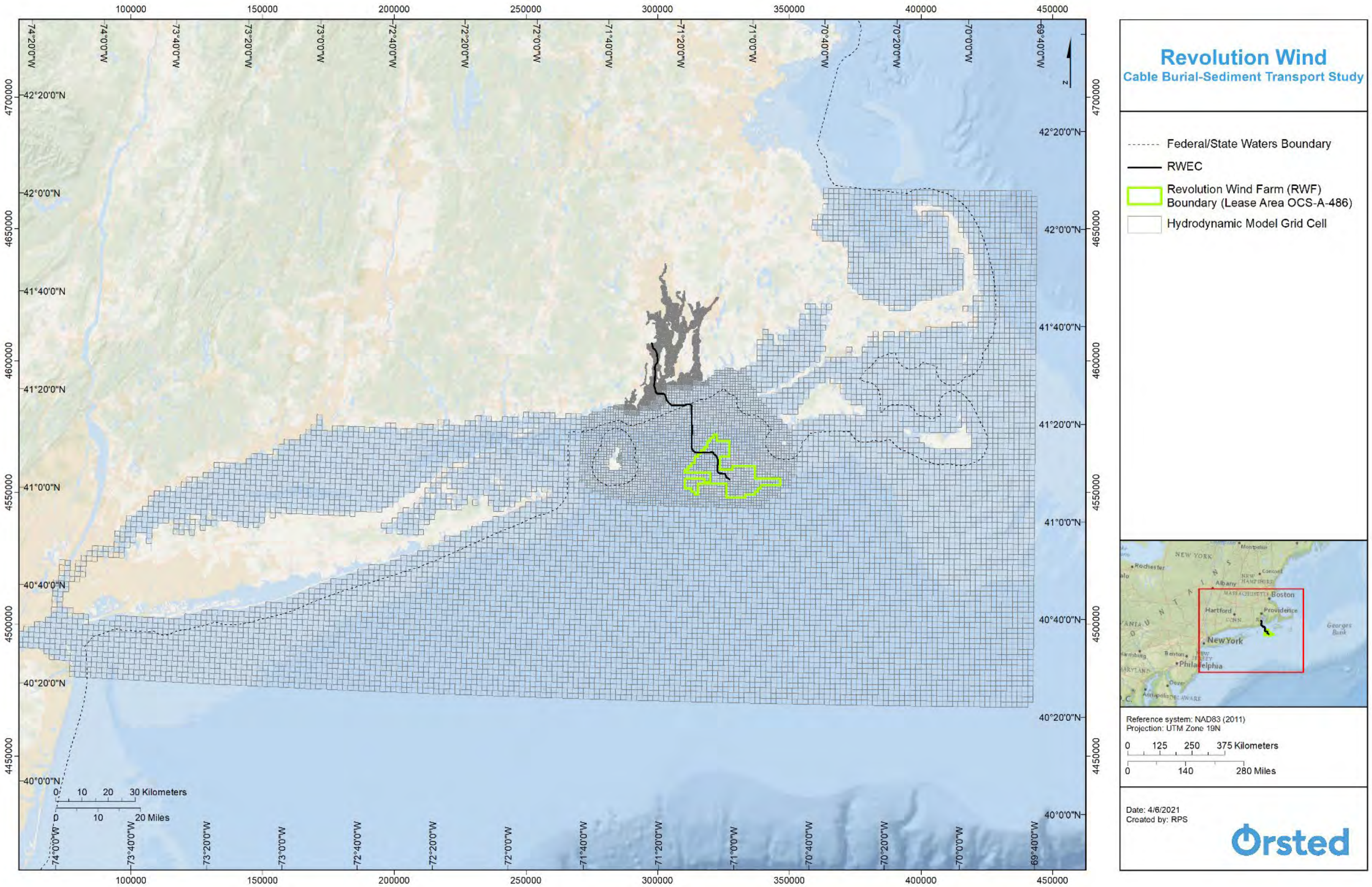

Figure 3.2-1. Hydrodynamic Model Grid.

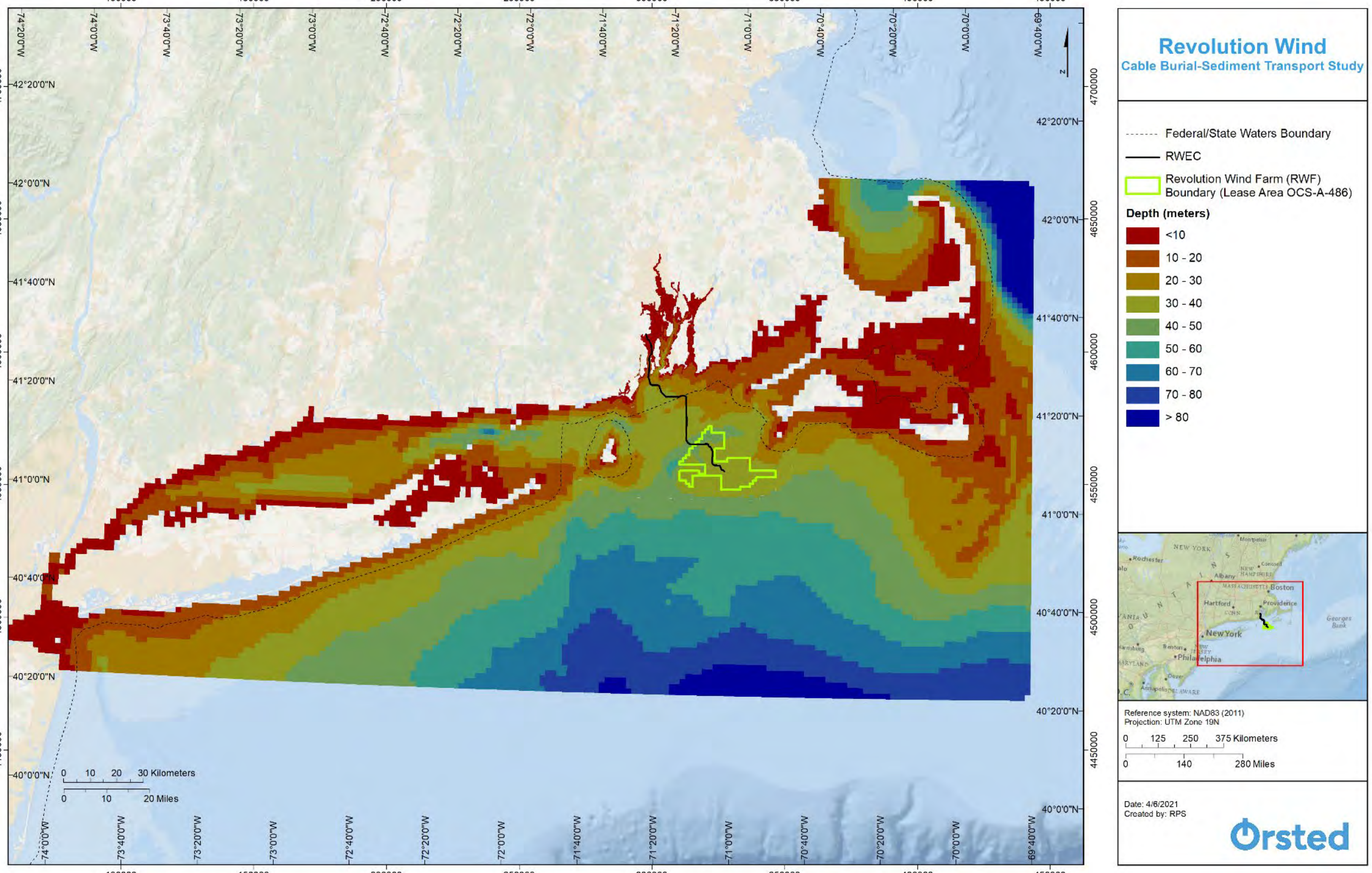

Figure 3.2-2. Hydrodynamic Model Grid Bathymetry.

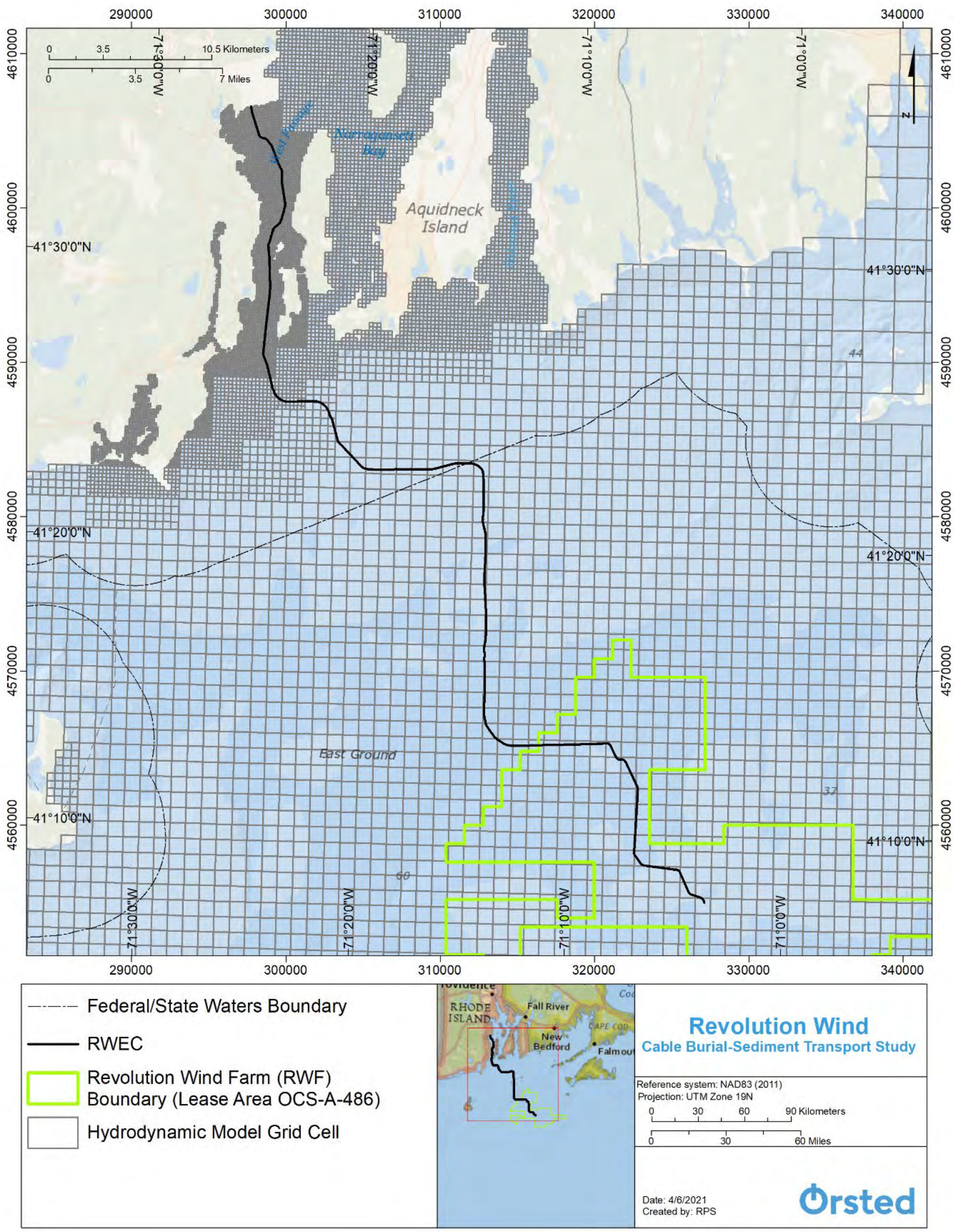

Figure 3.2-3. Zoomed-in View of Hydrodynamic Model Grid Focused on Project Components.

3.2.2 Model Boundary Conditions

Model boundary conditions for this application included specification of tidal characteristics at open boundary water cells at the edge of the domain and surface winds applied to all cell surfaces.

Tidal Boundary Conditions

The circulation in the study area is tidally dominated, and therefore an important feature of the model application is the characterization of tidal boundary conditions. Harmonic constituent data extracted from the TPXO global tidal model was used at the model open boundaries. Each boundary cell was assigned a unique set of the harmonic constituent amplitudes and phases, interpolated from the TOPEX model predictions. In total, the open boundary was specified for the five predominant tidal constituents in the area: three semi-diurnals (M2, N2, and S2) and two diurnals (K1 and O1). The dominant tidal constituent in this region is the M2-principal lunar semi-diurnal (twice daily) constituent. Illustrations of amplitude and phase of the M2 constituent along the model grid open boundaries are shown in Figure 3.2-4 and Figure 3.2-5, respectively. Figure 3.2-4 illustrates that the M2 amplitude is greater than 1.31 ft (0.4 m) in most places, with the exception of the southeast region of the domain. Figure 3.2-5 illustrates how the M2 phase is generally similar parallel to Long Island and Narragansett Bay.

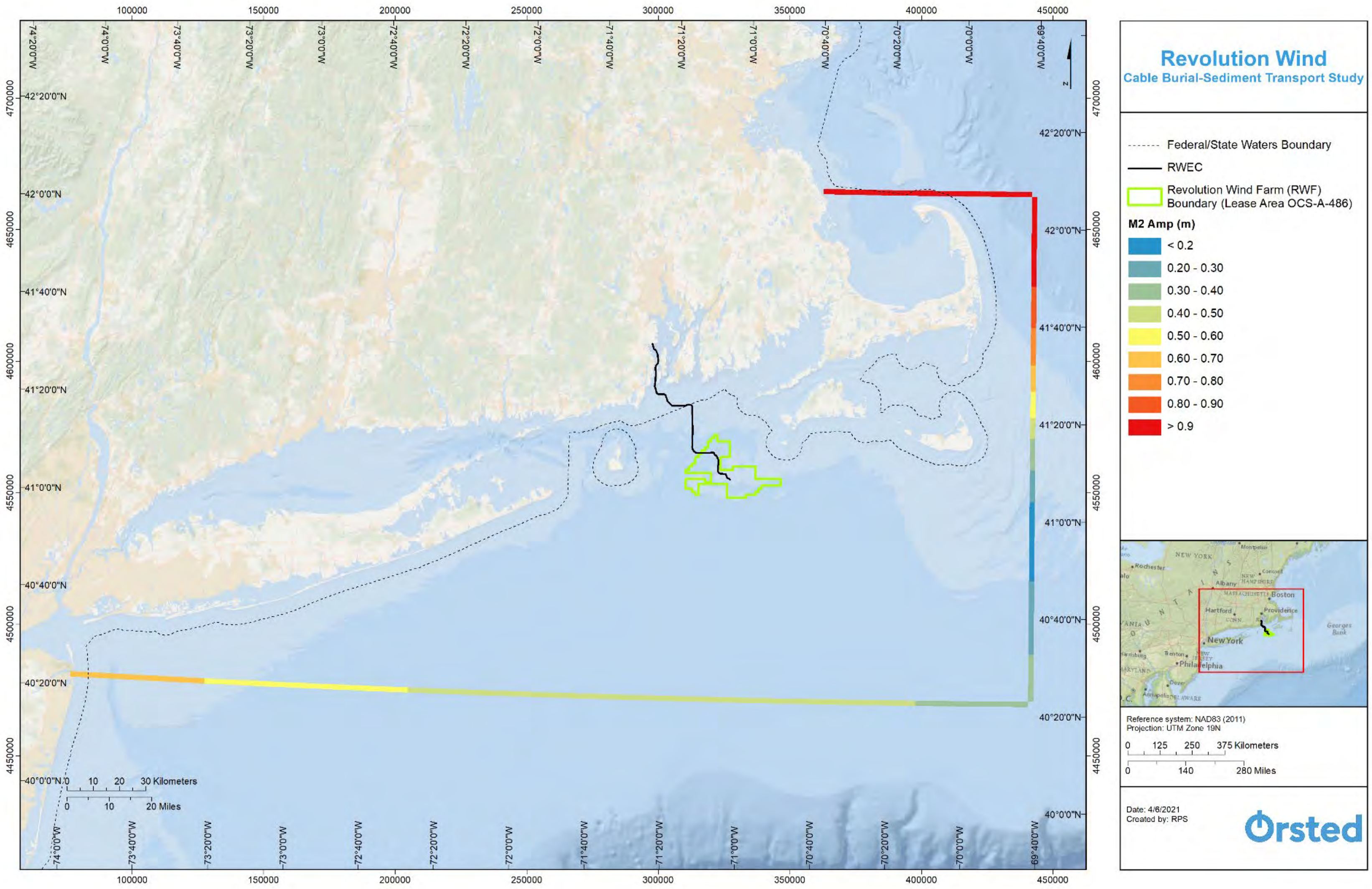

Figure 3.2-4. Tidal Boundary Forcing: M2 Amplitude.

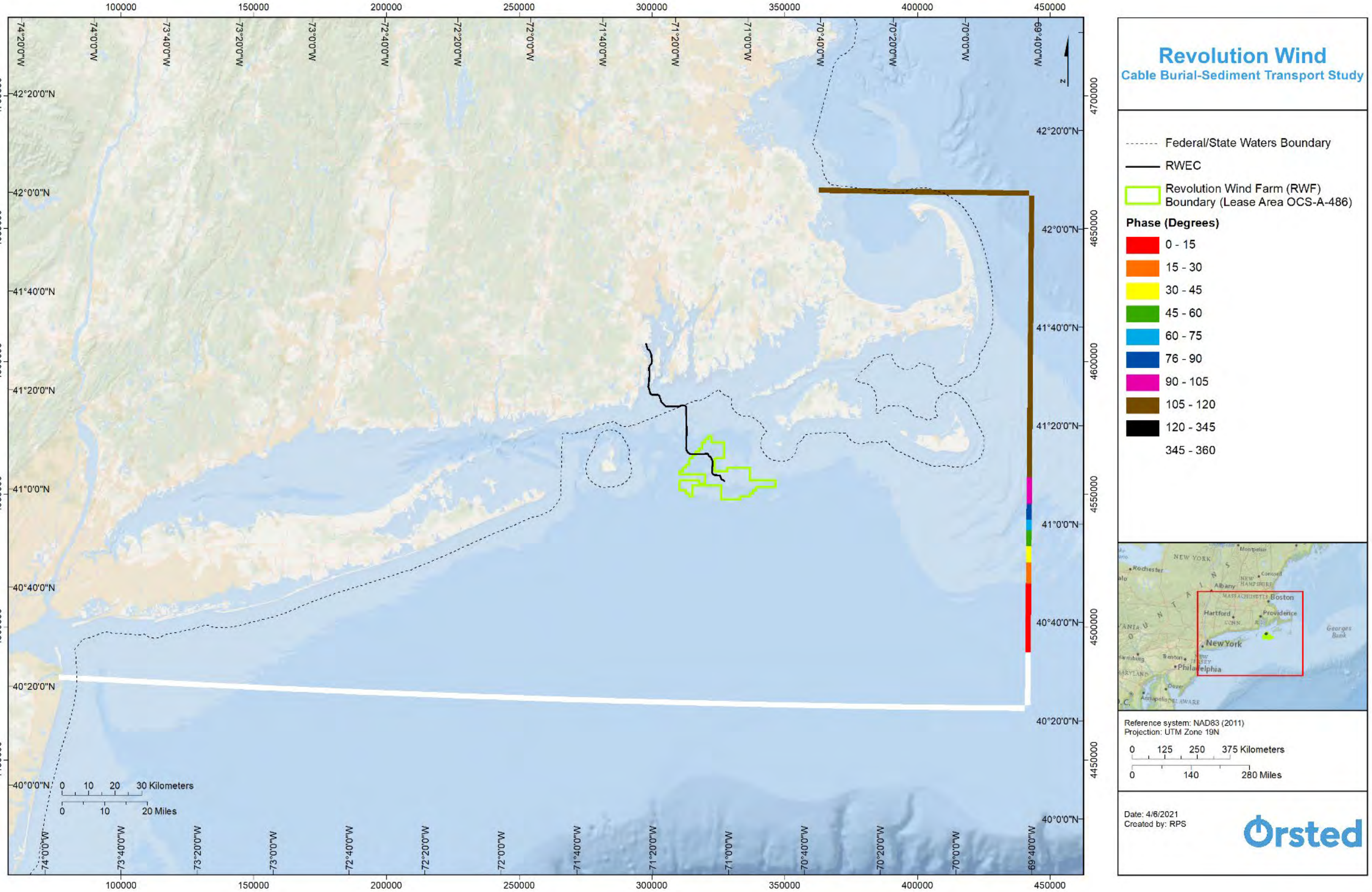

Figure 3.2-5. Tidal Boundary Forcing: M2 Phase.

Meteorological Boundary Conditions

The water surface boundary covers the entire gridded area and is influenced by wind speed and direction. Meteorological data was obtained from the NDBC Buzzards Bay Station (NDBC, 2019) and was applied to the entire grid surface. The wind rose from the validation period is shown in Figure 3.2-6. The wind rose generated from the record of winds within the most recent ten (2009-2018) is presented in Figure 3.2-7. The wind rose represents speed with colors and direction by the size of the rose 'petals', with each petal representing a directional field (e.g., Northeast) and located within the compass rose in accordance with the direction from which the wind is coming. The winds at this location come predominantly from the southwest. Details of the winds used for the different modeling periods are presented in Section 3.2.1.4.2.

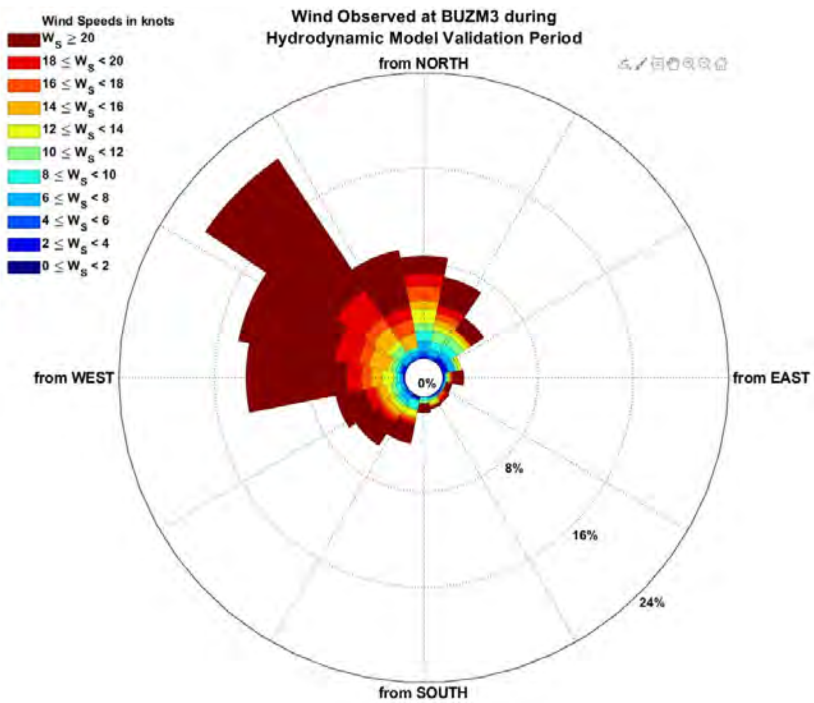

Figure 3.2-6. Wind Rose from Observed NDBC Station BUZM3 from the Hydrodynamic Model Validation Period of November 25, 2009 – December 25, 2009.

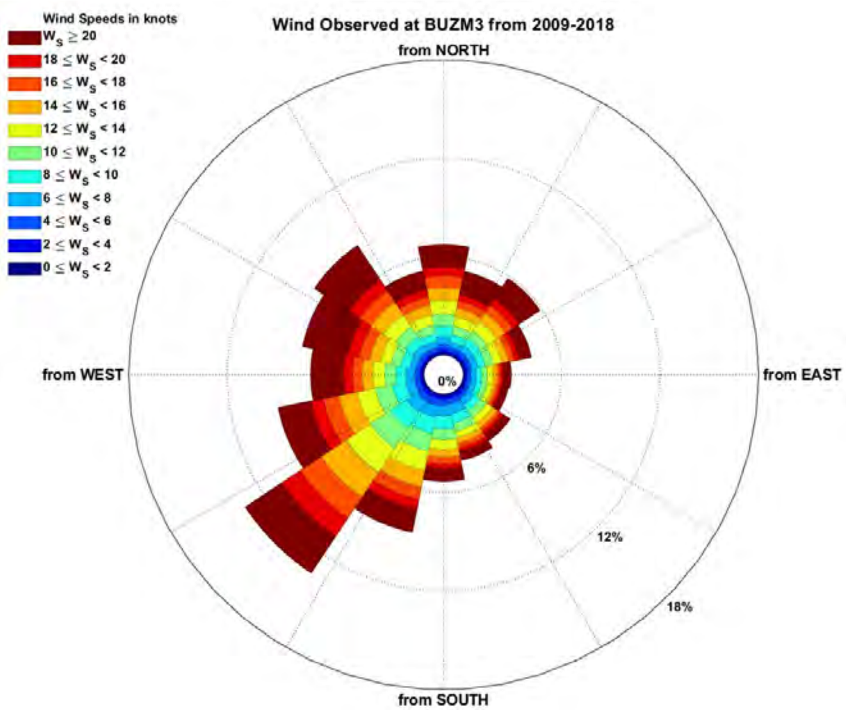

Figure 3.2-7. Wind Rose from Observed NDBC Station BUZM3 from 2009-2018.

Selection of Representative Periods for Sediment Transport Modeling Based on Wind

The exact timing of the Project cable burying activities is not known at this time. The approach for the cable burial modeling is to use currents that reflect a typical timeframe. Currents local to the planned cable burial activities vary primarily due to tides and winds. Since tides do not vary seasonally, an analysis of monthly wind records was conducted to define the scenario timeframes.

The most recent ten-year record of winds at BUZM3 (2009-2018) was analyzed to evaluate the wind characteristics and to select a typical timeframe. Monthly average speeds were calculated for the full record and were assessed quantitatively and qualitatively to determine which year had monthly averages that most closely represented the full record. The monthly average wind speed ranges from 7.45 knots (3.8 m/s) to 20 knots (10.3 m/s) and the annual speed at this location is 14.9 knots (7.6 m/s). The trends of individual years were investigated through analysis of the monthly average wind speeds. A two-plot figure showing (1) the differences in monthly average wind speed from the full 10-year record, and (2) the selected typical year (2016) along with the record average, is presented in Figure 3.2-8.

As shown in Figure 3.2-9, the monthly averages during 2016 remain close to the record averages throughout the year with no extreme outliers. It can also be seen that April 2016 has winds close to the annual average from the 10-year record. Based on this analysis, a scenario simulation period used to develop currents for the sediment transport modeling of April 1, 2016 – May 15, 2016 was established to generate currents for use in the sediment transport modeling. The wind roses for the long term ten-year record and this scenario simulation period are shown in Figure 3.2-9. The long term record shows that winds are predominately from the southwest followed by a relatively high frequency of occurrences from the northwest (though the wind rose indicates that the winds blow from all directions for some portions of the year). The scenario simulation period captures the southwest predominance, though it does have a relatively greater fraction of winds from the northeast.

Figure 3.2-8. Monthly Average Wind Speeds. Differential Between Monthly Average Wind Speed for a Given Year and the Record Monthly Average (Top) and Monthly Average Wind Speeds for the Selected Typical Year (2016) as well as the Record Average (Bottom).

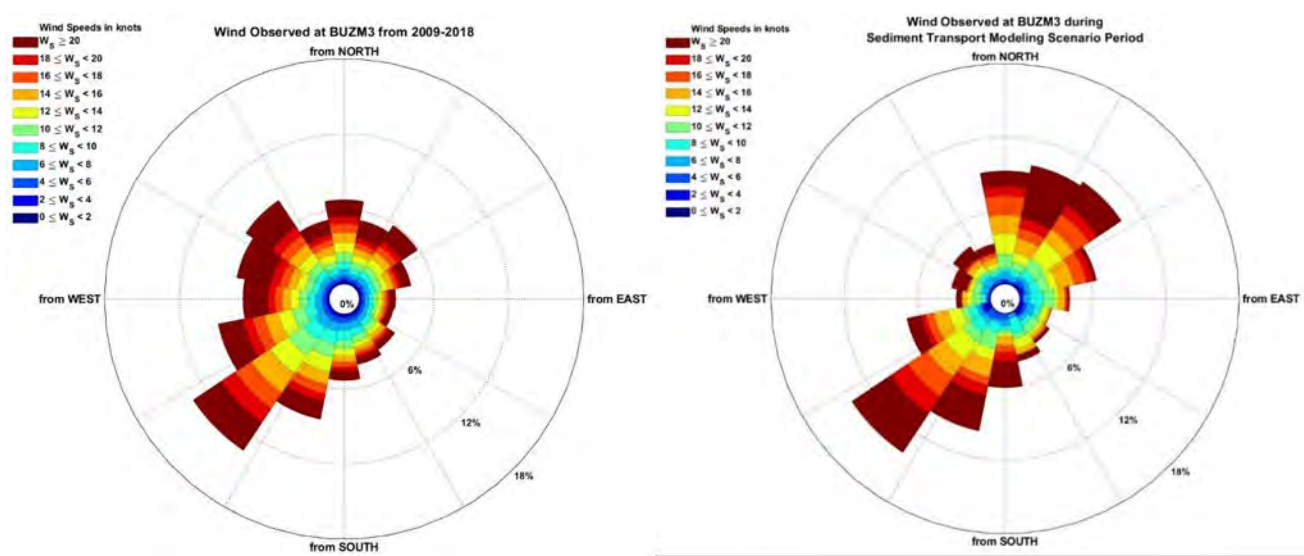

Figure 3.2-9. Wind Rose from Observed NDBC Station BUZM3 from the Most Recent 10 Year Record of 2009-2018 (Left) and the Scenario Period of April 1, 2016 – May 15, 2016 (Right).

3.2.3 HYDROMAP Hydrodynamic Model Results

The hydrodynamic model application was first run to verify model performance and subsequently to generate currents for use in the sediment transport model simulations. The following sections provide the results from both simulations.

3.2.3.1 Model Validation Results

The model was run from November 25, 2009 through December 25, 2009 to verify model performance. This period was chosen because it lies within the time period of available tide and current observations from the OSAMP.

HYDROMAP predictions of water elevation are shown along with observations of water levels in Figure 3.2-10 and Figure 3.2-11. Note that the Block Island station did not have observations available for this time period. However, a record of expected water level was generated based on the harmonic constituents using the publicly available T_Tide Matlab Toolbox and the NOAA published data. Methodologies of the T_Tide toolbox are described in Pawlowicsz et al. (2002). The generated time history was used for comparisons of the model predictions of water level at these locations. Figure 3.2-10 and Figure 3.2-11 show that the model was able to recreate the spatial and temporal variability in the tide across the domain. The model recreated the semidiurnal nature of the tides and further was able to reproduce the spring/neap cycle of changing tidal amplitude. The model response to wind driven setup and surge is less pronounced. However, the daily variations in tidal energy is captured well.

HYDROMAP predictions of currents were compared to observed currents at five locations through comparison of current roses; these are presented in Figure 3.2-12 through Figure 3.2-16. The OSAMP stations had observations throughout the water column and therefore comparisons of surface, mid, and bottom currents were made (Figure 3.2-12 - Figure 3.2-15). The NOAA CO-OPS station measures only upper water column currents near Quonset Point, therefore a comparison of only surface current roses were made (Figure 3.2-16). These figures show that the model was able to recreate general circulation patterns. The order of magnitude of the speeds was recreated, and the spatial variability was captured. For example, both the model and observations showed that current speeds were stronger at the OSAMP MDS and MDF stations compared to the OSAMP POS and POF stations. The model was able to recreate the trend in variability in current direction. For example, with respect to bottom currents, the model recreated the predominate northeast current at OSAMP POS, the predominate southeast current at OSAMP MDF, the less singularly predominate direction of OSAMP MDS, and the predominately eastern current at OSAMP POF. Similarly, at the surface, the Quonset Point station the model was able to recreate the predominately rectilinear nature of the currents that oscillate between northeast and southwest, though the observations showed a southern residual that was not captured in the model. Differences in predicted directions are likely due to influences from larger scale circulation features in the region at large that are not simulated with this model application.

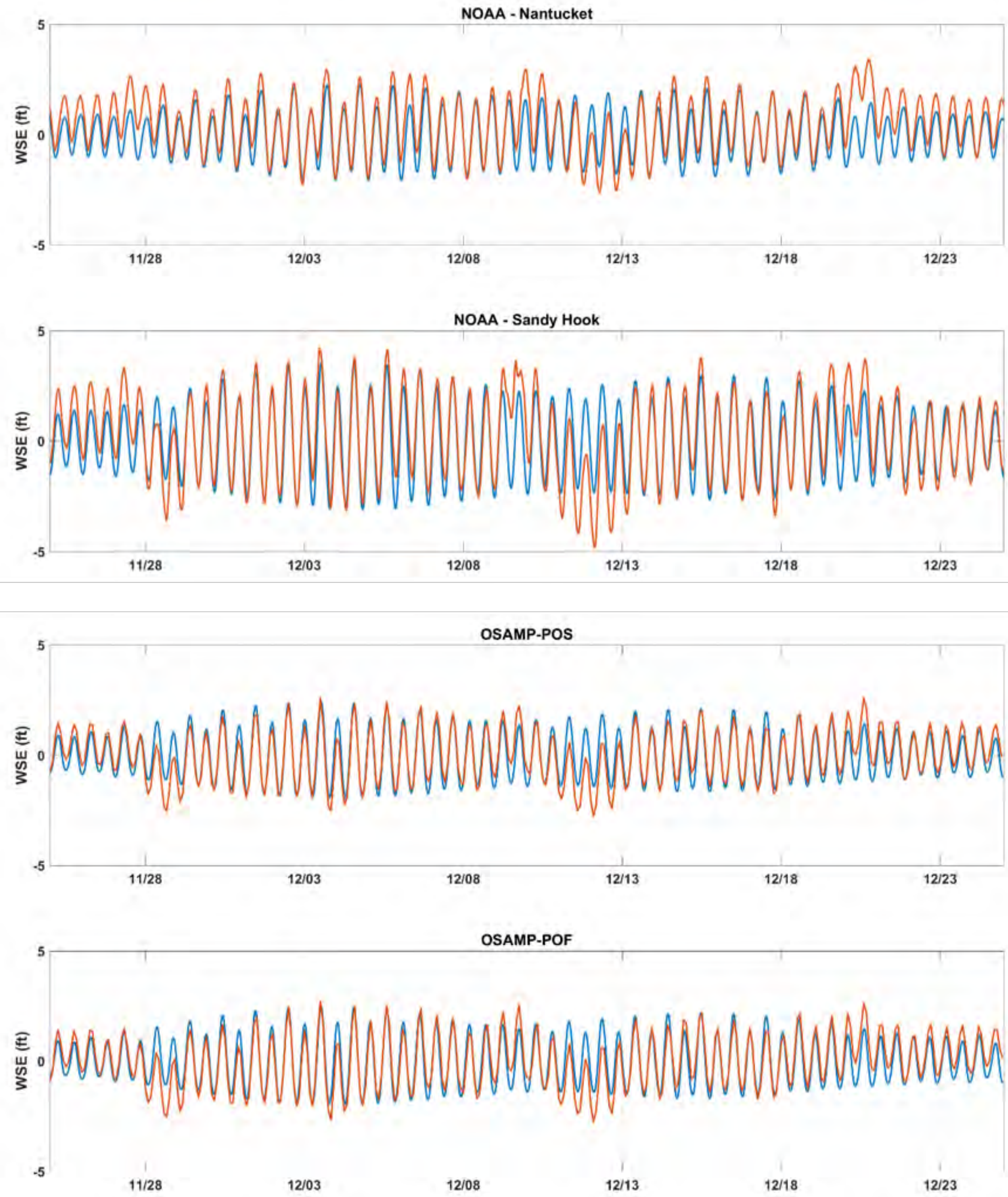

Figure 3.2-10. Model-Predicted (Blue) vs. Observed (Orange) Surface Water Elevations at Locations within the Model Domain (1 of 2).

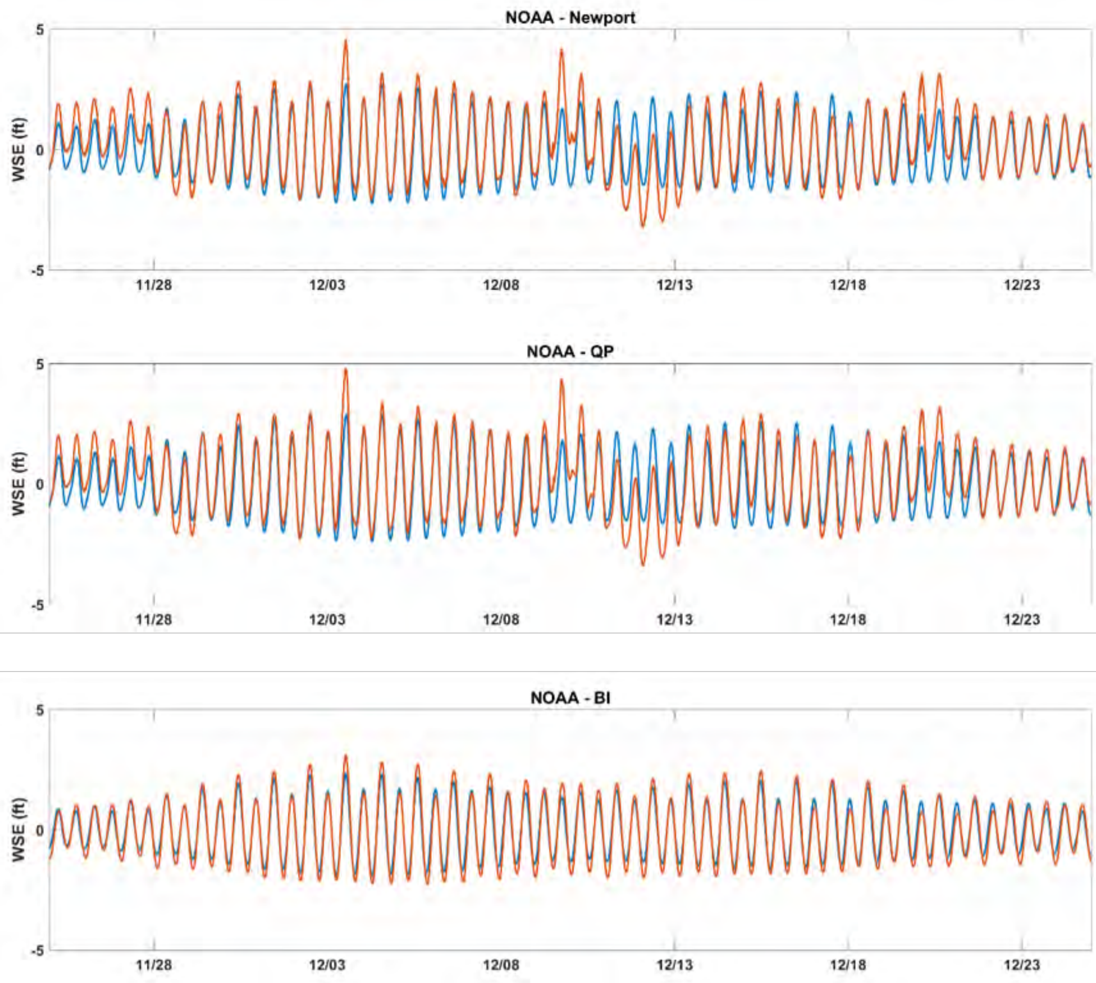

Figure 3.2-11. Model-Predicted (Blue) vs. Observed (Orange) Surface Water Elevations at Locations within the Model Domain (2 of 2).

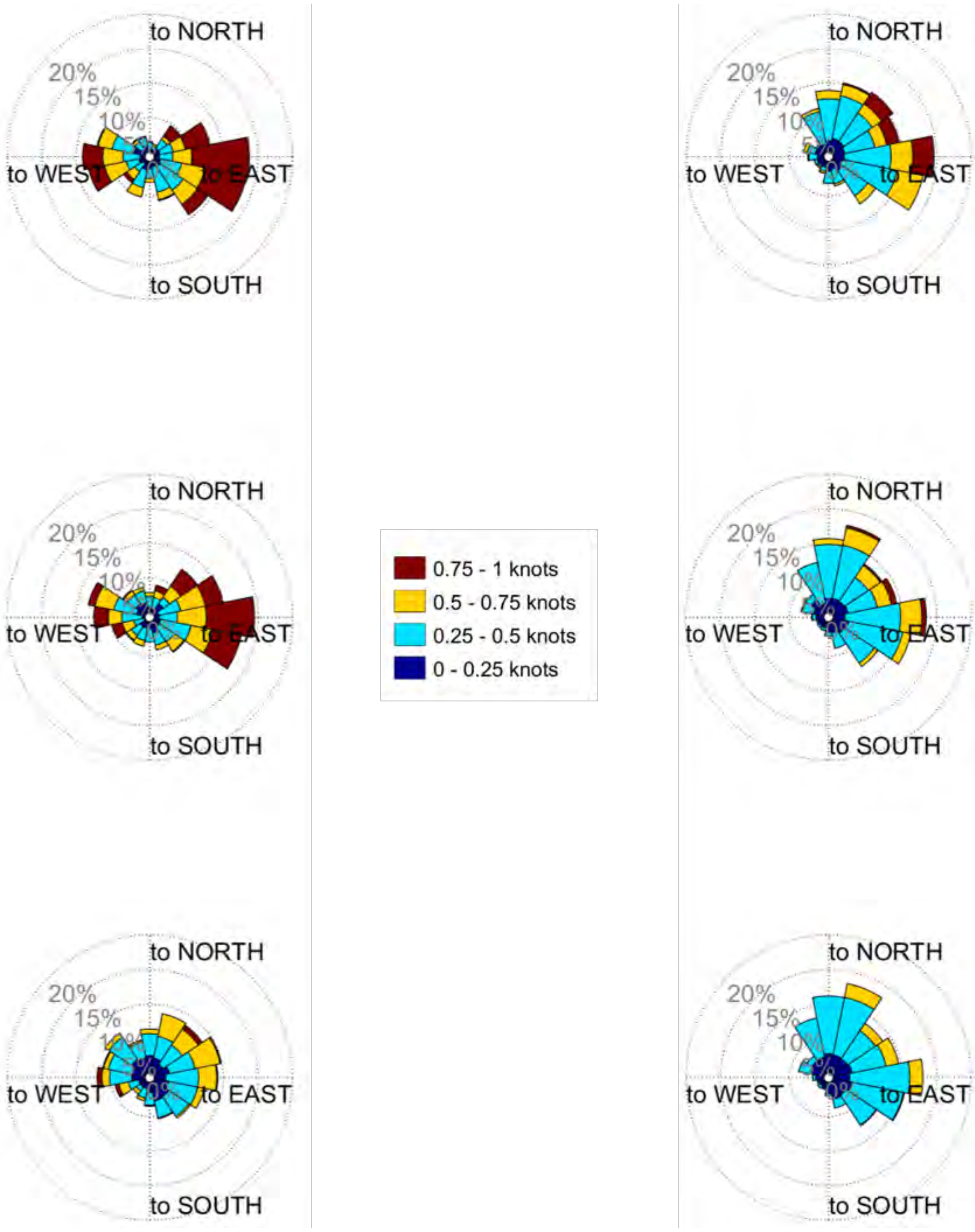

Figure 3.2-12. Model-Predicted (Right) vs Observed Currents (Left) at OSAMP MDS Station Location for Surface (Top), Mid (Middle) and Bottom (Bottom) of the Water Column.

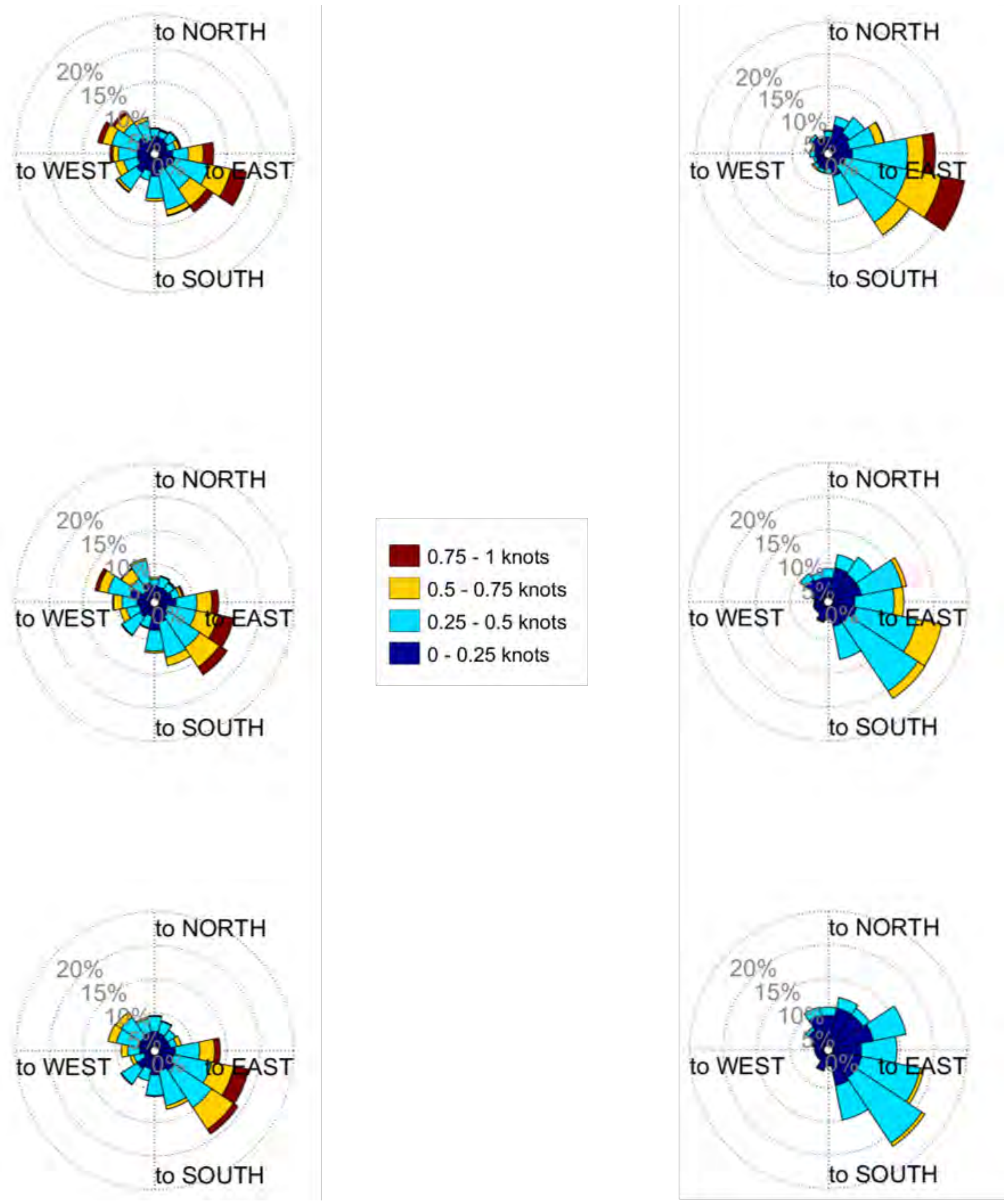

Figure 3.2-13. Model-Predicted (Right) vs. Observed (Left) Currents at OSAMP MDF Station Location for Surface (Top), Mid (Middle) and Bottom (Bottom) of the Water Column.

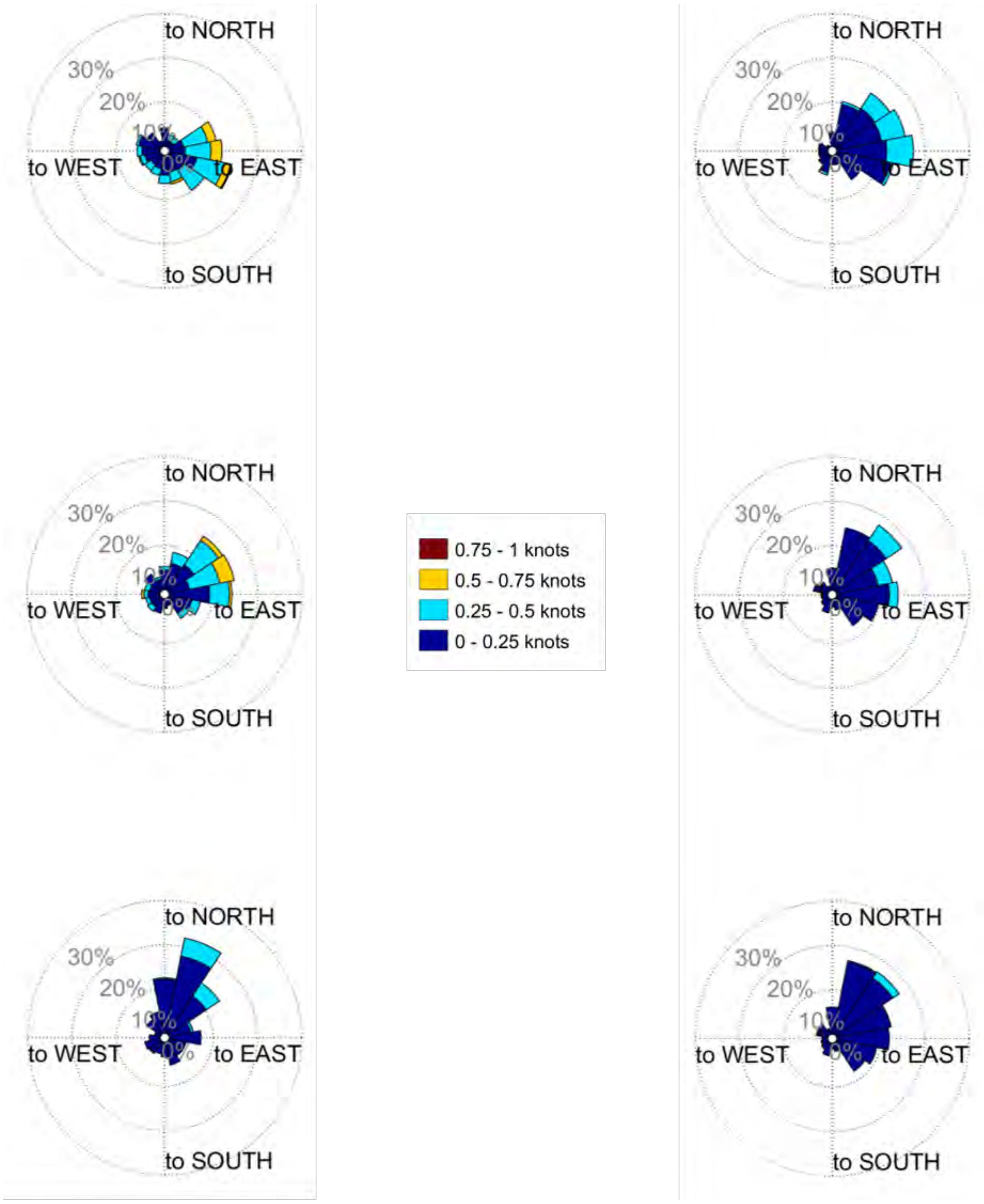

Figure 3.2-14. Model-Predicted (Right) vs. Observed (Left) Currents at OSAMP POS Station Location for Surface (Top), Mid (Middle) and Bottom (Bottom) of the Water Column.

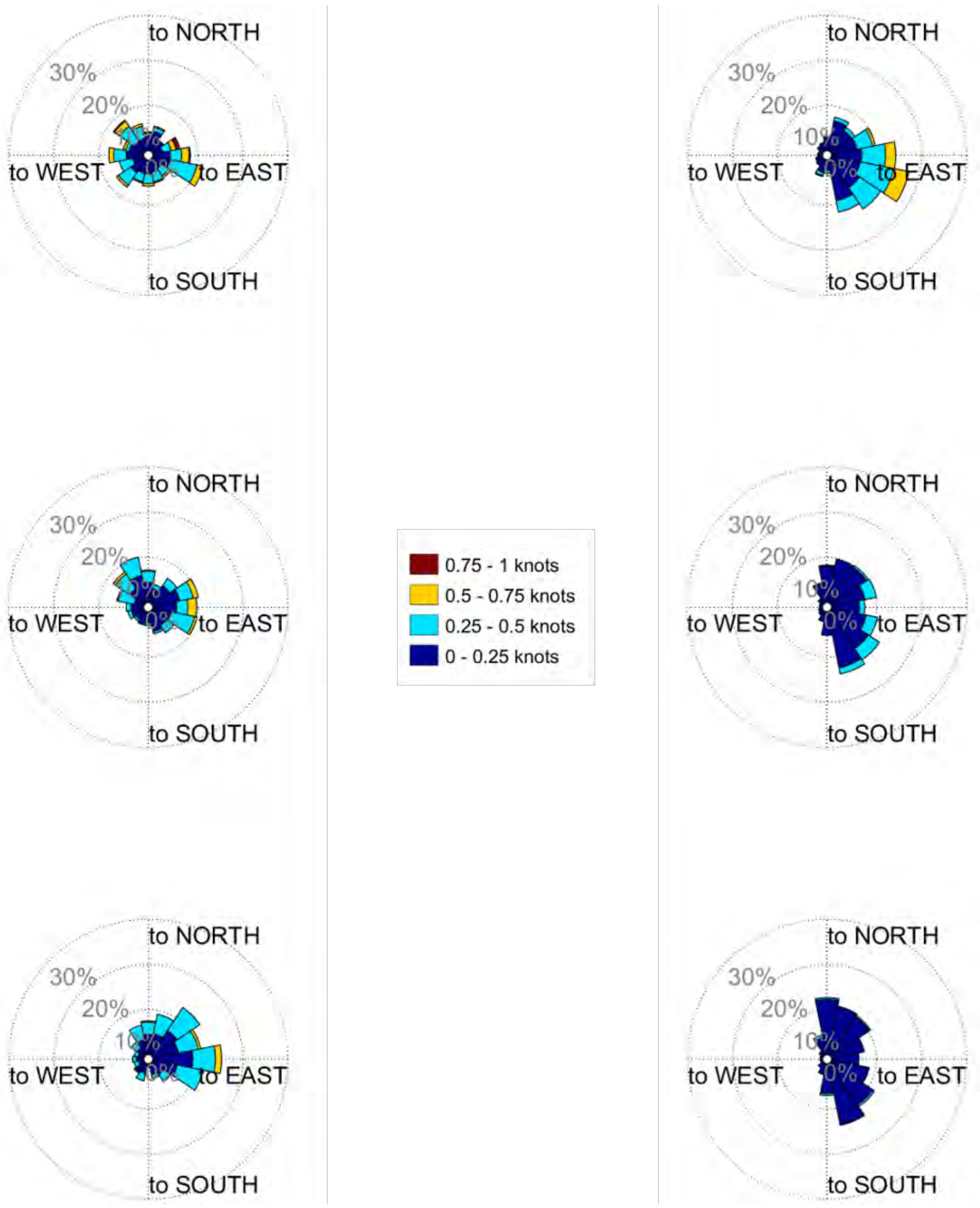

Figure 3.2-15. Model-Predicted (Right) vs Observed (Left) Currents at OSAMP POF Station Location for Surface (Top), Mid (Middle) and Bottom (Bottom) of the Water Column.

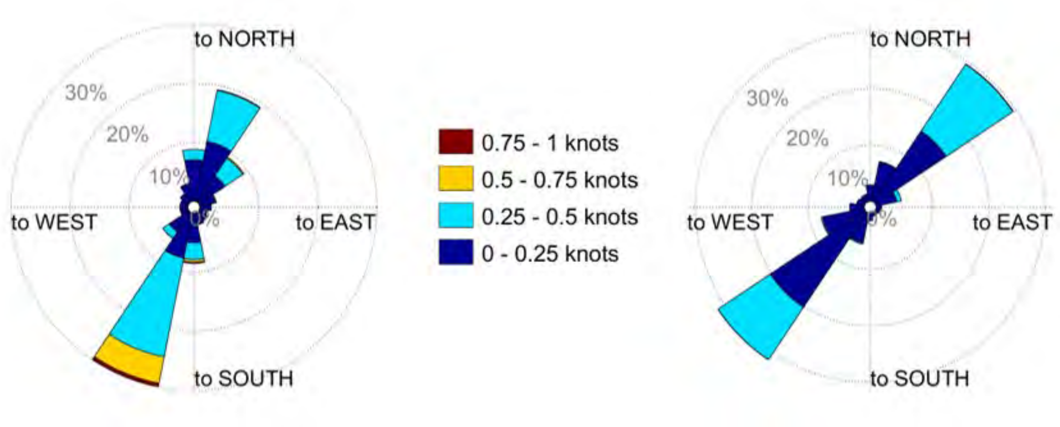

Figure 3.2-16. Model-Predicted (Right) vs Observed (Left) Currents at NOAA nb0301 Station Location for Upper Water Column Currents.

3.2.3.2 Model Results for Use in Sediment Transport Modeling Scenarios

Following model validation, HYDROMAP was used to develop currents for a scenario time period with typical winds established as April 1, 2016 through May 15, 2016. The purpose of this application was to generate a window of time that could be used as forcing for the sediment dispersion modeling. Snapshots of the bottom currents during ebb and flood from this time period are shown in Figure 3.2-17 and Figure 3.2-18, respectively. These figures have color coded arrows where the color represents the speed in knots and the orientation represents the direction the current is moving. These figures are taken at moments of near peak speeds, and do not reflect the speeds at all times. The currents oscillate in and out of the domain, with lower speeds offshore (peaking at approximately 0.4 knots [0.2 m/s] in these snapshots) and along the RWEC until it enters Narragansett Bay where currents increase (approaching approximately 0.8 knots [0.4 m/s] at these snapshots).

Based on the cable installation parameters, the total duration for installation of the cables was known. For the simulation of the RWEC burial, the duration of construction is sufficient to adequately capture variability of the tides and currents in the region since the activities will take place over multiple weeks.

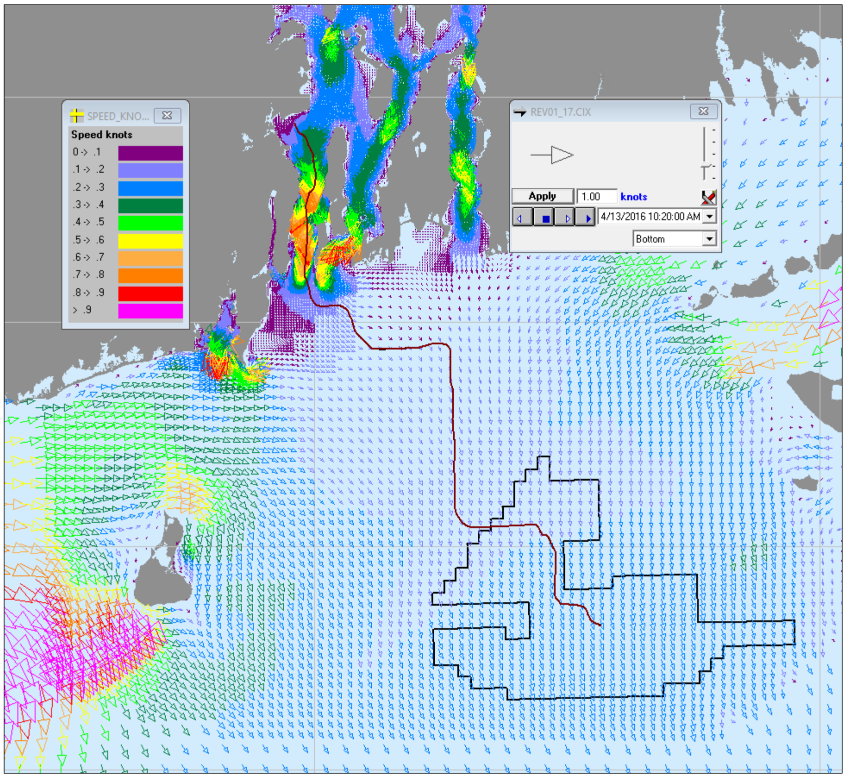

Figure 3.2-17. Example Snapshot of Ebb Bottom Currents Local to Project Boundaries.

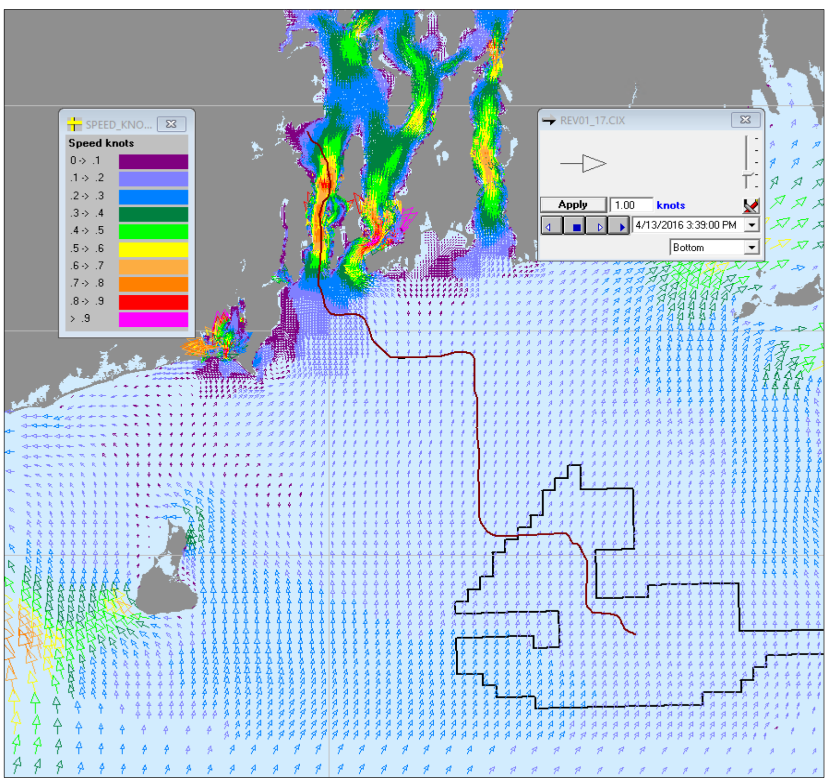

Figure 3.2-18. Example Snapshot of Flood Bottom Currents Local to Project Boundaries.

4.0 SEDIMENT TRANSPORT MODELING

SSFATE was used to perform a series of simulations to assess suspended sediment concentration and seabed deposition resulting from anticipated cable burial activities. This study has three components: (1) seabed preparation alternatives, (2) RWEC Circuit 1, and (3) landfall. This section includes details of the study components, the model application, and the model results.

4.1 SSFATE Model Components and Scenario Descriptions

A set of scenarios was developed to capture the various activities. Figure 4.1-1 depicts the study components associated with each modeling scenario within RI state waters, and Table 4.1-1 provides a summary of each modeling scenario and associated methods modeled. The model scenarios along with their key parameters are described below.

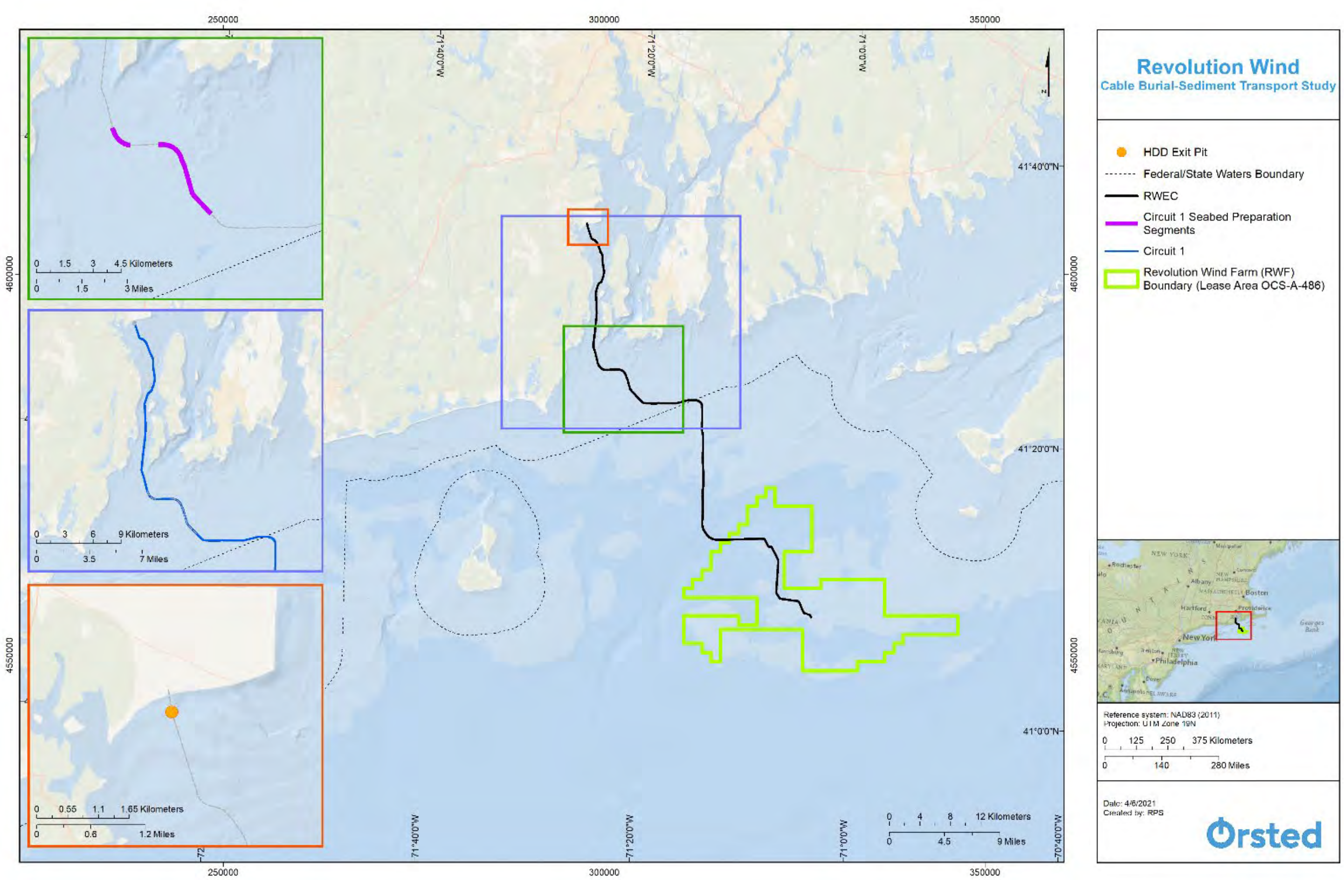

Figure 4.1-1. Study Components within RI State Waters.

Table 4.1-1. Description of Activities Being Simulated.

RWEC Modeling Scenarios		
Project Component	Description of Scenario	Methods Modeled
RWEC Seabed Preparation	Circuit 1 – Seabed Preparation Segments	CFE
	Circuit 1 – Seabed Preparation Segments	TSHD – Split Bottom
	Circuit 1 – Seabed Preparation Segments	TSHD – Continuous Overflow
RWEC	Circuit 1	Jet Plow
Landfall	HDD Exit Pit	Backhoe Excavator followed by Venturi Eductor Device

4.1.1 Study Component 1: Seabed Preparation Alternatives, Segments of the RWEC Circuit 1

Prior to cable burial, two segments along the RWEC route within RI state waters (approximately 4.0 mi [6.4 km]) may require seabed preparation. Seabed preparation may be necessary in regions where the sediment is deeper to ensure that the sediment clearance is sufficient before commencing the cable burial process. If required, it is assumed that the seabed preparation will occur consecutively and be completed along the segments before cable burial begins. This assessment evaluated three different modeling scenarios which reflect alternative seabed preparation equipment types and parameters: (1) CFE, (2) TSHD using periodic overflow and split bottom barge disposal, and (3) TSHD using continuous overflow. Note that the seabed preparation equipment types were modeled separately to compare the potential impacts from each alternative method, and all methods are not anticipated to be used.

The CFE method mobilizes the cross-sectional area of the trench and introduces sediment along the route centerline near the seabed. Alternatively, the TSHD method removes sediment and introduces it along the route centerline at, and/or near, the water surface. The two TSHD simulations, split bottom and continuous overflow, differed in the way sediment was introduced to the water column. The split bottom method includes periodic overflow and split bottom barge disposal, which would occur as the hopper becomes full. It was assumed that overflow and disposal occurred along the RWEC with overflow composed primarily of fine sediment and split bottom disposal consisting of primarily coarse sediment. This difference in grain size is due to the settlement of coarse sediment within the hopper. Sediment was introduced as overflow at the water surface, and a few meters below the water surface as split bottom disposal. The continuous overflow method conservatively assumed the dredged sediments were immediately introduced to the water column at the surface, bypassing hopper storage. Therefore, the grain size distribution entering the water from the continuous overflow was representative of *in-situ* material. An overview of the scenarios associated with the seabed preparation modeling is presented in Table 4.1-2. Figure 4.1-2 depicts the two seabed preparation segments within RI state waters.

Table 4.1-2. Description of Activities Modeled for RWEC Seabed Preparation.

RWEC Seabed Preparation Modeling Scenarios				
Project Component	Description of Scenario	Methods Modeled	State Length Modeled, Miles (mi) (Kilometers [km])	State Dredge Duration (Days)
RWEC Seabed Preparation	Circuit 1 – Seabed Preparation Segments	CFE	4.0 (6.4)	0.67
	Circuit 1 – Seabed Preparation Segments	TSHD – Split Bottom	4.0 (6.4)	5.16
	Circuit 1 – Seabed Preparation Segments	TSHD – Continuous Overflow	4.0 (6.4)	4.12

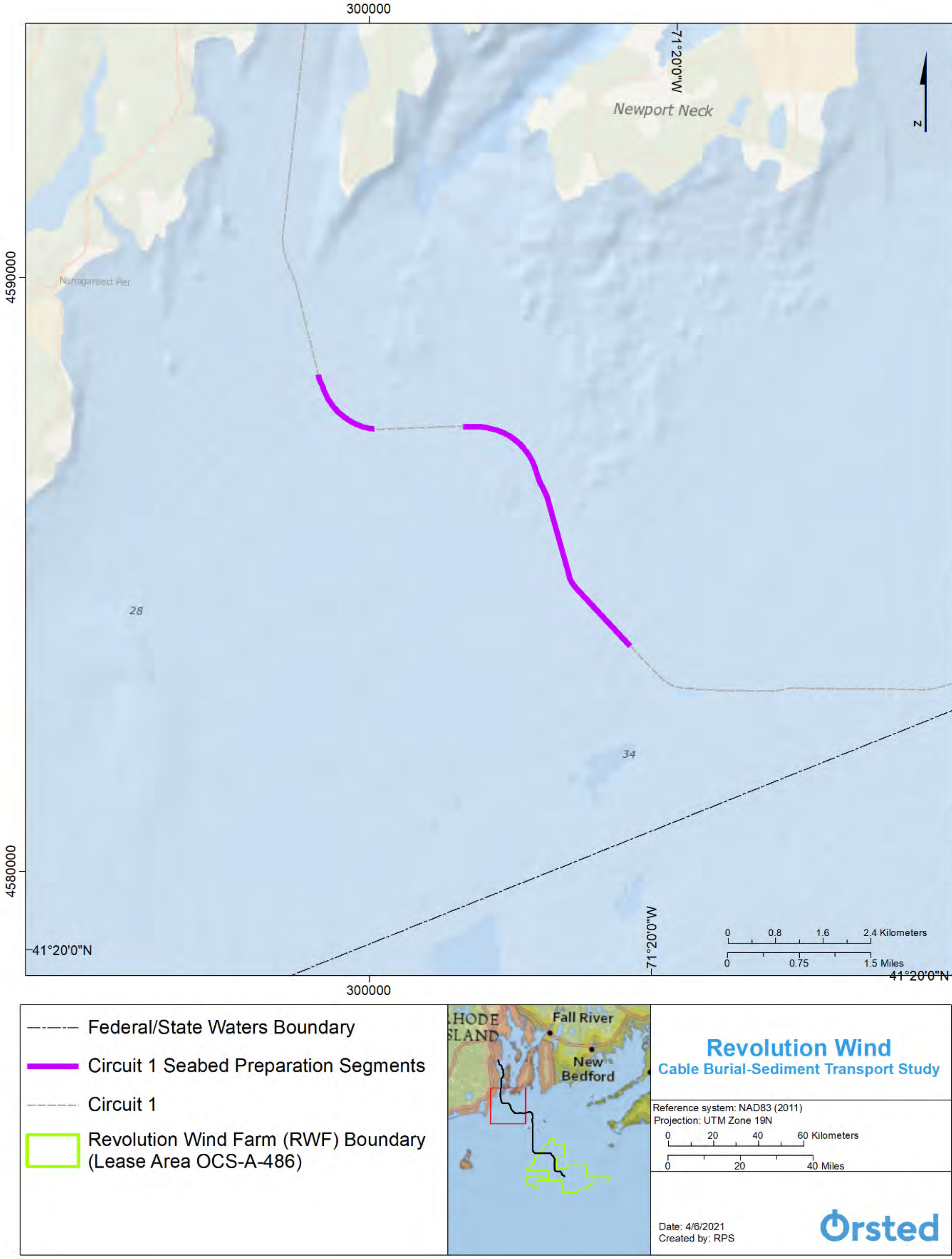

Figure 4.1-2. Seabed Preparation Segments of RWEC Circuit 1 Route within RI State Waters.

4.1.2 Study Component 2: RWEC Circuit 1 Cable Burial

The Project includes approximately 21.4 mi (34.4 km) of RWEC corridor within RI state waters. The RWEC may include up to two circuits, but because the circuits follow a similar path and are in proximity to one another, only Circuit 1 was modeled as a representative case. An overview of the scenarios associated with the RWEC modeling is presented in Table 4.1-3. Figure 4.1-3 depicts the modeled RWEC Circuit 1 within RI state waters.

Table 4.1-3. Description of Activities Modeled for RWEC Circuit 1 Cable Burial.

RWEC Circuit 1 Modeling Scenarios				
Project Component	Description of Scenario	Methods Modeled	State Length Modeled, mi (km)	State Dredge Duration (Days)
RWEC	Circuit 1	Jet Plow	21.4 (34.4)	3.53

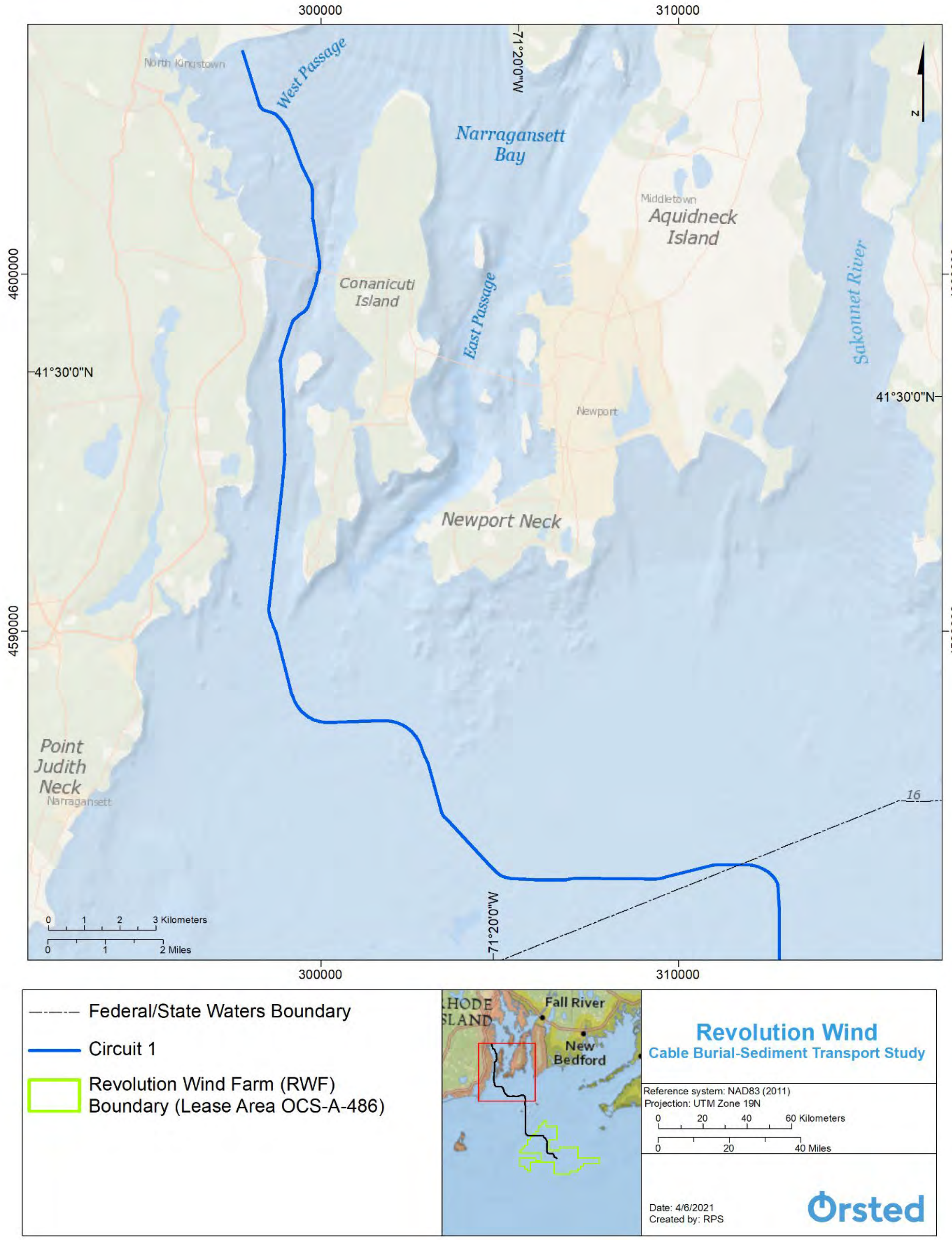

Figure 4.1-3. RWEC Circuit 1 Route within RI State Waters.

4.1.3 Study Component 4: RWEC Landfall

The RWEC study evaluated two different landfall equipment types to excavate the HDD exit pit, which are anticipated to be implemented consecutively: a backhoe excavator to clear the majority of the material and a Venturi eductor device for more precise clearing. The pit would be cleared and subsequently backfilled after tie-in. Although the volume cleared is expected to be the same as the volume backfilled, it is anticipated that the backfilling process will begin on the order of hours to days after the pit has been cleared, thus allowing sufficient time for sediment to disperse and settle. Therefore, only the clearance was modeled and is considered representative of the backfill process. A summary of the scenarios is presented in Table 4.1-4. Figure 4.1-4 depicts the HDD exit pit location along the RWEC.

Table 4.1-4. Description of Activities Modeled for Landfall.

Landfall Scenario			
Project Component	Description of Scenario	Methods Modeled	Total Dredge Duration (Days)
Landfall	HDD Exit Pit	Backhoe Excavator followed by Venturi Eductor Device	2.9

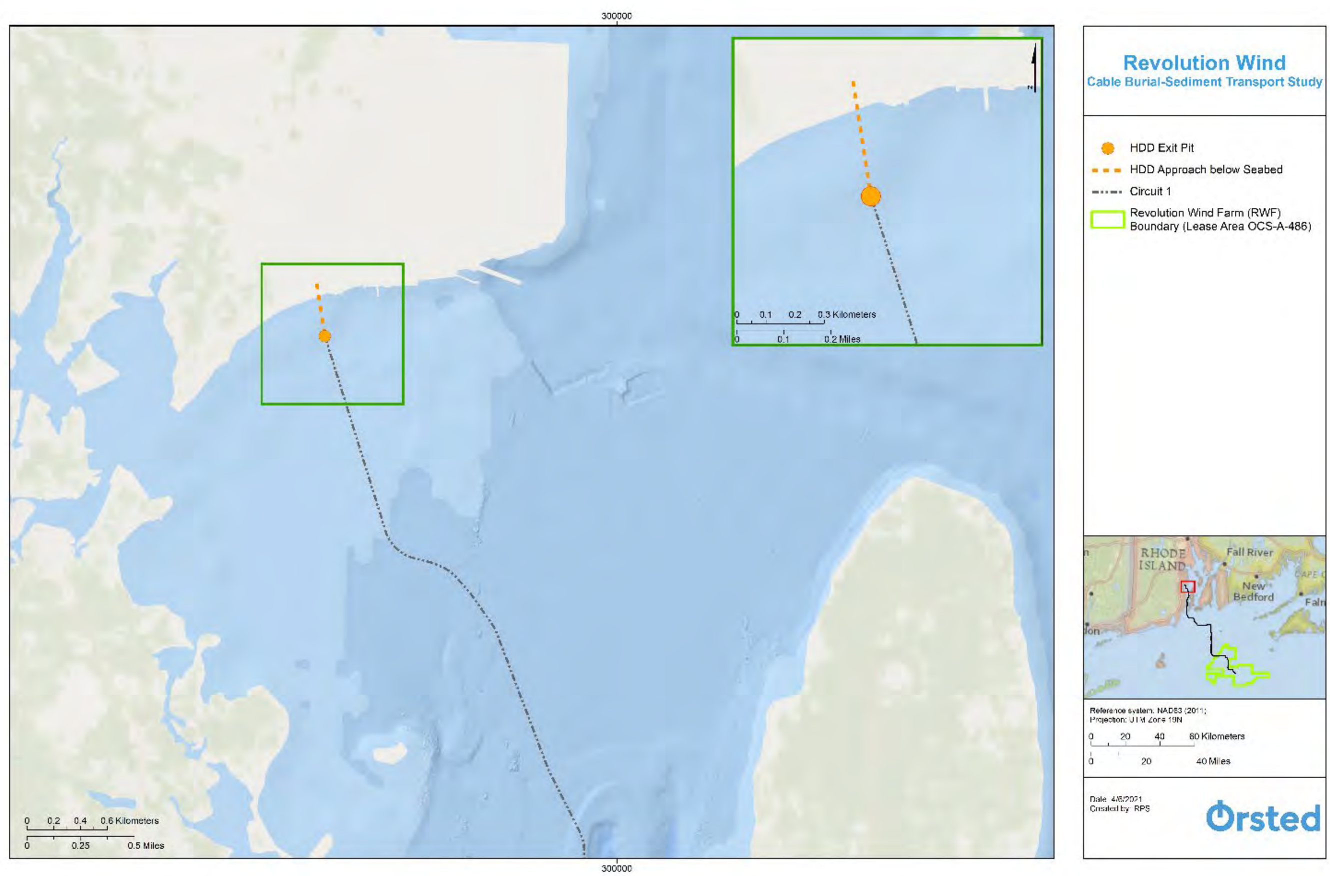

Figure 4.1-4. RWEC Landfall HDD Exit Pit Location.

4.2 SSFATE Sediment Transport Model Application

Setup of the SSFATE model consists of defining the environmental conditions, the construction scenario, and computational parameters. For each scenario, this includes:

- The study area environmental conditions
    - Shoreline and bathymetry
    - Tides and currents
- The construction activity source terms
    - The geographic extent of the activity (point release vs. line source)
    - The dates and duration of the activity
    - The volumes and cross-sectional areas of the trench or excavation pit
    - The production rate for each dredge/trenching method
    - Loss rates for each dredge/trench method
    - The grain size distribution along the route
    - The vertical distribution of sediments as they are initially released to the water column
- Specification of model run parameters
    - The concentration and deposition grid resolution
    - Model calculation and output timesteps

4.2.1 Environmental Conditions in SSFATE

The SSFATE model uses hydrodynamics and bathymetry sources from the HYDROMAP application described in Section 3. Concentration and deposition gridding in SSFATE is independent of the resolution of the hydrodynamic data used to calculate sediment transport.

4.2.2 Sediment Source Terms

The sediment loading was developed for each scenario based on conservative assumptions about the construction activities and the associated trench size (i.e., the disturbed sediment volume). A summary of the trench dimensions, installation rate, production rate, and 'loss rate' for each trench type associated with seabed preparation and installation of the RWEC is presented in Table 4.2-1. The loss rate is the percentage of the trench volume that is assumed to be resuspended into the water column. A 30% loss rate was assumed for jet plow installation, while a loss rate of 100% was assumed for all other construction methods (i.e., CFE, TSHD). For both the CFE and jet plow it was assumed that the resuspension would be evenly distributed within the bottom 8.2 ft (2.5 m) of the water column. For the TSHD split bottom method, it was assumed 20% of the resuspension would occur at the water surface as periodic overflow, and 80% would occur 16.4 ft (5 m) below the water surface as periodic disposal from the split bottom. For the TSHD continuous overflow method, it was assumed that 100% of the dredged sediment would be introduced at the water surface.

Table 4.2-1. Installation Details Assumed for the RWEC Modeling.

Trenching Parameters for RWEC						
Project Component	Equipment	State Length Modeled, mi (km)	Disturbance Depth, ft (m)	Disturbance Cross-Sectional Area, ft^2 (m^2)	Installation Rate, ft/hr (m/hr)	Loss Rate
RWEC Seabed Preparation	CFE	4.0 (6.4)	6.6 (2.0)	301.4 (28.0)	1312 (400)	100%
	TSHD – Split Bottom	4.0 (6.4)	6.6 (2.0)	301.4 (28.0)	215 (65.5)	100%
	TSHD – Continuous Overflow	4.0 (6.4)	6.6 (2.0)	301.4 (28.0)	215 (65.5)	100%
RWEC	Jet Plow	21.4 (34.4)	9.8 (3.0)	88.3 (8.2)	1312 (400)	30%

Two construction methods to clear the HDD exit pit were modeled for the landfall simulations: a backhoe excavator and a Venturi eductor device. The landfall approach includes drilling underneath the seabed, from the shore to the HDD exit pit, eliminating sediment resuspension to the water column. The pit would be cleared and subsequently backfilled after tie-in. However, as previously discussed in Section 4.1, only the clearance was modeled and is considered representative of the backfill process. A summary of scenario parameters for the landfall simulation is presented in Table 4.2-2. It was assumed that 100% of the sediments excavated by the backhoe were introduced near the surface and 30% of the sediments removed by the Venturi eductor device were evenly distributed within the bottom 3.28 ft (1 m) of the water column.

Table 4.2-2. Installation Details Assumed for the Landfall Modeling.

Sediment Transport Modeling Scenarios Overview				
Project Component	Equipment	Trench or Pit Volume Excavated, Cubic Yards (cy) (Meters Cubed [m^3])	Production Rate, cy/hr (m^3/hr)	Loss Rate
Landfall	HDD Exit Pit – Backhoe Excavator followed by Venturi Eductor Device	4,901 (3,750)	78 (60)	100%
		980 (750)	131 (100)	30%

4.2.2.1 Sediment Grain Size Distribution

The sediment characteristics and grain size distribution are key input parameters in the SSFATE model when predicting sediment transport. Based on the sediment samples (e.g., vibracores, grab samples) collected during multiple offshore surveys, the spatial variability of the sediment characteristics and grain size distribution were captured in the modeled scenarios. Once collected, the samples underwent further laboratory analysis, as documented in Section 4.3.2 of the COP, and results from these analyses were then refined by RPS as it pertained to the sediment characterization used in the SSFATE model. Sediment data was divided into classes based on the grain size, and the depth-dependent samples were weighted to represent *in-situ* conditions for the various installation activities. Specifically, the objective was to determine the distribution within the five delineated classes used in SSFATE (Table 2.2-1) and the percentage of the upper seabed that is solid based on the measure of sediment water content, a measure of the interstitial pore waters in the sediments.

The sediment characteristics along the RWEC within RI state waters, as used in the modeling, are presented in Figure 4.2-1 and Figure 4.2-2. As shown in these figures, the sediments have a relatively larger fraction of fine-grained sediments closer to shore.

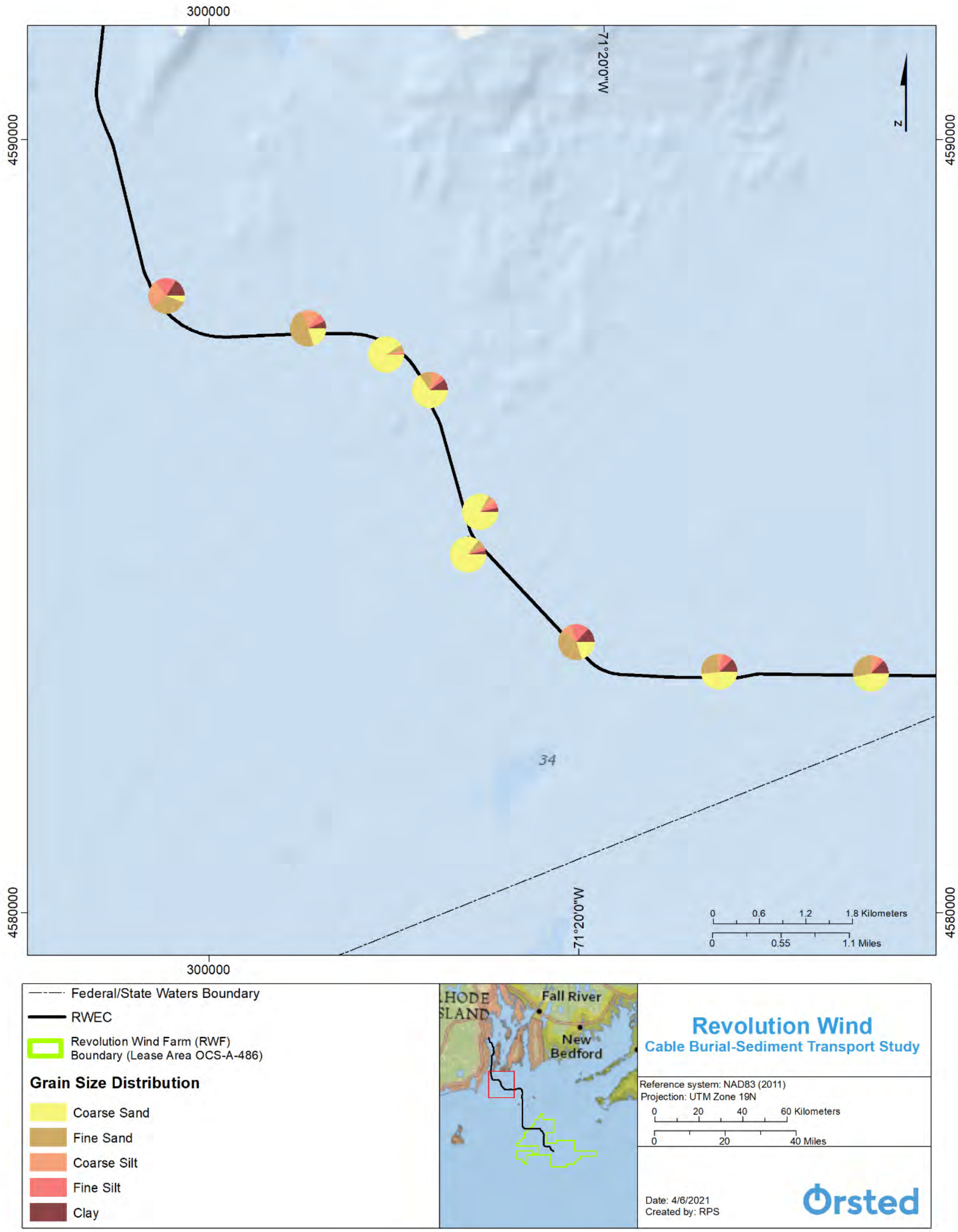

Figure 4.2-1. Sediment Grain Size Distributions for Seabed Preparation Modeling within RI State Waters.

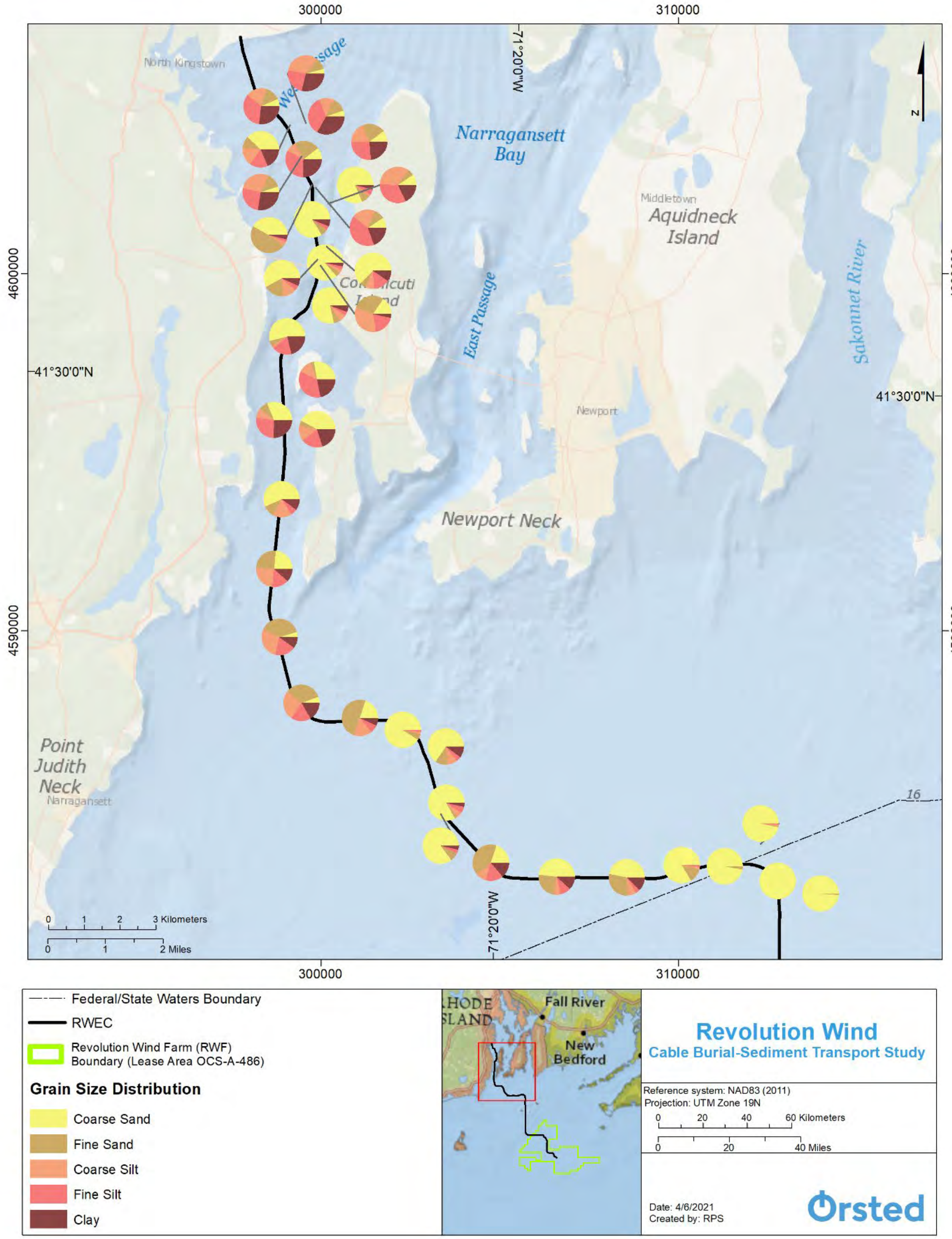

Figure 4.2-2. Sediment Grain Size Distributions for Modeling along the RWEC within RI State Waters.

4.2.3 Model Run Parameters

For the entire RWEC and associated cable burial activities, model computations were performed every 10 minutes, with output saved at a 10-minute time step. For the seabed preparation and landfall activities, model computations were performed every 5 minutes and model output was saved every 10 minutes. Sediment concentrations were computed on a grid with resolution of 197 ft x 197 ft (50 m x 50 m) in the horizontal dimension and 3.3 ft (1.0 m) in the vertical dimension for the entire RWEC cable burial activities and 66 ft x 66 ft (20 m x 20 m) in the horizontal dimension and 1.6 ft (0.5 m) in the vertical dimension for landfall activities. Seabed preparation activities were computed on a grid with resolution of 82 ft x 82 ft (25 m x 25 m) in the horizontal dimension and 1.6 ft (0.5 m) in the vertical dimension.

4.3 SSFATE Model Results

SSFATE simulations were performed for each construction activity. All modeling assumed continuous operation for each phase of the construction. Note that reported concentrations are those predicted above the background concentration in the study area.

The results from the model runs are presented below in maps showing the predicted TSS concentrations and subsequent deposition for each activity. Specifically, three sets of graphics were developed for each scenario:

- **Maps of Instantaneous TSS Concentrations**: These figures present the predicted instantaneous excess TSS concentrations at a moment in time for line sources. The concentrations are depicted as contours using mg/L. The plan view shows the maximum concentration throughout the water column (i.e., maximum value at any depth).

- **Maps of Time-integrated Maximum TSS Concentrations**: These figures present the predicted maximum time-integrated excess water column concentration from the entire water column (i.e., maximum value at any point in time at any depth). The concentrations are depicted as contours using mg/L. The entire area within the contour was predicted to be at or above the concentration defined by the contour itself. Most importantly, it should be noted that these maps portray the maximum TSS concentration that occurred throughout the entire simulation at all depths and that: (1) these concentrations do not persist throughout the entire simulation and may be just one time step; and (2) these concentrations do not occur concurrently throughout the entire modeled area. Therefore, results are time-integrated spatial views of maximum predicted concentrations.

- **Maps of Seabed Deposition**: These figures present the predicted deposition on the seabed that would occur following completion of the construction activity and after suspended sediments settled out of the water column. The thickness levels are shown as contours (in mm) and the entire area within the contour is at or above the thickness defined by the contour itself.

4.3.1 Study Component 1: Seabed Preparation Alternatives, Segments of the RWEC Circuit 1

Seabed Preparation – CFE

A snapshot of the instantaneous concentration from the modeled CFE seabed preparation illustrates that highest concentrations are predicted to be adjacent to the route centerline, with lower concentrations extending further towards the northwest due to transport from local currents (Figure 4.3-1). The inset shows the instantaneous plume along the first segment, with the cross-section showing the introduction of sediment near the seabed. Figure 4.3-2 shows the time-integrated maximum TSS for seabed preparation using the CFE method. The plume footprint tends to remain close to the route due to the resuspension of the entire cross-sectional area near the bottom of the water column and a relatively quick installation rate. The cumulative deposition along the seabed preparation segments is presented in Figure 4.3-3, which depicts a similar footprint to the time-integrated maximum TSS.

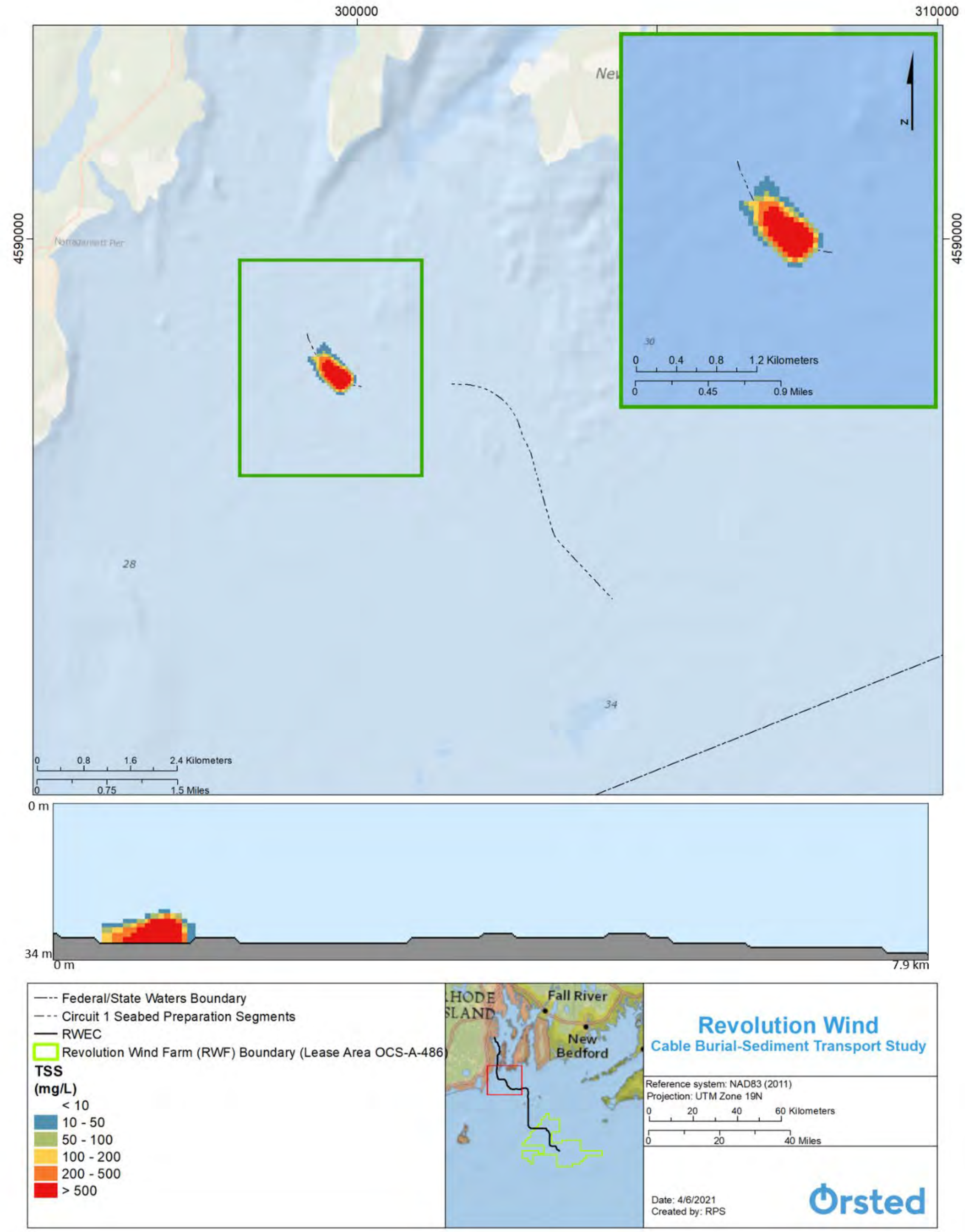

Figure 4.3-1 Snapshot of Predicted Instantaneous TSS Concentrations Associated with CFE Seabed Preparation.

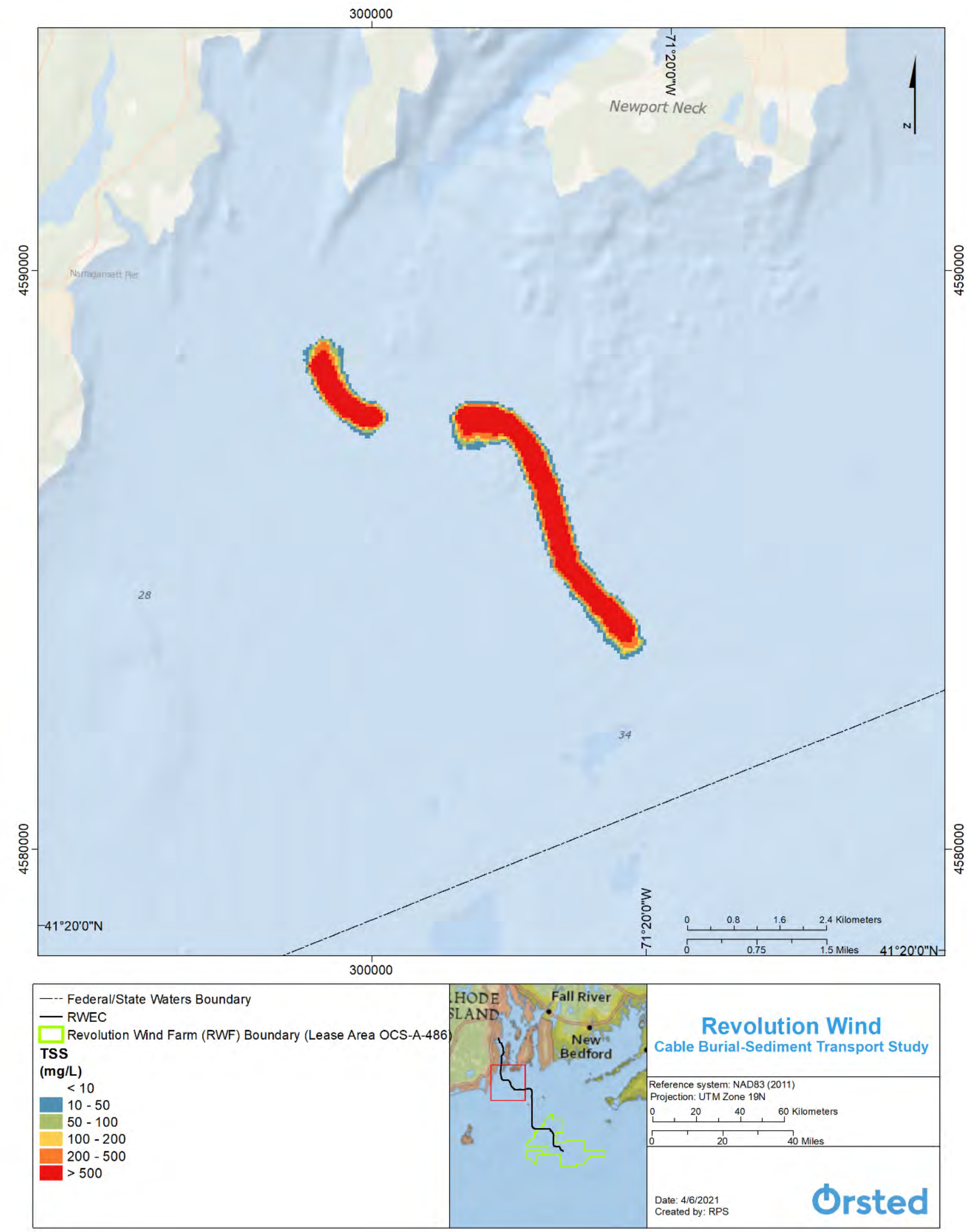

Figure 4.3-2 Map of Predicted Time-Integrated Maximum TSS Concentrations Associated with CFE Seabed Preparation.

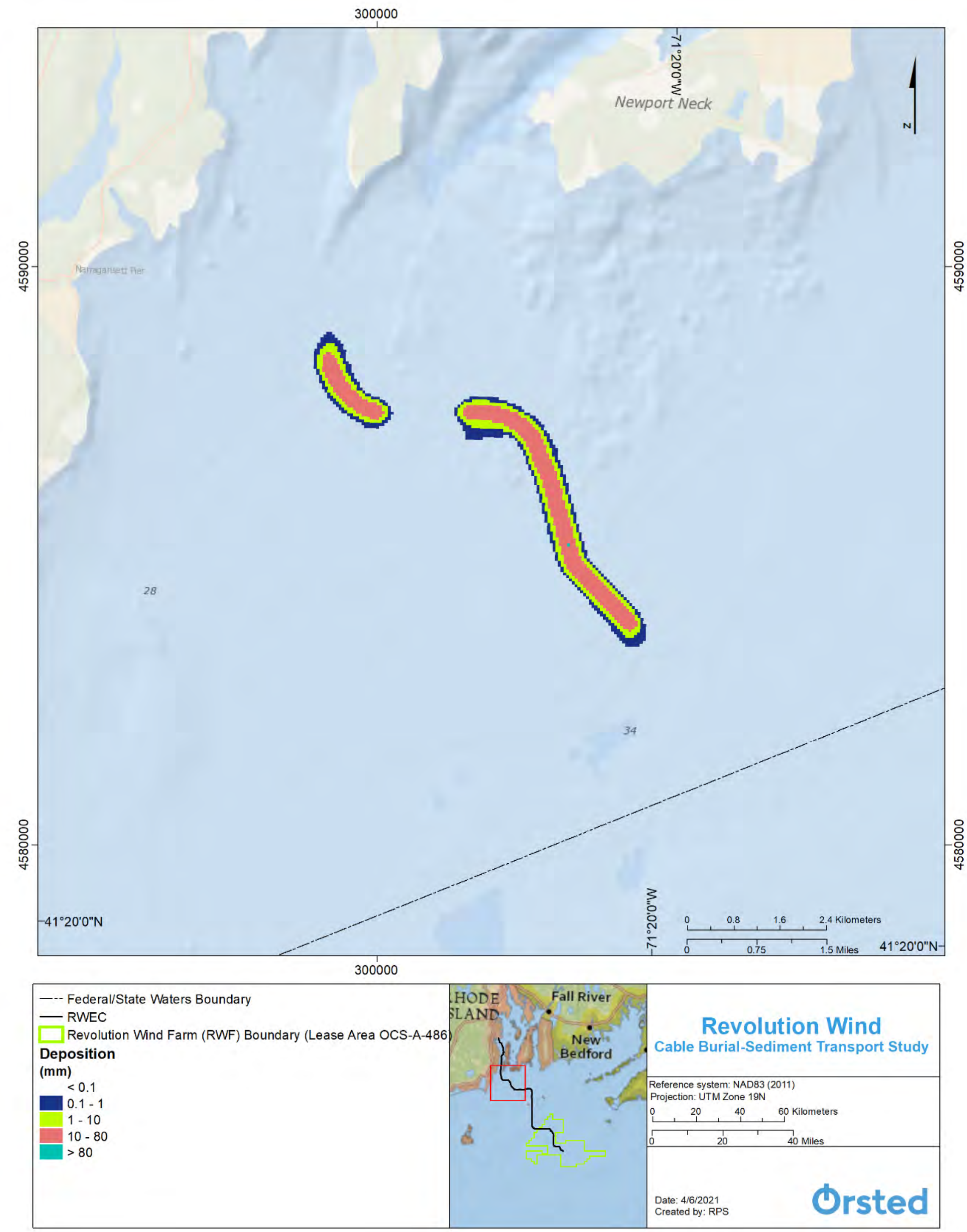

Figure 4.3-3 Map of Predicted Deposition Thickness Associated with CFE Seabed Preparation.

Seabed Preparation – TSHD, Split Bottom

A snapshot of the instantaneous concentration from the modeled TSHD split bottom seabed preparation illustrates that highest concentrations are predicted to be directly adjacent to the route centerline, with lower concentrations extending further south due to transport from local currents (Figure 4.3-4). The inset shows the instantaneous plume along the first segment, with the cross-section showing the introduction of sediment at, and just below, the water surface. The plume footprint is reflective of the periodic overflow and split bottom disposal. Figure 4.3-5 shows the time-integrated maximum TSS for seabed preparation using the TSHD split bottom method. Because sediment is introduced at or near the water surface with a relatively slow installation rate, the plume footprint experiences multiple tidal cycles and tends to oscillate with the currents. The cumulative deposition along the seabed preparation segments is presented in Figure 4.3-6, which depicts a similar footprint to the time-integrated maximum TSS.

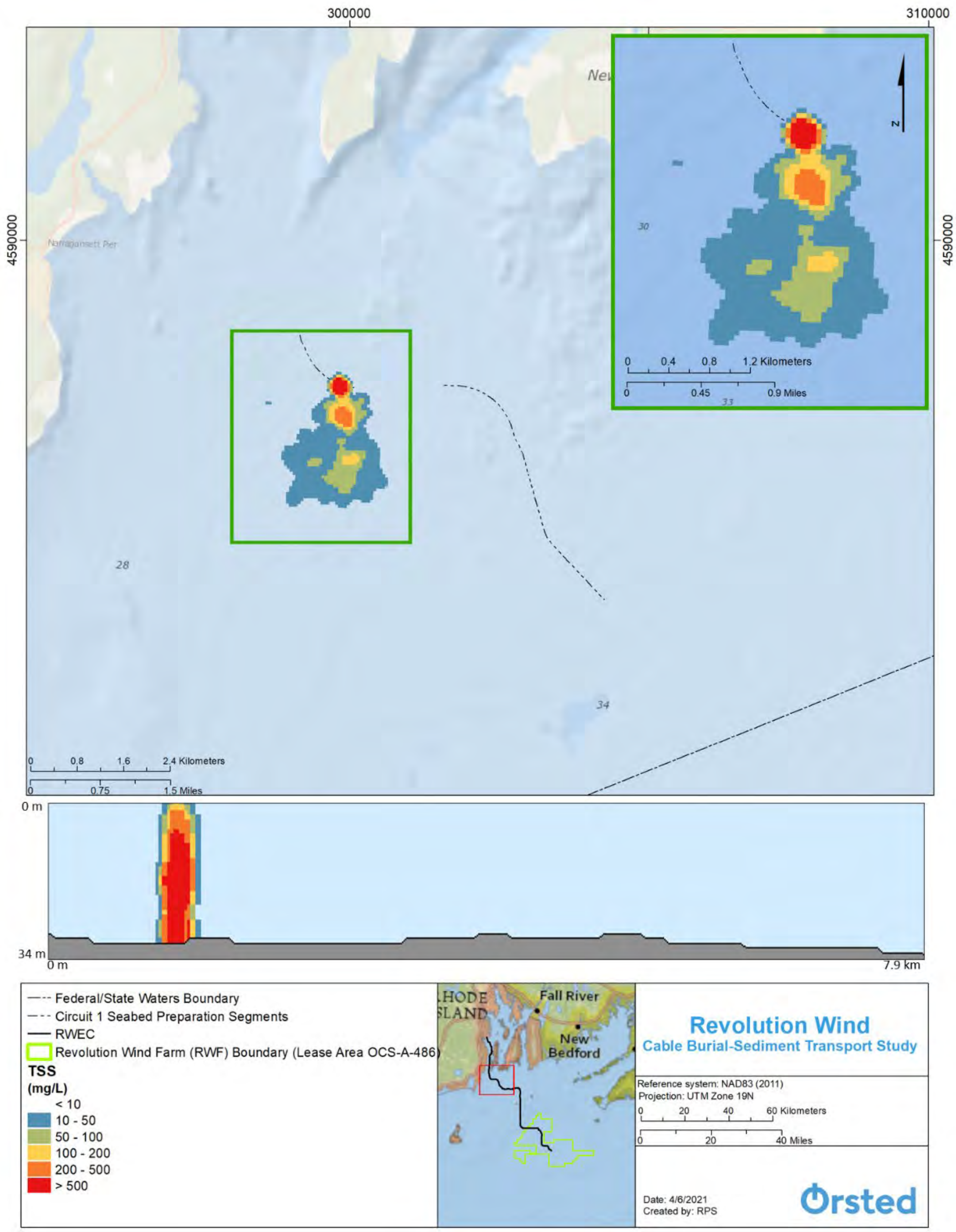

Figure 4.3-4 Snapshot of Predicted Instantaneous TSS Concentrations Associated with TSHD, Split Bottom Seabed Preparation.

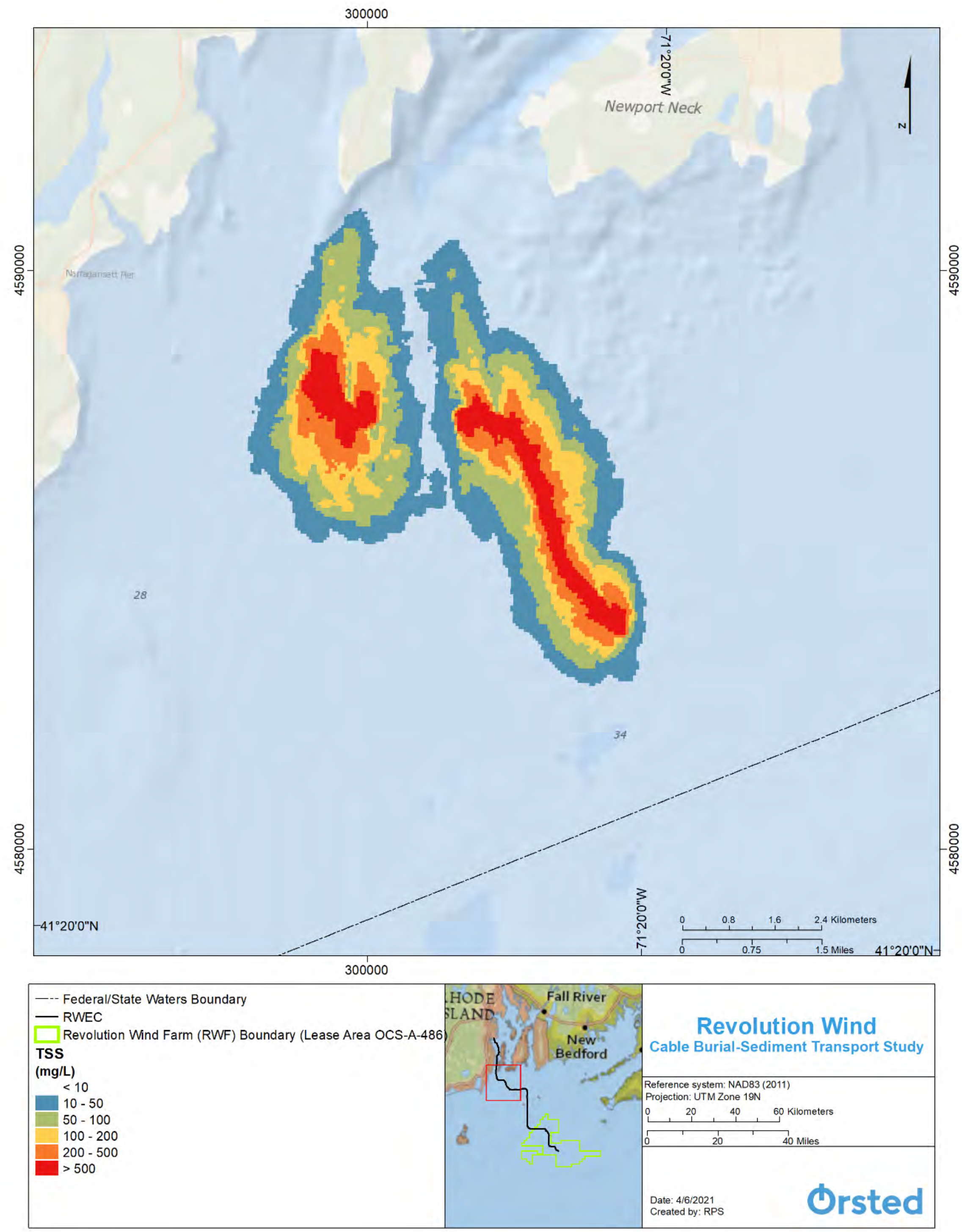

Figure 4.3-5 Map of Predicted Time-Integrated Maximum TSS Concentrations Associated with TSHD, Split Bottom Seabed Preparation.

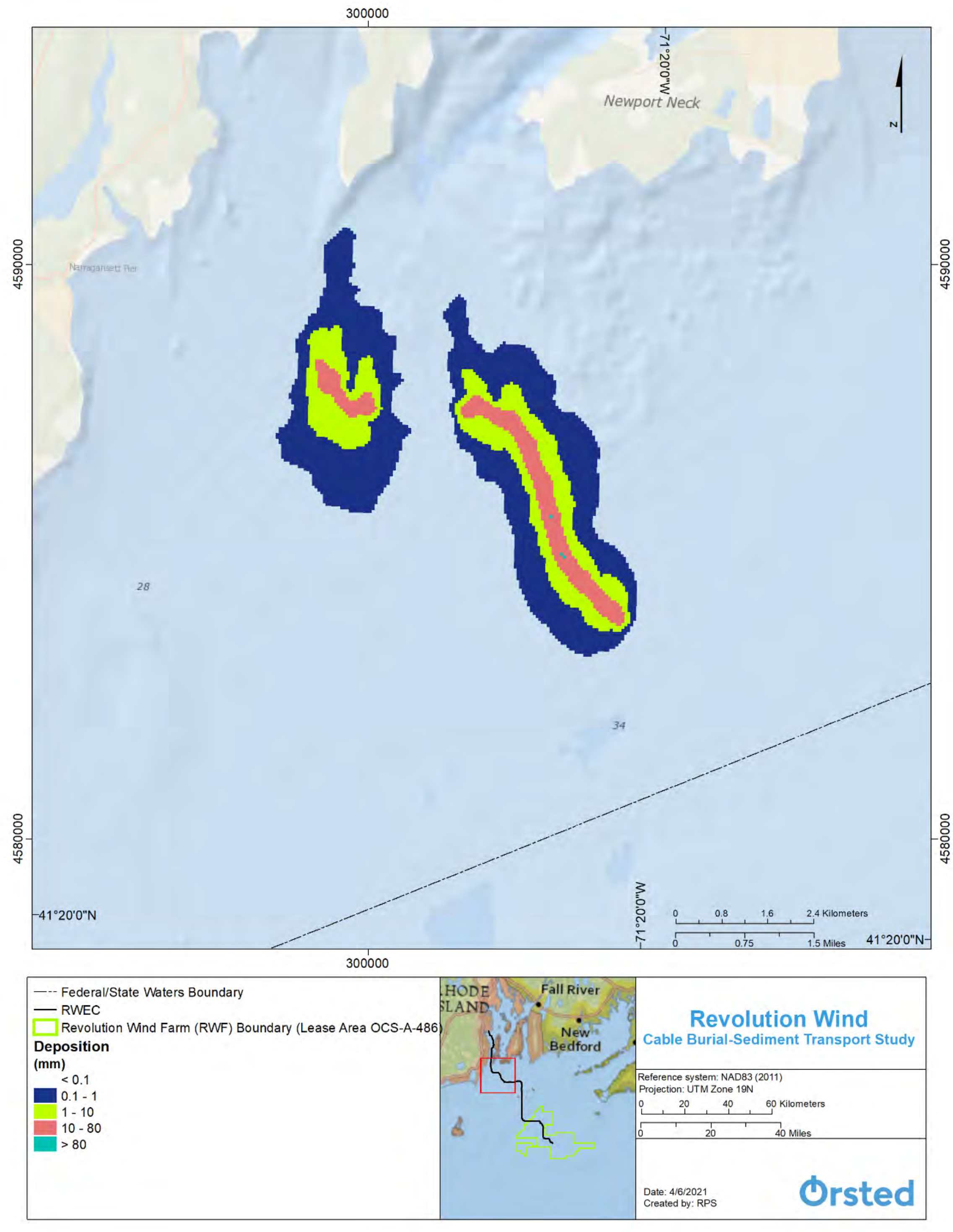

Figure 4.3-6 Map of Predicted Deposition Thickness Associated with TSHD, Split Bottom Seabed Preparation.

Seabed Preparation – TSHD, Continuous Overflow

A snapshot of the instantaneous concentration from the modeled TSHD continuous overflow seabed preparation illustrates that highest concentrations are predicted to be directly adjacent to the route centerline, with lower concentrations extending further towards the south due to transport from local currents (Figure 4.3-7). The inset shows the instantaneous plume along the first segment, with the cross-section showing the introduction of sediment at the water surface. Figure 4.3-8 shows the time-integrated maximum TSS for seabed preparation using the TSHD continuous overflow method. Because sediment is introduced at the water surface with a relatively slow installation rate, the plume footprint experiences multiple tidal cycles and tends to oscillate with the currents. The cumulative deposition along the seabed preparation segments is presented in Figure 4.3-9, which depicts a similar footprint to the time-integrated maximum TSS.

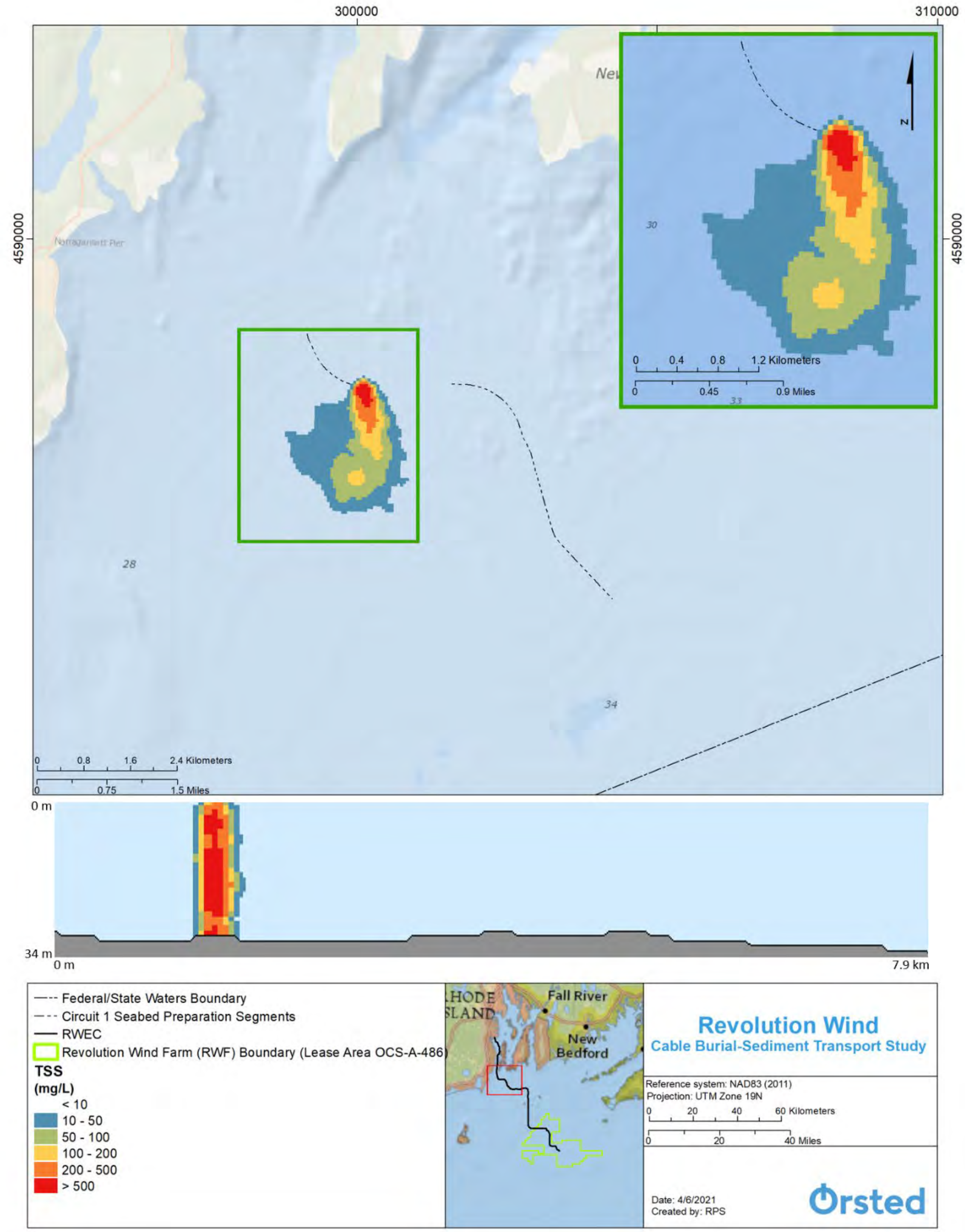

Figure 4.3-7 Snapshot of Predicted Instantaneous TSS Concentrations Associated with TSHD, Continuous Overflow Seabed Preparation.

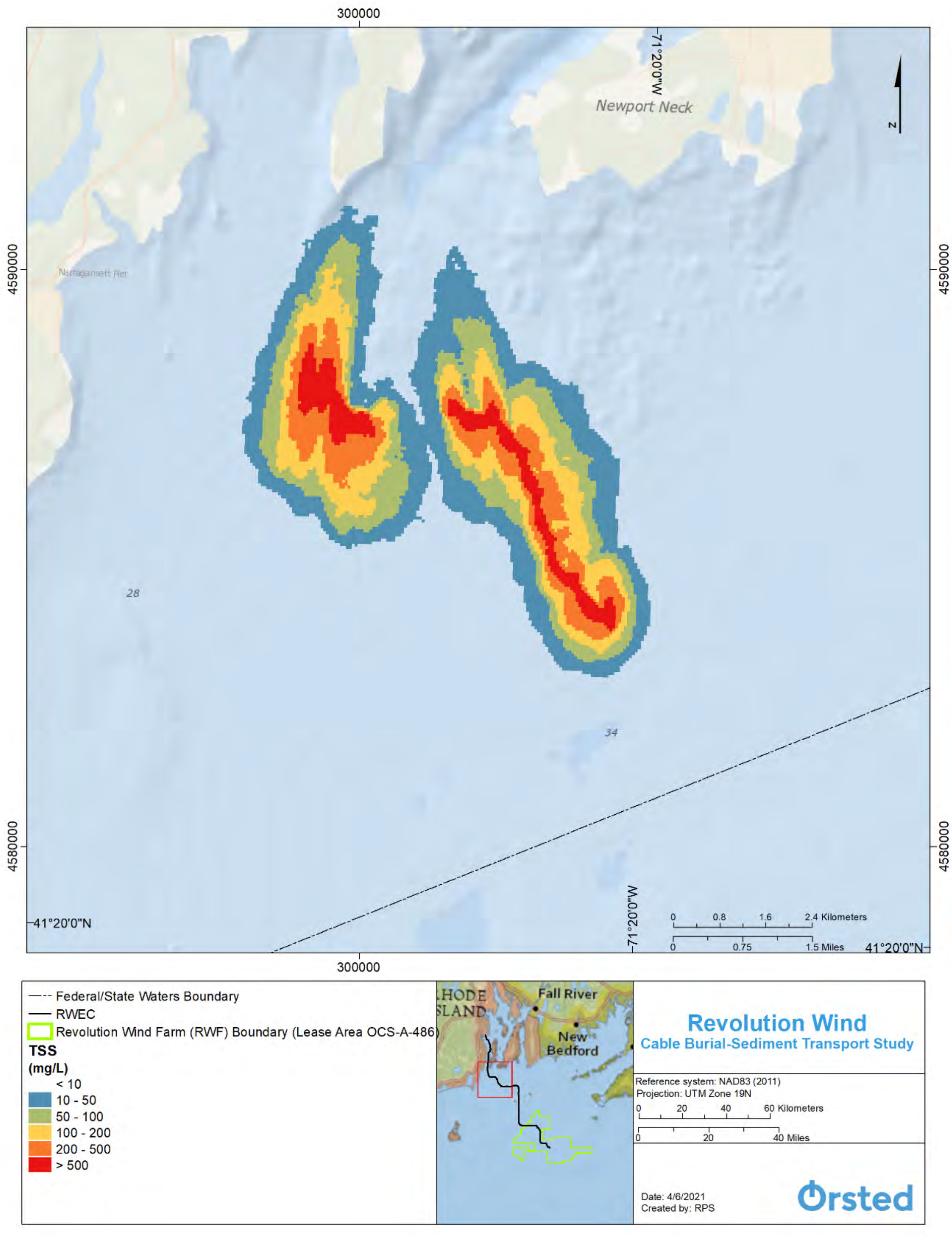

Figure 4.3-8 Map of Predicted Time-Integrated Maximum TSS Concentrations Associated with TSHD, Continuous Overflow Seabed Preparation.

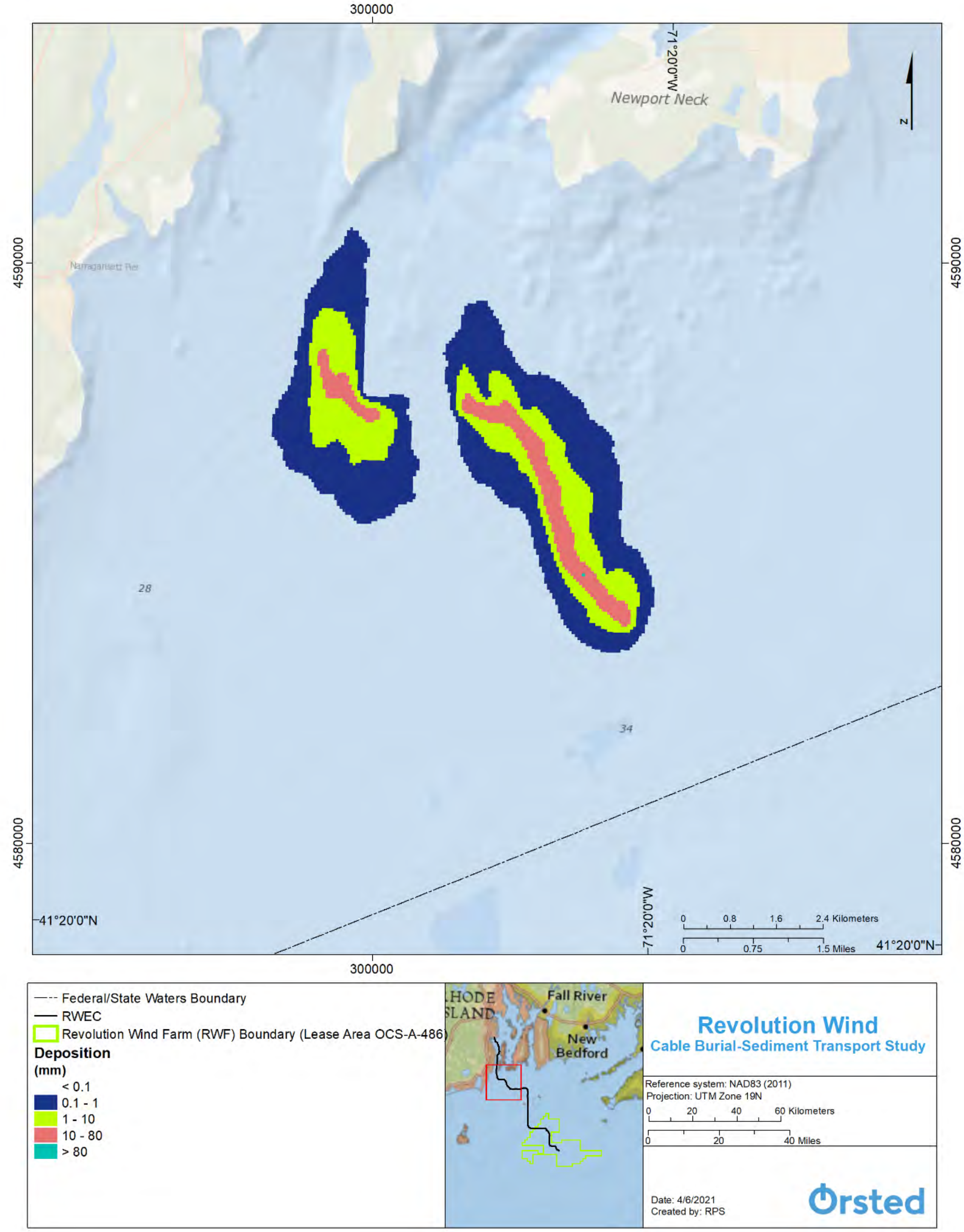

Figure 4.3-9 Map of Predicted Deposition Thickness Associated with TSHD, Continuous Overflow Seabed Preparation.

Seabed Preparation – Alternatives Comparison

Comparisons of instantaneous TSS concentration, time-integrated maximum TSS concentration, and deposition thickness for each seabed preparation alternative are provided in Figure 4.3-10, Figure 4.3-11, and Figure 4.3-12, respectively. Predictions show the plume of the CFE method tends to remain closer to the route centerline, with relatively higher concentrations than the TSHD methods. The localization of sediment plumes for the CFE method is likely due to the introduction of sediment closer to the seabed and faster installation rate. The TSHD split bottom method instantaneous plume reflects the periodic overflow and split bottom disposal in comparison to the TSHD continuous overflow. However, the footprints of both TSHD methods appear alike due to the similar disposal locations within the water column and same installation speed. The slight differences are most likely due to the periodic introduction of finer sediment at the surface and coarser sediment a few meters below the surface for the split bottom method, whereas all sediment is disposed of at the surface for the continuous overflow method. These differences are evident in the results tables presented in Section 4.4.

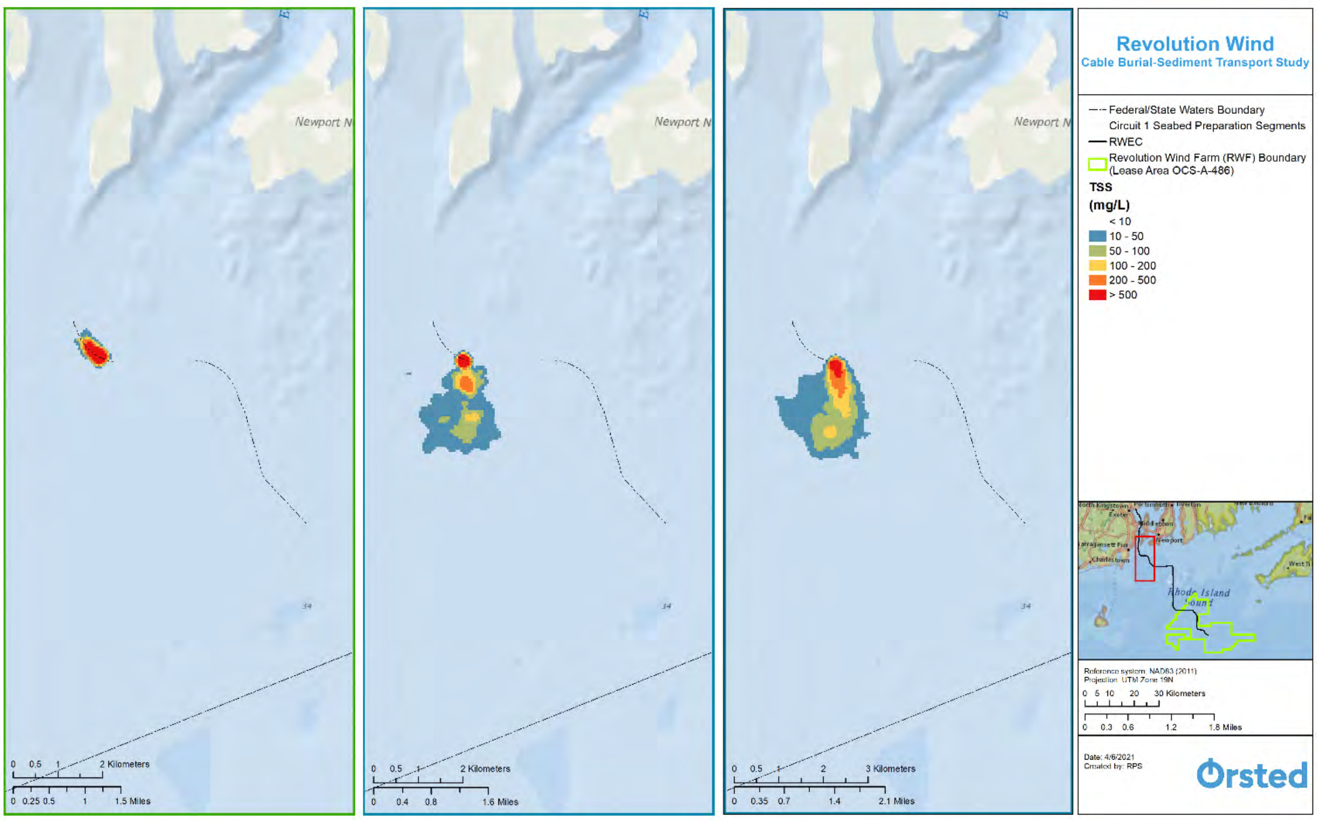

Figure 4.3-10 Snapshot of Predicted Instantaneous TSS Concentrations Associated with (A) CFE, (B) TSHD, Split Bottom, and (C) TSHD, Continuous Overflow Seabed Preparation.

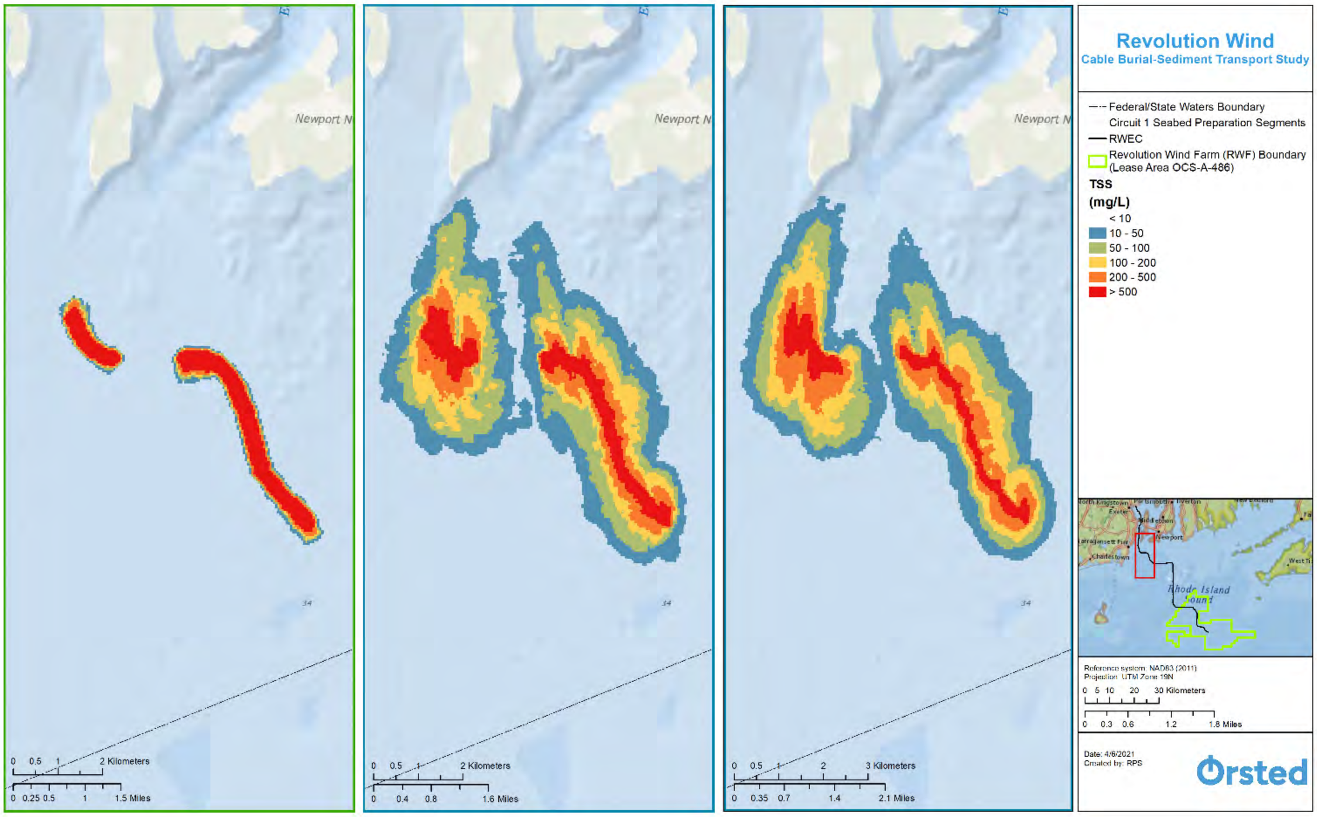

Figure 4.3-11 Map of Predicted Time-Integrated Maximum TSS Concentrations Associated with (A) CFE, (B) TSHD, Split Bottom, and (C) TSHD, Continuous Overflow Seabed Preparation.

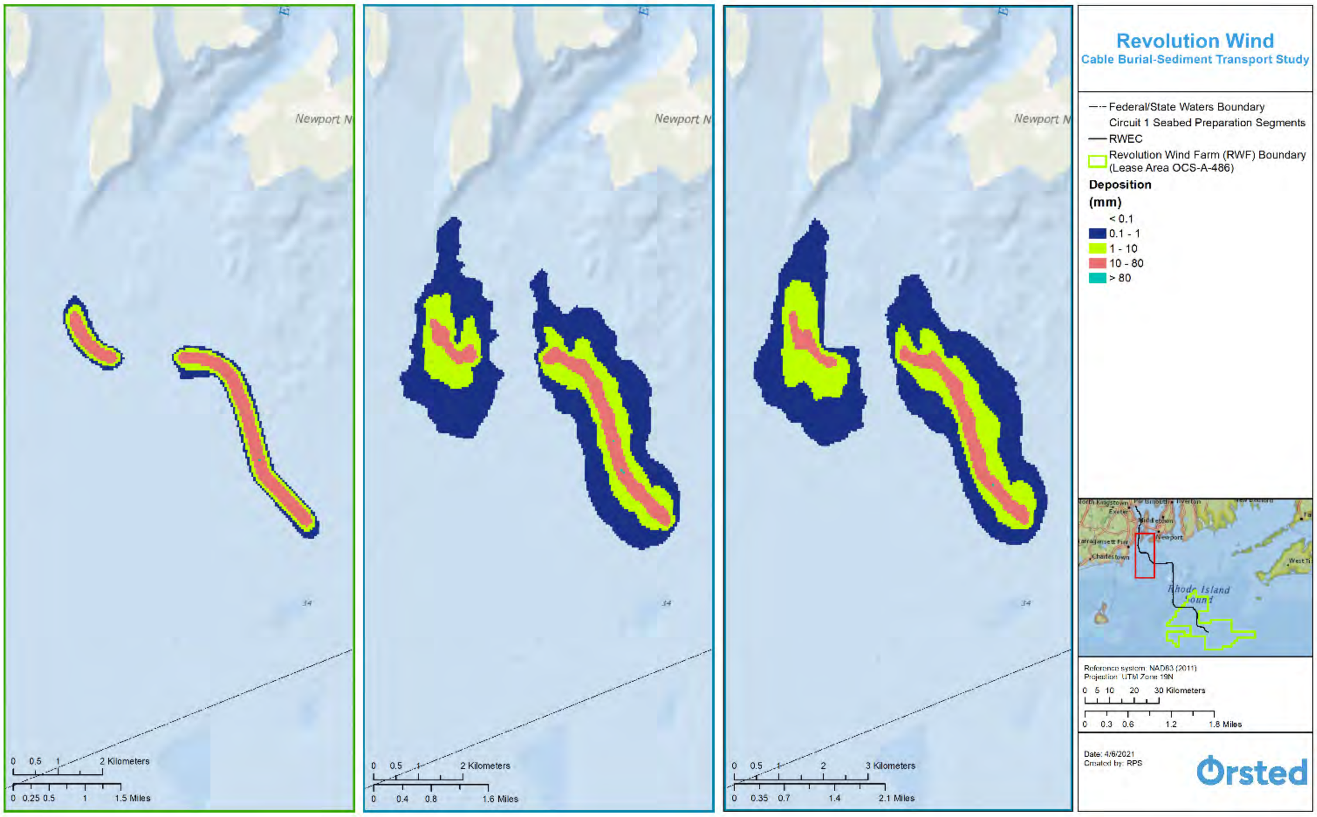

Figure 4.3-12 Map of Predicted Deposition Thickness Associated with (A) CFE, (B) TSHD, Split Bottom, and (C) TSHD, Continuous Overflow Seabed Preparation.

4.3.2 Study Component 2: RWEC Circuit 1 Cable Burial

A snapshot of the instantaneous concentration from the modeled RWEC Circuit 1 cable burial illustrates that highest concentrations are predicted to be directly adjacent to the route centerline, with lower concentrations extending further towards the south due to transport from local currents (Figure 4.3-13). The cross-section, which spans the section of Circuit 1 within RI state waters, shows sediment is introduced and remains near the seabed.

The results from the entire simulation are provided in Figure 4.3-14 and Figure 4.3-15. Figure 4.3-14 shows the time-integrated maximum TSS for installation within RI state waters. The response of the plume to the oscillating currents is evident in the footprint, particularly in sections where the route is perpendicular to the predominate current direction. It is also evident that, in areas of almost all coarse sand, the plume is smaller and the footprint does not extend as far from the route centerline. The cumulative deposition along the circuit is presented in Figure 4.3-15.

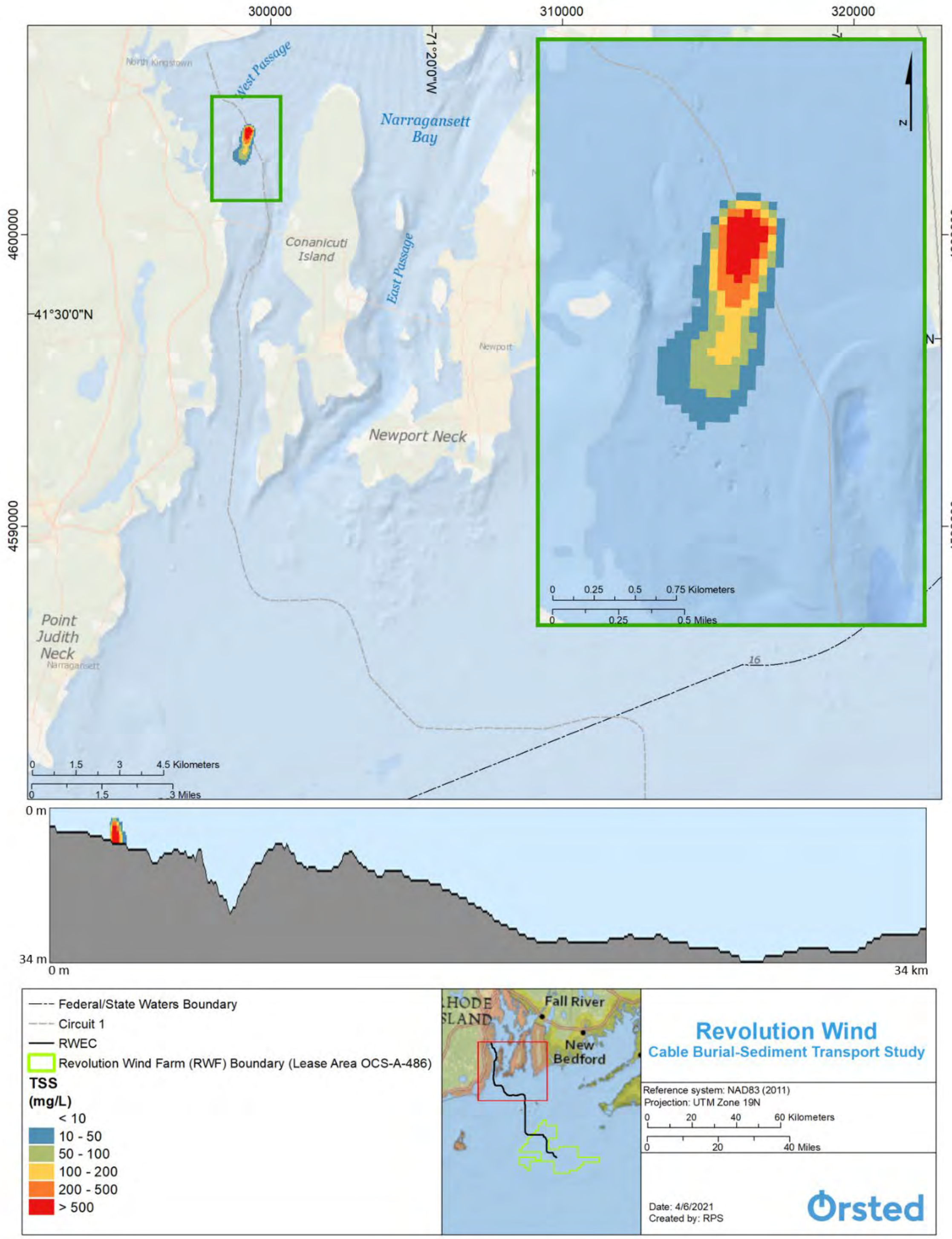

Figure 4.3-13 Snapshot of Predicted Instantaneous TSS Concentrations Associated with RWEC Circuit 1 Cable Burial.

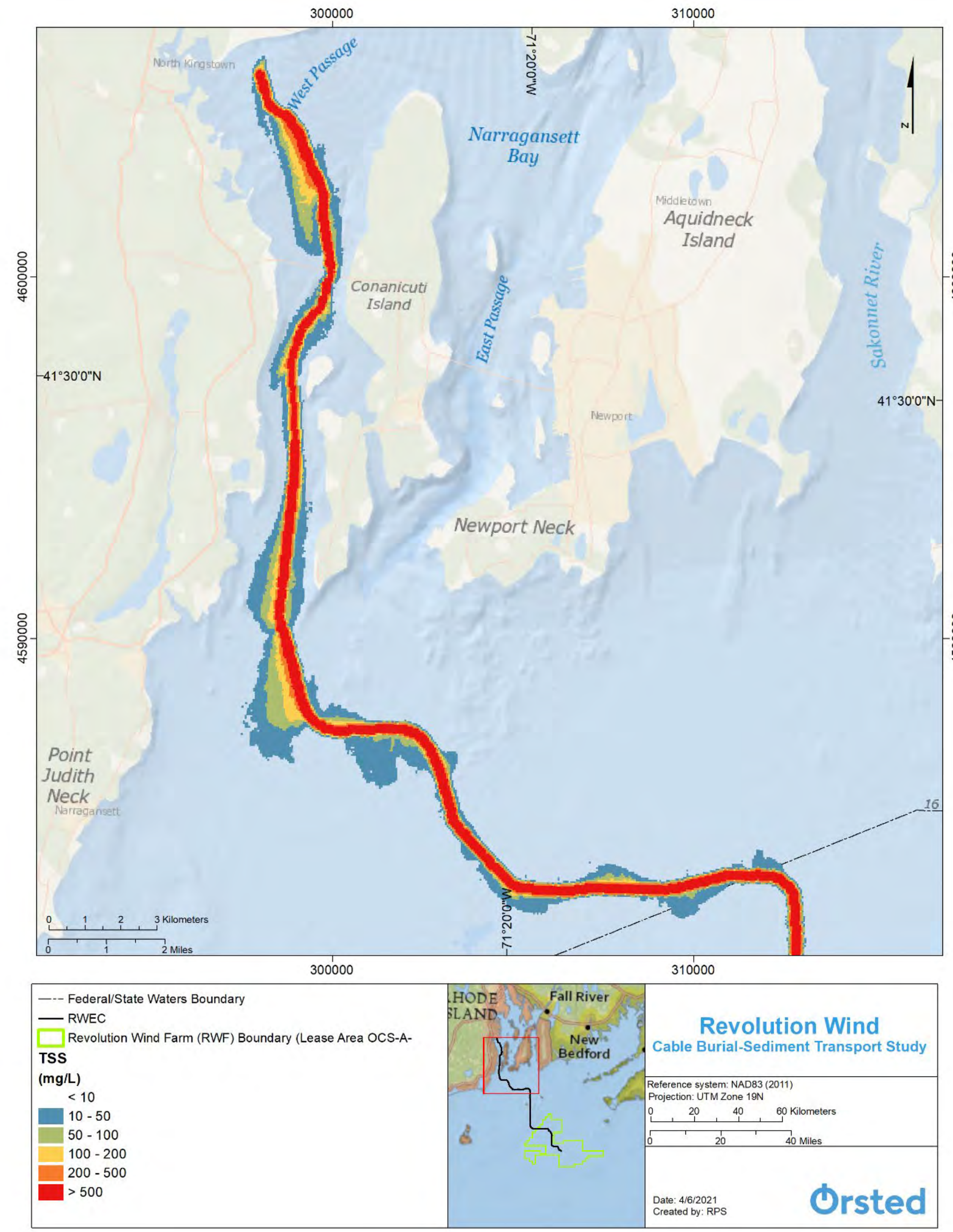

Figure 4.3-14 Map of Predicted Time-Integrated Maximum TSS Concentrations Associated with RWEC Circuit 1 Cable Burial.

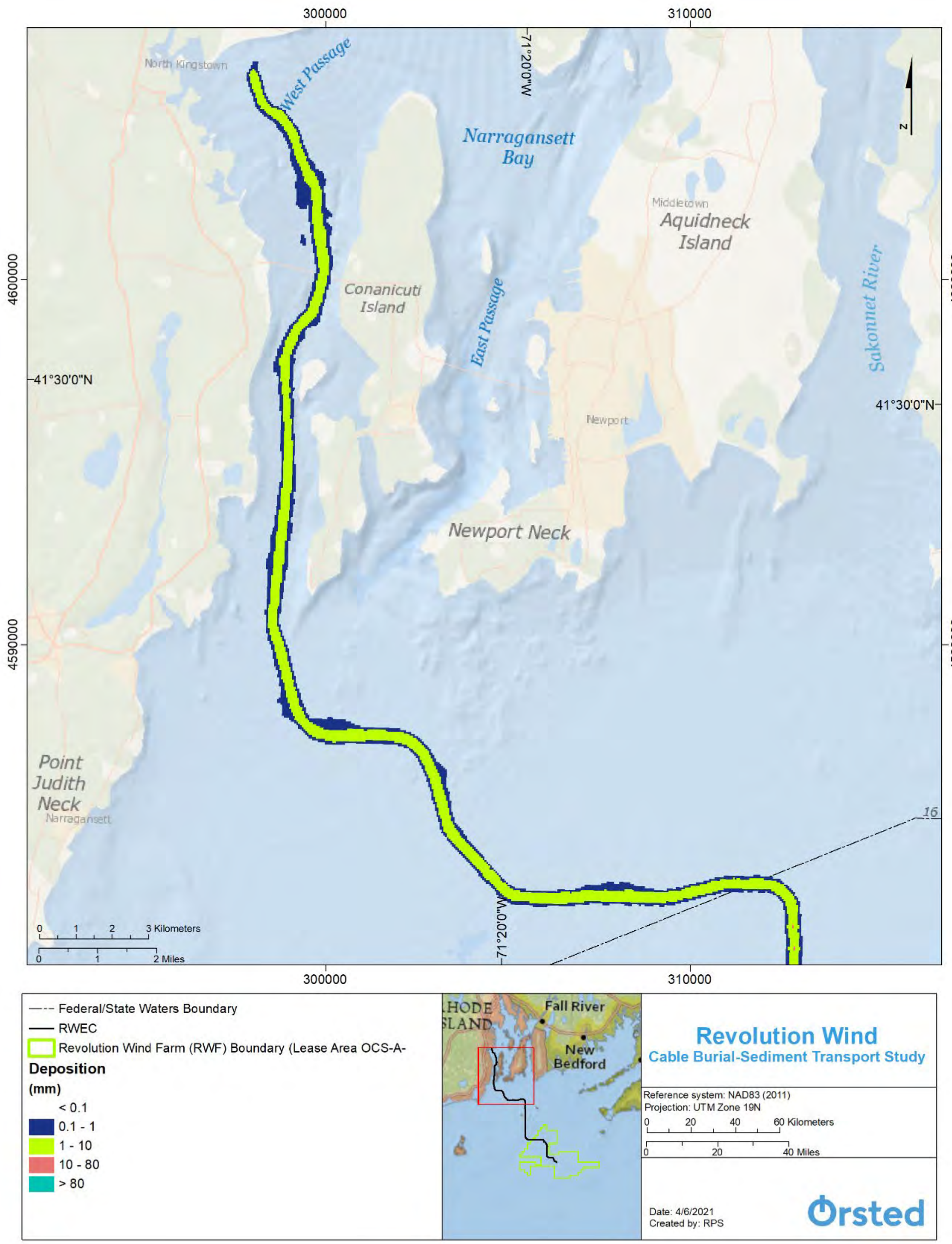

Figure 4.3-15 Map of Predicted Deposition Thickness Associated with RWEC Circuit 1 Cable Burial.

4.3.3 Study Component 4: RWEC Landfall

A snapshot of the instantaneous concentration from the RWEC landfall simulation is provided in Figure 4.3-16. The snapshot illustrates that highest concentrations are predicted to be directly adjacent to the route centerline, with lower concentrations extending further towards the northeast due to transport from local currents. The cross-sections, extending from the shoreline to just past the HDD exit pit, show sediment is introduced near the surface.

The time-integrated maximum TSS concentrations and deposition thickness results from the RWEC landfall simulation are presented in Figure 4.3-17 and Figure 4.3-18, respectively. Since the landfall analysis only includes clearance of the HDD exit pit, the concentration footprint is small, though exhibits fairly high concentrations due to the shallow depth and low currents of the site which reduce sediment transport extents.

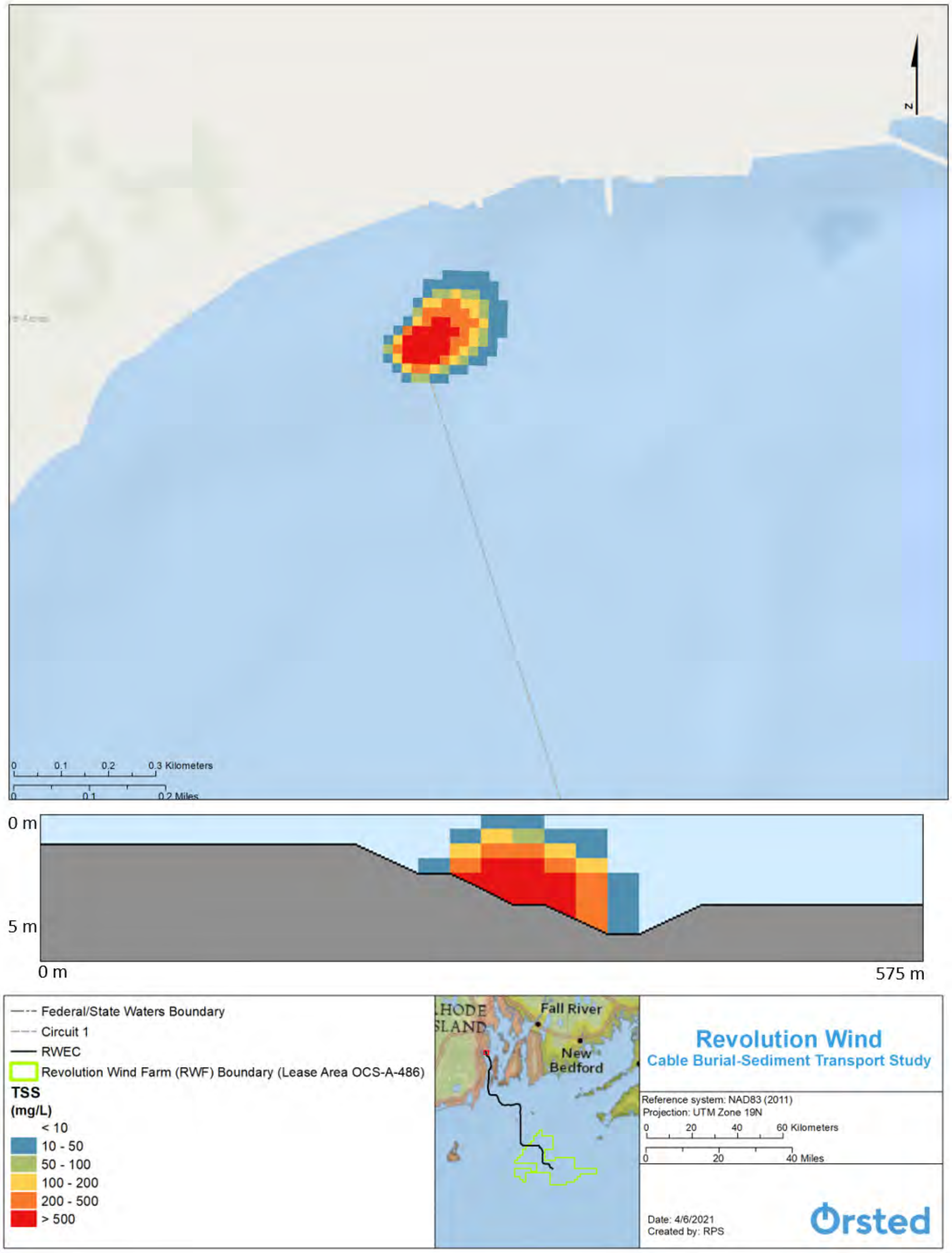

Figure 4.3-16 Snapshot of Predicted Instantaneous TSS Concentrations Associated with RWEC Landfall.

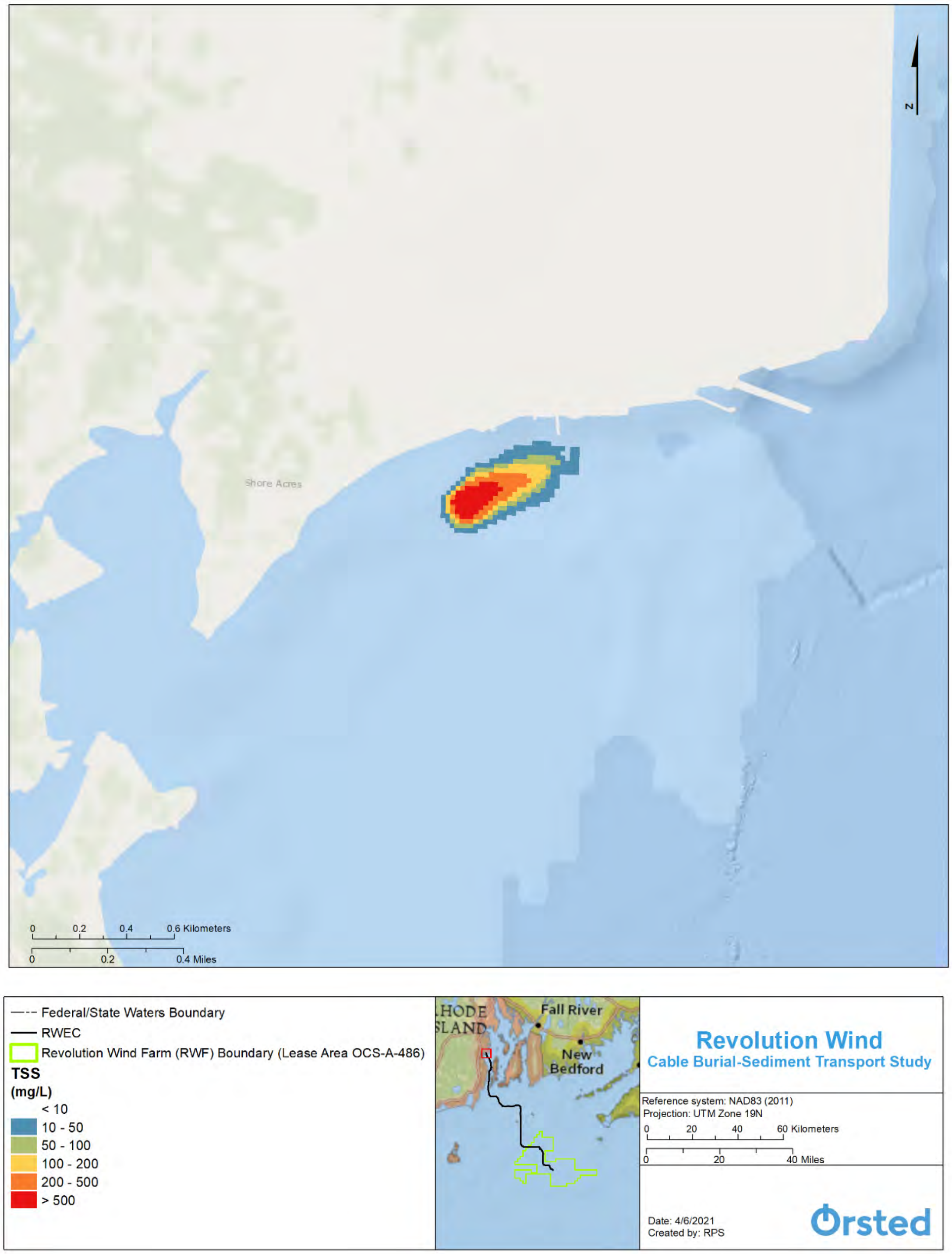

Figure 4.3-17 Map of Predicted Time-Integrated Maximum TSS Concentrations Associated with RWEC Landfall.

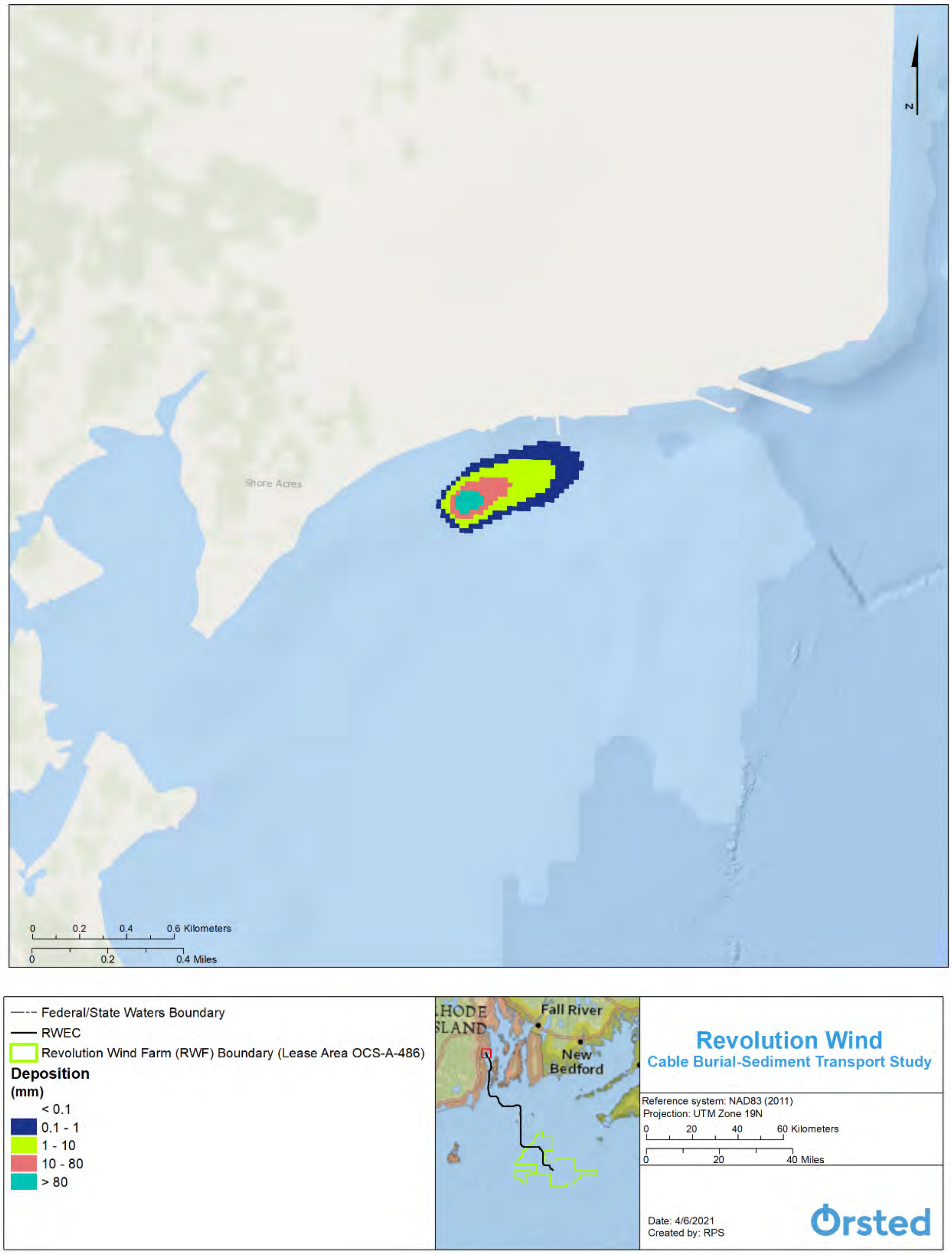

Figure 4.3-18 Map of Predicted Deposition Thickness Associated with RWEC Landfall.

4.4 Results Summary Tables

The results of the modeling showed that the cable burial activities will result in plumes of excess TSS in the water column and seabed deposition. The TSS plumes are limited to the bottom of the water column for the CFE seabed preparation method and RWEC Circuit 1 burial because the construction methods modeled for these scenarios introduce sediment near the seabed. The TSS plumes for TSHD seabed preparation and the landfall are present throughout the majority of the water column due to sediment introduction at or near the water surface and, for the landfall, shallow depths. Each plume is temporary in any given location and was transported by local currents. Key metrics of each scenario are compiled and presented in the tables below. The bullets below describe the summary tables and discuss key results.

- Table 4.4-1 summarizes the total volumes resuspended for each scenario and the amount resuspended within RI state waters.
- Table 4.4-2 and Table 4.4-3 summarize the total area over different deposition thickness thresholds (0.1 mm, 1.0 mm, and 10 mm). The two tables present the same information (i.e., total area and area within RI state waters above each threshold) as acres and hectares.
- Table 4.4-4 summarizes the maximum extent of deposition over three thickness thresholds (0.1 mm, 1.0 mm, and 10 mm). The extents were measured perpendicular to the modeled route centerline. The results are provided for RI state waters, as applicable. Note that while the maximum extent is presented, the typical extent is often less than the scenario-specific maximum.
    - For the seabed preparation segments within RI state waters, deposition exceeding 10 mm is predicted to remain within 688.8 ft (210 m), 1,033.2 ft (315 m), and 852.8 ft (260 m) from the route centerline for CFE, TSHD split bottom, and TSHD continuous overflow seabed preparation activities, respectively.
    - For jet plow installation along the RWEC within RI state waters, deposition thickness is not predicted to reach 10 mm. Deposition exceeding 1.0 mm is predicted to remain within 787.2 ft (240 m) from the route centerline.
    - Evaluation of the landfall showed that deposition exceeding 10 mm may extend up to 738 ft (225 m) from the exit pit location.
- Table 4.4-5 summarizes the maximum extent of the TSS plume over two different thresholds (50 mg/L and 100 mg/L). The extents were measured perpendicular to the modeled route centerline. The results are provided for RI state waters. Note that while the maximum extent is presented, the typical extent is often less than the scenario-specific maximum. The persistence of concentrations associated with the activities was investigated and the following points summarize those findings.
    - For the seabed preparation segments within RI state waters, the predicted concentrations above background (> 0 mg/L) do not persist in any given location (grid cell) for greater than 3.5 hours, 47.8 hours, and 46 hours for CFE, TSHD split bottom, and TSHD continuous overflow seabed preparation activities, respectively. In most locations (> 75% of the affected area within RI state waters) concentrations return to ambient within approximately 2.5 hours for CFE and approximately 16 hours for both TSHD methods. Predicted concentrations greater than 100 mg/L do not persist in RI state waters for greater than 2.3 hours, 13.5 hours, and 13.8 hours for CFE, TSHD split bottom, and TSHD continuous overflow seabed preparation activities, respectively.
    - For jet plow installation along the RWEC within RI state waters, predicted concentrations above background (> 0 mg/L) do not persist in any given location (grid cell) for greater than 69.7 hours. In most locations (> 75% of the affected area within RI state waters) concentrations return to

ambient within approximately 26 hours. Predicted concentrations greater than 100 mg/L do not persist in RI state waters for greater than 4.5 hours.

- o Evaluation of the landfall showed that predicted concentrations above background (> 0 mg/L) do not persist in any given location (grid cell) for greater than 70.3 hours. In most locations (> 75% of the affected area within RI state waters) concentrations return to ambient within approximately 6 hours. Predicted concentrations greater than 100 mg/L do not persist in RI state waters for greater than 70.2 hours.

Table 4.4-1. Summary of Volume Resuspended for Modeling Scenarios.

Volumes Resuspended		
Study Component	Description of Scenario	Volume Resuspended within RI State Waters, cy (m^3)
RWEC Seabed Preparation	Circuit 1 – Seabed Preparation, CFE	103,875.3 (79,418.4)
	Circuit 1 – Seabed Preparation, TSHD Split Bottom	103,163.2 (78,873.9)
	Circuit 1 – Seabed Preparation, TSHD Continuous Overflow	103,875.3 (79,418.4)
RWEC	Circuit 1 – Jet Plow	46,287.1 (35,388.9)
Landfall	HDD Exit Pit – Backhoe Excavator followed by Venturi Eductor Device	3,097.8 (2,368.4)

Table 4.4-2. Summary of Areas (ac) Exceeding Deposition Thickness Thresholds.

Deposition Results: Area in Acres Exceeding Thickness Thresholds				
		Area (Acres [ac]) within RI State Waters of Deposition Exceeding Threshold		
Study Component	Description of Scenario	0.1 mm	1.0 mm	10 mm
RWEC Seabed Preparation	Circuit 1 – Seabed Preparation, CFE	992.1	727.1	453.4
	Circuit 1 – Seabed Preparation, TSHD Split Bottom	4,056.9	1,498.1	481.9
	Circuit 1 – Seabed Preparation, TSHD Continuous Overflow	4,270.0	1,677.8	480.0
RWEC	Circuit 1 – Jet Plow	4,017.3	2,335.8	0
Landfall	HDD Exit Pit – Backhoe Excavator followed by Venturi Eductor Device	35.4	20.4	7.4

Table 4.4-3. Summary of Areas (ha) Exceeding Deposition Thickness Thresholds.

Deposition Results: Area in Hectares Exceeding Thickness Thresholds				
		Area (Hectare [ha]) within RI State Waters of Deposition Exceeding Threshold		
Study Component	Description of Scenario	0.1 mm	1.0 mm	10 mm
RWEC Seabed Preparation	Circuit 1 – Seabed Preparation, CFE	401.5	294.3	183.5
	Circuit 1 – Seabed Preparation, TSHD Split Bottom	1641.8	606.3	195.0
	Circuit 1 – Seabed Preparation, TSHD Continuous Overflow	1,728.0	679.0	194.3
RWEC	Circuit 1 – Jet Plow	1,625.8	945.3	0
Landfall	HDD Exit Pit – Backhoe Excavator followed by Venturi Eductor Device	14.3	8.2	3.0

Table 4.4-4. Summary of Extent of Deposition Exceeding Thickness Thresholds as Measured Perpendicular from the Modeled Cable Centerline.

Deposition Extent				
		Maximum Extent of Deposition Exceeding Threshold within RI State Waters, ft (m)		
Study Component	Description of Scenario	0.1 mm	1.0 mm	10 mm
RWEC Seabed Preparation	Circuit 1 – Seabed Preparation, CFE	1,587.5 (484)	1,049.6 (320)	688.8 (210)
	Circuit 1 – Seabed Preparation, TSHD Split Bottom	6,553.4 (1998)	3,017.6 (920)	1033.2 (315)
	Circuit 1 – Seabed Preparation, TSHD Continuous Overflow	6,510.8 (1985)	3,755.6 (1145)	852.8 (260)
RWEC	Circuit 1 – Jet Plow	1,869.6 (570)	787.2 (240)	0.0 (0)
Landfall	HDD Exit Pit – Backhoe Excavator followed by Venturi Eductor Device	1,771.2 (540.0)	1,377.6 (420.0)	738.0 (225.0)

Table 4.4-5. Summary of Extent of Plume Exceeding TSS Thresholds as Measured Perpendicular from the Modeled Cable Centerline

Plume Concentration Extent			
		Maximum Extent of Plume Concentration Perpendicular to Route Exceeding TSS Threshold within RI State Waters, ft (m)	
Study Component	Description of Scenario	50 mg/L	100 mg/L
RWEC Seabed Preparation	Circuit 1 – Seabed Preparation, CFE	1,754.8 (535)	1,443.2 (440)
	Circuit 1 – Seabed Preparation, TSHD Split Bottom	6,888.0 (2100)	4,690.4 (1430)
	Circuit 1 – Seabed Preparation, TSHD Continuous Overflow	6,560.0 (2000)	5,838.4 (1780)
RWEC	Circuit 1 – Jet Plow	3,673.6 (1120)	2,345.2 (715)
Landfall	HDD Exit Pit – Backhoe Excavator followed by Venturi Eductor Device	1,459.6 (445)	1,312.0 (400)

4.5 Results Discussion and Conclusions

Based on conservative assumptions for the modeled study components, the goal of this assessment was to bound the range of predicted movement, behavior, and potential for effects that may be expected during and following sediment-disturbing activities anticipated for the Project. Using SSFATE, developed jointly by the USACE ERDC and Applied Science Associates (now part of RPS), sediment transport modeling was conducted to predict the extent, magnitude, and duration of sediment plumes above background values.

Simulations of CFE seabed preparation predict a plume that is localized to the seabed due to the introduction of sediment near the bottom of the water column. Predictions show the plume of the CFE method tends to remain closer to the route centerline, with relatively higher concentrations, than the TSHD methods. The localization of sediment plumes for the CFE method is likely due to the introduction of sediment closer to the seabed and a faster installation rate. For CFE, the maximum extent of deposition exceeding 10 mm is predicted to remain within 688.8 ft (210 m) from the route centerline. In comparison, this maximum extent was approximately 344.4 ft (105 m) and 164 ft (50 m) smaller than the TSHD split bottom and TSHD continuous overflow, respectively. For the TSHD seabed preparation simulations, the predicted plume was present throughout the water column due to the introduction of sediment at or near the water surface. While the TSHD split bottom's instantaneous plume reflects the periodic overflow and split bottom disposal compared to the TSHD continuous overflow, the footprints of both TSHD methods appear alike. For example, the total area of deposition exceeding 10 mm in RI state waters differed by approximately 1.9 acres (0.7 ha). These similarities are due to the similar disposal locations within the water column and identical installation speed. The slight differences are most likely due to the periodic introduction of finer sediment at the surface and coarser sediment a few meters below the surface for the split bottom method, whereas all sediment was disposed of at the surface for the continuous overflow method. The influence of the location where sediment is introduced to the water column (e.g., seabed vs. water surface) was highlighted by the TSHD methods larger duration of predicted concentrations above background (> 0 mg/L). For example, the predicted concentration above background for CFE was estimated to subside 44.3 hours and 42.5 hours before the TSHD split bottom and TSHD continuous overflow activities, respectively. Additionally, in > 75% of the affected area within RI state waters, concentrations are predicted to return to ambient within approximately 2.5 hours for CFE and approximately 16 hours for both TSHD methods.

Simulations of RWEC Circuit 1 cable installation using jet plow installation parameters predict a plume that is localized to the seabed due to the introduction of sediment near the bottom of the water column. The response of the plume to the oscillating currents is evident in the footprint, particularly in sections where the route is perpendicular to the predominate current direction. Along the RWEC within RI state waters, deposition thickness is not predicted to reach 10 mm. The maximum deposition exceeding 1.0 mm is predicted to remain within 787.2 ft (240 m) from the route centerline. The predicted concentrations above background (> 0 mg/L) within RI state waters do not persist in any given location (grid cell) for greater than 69.7 hours. In most locations (> 75% of the affected area within RI state waters) concentrations return to ambient within approximately 26 hours.

The landfall simulation predicts the concentration footprint is relatively small, though exhibits fairly high concentrations due to the shallow depth and low currents of the site which reduce sediment transport extents. Deposition greater than 10 mm may extend up to 738 ft (225 m) from the exit pit location. The predicted concentrations above background (> 0 mg/L) do not persist in any given location (grid cell) for greater than 70.3 hours. In most locations (> 75% of the affected area within RI state waters) concentrations return to ambient within approximately 6 hours.

SSFATE was used to effectively simulate three representative study components of the types of activities that are expected with the Project. The modeling predicted the potential TSS concentrations, deposition thicknesses, exposure durations, and corresponding areas and distances associated with each Project-related construction activity.

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Appendix P: RWEC-RI Benthic Habitat Maps and Report

Benthic Habitats in Rhode Island State Waters

Revolution Wind Offshore Wind Farm

Prepared for:

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Submitted by:

INSPIRE Environmental
Newport, Rhode Island 02840

June 30, 2021

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LIST OF ACRONYMS

APCs	Areas of particular concern
BOEM	Bureau of Ocean Energy Management
CMECS	Coastal and Marine Ecological Classification Standard
COP	Construction and Operations Plan
CRMC	Rhode Island Coastal Resources Management Council
EFH	Essential fish habitat
FGDC	Federal Geographic Data Committee
Fugro	Fugro USA Marine, Inc.
GIS	Geographic Information System
HAPC	Habitat Area of Particular Concern
HDD	horizontal directional drilling
INSPIRE	INSPIRE Environmental, LLC
MBES	Multibeam echosounder
mmu	Minimum mapping unit
NOAA	National Oceanic and Atmospheric Administration
NOAA Habitat	NOAA National Marine Fisheries Greater Atlantic Regional Fisheries Office Habitat Conservation and Ecosystem Services Division
OCS	Outer continental shelf
OSAMP	Ocean Special Area Management Plan
PV	Plan View
RWEC	Revolution Wind Farm Export Cable
RWEC-RI	Revolution Wind Farm Export Cable in Rhode Island state waters
RWEC-OCS	Revolution Wind Farm Export Cable traversing federal waters
RWF	Revolution Wind Farm
SAV	Submerged aquatic vegetation
SPI	Sediment Profile Imaging
SSS	Side-scan sonar

GLOSSARY

Revolution Wind & CRMC Permitting: Key Terms & Abbreviations

Term	Definition
Boulder picks	Isolated boulders, outside boulder field; Boulders >= 50 cm (0.5 m) identified from geophysical data
Facies	Bodies of sediment that are recognizably distinct from adjacent sediments that resulted from different depositional environments.
Hard bottom	Stable cobbles and boulders found predominantly within Glacial Moraine A & B habitats and within Boulder Fields.
horizontal directional drilling (HDD)	Landfall of RWEC will be completed via HDD. HDD is a subsurface installation technique that will create an underground conduit through which the RWEC will be installed through the intertidal zone. The HDD methodology avoids impacts to the beach and nearshore environment.
Benthic Habitat Classification	Benthic habitat classifications with a minimum mapping unit of 2,000 m^2, prepared by INSPIRE
Minimum mapping unit (mmu)	The smallest size areal seabed or habitat polygon to be mapped as a discrete entity
Revolution Wind Farm Project (the Project)	Revolution Wind Farm (RWF) and the Revolution Export Cable (RWEC), collectively, the Project. The purpose of the Project is to construct and operate a new offshore wind farm designed to provide renewable energy to New England.
Revolution Wind Farm (RWF)	Located in federal waters off the coast of Rhode Island, within the Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf (OCS) #OCS-A 0486 (Lease Area). The RWF will consist of up to 100 WTGs, inter-array cables (IAC), up to two offshore substations (OSSs), and an OSS-Link Cable.
Revolution Export Cable (RWEC)	The export cable system from the RWF to the mainland electric grid interconnection includes RWEC in federal waters (RWEC-OCS), RWEC in state waters (RWEC-RI), and onshore components (Onshore Facilities), collectively referred to as the RWEC.
Revolution Export Cable – Outer Continental Shelf (RWEC-OCS)	The submarine segment of the export cable system located on the OCS from the RWF to the 3-nautical mile (3.5-mile; 5.6-km) state boundary.
Revolution Export Cable – RI State Waters (RWEC-RI)	The submarine segment of the export cable system located within the state waters of Rhode Island to the landfall location at Quonset Point.

1.0 INTRODUCTION

1.1 Revolution Wind Project Overview and Layout

Revolution Wind, LLC (Revolution Wind), a 50/50 joint venture between Orsted North America Inc. (Orsted NA) and Eversource Investment LLC (Eversource), proposes to construct and operate the Revolution Wind Farm Project (hereinafter referred to as the Project). The wind farm portion of the Project will be located in federal waters on the Outer Continental Shelf (OCS) in the designated Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0486 (Lease Area) (Figure 1-1). The Project consists of the Revolution Wind Farm (RWF), located within the Lease Area, and the Revolution Wind Farm Export Cable (RWEC), traversing federal waters (RWEC-OCS) and Rhode Island state waters (RWEC-RI) (Figures 1-1 and 1-2) to a landfall location at Quonset Point in North Kingstown, Rhode Island (Figure 1-3).

The Project will be comprised of both offshore and onshore components, which are described in detail in Section 3 of the Construction and Operations Plan (COP) (Revolution Wind, LLC 2021a). This Report focuses on evaluation of the Project's offshore components within Rhode Island state waters, which includes up to two submarine export cables (referred to as the RWEC-RI).

This report provides a detailed assessment of benthic habitats that have been mapped from geophysical and benthic ground-truth data within the RWEC-RI Study Area. The RWEC-RI Study Area is defined as the area Revolution Wind surveyed for siting the RWEC-RI, ranging in width from approximately 10,500 ft (3,200 m) at its widest point and approximately 1,300 ft (396 m) at its narrowest. Ultimately, the RWEC-RI route will be sited within this broader Study Area and impacts will be limited to an approximate 131-foot (40-meter) -wide disturbance corridor centered on each cable. To provide information on offshore habitats compared to estuarine habitats, benthic habitats are presented both in Rhode Island Sound and in Narragansett Bay (Figure 1-2).

1.2 Rhode Island State Permitting Overview

The Project requires approvals from various state agencies, including the Rhode Island Energy Facility Siting Board, the Coastal Resources Management Council (CRMC), and the Rhode Island Department of Environmental Management. Most relevant to this report, CRMC regulations in both the Coastal Resources Management Program, or "Red Book", (650-RICR-20-00-1 et seq.) and the Ocean Special Area Management Plan (OSAMP) (RI CRMC 2010) include requirements pertaining to identification and evaluation of benthic habitats. This report provides the baseline data and information necessary to support CRMC's review of any Project impacts on benthic habitats under its regulations.

Specific Red Book requirements related to benthic habitats pertain to those habitats that support submerged aquatic vegetation (SAV). Section 1.3.1(R) of the Red Book defines CRMC's goals to preserve, protect, and where possible, restore SAV habitat. These habitats are found throughout shallow coastal areas in Narragansett Bay and their presence is periodically mapped across the Bay using aerial imagery and field verification by the URI Environmental Data Center (URI Environmental Data Center and RIGIS). The Red Book outlines information pertaining to site-specific monitoring, assessment of impacts, and mitigation for SAV.

Specific OSAMP requirements related to benthic habitats pertain to those habitats that meet the criteria for areas of particular concern (APCs), as defined by CRMC in Section 11.10.2 of the OSAMP. Glacial moraines are considered to be "areas of particular concern" because they provide structural complexity and permanence that serve to provide valuable habitat for benthic species and demersal fish.[1] Glacial moraines are complex geoforms that may have many different expressions at the seafloor surface based on geological origin, position within a larger moraine complex, and modern geological processes, including sediment supply. Rhode Island's marine landscapes were carved by glaciers and remnants of this glaciation are evident on the seafloor. Deposits on the surface of glacial moraine landforms can be a mix of till, stratified drift, and reworked sediments derived from the glacial deposits and subsequent marine transgression. The OSAMP presumptively excludes development from APCs unless an applicant demonstrates, for example, "by clear and convincing evidence that there are no practicable alternatives that are less damaging in areas outside of the APC, or that the proposed project will not result in a significant alteration to the values and resources of the APC."

1.3 Benthic Habitat Mapping Assessment Purpose

The purpose of this report and associated data is to provide detailed information about the physical and biological characteristics and spatial composition of benthic habitats found within the RWEC-RI Study Area. These data are compared to existing data on the seafloor in Rhode Island Sound and Narragansett Bay for additional context concerning the habitats within the RWEC-RI Study Area. Results from the habitat mapping assessment will be used to evaluate the potential impacts for the Project to benthic habitats and to support Rhode Island state permitting efforts, as summarized above in Section 1.2. To achieve these results, high-resolution geophysical and ground-truth data were used to further delineate and refine geological seabed interpretations prepared for the Revolution Wind Marine Site Investigation Report (Revolution Wind, LLC 2021b) into a detailed benthic habitat map for the RWEC-RI.

[1] The Ocean SAMP describes Areas of Particular Concern: (APC): "Glacial moraines are important habitat areas for a diversity of fish and other marine plants and animals because of their relative structural permanence and structural complexity. Glacial moraines create a unique bottom topography that allows for habitat diversity and complexity, which allows for species diversity in these areas and creates environments that exhibit some of the highest biodiversity within the entire Ocean SAMP area. The Council also recognizes that because glacial moraines contain valuable habitats for fish and other marine life, they are also important to commercial and recreational fishermen. Accordingly, the Council shall designate glacial moraines as identified in Figures 11.3 and 11.4 as Areas of Particular Concern." CRMC 1160.2 (RI CRMC 2010)

2.0 INPUT DATA AND APPROACH

Multiple sources of geophysical and ground-truth data were used as input data sources for mapping benthic habitats within the RWEC-RI Study Area. Brief summaries of these data sources and details pertinent to their use in the habitat mapping process are described here. Full details of geophysical and ground-truth data collection, processing, and analysis are provided in the Marine Site Investigation Report (Revolution Wind, LLC 2021b) and benthic assessment report (Revolution Wind, LLC 2021c) appended to the Revolution Wind COP (Revolution Wind, LLC 2021a).

2.1 Input Data

2.1.1 Geophysical Data

To support Revolution Wind Site Investigations, Fugro USA Marine, Inc. (Fugro) conducted high-resolution multibeam echosounder (MBES) and side-scan sonar (SSS) surveys within the Project Area (Revolution Wind, LLC 2021b). MBES and SSS are collected using different instruments deployed from the same survey vessel (Figure 2-1). The MBES is mounted to the vessel and provides the highest degree of positional accuracy; the MBES can be optimized either for bathymetric or backscatter data, not for both. The geophysical surveys conducted for offshore wind development are designed to support engineering and construction design and, therefore, the MBES was optimized for bathymetric data and backscatter data were collected as an ancillary data product. Bathymetric data were derived from the MBES and processed to a resolution of 50 cm (Revolution Wind, LLC 2021b). Bathymetric data provide information on depth and seafloor topography (Figure 2-2). Backscatter data were derived from the MBES and processed to a resolution of 25 cm (Revolution Wind, LLC 2021b). Backscatter data are based on the strength of the acoustic return to the instrument and provide information on seafloor sediment composition and texture and are best interpreted in concert with hill-shaded bathymetry (Figure 2-3). Backscatter returns are relative (see below) and referred to in terms of low, medium, and high reflectance rather than absolute decibel values. Nominally softer, fine-grained sediments absorb more of the acoustic signal and a weaker signal is returned to the MBES. Although backscatter data provide valuable information about sediment grain size, decibel values reflect not only sediment grain size, but also compaction, water content, and texture (Lurton and Lamarche 2015). For example, sand that is hard-packed and sand that has prominent ripples may have higher acoustic returns than sediments of similar grain size that do not exhibit these characteristics.

In addition, backscatter decibel values are also influenced by water temperature and salinity, sensor settings, seafloor rugosity, and MBES operating frequency, among others (Lurton and Lamarche 2015; Brown et al. 2019). Differences in backscatter decibel values can also occur when data have been collected over a very large survey area under dynamic conditions, with different instruments, and in different years. This scenario is common and does not nullify the data; rather geophysicists and geographic information system (GIS) practitioners experienced at working with these data have developed methods to optimize processing (as appropriate to the sensors) and to display the data in a manner optimal for interpretation (Lurton and Lamarche

2015; Schimel et al. 2018). Backscatter data products vary based on processing (Lucieer et al. 2017) and data display procedures. Mapping of seafloor composition and habitats, while greatly aided by backscatter data, rarely relies solely on these data (see Table 1 in Brown et al. 2011). The manner in which the suite of data collected were used for habitat delineations is described further in Section 2.2.

SSS data were generated from a towed instrument and, thus, have a lower positional accuracy than MBES data. However, because the SSS is closer to the seafloor with a lower angle of incidence the resolution, signal to noise ratio and intensity contrast of SSS images are higher than those of MBES backscatter images (Lurton and Jackson 2008). The processed SSS images provide the highest resolution data on sediment textures and objects on the seafloor (boulders, debris) (Figure 2-4). Thermoclines and haline variations affected the acoustic signal and resulted in data artifacts, presenting as sinuous rippling of alternating low and high returns that could not be removed from the data; they are visible when viewed at very close range. SSS data were processed to a resolution of 10 cm along the RWEC-RI; this resolution permits detection of boulders but does not permit the reliable detection of individual cobbles (6.4 cm to 25.6 cm).

An artificial intelligence algorithm paired with a manual review step was used to aggregate boulders into boulder fields where they were present in low (20 – 99 per 10,000 m^2), medium (100 – 99 per 10,000 m^2) and high (>199 per 10,000 m^2) densities. (Revolution Wind, LLC 2021b). These density values were set by the Revolution Wind Site Investigations team; boulder fields are defined as a geoform by the federal Coastal and Ecological Marine Classification Standard (CMECS; FGDC 2012), however no density values are provided. Isolated individual boulders greater than or equal to 50 cm (0.5 m) outside the boulder fields were identified from the MBES and SSS data using automatic and manual detection methods to generate a “boulder pick” data set to accompany the boulder field dataset (Figure 2-5). In addition to individual boulders, other solitary objects (known as “contacts” in geophysical survey terminology), such as various types of debris were identified in this manner. A combination of these geophysical data was used to detect large and small-scale bedforms, such as mega-ripples and ripples (*sensu* BOEM 2020a) (Figure 2-6).

2.1.2 Ground-Truth Data

Sediment profile and plan view images (SPI/PV) were collected at 34 stations along the RWEC-RI Study Area in July 2019; 10 stations within Rhode Island Sound and 24 stations within Narragansett Bay (Figure 2-7). All 34 stations were within the footprint of the RWEC-RI Study Area; summarized data results are presented in Attachment A. SPI/PV images were used to ground-truth sediment types, bedform dynamics, presence of sensitive habitats and taxa, and to characterize benthic biological communities. SPI/PV images were analyzed for a suite of variables (Table 2-1) and were classified using CMECS Substrate and Biotic components (Table 2-2). CMECS Substrate Group/Subgroup was particularly useful as ground-truth data for purposes of delineating seafloor sediments and benthic habitats (Figure 2-8). CMECS Biotic Subclasses and notations of sessile and mobile epifauna present (Figure 2-9) were used to provide detail about the biological communities observed within each mapped habitat type. Detailed descriptions of each variable analyzed and full data analysis results can be found in the COP Benthic Assessment (Revolution Wind, LLC 2021c).

In addition, a towed video survey along 52 transect lines was conducted near the RWEC-RI landfall at Quonset Point (Figure 2-10). This survey focused on nearshore regions around the landfall where there was a higher probability of SAV presence. Survey planning and analysis followed protocols as outlined in federal agency protocols (Colarusso and Verkade 2016) and in the CRMC Red Book (detailed in Attachment B). Video transect data were analyzed to identify the presence or absence of SAV in each video file. Additional parameters were analyzed where SAV was present including SAV bed extent and general sediment type, in accordance with federal agency protocols (Colarusso and Verkade 2016).

2.2 Habitat Mapping Approach

Geophysical and ground-truth data were reviewed in an iterative process to delineate benthic habitats. MBES data, viewed as backscatter draped over a hill-shaded bathymetric relief model, was used at a “zoomed out” scale (~1:10,000) to identify large-scale facies – areas of sedimentary characteristics (reflectance, bedform, slope) distinct from those adjacent. These initial delineations were further refined at “zoomed in” scales (~1:2,000 or finer) using the MBES data in combination with SSS, boulder picks, and ground-truth data (Figure 2-11). Delineations must be of a size appropriate both to the resolution of the data and to the subject of interpretation. For these purposes, a minimum mapping unit (mmu) is defined as “the smallest size areal entity to be mapped as a discrete entity” (Lillesand et al. 2015). Minimum mapping units, the resolution of the geophysical data, and the use the CMECS Substrate Component meet agency recommendations (NOAA Habitat 2020, 2021).

2.2.1 Geological Seabed Characterization

Revolution Wind developed information on the geological seabed to characterize the geological provenance and stratigraphic conditions of the seafloor inclusive of surface and subsurface features. Methods used to collect this information included MBES bathymetry and backscatter, SSS, sub-bottom profile, magnetometer, and seismic profile data, along with vibracores. For the purposes of defining geological seabed types present at the sediment surface, the Folk classification (Folk 1954) was used, which aligns with CMECS Substrate classifications (Figure 2-12). Seabed types present along the RWEC-RI based solely on this scheme are Mud and Sandy Mud, Sand and Muddy Sand, and Coarse Sediment. In addition, areas of the seabed of unconsolidated and consolidated glacial drift deposits were mapped as Glacial Moraine and exposed bedrock was mapped as such. Anthropogenic features, such as dredged material and debris from the former Jamestown Bridge were also mapped as such. The geological seabed characterization map was developed using a minimum mapping unit of 4,000 m^2

2.2.2 Delineation of Benthic Habitat Types

Geological characterizations of seabed conditions are not strictly equivalent to benthic habitats as experienced by benthic biological communities and demersal fish. To map these habitats for the purposes of assessing the potential impacts of the Project on these biotic communities, INSPIRE refined the seabed interpretations to map benthic habitats with a minimum mapping unit of 2,000 m^2 along the RWEC-RI Study Area. Multibeam 50-cm resolution bathymetry, 25-cm resolution backscatter, and 10-cm SSS data were examined along with boulder picks and SPI/PV data (Figure 2-13) to delineate new habitat polygons and to refine the seabed classifications for the purposes of evaluating benthic habitats (Figure 2-14).

Modifiers were used to provide additional descriptive information about the benthic habitats found along the RWEC-RI; CMECS modifier and Geoform or Substrate terms were used to the extent practicable. These modifiers include features of the seafloor that are relevant to the biota that utilize these habitats and describe the value of the habitats for these biota beyond what is provided in the geological seabed mapping. Modifiers are related to features that describe the mobility, stability, and complexity of the benthic habitats mapped along the RWEC-RI. Where bedforms indicating frequent physical disturbance of the seafloor were observed, the “Mobile” modifier was used. Boulder fields mapped by Fugro were used to refine habitat boundaries and applied as modifiers, except where they overlapped with glacial habitats, as these habitats are all characterized by high densities of boulders. Shell substrate (living or non-living shells) and submerged aquatic vegetation both provide unique habitats for certain species of benthic invertebrates and demersal fish; modifiers have been applied for both.

Glacial moraine habitats do not fit neatly into the Folk or CMECS classification schemes and modifiers were not applied to these habitats as they were to those described above. Glacial moraines are complex and heterogeneous environments with characteristic surface and subsurface features that relate to their glacial origin. The surface benthic habitats associated with glacial moraines often provide valuable habitat for sessile and mobile benthic invertebrates and for demersal fish. Glacial Moraine habitats are presented as two types (A and B), in order to distinguish unconsolidated glacial moraine deposits (A) from consolidated moraine habitats that have high structural complexity and structural permanence (B).

All habitats and their distributions along the RWEC-RI Study Area are described in more detail in Section 3.0. In addition to the habitat data present on maps in this report, the geospatial data contain separate attributes to record several other features of each habitat polygon: type of bedforms observed, area, presence of scattered boulders and debris, and refinements of Coarse Sediment habitats. In addition to the natural bedforms defined in the BOEM Geophysical Survey Guidelines (2020a): mega-ripples = 5 - 60 m wavelength and 0.5 - 1.5 m height; ripples = <5 m wavelength and <0.5 m height; other bedforms such as linear depressions and trawl marks were noted where present. The presence of isolated boulders and debris identified by Fugro in the geophysical analysis (boulder picks and debris contacts) were noted as “scattered boulders and debris” in the habitat data. Additionally, further characterization of Coarse Sediment habitat polygons was recorded as “coarse sediment refinements” to provide additional detail on the nature of coarse sediment (e.g., gravelly sand or sandy gravel) where it could be reliably determined from ground-truth geophysical data. These data are available in the interactive Popup map which will be provided to CRMC upon request.

Table 2-1. SPI/PV Ground-truth Parameters with Corresponding BOEM COP Requirements and Guidelines (BOEM 2019, 2020b; NOAA Habitat 2021)

BOEM COP Guidelines and *NOAA*† *Recommendations*	**Parameters Derived from PV Images**	**Parameters Derived from SPI Images**
Classification of CMECS sediment type Grain size analysis	CMECS Substrate Group CMECS Substrate Subgroup Gravel measurements	Sediment type (based on grain size major mode)
Identification of distinct horizons in subsurface sediment	None	Sediment type (based on grain size major mode) Apparent Redox Potential Discontinuity (aRPD)*
Delineate hard bottom substrates	CMECS Substrate Group CMECS Substrate Subgroup	Sediment type (based on grain size major mode)
Identification of bedforms Characterization of physical hydrodynamic properties	Bedform type	Boundary roughness
Identification of rock outcrops and boulders Characterization and delineation of any hard bottom gradients of low to high relief such as coral (heads/reefs), rock or clay outcroppings, or other shelter-forming features	CMECS Substrate Group CMECS Substrate Subgroup Gravel measurements	None
Characterization of benthic habitat attributes	Gravel measurements Sediment Descriptor* Macrohabitat	aRPD* Prism penetration depth Sediment oxygen demand and proxies (methane, *Beggiatoa*)
Classification to CMECS Biotic Component to lowest taxonomic unit practicable	CMECS Dominant Biotic Subclass CMECS Co-occurring Biotic Subclass	None
Characterization of benthic community composition (identify and confirm benthic species (flora and fauna) that inhabit the area) Identification of communities of sessile and slow-moving marine invertebrates (clams, quahogs,	CMECS Dominant Biotic Subclass CMECS Co-occurring Biotic Subclass Epifauna* Sensitive taxa Attached Flora/Fauna Percent Cover* Burrows/Tubes/Tracks	Epifauna* Sensitive taxa Tubes/Voids Successional Stage*

BOEM COP Guidelines and *NOAA† Recommendations*	Parameters Derived from PV Images	Parameters Derived from SPI Images
mussels, polychaetes, anemones, sponges, echinoderms) *Identification of potentially sensitive seafloor habitat* *Identification of important biogenic habitats:* • *Hard bottom substrates with epifauna* • *Hard bottom substrates with macroalgae* • *Submerged aquatic vegetation (seagrass)* • *Long-lived and habitat forming taxa (e.g. emergent fauna)*	Macrohabitat	

† NOAA Habitat Recommendations are indicated by use of italicized characters and support BOEM Guidelines with further detail.

* Indicates variable that is a CMECS modifier. CMECS Modifiers provide additional detail to further characterize habitat components using a consistent set of definitions.

Table 2-2. CMECS Classification Levels Used in Analysis and Classifications for the Revolution Wind SPI/PV Survey in Rhode Island State Waters – Rhode Island Sound

CMECS Term	Scale of Classification	Classifications
	Substrate Component	
Substrate Origin	Site	Geologic Substrate
Substrate Class	SPI/PV	Unconsolidated Mineral Substrate
Substrate Subclass	SPI/PV	Fine Unconsolidated Substrate
+Substrate Group	PV	Sand or finer
+Substrate Subgroup	SPI	Silt-Clay; Very Fine Sand; Fine Sand; Medium Sand; Coarse Sand
	Biotic Component	
Biotic Setting	SPI/PV	Benthic/Attached Biota
Biotic Class	SPI/PV	Faunal Bed
Biotic Subclass	SPI/PV	**Soft Sediment Fauna**; Inferred Fauna
+Biotic Group	SPI/PV	**Larger Tube-Building Fauna; Larger Deep-Burrowing Fauna**; Small Tube-Building Fauna

+ Indicates variability within the surveyed area at this level of the hierarchy.
Bold text indicates an overwhelming dominant classification across the surveyed area.

Table 2-3. CMECS Classification Levels Used in Analysis and Classifications for the Revolution Wind SPI/PV Survey in Rhode Island State Waters – Narragansett Bay

CMECS Term	Scale of Classification	Classifications
Substrate Component		
Substrate Origin	Site	Geologic Substrate
Substrate Class	SPI/PV	Unconsolidated Mineral Substrate
Substrate Subclass	SPI/PV	Fine Unconsolidated Substrate
+Substrate Group	PV	**Sand**; Slightly Gravelly; Shell Substrate
+Substrate Subgroup	SPI	Silt-Clay; Very Fine Sand; Fine Sand; Medium Sand; Coarse Sand; Slightly Gravelly Sand; Crepidula Reef Substrate; Shell Hash;
Biotic Component		
Biotic Setting	SPI/PV	Benthic/Attached Biota
Biotic Class	SPI/PV	Faunal Bed
+Biotic Subclass	SPI/PV	**Soft Sediment Fauna**; Attached Fauna; Benthic Macroalgae; Inferred Fauna;
+Biotic Group	SPI/PV	**Larger Deep-Burrowing Fauna;** Larger Tube-Building Fauna; Small Tube-Building Fauna; Tracks and Trails; Attached Hydroids; Attached Sponges; Filamentous Algal Bed; Mussel Bed; Sessile Gastropods; Tunneling Megafauna

+ Indicates variability within the surveyed area at this level of the hierarchy.

Bold text indicates an overwhelming dominant classification across the surveyed area.

3.0 RESULTS

3.1 Benthic Habitat Types

Six primary benthic habitat types were mapped within the RWEC-RI: Glacial Moraine B, Glacial Moraine A, Coarse Sediment, Sand and Muddy Sand, Mud and Sandy Mud, and Bedrock. When habitats were updated with modifiers, a total of 17 were mapped within the RWEC-RI Study Area (12 within Rhode Island Sound and 14 within Narragansett Bay). In addition, Anthropogenic Features were mapped in several locations near landfall and near the Jamestown Bridge. Overall descriptions of each habitat type as observed across the RWEC-RI are provided below and descriptions of spatial distribution within the Rhode Island Sound and Narragansett Bay are provided in Section 3.2. Spatial distributions and characteristics of the benthic habitat types are summarized in Table 3-1 for Rhode Island Sound and Table 3-3 for Narragansett Bay. One very small (~0.01 acres) area of Mixed-Sized Gravel in Muddy Sand habitat was identified from aerial imagery along the shoreline west of the landfall location in Quonset Point; this habitat is not discussed further in the section below. Each of the benthic habitat categories mapped are also crosswalked to CMECS Substrate and Biotic component classifications using SPI/PV ground-truth data; these data are presented in Table 3-2 for Rhode Island Sound and in Table 3-4 for Narragansett Bay. Full data results by station are provided in Attachment A. A range of substrate and biotic communities were present within each benthic habitat category as expected, given the differences in observation scale between geophysical data and ground-truth point samples (Tables 3-2 and 3-4).

3.1.1 Glacial Habitats

Many of the habitats within the RWEC-RI have their origin in the region’s glacial history. Glaciation results in characteristic geologic remnants that indicate how glaciers sculpted the landscape and seascape. For example, Narragansett Bay and Rhode Island Sound were once both glacial lakes and Narragansett Bay is a drowned river valley that was shaped by actions of the Laurentide ice sheet during the last glacial period (~18,000 years ago). Channels cut by the ice are evident in the channels of the West and East Passages of the Bay on either side of Conanicut Island. Deglaciation and modern geological action have continued to influence the seafloor and benthic habitats found within Narragansett Bay and Rhode Island Sound. Subsurface expressions of glaciation are present in the study area and are reviewed in detail in the Marine Site Investigation Report (Revolution Wind, LLC 2021b); only the surface expression of these geologic features represent benthic habitats and are of relevance to the assessment presented here. Three of the primary benthic habitat types mapped for the present assessment are direct remnants of glaciation that remain present at the seafloor surface. These three habitat types are Glacial Moraine B, Glacial Moraine A, and Bedrock, all of which have distinct geophysical signatures (Figure 3-1). Due to the presence of very coarse and poorly sorted sediment, the seabed of these habitat types generally exhibits high reflectance in backscatter data and SSS data reveal distinct characteristics of each glacial habitat. Bedrock habitats consist of exposed outcroppings of bedrock, either present as solitary outcrops or in groupings of large bedrock outcrops (Figure 3-1). Glacial Moraine habitats, on the other hand, are complex habitat classification categories composed of consolidated and unconsolidated geologic debris directly deposited by glacial movement (rather than reworking from meltwaters or transgressive seas) and are limited in distribution along the outer continental shelf near New England.

A distinction was made between Glacial Moraine A and Glacial Moraine B habitats to distinguish between areas of unconsolidated geological debris (A) and consolidated geological debris (B). The surface of Glacial Moraine B deposits appeared poorly sorted and dense with very high boulder densities resulting in greater structural complexity and permanence. By comparison, the surfaces of Glacial Moraine A units have been reworked with sand and gravel deposits resulting in less structural complexity and permanence. More specifically, Glacial Moraine B habitats are characterized by marked topographic relief, highly consolidated cobble and boulder features that commonly lack loose / mobile cover sediments (Figure 3-1), and, in locations further offshore, evidence of striations oriented NNW-SSE. In contrast, densities of boulders are generally lower and distribution of cobbles and boulders is more dispersed and patchy within Glacial Moraine A habitats (Figure 3-1). The seabed of Glacial Moraine A habitats is typically irregular and contains loose mobile sediments near/at the boulders, which can also display morphological features (ripples). Generally, however, boulders appear chaotic with no apparent structural pattern. Because medium to high density boulder fields are typically a characteristic of both of these moraine habitats, boulder field modifiers were not applied to Glacial Moraine A & B habitat types.

Sediments include sand, small mobile gravel, and areas with high density of cobbles and boulders; small patchy areas of ripples are also present (Tables 3-1 and 3-3). Although the density of cobbles and boulders is generally high in areas designated as Glacial Moraine A, the areas of high density are rarely continuous; rather, distribution of cobbles and boulders is very patchy and not well captured by point sampling approaches (SPI/PV stations); therefore, a high degree of heterogeneity was observed among ground-truth sampling with few capturing features diagnostic of Glacial Moraine A & B habitats (cobbles, boulder, attached fauna) (Table 3-4). Glacial Moraine A & B habitats were limited in distribution in the RWEC-RI Study Area in both Rhode Island Sound (0.3%; Table 3-1) and Narragansett Bay (3%; Table 3-3). Within Rhode Island state waters, these moraine habitats were generally present as discrete surface outcroppings and reefs. Only one ground-truth SPI/PV station sampled Glacial Moraine B and none sampled Glacial Moraine A habitats (Tables 3-2 and 3-4). At that one station, the CMECS Substrate Subgroup was Slightly Gravelly Sand and a mix of CMECS Biotic Subclasses Soft Sediment Fauna and Attached Fauna (barnacles, sponges) were observed (Table 3-4). As noted in Section 5 of this report, Revolution Wind anticipates siting the RWEC-RI to avoid the areas of Glacial Moraine A and B identified within the broader RWEC-RI Study Area.

3.1.2 Coarse Sediment Habitats

Coarse Sediment habitat types encompass sands with varying degrees of gravel. The Coarse Sediment – Mobile habitat type describes these sand and gravel habitats where the seafloor is subjected to small, but frequent currents and storm events and is common on the outer continental shelf. The seafloor of these Coarse Sediment habitat types exhibited generally medium to high reflectance values in backscatter and SSS data (Figure 3-2). Expressions of these habitats in Rhode Island state waters was often characterized as gravelly sands collected with depressions on the seafloor surrounds by sand (Figure 3-2); depressions were most evident in bathymetric data and the coarser nature of the sediment was evident in backscatter data. Ripples and/or mega-ripples were prevalent in Coarse Sediment – Mobile habitats (Tables 3-1 and 3-3; Figure 3-3). Coarse Sediment – Mobile was limited in distribution in the RWEC-RI Study Area in both Rhode Island Sound (5%; Table 3-1) and Narragansett Bay (2%; Table 3-3). Coarse Sediment with Low or Medium Density Boulder Field were very limited in distribution in Rhode Island Sound (<0.1%; Table 3-1). Examples of Low and Medium Density Boulder Fields are provided in Figure 3-4. Only two ground-truth SPI/PV stations sampled Coarse Sediment habitats (Tables 3-2 and 3-4). At those two stations, the CMECS Substrate Subgroup was Sand and a mix of CMECS Biotic Subclasses Soft Sediment Fauna and Inferred Fauna (tracks and trails of mobile epifauna) were observed (Table 3-4). Taxa were generally comprised of amphipods, and mobile crustaceans and mollusks (Attachment A; Tables 3-2 and 3-4; Figure 2-9). In a few cases, ground-truth data and/or geophysical data supported a refinement of coarse sediment to Gravelly Sand.

3.1.3 Sand and Muddy Sand Habitats

The Sand and Muddy Sand habitat types consist of sand that has been subjected to a wide range of oceanic processes. These habitat types are very common on the outer continental shelf and were widespread in the RWEC-RI Study Area, both in Rhode Island Sound and in Narragansett Bay. The Muddy Sand included in this category has a high sand to mud ratio, ranging from an 8:2 sand to mud ratio to 100% sand (Figure 2-12). The seafloor of these habitats exhibited a range of values in backscatter and SSS data reflectance but were predominantly low to medium (Figure 3-2). The Sand and Muddy Sand – Mobile habitat type describes these sandy habitats where the seafloor is subjected to small but frequent currents and storm events where ripples and/or mega-ripples are prevalent. (Figure 3-3) These habitats and bedform comprised the majority of the Rhode Island Sound portion of the RWEC-RI Study Area (57%; Table 3-1). In addition to Sand and Muddy Sand – Mobile, sandy habitats within the RWEC-RI Study Area also included a small delta near the shoreline at Quonset Point and small areas coincident with Low and Medium Density Boulder Fields (Tables 3-1 and 3-3; Figure 3-4).

Thirteen ground-truth SPI/PV stations were sampled within Sand and Muddy Sand habitats within the RWEC-RI Study Area (Tables 3-2 and 3-4). The sediments within these habitats were generally composed of very fine and fine sands (Attachment A) and included the CMECS Substrate Subgroup of Sand or finer (Tables 3-2 and 3-4). The CMECS Biotic Subclasses of Soft Sediment Fauna and Inferred Fauna were observed within Sand and Muddy Sand – Mobile habitats (Tables 3-2 and 3-4). Of these, Soft Sediment Fauna were observed most frequently, with Inferred Fauna (epifaunal tracks and trails) generally observed as the co-occurring Subclass (Attachment A). Soft Sediment Taxa were generally comprised of large and small burrowing taxa, large and small tube-building taxa, amphipods, and mobile crustaceans and mollusks (Attachment A; Tables 3-2 and 3-4; Figure 2-9A). In the non-mobile Sand and Muddy Sand habitats sampled with SPI/PV in Narragansett Bay, sediments ranged from fine to coarse sand with sparse gravel presence and benthic macroalgae and sponges were observed (Table 3-4; Figure 2-9D).

3.1.4 Mud and Sandy Mud Habitats

The Mud and Sandy Mud habitat types consist of relatively featureless mud and sand, except where described by modifiers for boulder fields, shell substrate, and SAV. The sand to silt/clay ratio within these habitat types is expected to be less than 8:2 (Figure 2-12). The seafloor of these habitats exhibited predominantly low backscatter and SSS data reflectance (Figure 3-5) indicating that the surface is less dense and the sediments more fine-grained compared to other habitat types. Backscatter values were higher and of medium reflectance in one area in Narragansett Bay where Shell Substrate was evident in ground-truth data and was used as a modifier to these habitats (15%; Tables 3-3 and 3-4; Figure 3-5). These Shell Substrates were composed of both living and dead mollusks (Table 3-4; Figures 2-9B and 2-9C) namely blue mussels and Crepidula. These habitats also support mobile mollusks and crustaceans (Table 3-4). A very small area of Mud and Sandy Mud with SAV habitat was observed and mapped near the shoreline at Quonset Point in Narragansett Bay based on aerial imagery and ground-truth video data (0.004%; Table 3-3; Figure 3-6). In addition, very small areas of Mud and Sandy Mud were coincident with Low Density Boulder Fields (0.05% and 0.45%; Tables 3-1 and 3-3). Trawl marks related to fishing activity were also observed within many of the Mud and Sandy Mud habitats mapped (Tables 3-2 and 3-4).

Thirteen ground-truth SPI/PV stations were sampled within Mud and Sandy Mud habitats, and five within Mud and Sandy Mud with Shell Substrate habitats, within the RWEC-RI Study Area (Tables 3-2 and 3-4). The sediments within these habitats were generally composed of very fine sands and silt/clay (Attachment A) and included the CMECS Substrate Subgroup of Sand or finer (Tables 3-2 and 3-4). The CMECS Biotic Subclasses of Soft Sediment Fauna and Inferred Fauna were observed within Mud and Sandy Mud habitats (Tables 3-2 and 3-4). Of these, Soft Sediment Fauna were observed most frequently, with Inferred Fauna (epifaunal tracks and trails) generally observed as the co-occurring Subclass (Attachment A). Soft Sediment Taxa were generally comprised of large and small burrowing taxa, large and small tube-building taxa, amphipods, and mobile crustaceans and mollusks (Attachment A; Tables 3-2 and 3-4; Figure 2-9A). In the Mud and Sandy Mud with Shell Substrate habitats, CMECS Substrate Subgroups included Crepidula Reef Substrate and Shell Hash and the Biotic Subclasses included Soft Sediment Fauna, Inferred Fauna, and Attached Fauna (Tables 3-2 and 3-4). Sessile and mobile epifauna characteristic of these habitats were observed, namely blue mussels, barnacles, Crepidula, and mobile crustaceans and mollusks (Tables 3-2 and 3-3; Figures 2-9B and 2-9C).

3.1.5 Anthropogenic Features

Distinct features of anthropogenic origin were mapped on the seafloor within the RWEC-RI Study Area in Narragansett Bay. These features may provide some habitat value but are considered separately from the primary habitats evaluated. A series of structural objects and debris associated with the demolition of the old Jamestown Bridge were identified in geophysical data (Figure 3-7). A number of shoreline-related structures such as boat ramps and revetment walls along the shoreline in Quonset Point were identified in aerial imagery. Two areas of dredged material were also identified, one near the landfall location and one just south of the Jamestown Bridge.

3.2 Benthic Habitat Distributions

Distributions of benthic habitat types in the RWEC-RI Study Area are related to a combination of ancient and modern geological events in the region. The geophysical and benthic survey data collected by Revolution Wind have refined the understanding of the distribution of the habitats within Rhode Island Sound and Narragansett Bay. While six primary benthic habitat types were mapped, 17 with modifiers, not all types were present in each portion of the RWEC-RI Study Area. In addition, a few anthropogenic features (dredged material, demolition debris, revetment walls) was also mapped within Narragansett Bay. Habitat composition and characteristics and corresponding ground-truth data within the RWEC-RI Study Area in Rhode Island Sound are provided in Tables 3-1 and 3-2. Habitat composition and characteristics, and corresponding ground-truth data within the RWEC-RI Study Area in Narragansett Bay are provided in Tables 3-3 and 3-4.

3.2.1 Rhode Island Sound

A total of 1,629 acres were mapped within the RWEC-RI Study Area in Rhode Island state waters. Sand and Muddy Sand – Mobile was the primary habitat type mapped (930 acres, 57%), followed by Mud and Sandy Mud (450 acres, 28%) (Table 3-1; Figures 3-8 and 3-9). Sand and Muddy Sand without prevalent ripples was also present in patches totaling 143 acres (~9%) along a section of the RWEC-RI mostly characterized as Mud and Sandy Mud (Figure 3-10). The remainder of the habitats mapped within Rhode Island Sound were small areas of Coarse Sediment, Glacial Moraine A & B, Bedrock, and non-moraine habitats with Low or Medium Density Boulder Fields interspersed within the predominant sand and mud habitats (Table 3-1; Figures 3-9 and 3-10). Boulder fields were generally associated with areas of coarse sediment and bedrock, particular in the region of Brenton Reef, near the dividing line with Narragansett Bay (Figure 1-2).

Ten ground-truth SPI/PV stations were sampled within the RWEC-RI Study Area in Rhode Island Sound, seven in Sand and Muddy Sand – Mobile habitats and three in Mud and Sandy Mud habitats. As expected, the CMECS Substrate Subgroup of Sand was recorded at all of these stations and grain size major mode as measured in SPI ranged from very fine sand over silt/clay to fine sand (Table 3-1; Figure 3-11). Although all habitat types were dominated by Soft Sediment Fauna (Attachments A), a few patterns were evident at the Biotic Group classification level (Figure 3-12). Small and Larger Tube-building Fauna were the predominant Biotic Group observed in the sand and mud habitats furthest offshore and Larger Deep-Burrowing Fauna were the predominant group in the Sand and Muddy Sand – Mobile habitats at Brenton Reef close to the dividing line with Narragansett Bay (Figure 3-12).

Table 3-1. Composition & Characteristics of Mapped Benthic Habitat Types within the RWEC-RI Study Area – Rhode Island Sound

Rhode Island Sound *(~1,629 acres mapped)*	**Presence in Project Area**		**Bedforms** *Type Present in Given Percentage of Habitats*			
	Area (acres)	Percentage of Project Area	Mega-ripples	Ripples	Linear Depression	Trawl marks
Glacial Moraine B	3	0.2%	0%	46%	0%	0%
Glacial Moraine A	2	0.1%	0%	0%	0%	0%
Coarse Sediment with Medium Density Boulder Field	0.6	0.04%	0%	100%	0%	0%
Coarse Sediment with Low Density Boulder Field	0.5	0.03%	0%	54%	0%	0%
Coarse Sediment - Mobile	80	5%	0%	100%	13%	0%
Sand and Muddy Sand with Medium Density Boulder Field	5	0.3%	0%	0%	0%	0%
Sand and Muddy Sand with Low Density Boulder Field	2	0.1%	0%	87%	0%	0%
Sand and Muddy Sand - Mobile	930	57%	98%	100%	47%	0%
Sand and Muddy Sand	143	9%	0%	8%	2%	0%
Mud and Sandy Mud with Low Density Boulder Field	1	0.05%	0%	0%	0%	100%
Mud and Sandy Mud	450	28%	0%	0%	0%	57%
Bedrock	12	1%	0%	69%	0%	0%

Table 3-2. Characteristics of Mapped Benthic Habitat Types as Informed by SPI/PV Ground-truth Data within the RWEC-RI Study Area – Rhode Island Sound

Rhode Island Sound *(~1,629 acres mapped)*		**Sand and Muddy Sand - Mobile**	**Mud and Sandy Mud**
SPI/PV Ground-truth Values	Number of SPI/PV stations	7	3
	CMECS Substrate Subgroups Observed in Ground-truth Data	Sand or finer	Sand or finer
	CMECS Biotic Subclasses Observed in Ground-truth Data	Inferred Fauna, Soft Sediment Fauna	Inferred Fauna, Soft Sediment Fauna
	Maximum Percent Cover of Attached Fauna Observed in Ground-truth Data	None	None
	Sessile Epifauna Observed in Ground-truth Data	None	None
	Mobile Epifauna Observed in Ground-truth Data	Ampeliscid Amphipod, Gastropod(s), Moon Snail, Paguroid, Podocerid Amphipod, Shrimp	Ampeliscid Amphipod, Crab, Podocerid Amphipod

3.2.2 Narragansett Bay

A total of 4,100 acres were mapped within the RWEC-RI Study Area in Narragansett Bay. Mud and Sandy Mud comprised the majority of primary habitat types mapped (~65%; Table 3-3) followed by Sand and Muddy Sand, which totaled nearly 30% of habitats mapped (Table 3-3). Coarse Sediment, Glacial Moraine A, and Glacial Moraine B habitats each represented between 1 and 2% of the area mapped within the RWEC-RI in Narragansett Bay (Table 3-3). Bedrock, Mixed-Size Gravel in Muddy Sand habitats, and Anthropogenic features each represented less than 1% of the area mapped (Table 3-3). Sand and Muddy Sand habitats were located on the northwestern side of Conanicut Island north of the Jamestown Bridge and near the mouth of the Bay at Brenton Reef where Coarse Sediment habitats were interspersed within the sand matrix (Figure 3-13). Glacial Moraine A and B as well as Bedrock habitats were present at the edges of the RWEC-RI Study Area and near Conanicut and Dutch Islands within the West Passage of Narragansett Bay (Figure 3-13). Boulder fields in the Bay were generally associated with these same areas where outcroppings of bedrock and moraine were mapped (Figure 3-14). Anthropogenic features were mapped near the Jamestown Bridge and near the shoreline at Quonset Point (Figure 3-13).

Additional detail emerges when benthic habitats are described with modifiers (Figure 3-15). Notably, a large area of Mud and Sandy Mud habitat south of the Jamestown Bridge was characterized by a surface of Shell Substrate and comprised approximately 620 acres and 15% of the habitats mapped with the RWEC-RI Study Area in Narragansett Bay (Table 3-3; Figure 3-15). Sand and Muddy Sand – Mobile was mapped at the mouth of the Bay, whereas Sand and Muddy Sand habitats in the West Passage were not assigned the Mobile modifier because ripples did not dominate the habitat features, although there was some evidence of ripples in these habitats (Table 3-3; Figure 3-15). Smaller areas with distinct characteristics were captured with modifiers as well. Discrete areas of Sand and Muddy Sand and Mud and Sandy Mud with Low Density Boulder Fields were mapped near the Glacial Moraine habitats on the edges of Conanicut and Dutch Islands (Figure 3-15). A Sand and Muddy Sand – Delta was evident in aerial imagery along the shoreline at Quonset Point west of the landfall, as were areas of Coarse Sediment – Mobile and a very small area of Mixed-Sized Gravel in Muddy Sand (Figure 3-16). Mud and Sandy Mud with SAV was mapped to the east of the proposed landfall location (Figure 3-16).

Twenty-four ground-truth SPI/PV stations were sampled within the RWEC-RI Study Area in Narragansett Bay, ten in Mud and Sandy Mud habitats, five in Mud and Sandy Mud with Shell Substrate habitats, three within Sand and Muddy Sand habitats, three within Sand and Muddy Sand – Mobile habitats, two within Coarse Sediment – Mobile habitats, and one within Glacial Moraine B habitats. The CMECS Substrate Subgroup of Sand was recorded within all of these habitats with the exception of Glacial Moraine B and Mud and Sandy Mud with Shell Substrate habitats (Table 3-4; Figure 3-17). The Substrate Subgroup of Slightly Gravelly Sand was observed in Glacial Moraine B and Sand and Muddy Sand habitats, and Shell Hash and Crepidula Reef Substrate were recorded within Mud and Sandy Mud with Shell Substrate habitats (Table 3-4). The grain size major mode as measured in SPI within the Mud and Sandy

Mud with Shell Substrate habitats was silt/clay and in Mud and Sandy Mud ranged from very fine sand over silt/clay to very fine sand (Attachment A; Figure 3-17). The grain size major mode as measured in SPI within Sand and Muddy Sand habitats was very fine to medium sand, within Coarse Sediments habitats was fine to coarse sand, and within Glacial Moraine B was fine sand (Attachment A; Figure 3-17).

Most habitat types were dominated by Soft Sediment Fauna, with Attached Fauna dominating in Glacial Moraine B and Mud and Sandy Mud with Shell Substrate habitats. Benthic Macroalgae was the dominant Subclass at one Sand and Muddy Sand station (Attachment A), and additional patterns were evident at the Biotic Group classification level (Figure 3-12). Small and Larger Tube-Building Fauna were the predominant Biotic Group observed in the sand and mud habitats furthest offshore and Larger Deep-Burrowing Fauna were the predominant group in the Sand and Muddy Sand – Mobile habitats at Brenton Reef close to the dividing line with Narragansett Bay (Figure 3-12). Biotic Groups of Larger Deep-Burrowing Fauna were prevalent across the sand and mud habitats at the mouth of the Bay and within the West Passage, except in the section of Mud and Sandy Mud with Shell Substrate habitats where Sessile Gastropods, Mussel Bed, Attached Hydroids, and Small Tube-Building Fauna were the predominant Biotic Groups (Attachment A; Figure 3-18). Small Tube-Building Fauna were also the predominant Biotic Group in Sand and Muddy Sand near Brenton Reef at the mouth of Narragansett Bay and within Coarse Sediment - Mobile habitats (Attachment A; Figure 3-18). Attached Sponges were observed at Station 452 (north of the Jamestown Bridge) coincident with Glacial Moraine B habitats (Attachment A; Figure 3-18). Other Biotic Groups observed within sand and mud habitats included Tunneling Megafauna, Small and Larger Tube-Building Fauna and Tracks and Trails related to mobile epifauna (Attachment A; Figure 3-18).

Table 3-3. Composition & Characteristics of Mapped Benthic Habitat Types within the RWEC-RI Study Area – Narragansett Bay

Narragansett Bay *(~4,100 acres mapped)*	**Presence in Project Area**		**Bedforms** Type Present in Given Percentage of Habitats			
	Area (acres)	Percentage of Project Area	Mega-ripples	Ripples	Linear Depression	Trawl marks
Glacial Moraine B	47	1%	0%	0%	0%	0%
Glacial Moraine A	87	2%	0%	2%	0%	0%
Mixed - Sized Gravel in Muddy Sand	0.01	0.0002%	0%	0%	0%	0%
Coarse Sediment - Mobile	69	2%	0%	99%	7%	0%
Sand and Muddy Sand with Low Density Boulder Field	20	0.5%	0%	0%	0%	0%
Sand and Muddy Sand - Mobile	392	10%	100%	100%	100%	0%
Sand and Muddy Sand - Delta	0.3	0.01%	0%	0%	0%	0%
Sand and Muddy Sand	735	18%	0%	88%	0%	4%
Mud and Sandy Mud with Low Density Boulder Field	19	0.5%	0%	0%	0%	43%
Mud and Sandy Mud with Shell Substrate	620	15%	0%	0%	0%	100%
Mud and Sandy Mud with SAV	0.2	0.004%	0%	0%	0%	0%
Mud and Sandy Mud	2,060	50%	0%	0%	0%	79%
Bedrock	27	0.7%	0%	0%	0%	0%
Anthropogenic	26	0.6%	0%	0%	0%	0%

Table 3-4. Characteristics of Mapped Benthic Habitat Types as Informed by SPI/PV Ground-truth Data within the RWEC-RI Study Area – Narragansett Bay

Narragansett Bay *(~4,100 acres mapped)*		Glacial Moraine B	Coarse Sediment - Mobile	Sand and Muddy Sand - Mobile	Sand and Muddy Sand	Mud and Sandy Mud with Shell Substrate	Mud and Sandy Mud
SPI/PV Ground-truth Values	Number of SPI/PV stations	1	2	3	3	5	10
	CMECS Substrate Subgroups Observed in Ground-truth Data	Slightly Gravelly Sand	Sand or finer	Sand or finer	Slightly Gravelly Sand, Sand or finer	Crepidula Reef Substrate, Shell Hash	Sand or finer
	CMECS Biotic Subclasses Observed in Ground-truth Data	Attached Fauna, Soft Sediment Fauna	Inferred Fauna, Soft Sediment Fauna	Inferred Fauna, Soft Sediment Fauna	Benthic Macroalgae, Soft Sediment Fauna	Attached Fauna, Inferred Fauna, Soft Sediment Fauna	Soft Sediment Fauna
	Maximum Percent Cover of Attached Fauna Observed in Ground-truth Data	Sparse (1 to <30%)	None	None	Moderate (30 to <70%)	Complete (90-100%)	Sparse (1 to <30%)
	Sessile Epifauna Observed in Ground-truth Data	Barnacles, Sponge(s)	None	None	Sponge(s)	Barnacles, Hydroids, Mussels, Sponges	Barnacles, Hydroids
	Mobile Epifauna Observed in Ground-truth Data	Gastropod(s)	Gastropod(s), Paguroid(s), Podocerid Amphipod	Gastropod(s), Moon Snail, Paguroid(s), Podocerid Amphipod	Gastropod, Whelk	Crab, Crepidula, Gastropod, Jonah Crab	Crab(s), Gastropod(s), Paguroid(s), Podocerid Amphipod, Shrimp

4.0 DISCUSSION OF BENTHIC HABITATS AND BIOLOGICAL VALUE

The habitats mapped within the RWEC-RI Study Area and in Rhode Island Sound were primarily dynamic sands and muds typical of offshore environments in Southern New England. These habitats provide a mix of mobile sands and depositional muddy environments that support a combination of small and large tube-building and burrowing infauna, as well as mobile epifauna (mollusks and crustaceans). Monitoring results from the nearby Brenton Reef Disposal Site, which is located just north of RWEC-RI in Rhode Island Sound (Figure 1-2) indicate that the soft, muddy sediments and related infaunal and epifaunal communities mapped within the RWEC-RI Study Area are typical of the area (Carey et al. 2012). Where Low or Medium Density Boulder Fields coincide with these sand and mud habitats, structure is provided that supports attached fauna and demersal fish, such as black sea bass and tautog, that utilize hard bottom substrates and structure. A variety in benthic habitats is present near the mouth of Narragansett Bay at Brenton Reef. Outcroppings of Bedrock, Glacial Moraine B, and Glacial Moraine A habitats, which also provide valuable structure, were mapped at the end of the RWEC-RI Study Area. Discrete areas of Coarse Sediment - Mobile habitats were mapped within depressions in the seafloor interspersed within a Sand and Muddy Sand – Mobile matrix. This mapping effort adds to the collective understanding of benthic habitats in the offshore waters of Narragansett Bay near Brenton Reef and the Rhode Island state waters line given that few published benthic studies cover this specific area.

The benthic habitats mapped within the RWEC-RI Study Area and in Narragansett Bay, from the West Passage to Quonset Point, were primarily depositional muds and sandy mud. These habitats support a combination of small and large tube-building and burrowing infauna, as well as mobile epifauna (mollusks and crustaceans). Where these habitats are modified by shell substrate, additional taxa are supported, such as blue mussels and sessile gastropods (i.e., Crepidula), that provide filtration ecosystem services. In shallow nearshore water, mud and sandy mud habitats may support SAV beds, such as the one mapped to the east of the landfall location at Quonset Point. As noted in Section 5, Revolution Wind will avoid SAV mapped at Quonset Point by utilizing horizontal directional drilling (HDD) to install the RWEC-RI at the landfall location. These habitats also provide important ecosystem services related to water clarity and nutrient cycling, and provide habitat for invertebrates and demersal fish, particularly juveniles. Outcroppings of Bedrock, Glacial Moraine B, and Glacial Moraine A habitats were mapped within the RWEC-RI Study Area near Conanicut and Dutch Islands within the West Passage of Narragansett Bay. These habitats, as well as nearby Low or Medium Density Boulder Fields coincident with sand and mud habitats, provide structure that supports attached fauna such as sponges and, in shallower photic waters, flora such as benthic macroalgae, as well as demersal fish, such as black sea bass and tautog, that utilize hard bottom substrates and structure. As noted in Section 5, Revolution Wind anticipates siting the RWEC-RI to avoid the areas of Glacial Moraine A and B identified within the broader RWEC-RI Study Area.

Several recently published studies are available in the peer-reviewed and gray literature related to benthic habitats and fauna within the West Passage of Narragansett Bay (e.g., LaFrance et al. 2019; Hale et al. 2018; Shumchenia and King 2019; Shumchenia et al. 2016). The benthic habitats and their characterizing sediments and benthic biological communities as mapped for this Revolution Wind assessment generally agree with recent biotopes mapped from a SPI survey conducted throughout the Bay (Shumchenia and King 2019). For example, “Mud with shell hash” was the biotope identified at the sampling station coincident with the Mud and Sandy Mud with Shell Substrate habitat type mapped within the RWEC-RI Study Area. Similarly, mud dominated by burrowing fauna was documented at a station sampled at the south end of the West Passage in the vicinity of Mud and Sandy Mud habitats with the predominant Biotic Group of Larger Deep-Burrowing Fauna. There was similar concordance between the two data near Quonset Point. In contrast, recent surficial sediment and benthic habitat maps compiled from a suite of geophysical data and sediment grab samples show the West Passage as having a higher gravelly component compared with the habitats mapped within the RWEC-RI (LaFrance et al. 2019). Gravelly muddy sand is mapped where the Mud and Sandy Mud with Shell Substrate habitat type was identified, and gravelly sands were mapped north and south of the Jamestown Bridge where Sand and Muddy Sand habitats with fine to slightly gravelly sands were mapped. The authors of this report (LaFrance et al. 2019) recommend caution when using their maps as the sediment units represent average dominant sediment type from a suite of samples that were collected over a time period of 50 years; the geophysical data used was also collected over a time period from 2006 to 2012. Therefore, the habitats mapped within the RWEC-RI are more likely to be representative of current conditions, particularly given the concordance with 2018 biotope data (Shumchenia and King 2019).

SAV beds, dominated by *Zostera marina*, represent unique habitats throughout the shallow coastal waters of Narragansett Bay and their distribution is periodically mapped across the Bay using aerial imagery and field verification by the URI Environmental Data Center (URI Environmental Data Center and RIGIS). SAV extent varies over time and these aquatic plants experience peak growth during late summer months. SAV are found in mud and muddy sand sediments, and a single Mud and Sandy Mud with SAV habitat was mapped within the area east of the landfall location.

5.0 SUMMARY AND CONCLUSIONS

The benthic habitats mapped within the RWEC-RI Study Area that are currently subject to CRMC regulations include Mud and Sandy Mud with SAV, Glacial Moraine B, and Glacial Moraine A. All three of these habitats were limited in their distribution within the mapped RWEC-RI Study Area and were mostly located on the periphery.

Mud and Sandy Mud with SAV habitats totaled 0.004% (0.2 acres) of the habitats mapped within the RWEC-RI Study Area in Narragansett Bay. The western edge of the SAV habitat mapped at Compass Rose Beach is approximately 845 feet (257 m) east of the proposed location of HDD exit pits. SAV beds are found in shallow coastal areas throughout the Bay, including along the western shores of Conanicut and Dutch Islands, proximal to the RWEC-RI route. The nearest SAV bed within the West Passage is approximately 1,150 ft (350 m) from the indicative RWEC-RI route, on the western side of Dutch Island. At a distance of 1,150 ft (350 m), SAV habitat near the indicative cable route is 115 ft (35 m) beyond the projected impact distance for deposition and is within the projected impact distance for elevated turbidity (RPS 2021). The SAV bed mapped at the landfall location during the 2020 video survey is 105 ft (32 m) beyond the projected impact distance for deposition and is within the projected impact distance for elevated turbidity (RPS 2021).

Revolution Wind will utilize an HDD cable installation methodology to avoid documented SAV near the Project's landfall location. In addition, Revolution Wind will avoid construction during the peak SAV growing season (i.e., July 1 to September), which will minimize potential effects due to increased turbidity and sediment deposition associated with cable installation and excavation of the HDD exit pits.

Collectively, Glacial Moraine A and B habitats comprised 0.3% (5 acres) of the habitats mapped in the portion of the RWEC-RI Study Area in Rhode Island Sound and 3% (132 acres) of the habitats mapped in the portion of the Study Area in Narragansett Bay. A distinction was made between Glacial Moraine A and Glacial Moraine B habitats to distinguish between areas of unconsolidated geological debris (A) and consolidated geological debris (B). The surface of Glacial Moraine B deposits appeared poorly sorted and dense with very high boulder densities resulting in greater structural complexity and permanence. By comparison, the surface of Glacial Moraine A units was reworked with sand and gravel deposits resulting in less structural complexity and permanence. Glacial Moraine B and Glacial Moraine A benthic habitats were discrete areas of surface deposits along the edges of the RWEC-RI Study Area and were limited in distribution.

As described in Section 1.1, the RWEC-RI Study Area represents a broad area evaluated by Revolution Wind for siting of the export cables. Revolution Wind anticipates avoidance of Glacial Moraine A and B with siting of the RWEC-RI. Should complete avoidance of Glacial Moraine A and B habitats not be possible due to other, currently unknown, constraints (e.g., unexploded ordnance), Revolution Wind will take all feasible efforts to avoid any damage to the glacial moraine benthic habitats.

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Benthic Habitats in Rhode Island State Waters

Revolution Wind Offshore Wind Farm

FIGURES

Prepared for:

Revolution Wind | Powered by Ørsted & Eversource

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INSPIRE ENVIRONMENTAL

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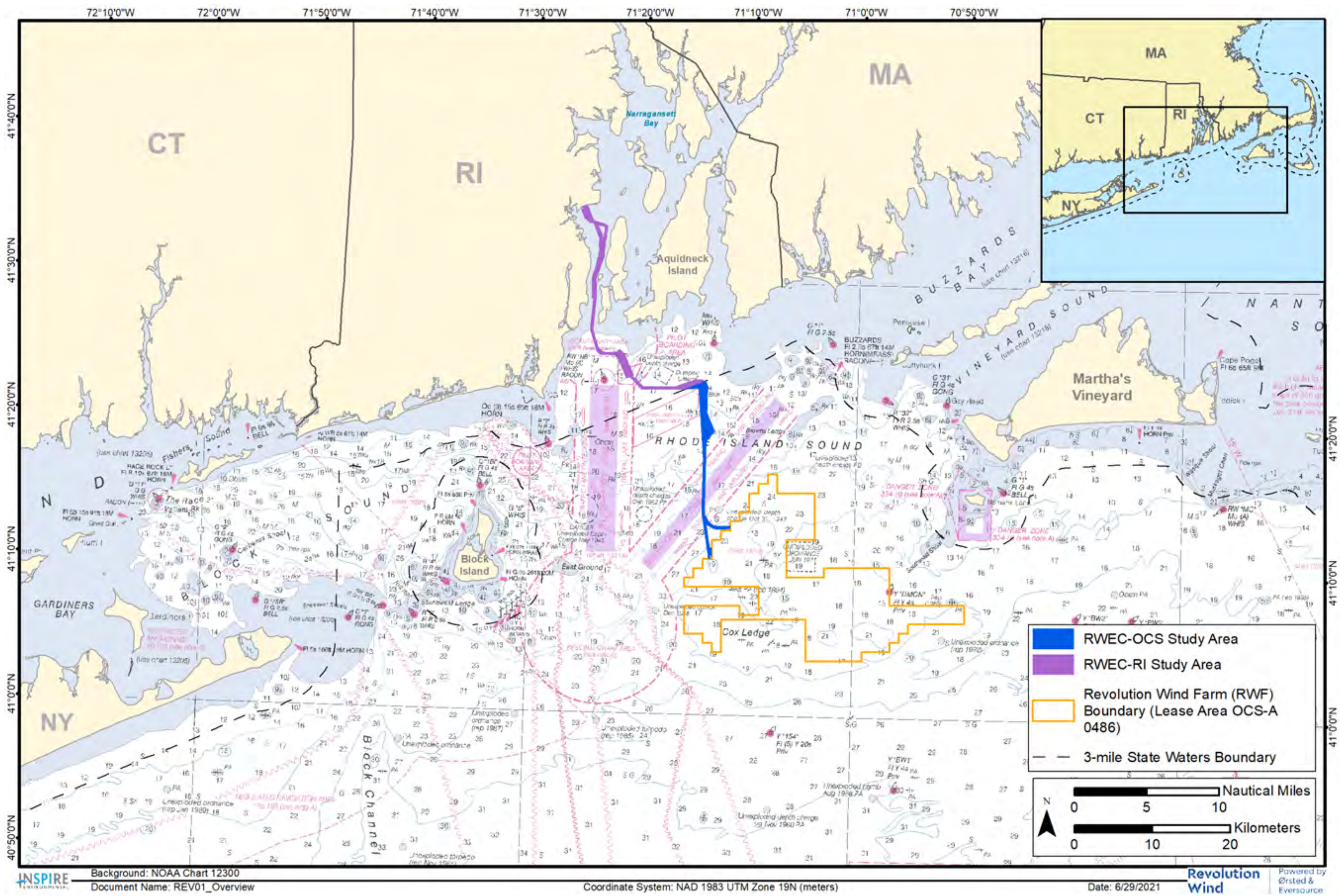

Figure 1-1. Location of the planned Revolution Wind Farm (RWF) and Export Cable Study Area (RWEC)

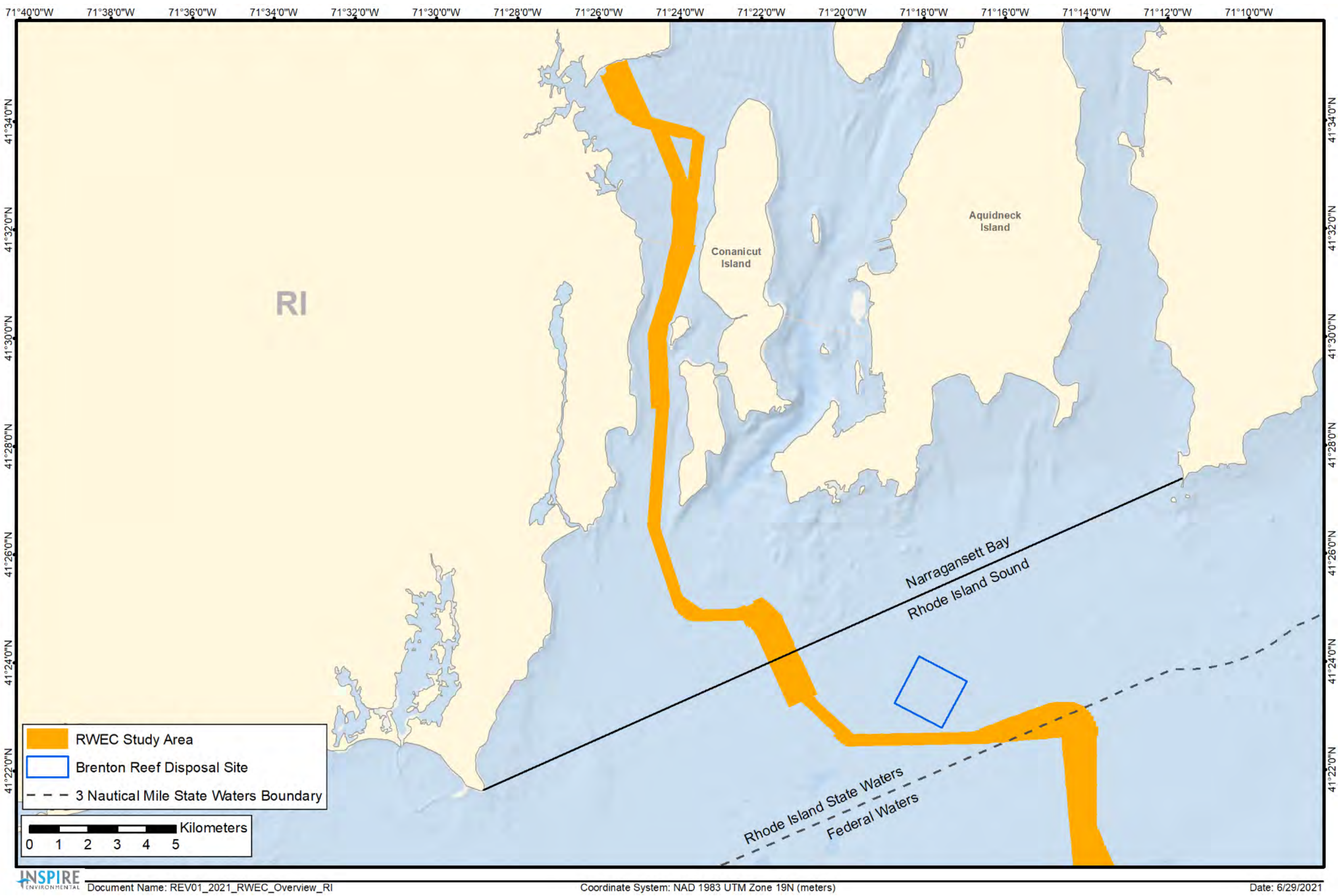

Figure 1-2. Location of the RWEC Study Area in Rhode Island state waters (RWEC-RI), including Rhode Island Sound and Narragansett Bay; the location of the Brenton Reef Disposal Site is shown for reference

Figure 1-3. Potential landfall of the RWEC at Quonset Point in North Kingstown, RI, including the RWEC-RI Study Area

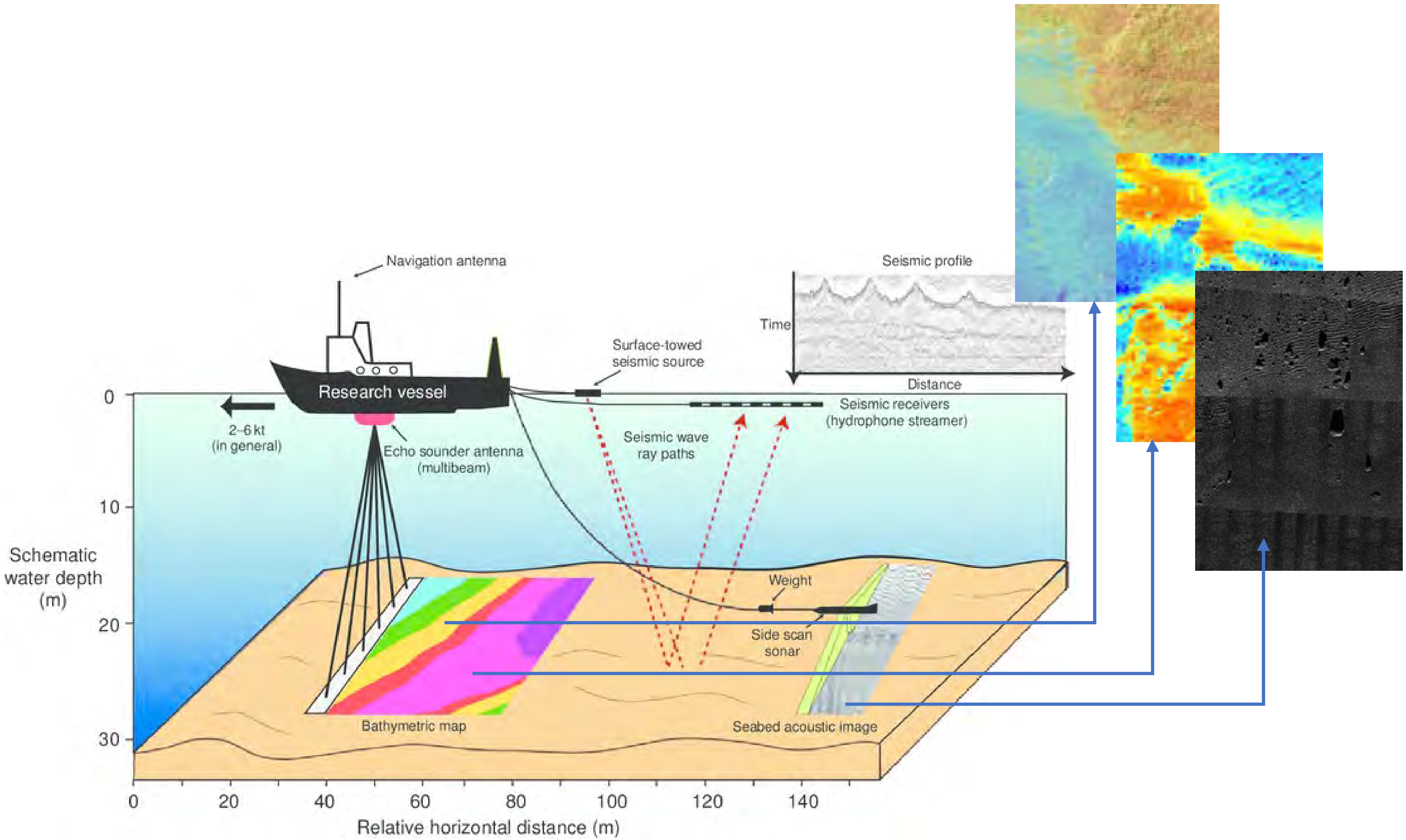

Figure 2-1. Schematic depicting a standard acoustic survey vessel set-up and data collection (after Garel et al. 2009)

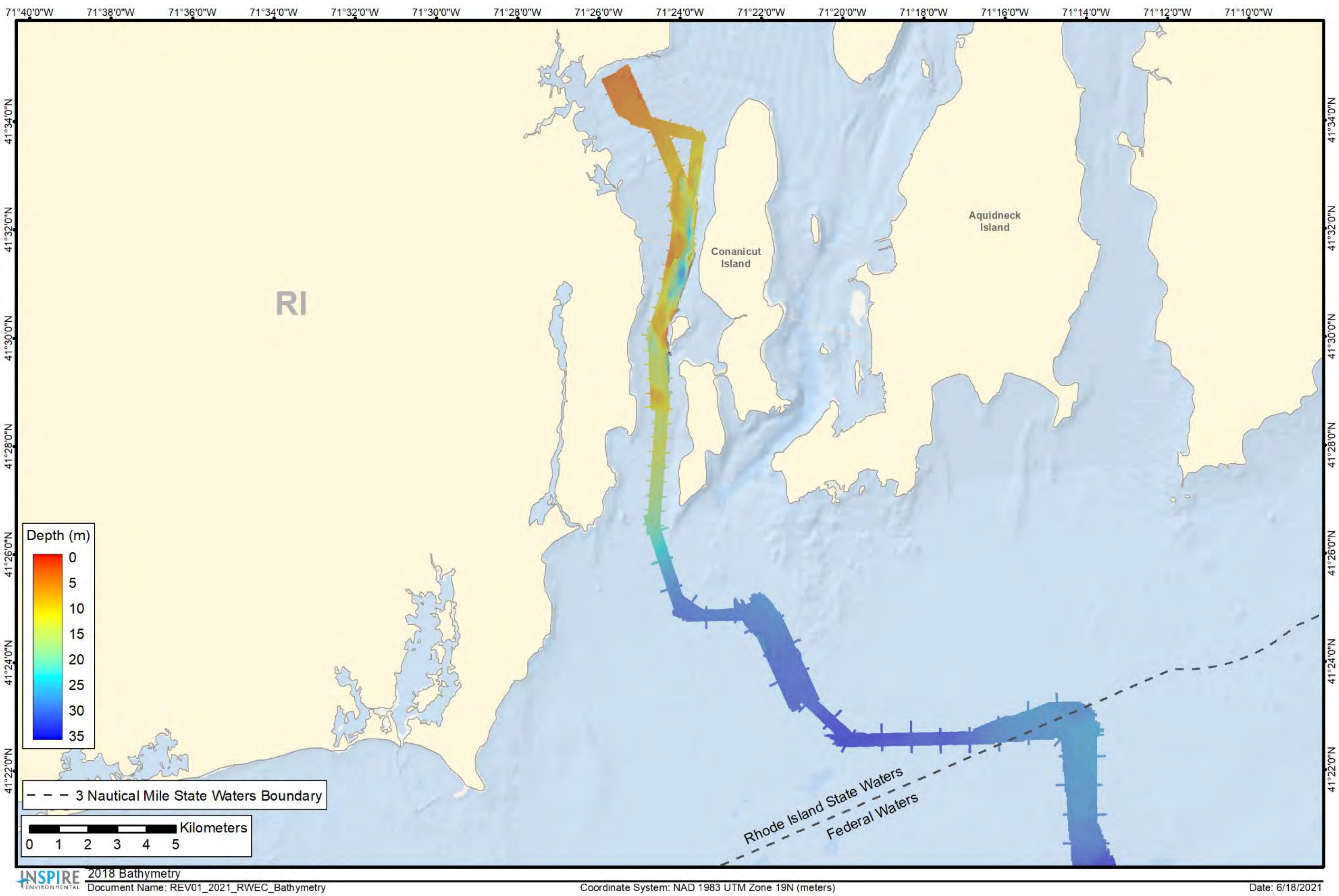

Figure 2-2. Bathymetric data along the RWEC-RI

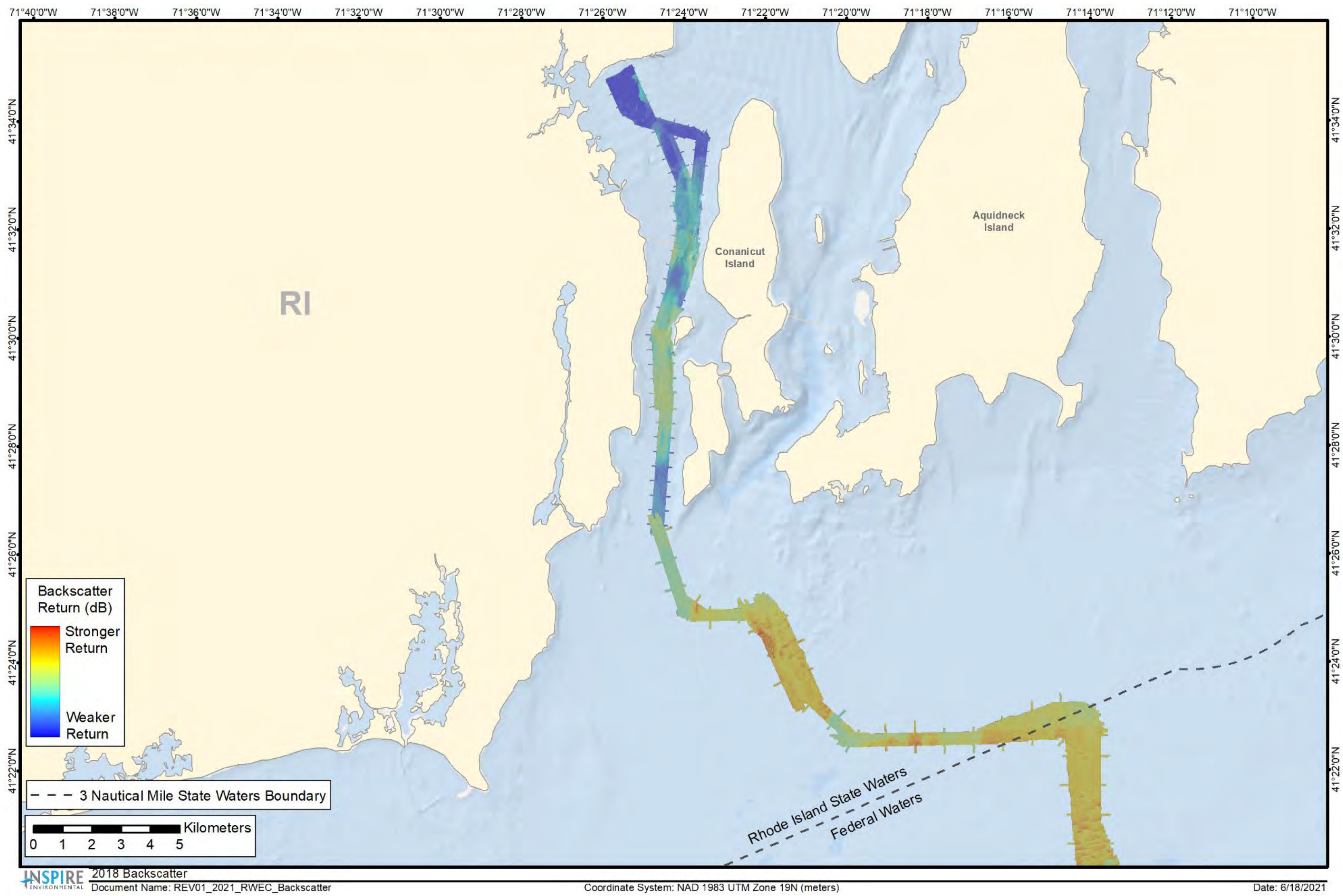

Figure 2-3. Backscatter data along the RWEC-RI

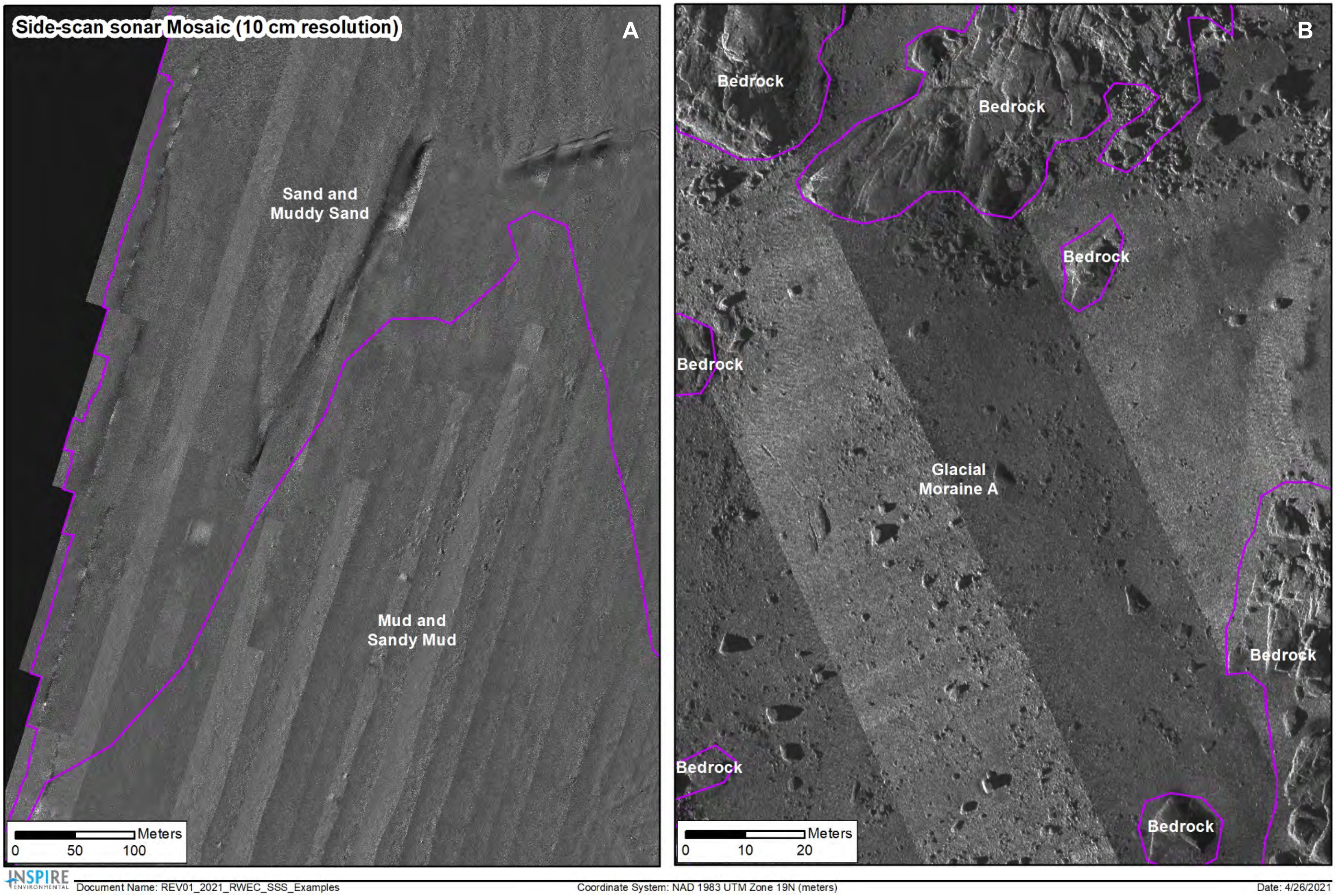

Figure 2-4. Examples of side-scan sonar data showing (A) soft benthic habitats of sand and mud and (B) heterogeneous and complex hard bottom habitats of glacial origin, namely bedrock and moraine

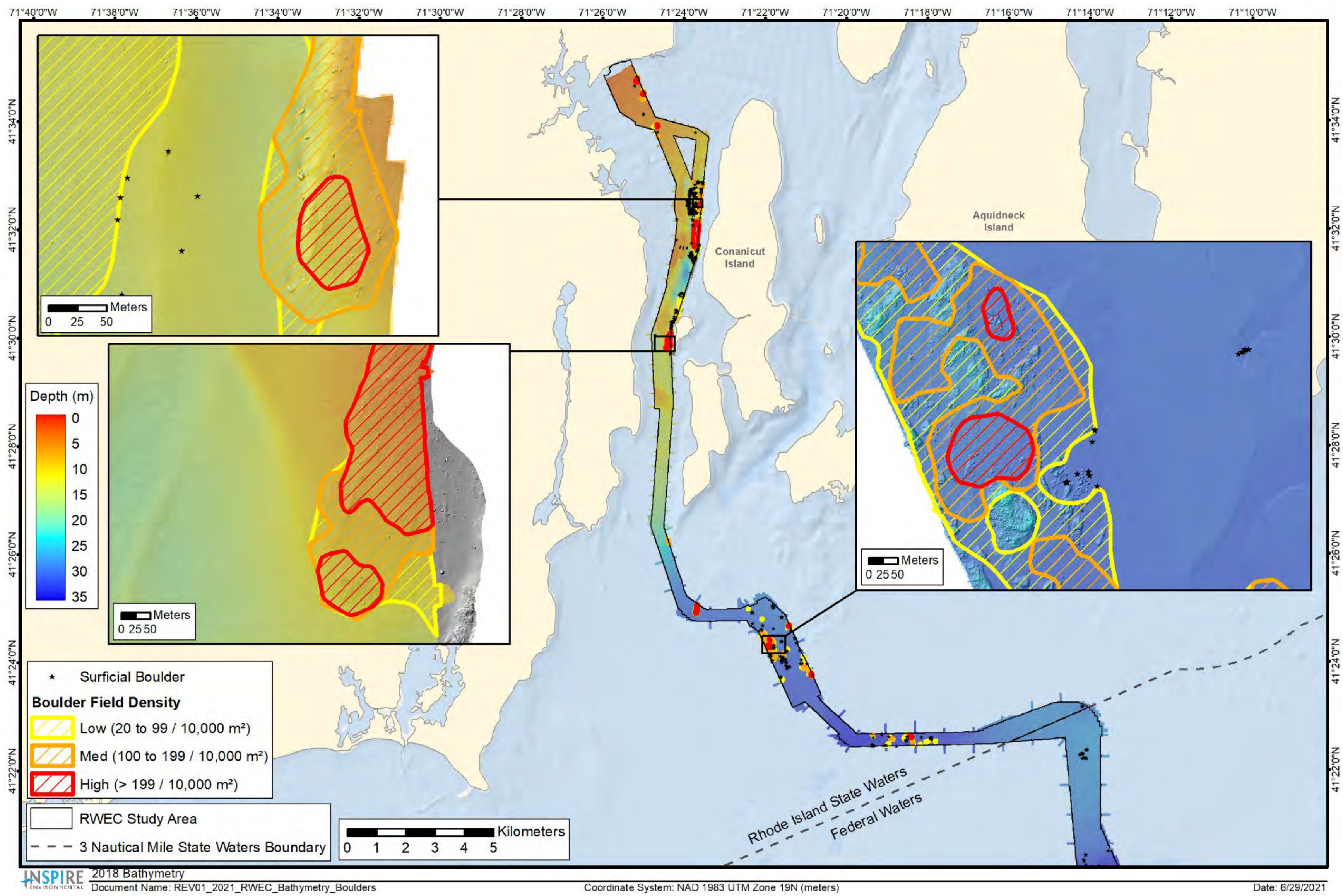

Figure 2-5. Boulder fields and individual boulder picks on hill-shaded bathymetric data along the RWEC. Note that individual boulders were aggregated into the boulder fields.

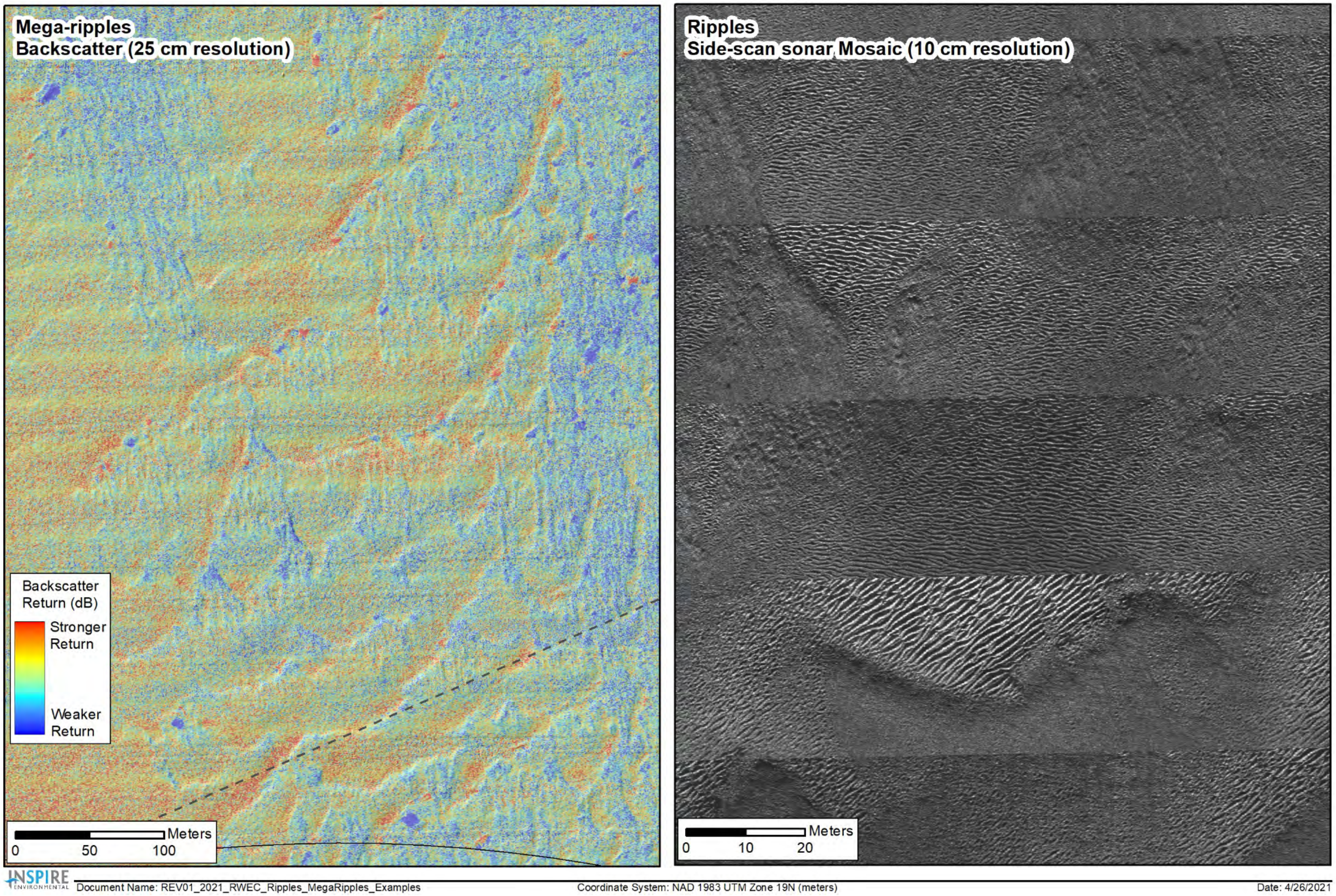

Figure 2-6. Mega-ripples visible in backscatter data (left) and small-scale ripples visible in SSS data (right)

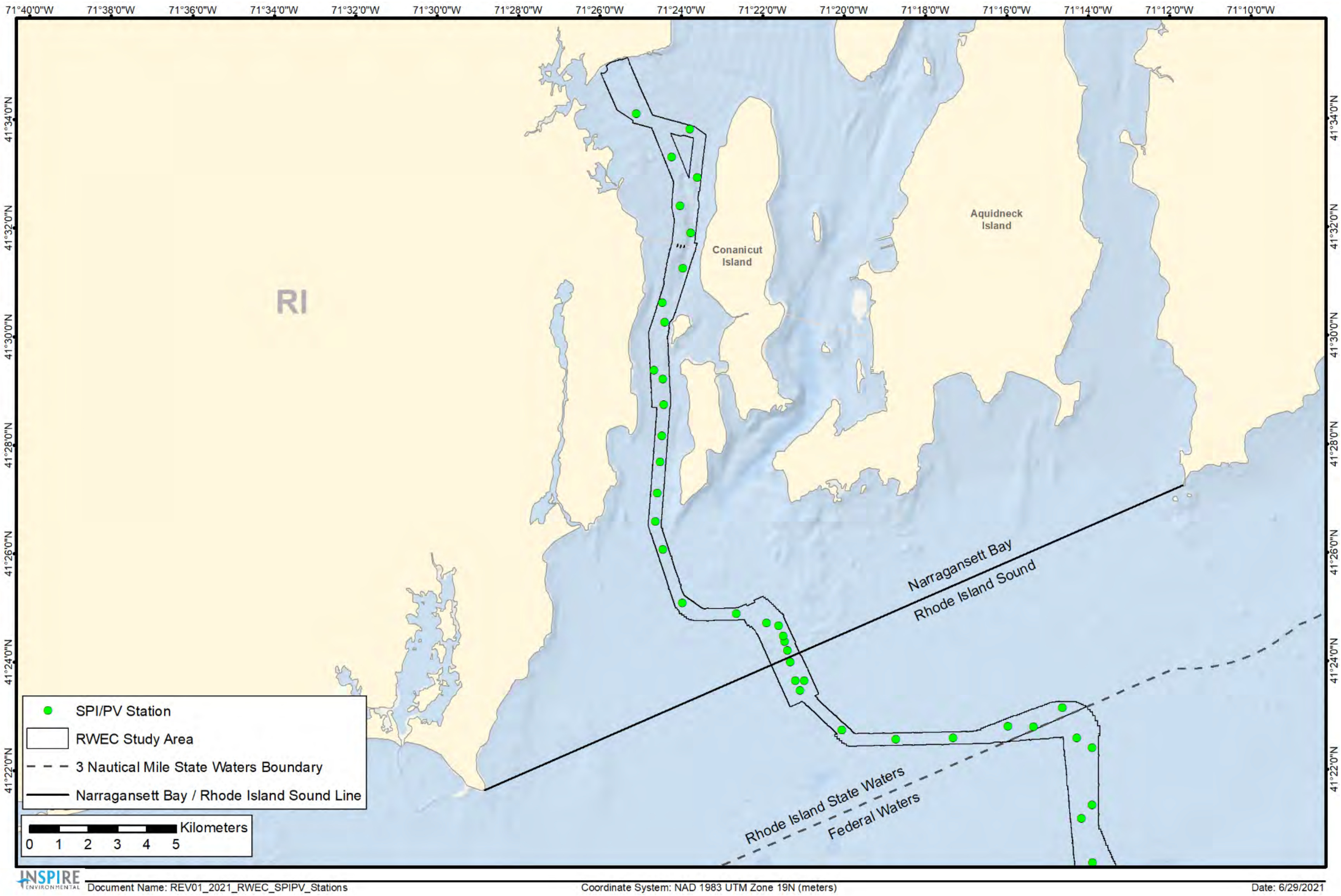

Figure 2.7. Locations sampled with sediment profile and plan view imaging (SPI/PV) used in ground-truthing geophysical data and habitat type interpretations

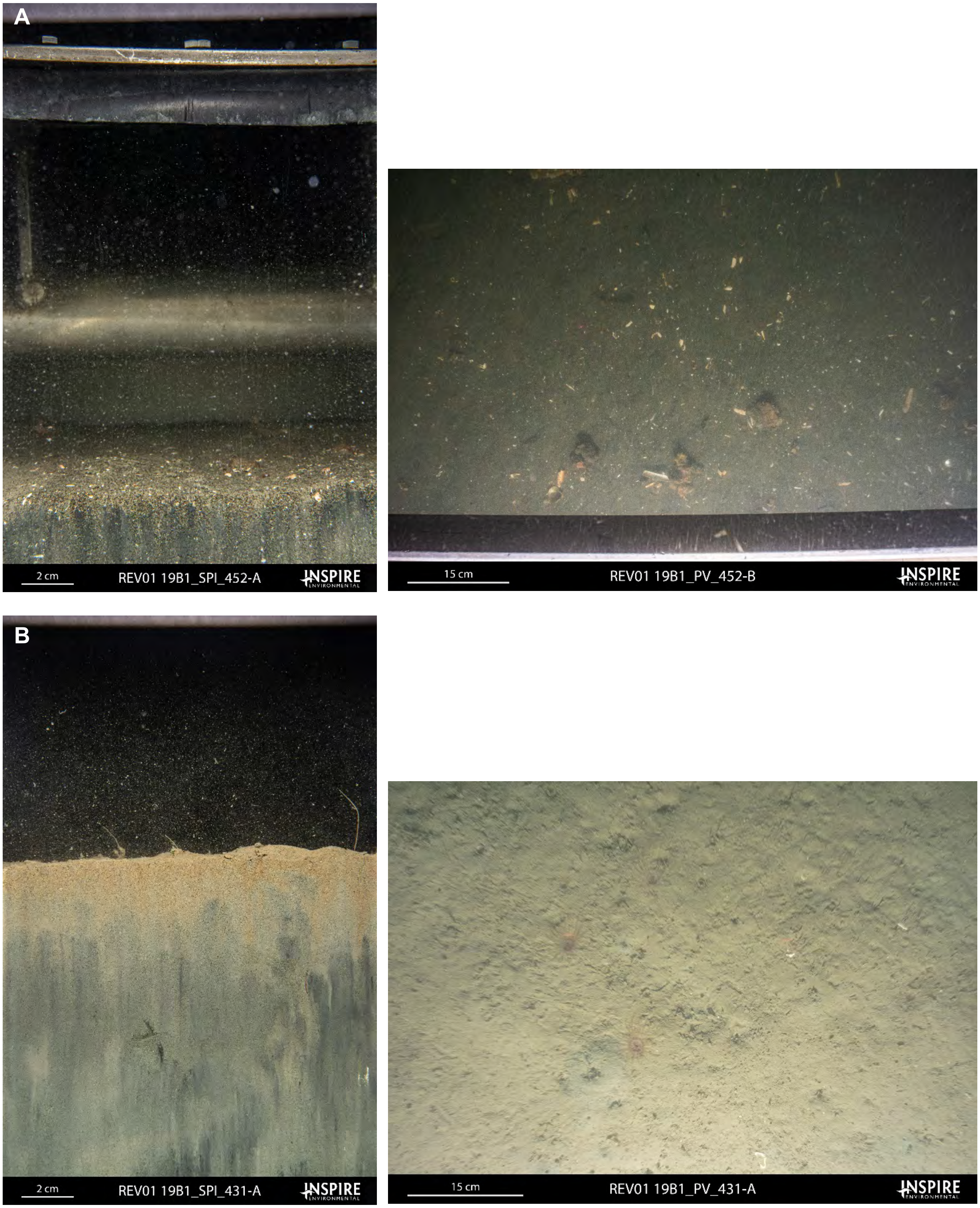

Figure 2-8. Representative SPI and PV images depicting the range of sediment types across the RWEC-RI: (A) fine sand - SPI, Slightly Gravelly (Cobbley) Sand - PV; (B) very fine sand - SPI, Sand - PV; and (C) silt/clay - SPI, Shell Substrate/Hash - PV

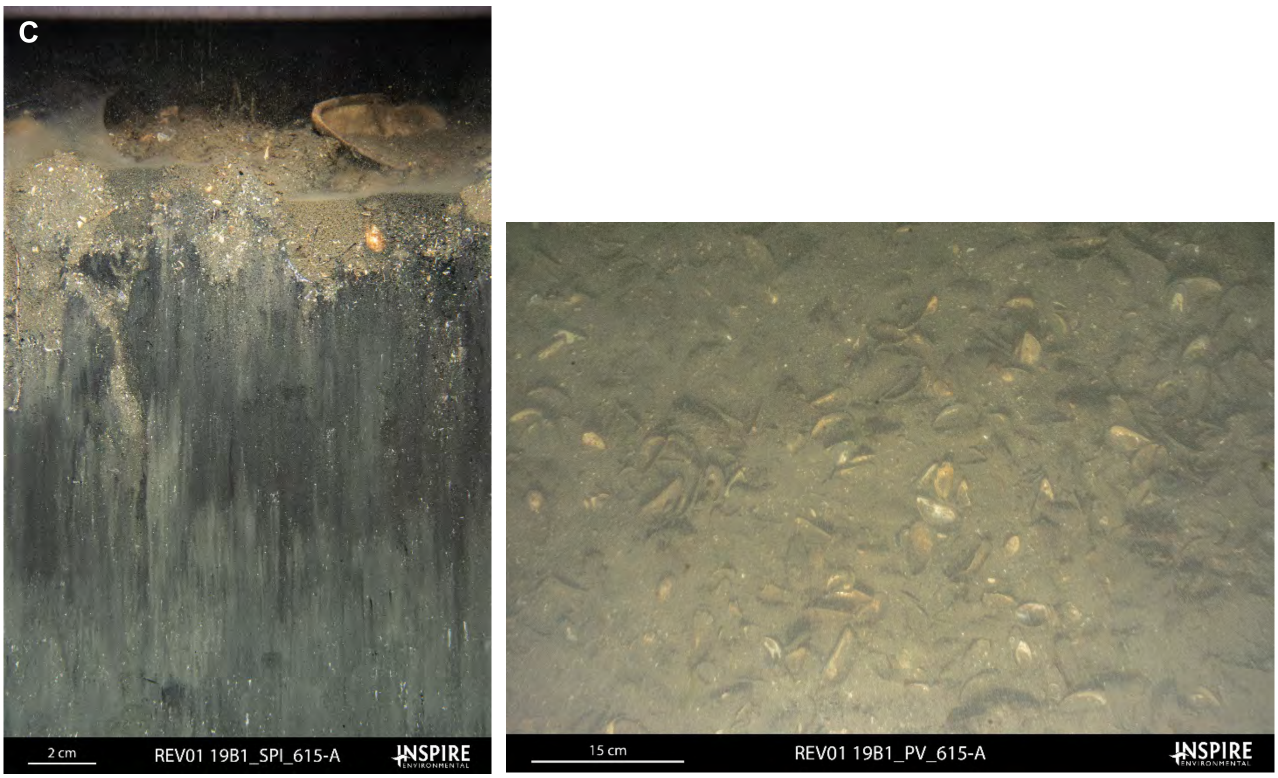

Figure 2-8. continued **Representative SPI and PV images depicting the range of sediment types across the RWEC-RI: (A) fine sand - SPI, Slightly Gravelly (Cobbley) Sand - PV; (B) very fine sand - SPI, Sand - PV; and (C) silt/clay - SPI, Shell Substrate/Hash – PV**

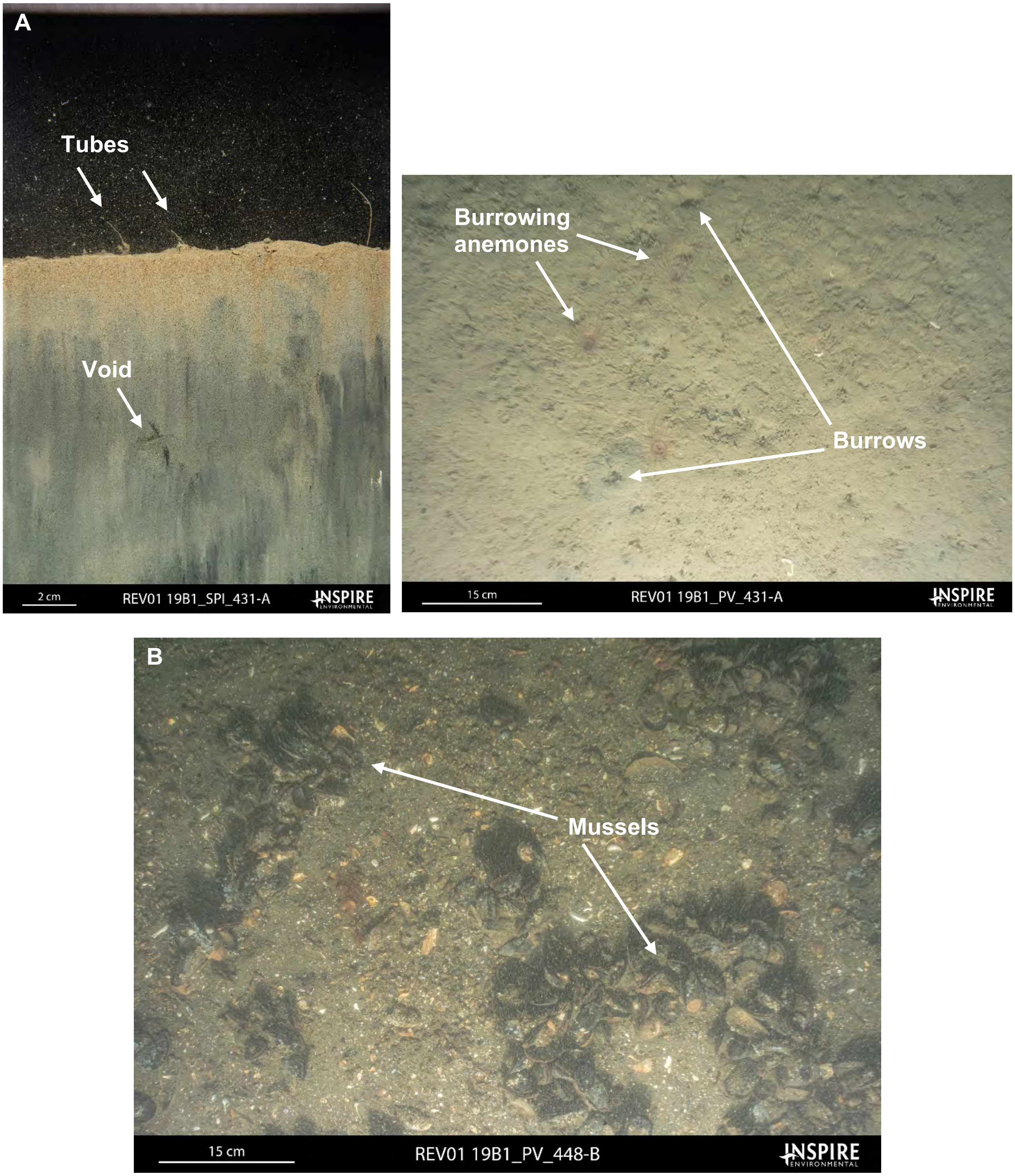

Figure 2-9. Representative SPI and PV images depicting soft sediment infaunal and epifaunal communities: (A) infaunal tubes, burrows, and voids, as well as burrowing anemones (Cerianthids); (B) blue mussels; (C) *Crepidula* gastropods forming a reef substrate; and (D) patchy attached epifaunal communities composed primarily of sponges

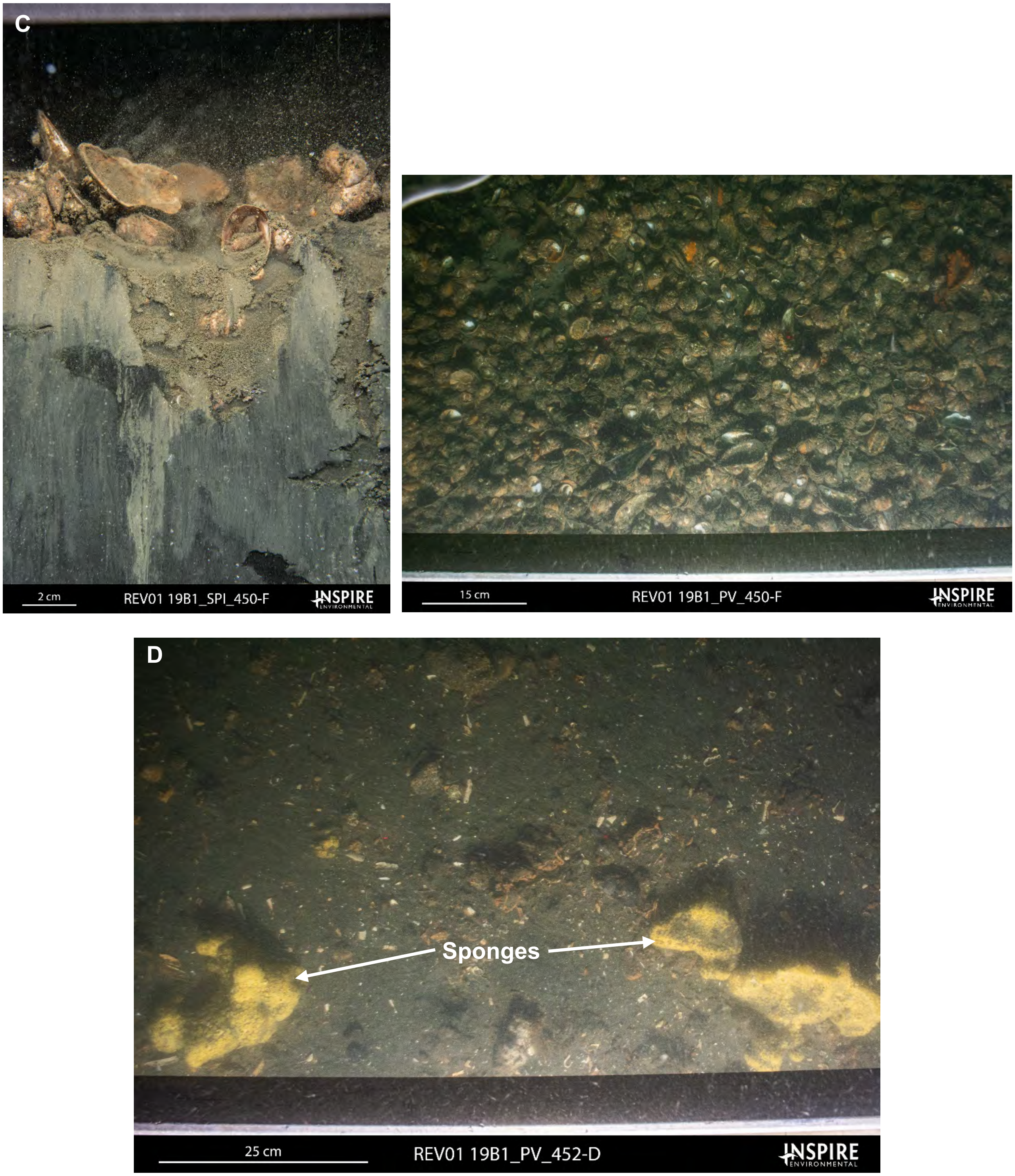

Figure 2-9. continued Representative SPI and PV images depicting soft sediment infaunal and epifaunal communities: (A) infaunal tubes, burrows, and voids, as well as burrowing anemones (Cerianthids); (B) blue mussels; (C) Crepidula gastropods forming a reef substrate; and (D) patchy attached epifaunal communities composed primarily of sponges

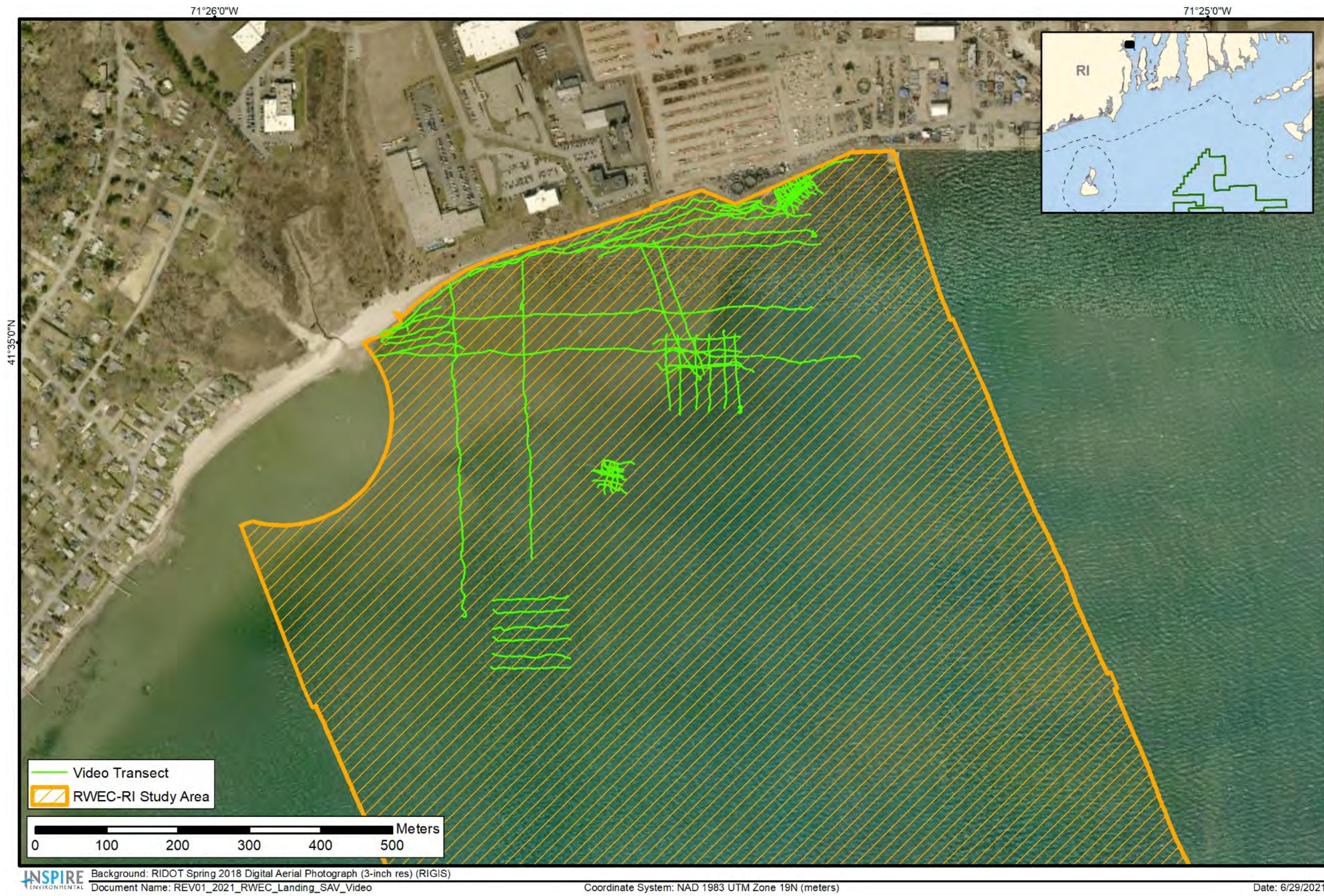

Figure 2-10. Locations of video transects surveyed for presence of submerged aquatic vegetation (SAV) in the vicinity of the potential landfall at Quonset Point

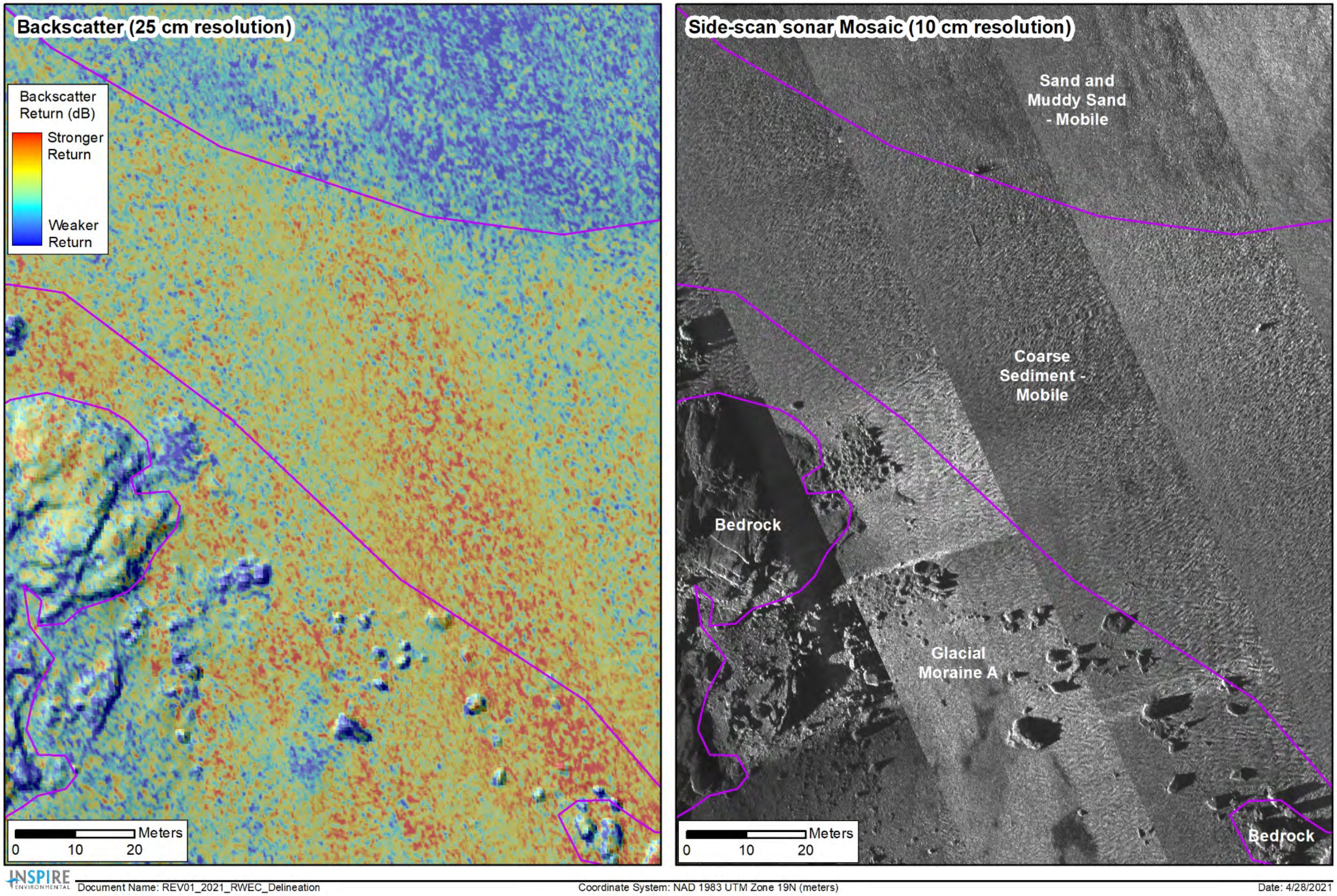

Figure 2-11. Example of using MBES (left) and SSS (right) data to delineate seabed types

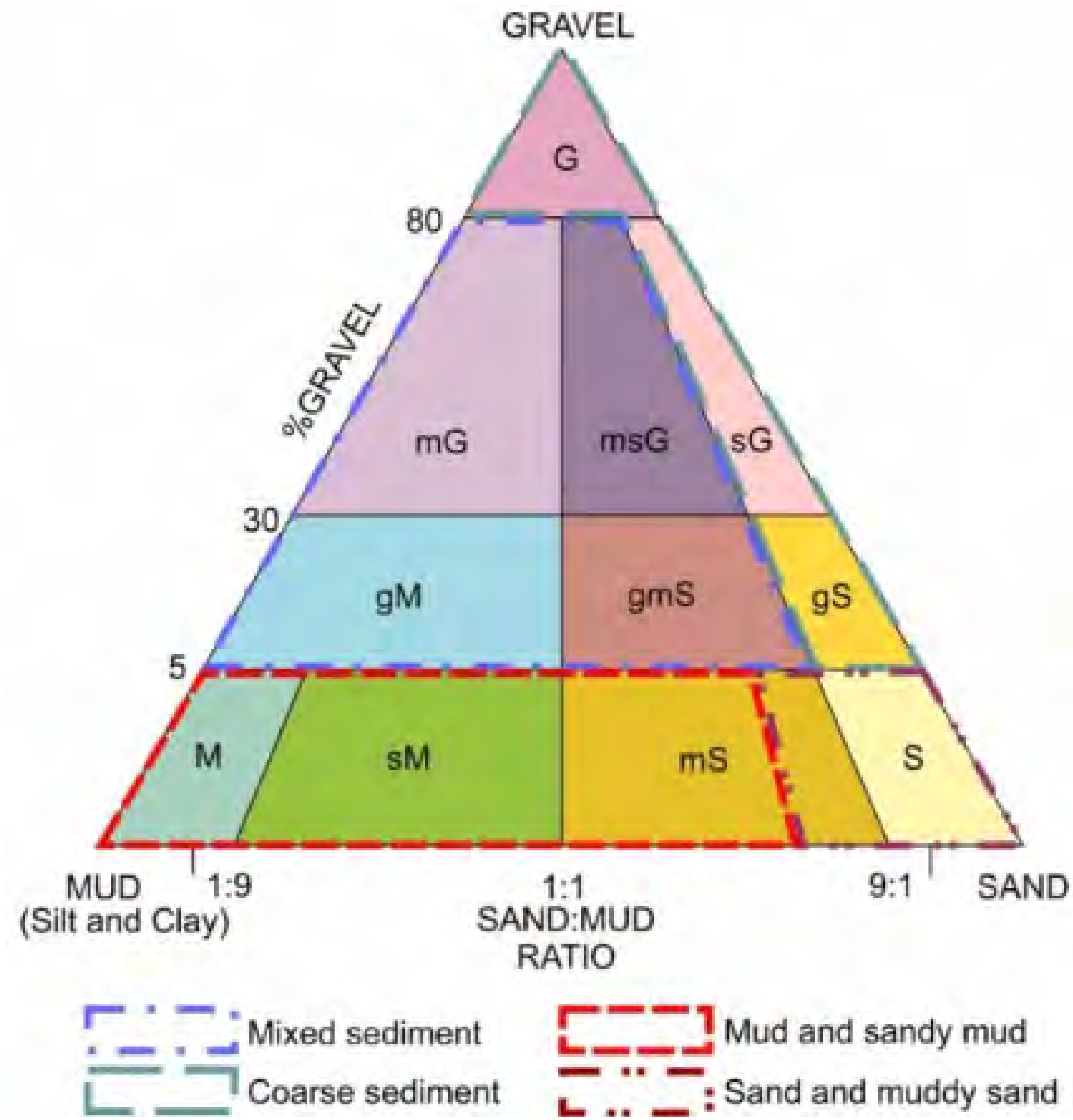

Figure 2-12. CMECS ternary diagram with Orsted's geological seabed interpretation categories

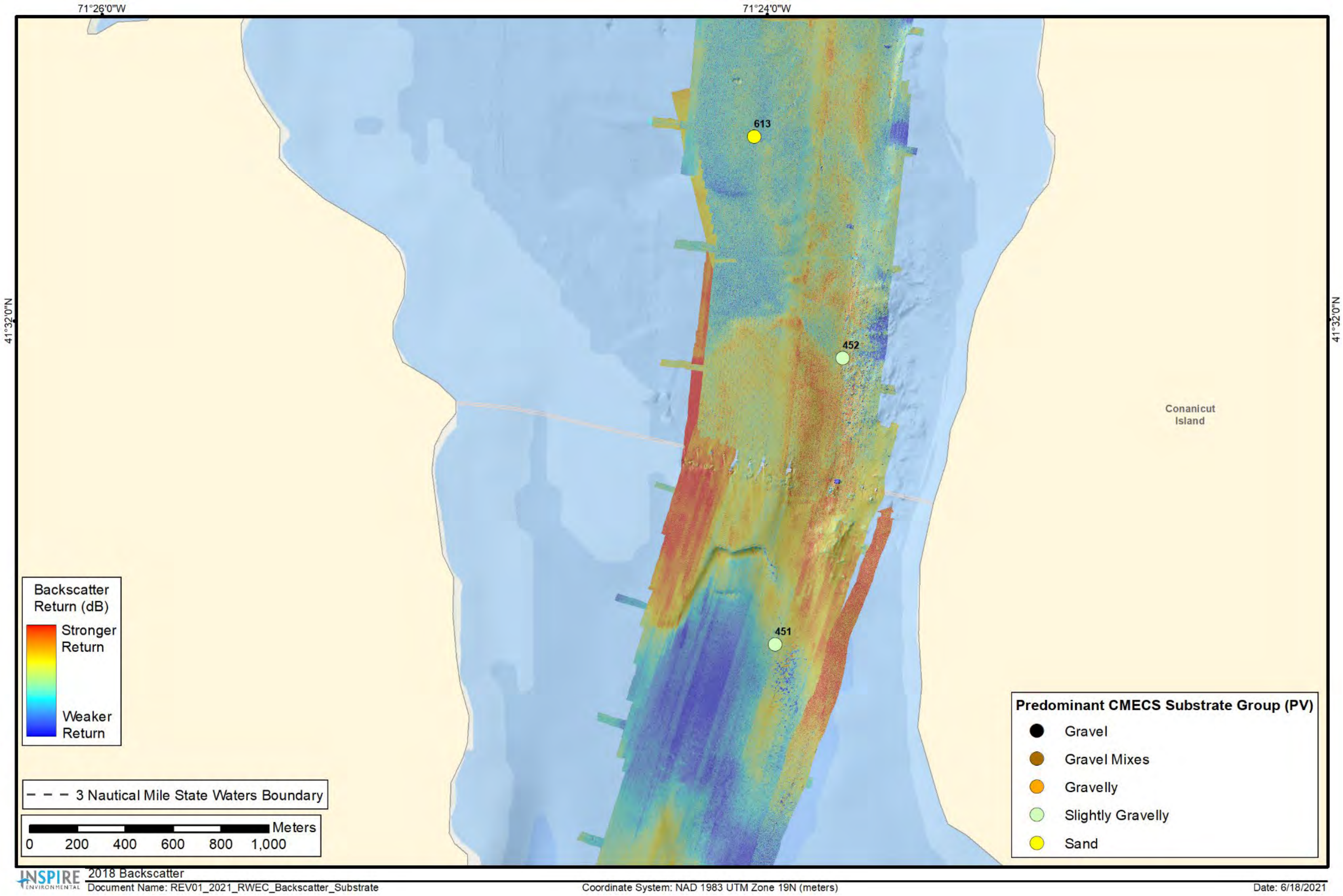

Figure 2-13. Ground-truth PV data for CMECS Substrate Group on backscatter data

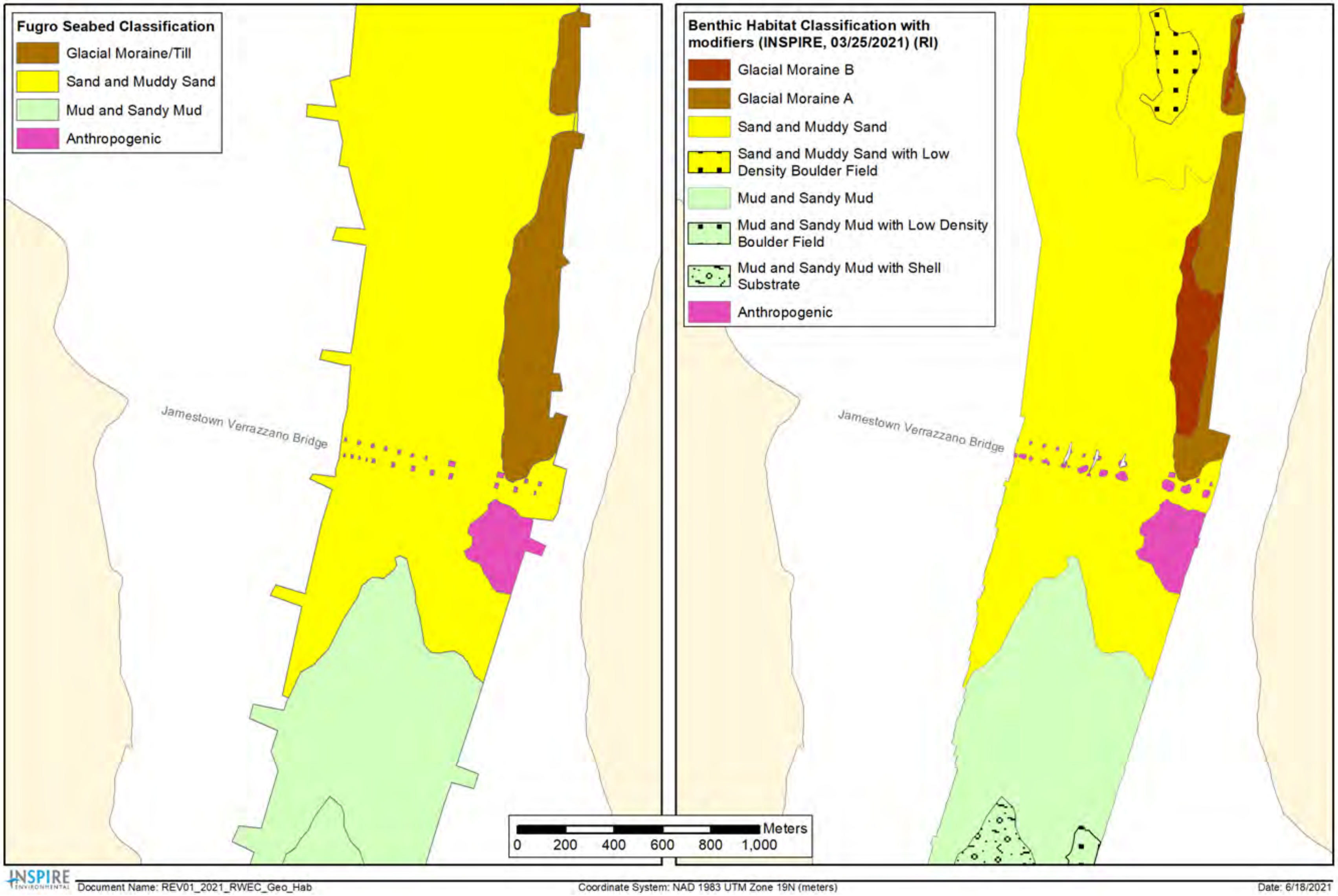

Figure 2-14. Geological seabed interpretations refined to benthic habitat types with modifiers for purposes of assessing potential impacts to essential fish habitat

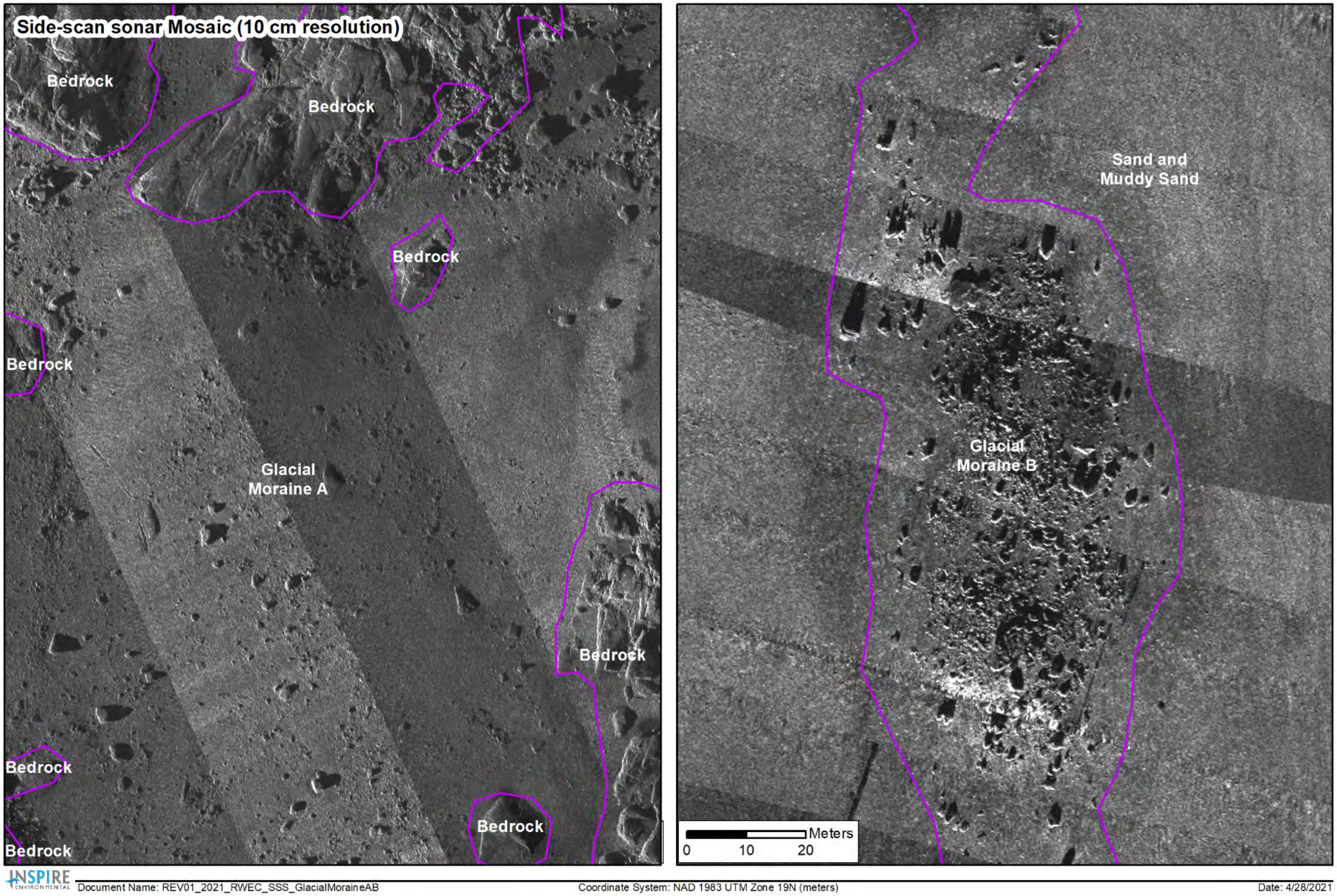

Figure 3-1. Glacial Moraine B, Glacial Moraine A, and Bedrock as detected in geophysical data

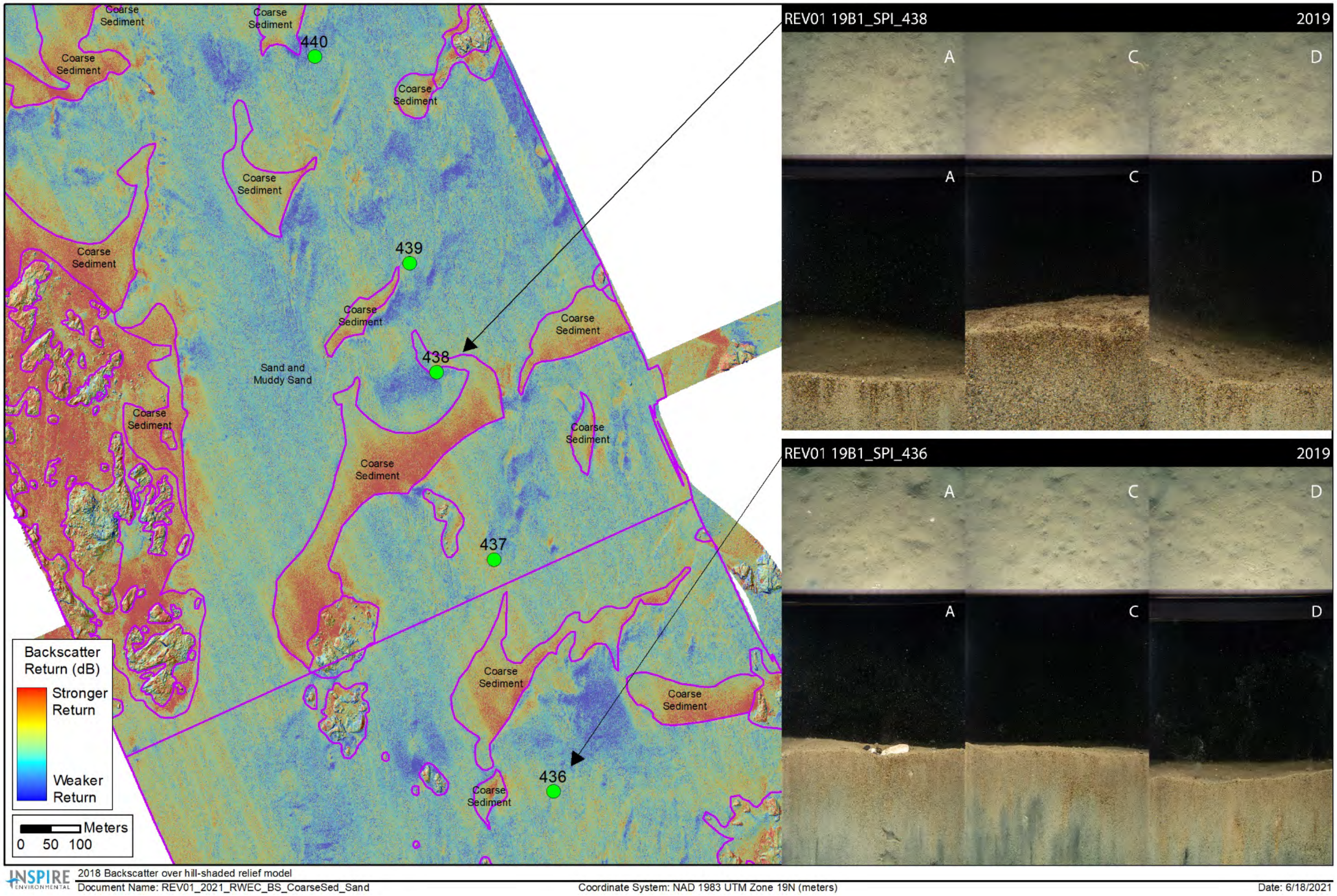

Figure 3-2. Coarse Sediment in depressions in the seafloor detected in geophysical data, surrounded by Sand and Muddy Sand detected in geophysical and ground-truth data

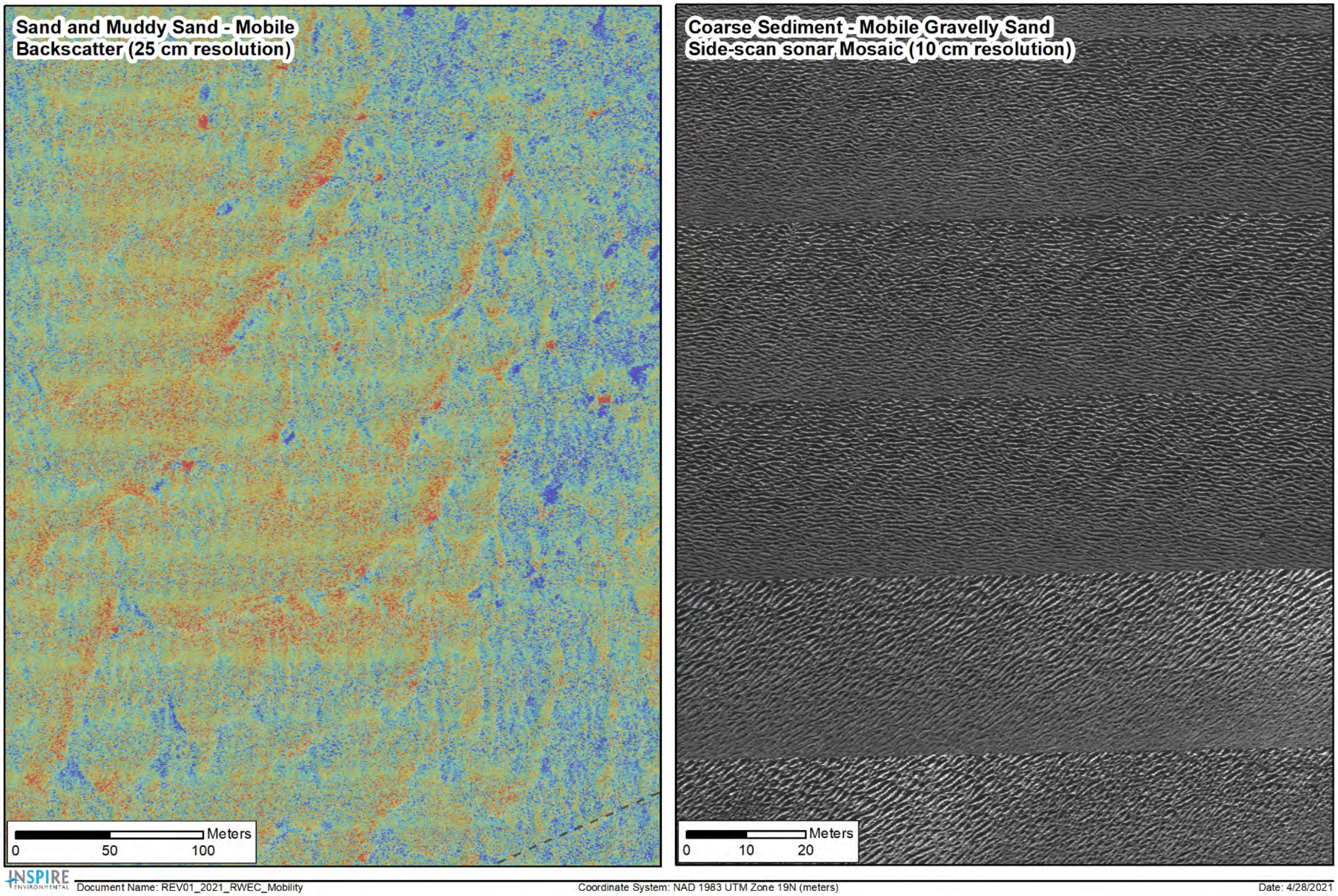

Figure 3-3. Mobility of the seafloor evident in geophysical data: mega-ripples detected in backscatter and bathymetric relief in Sand and Muddy Sand (left); and ripples detected in Coarse Sediment - Gravelly Sand in geophysical data (right). The modifier of "- Mobile" is applied to these habitats where seafloor features, including mega-ripples and/or ripples, are observed.

Figure 3-4. **Low density (20 to 99 boulders / 10,000 m^2) (left) and medium density (100 to 199 boulders / 10,000 m^2) (right) boulder fields identified from geophysical data and included as a habitat type modifier for mud, sand, and coarse sediment habitat types where present**

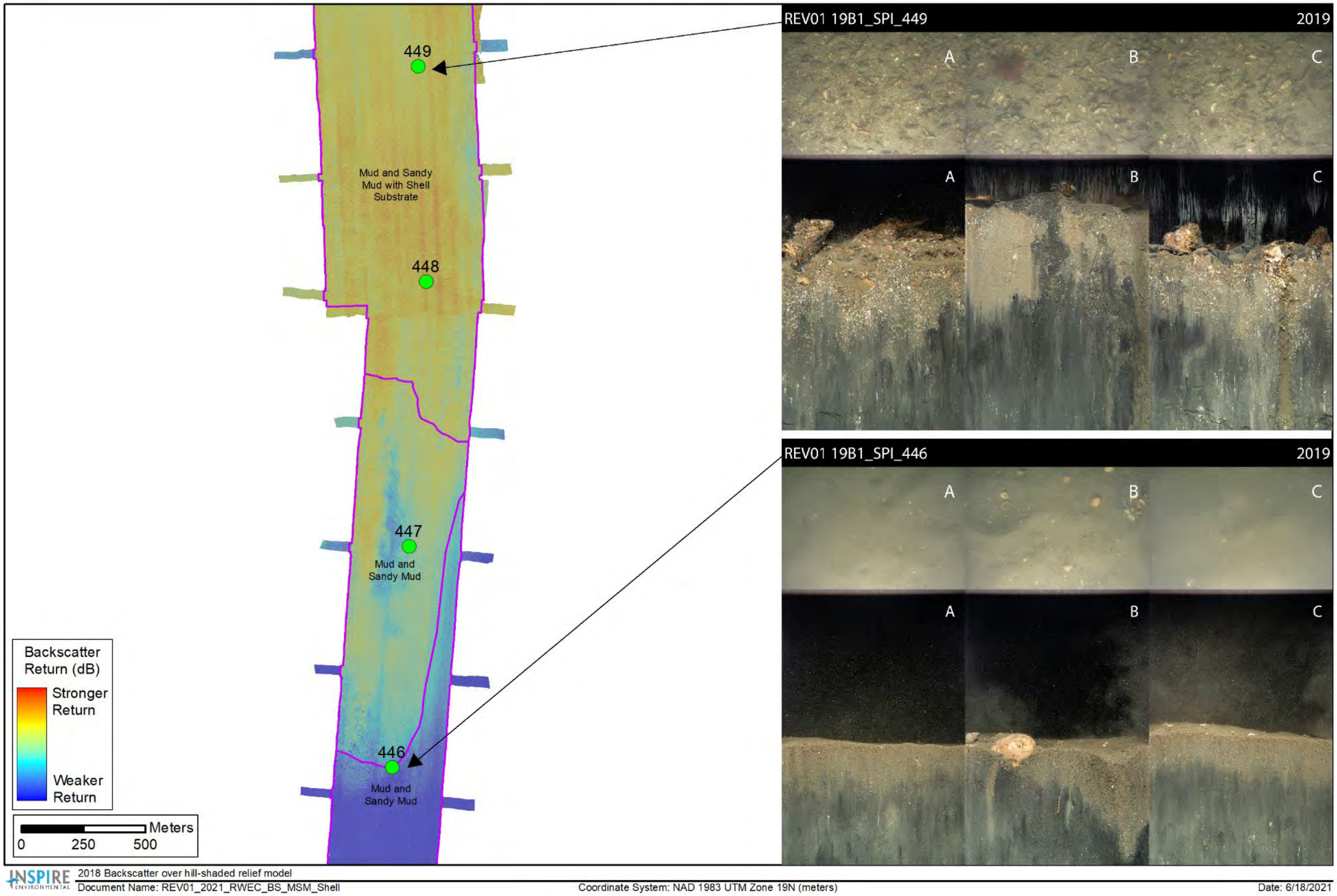

Figure 3-5. Mud and Sandy Mud and Mud and Sandy Mud with Shell Substrate as detected in geophysical and ground-truth data

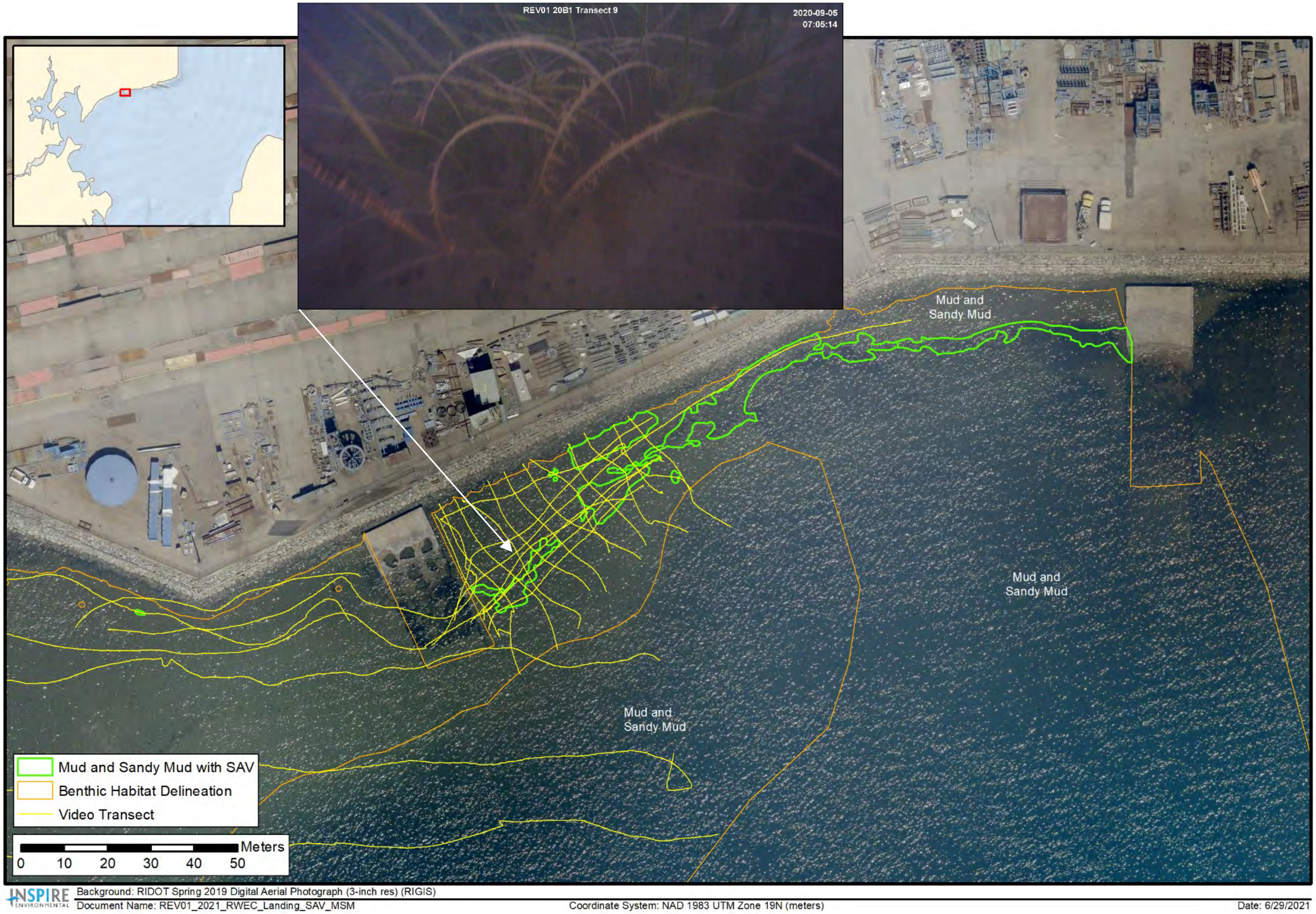

Figure 3-6. Mud and Sandy Mud with submerged aquatic vegetation (SAV) habitat detected in aerial imagery and underwater video footage

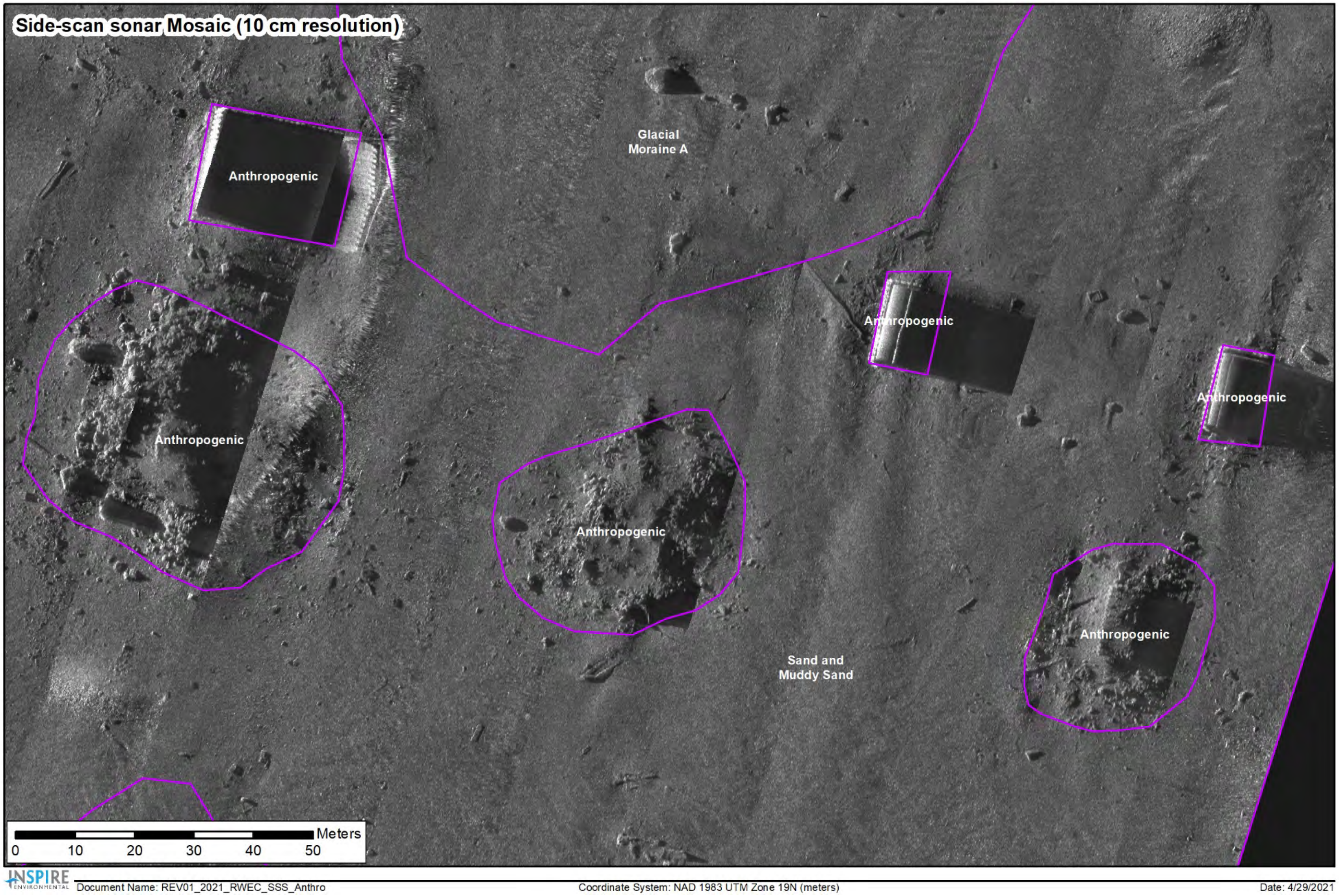

Figure 3-7. Anthropogenic features, such as debris related to the demolition of the old Jamestown Bridge, as detected in geophysical data

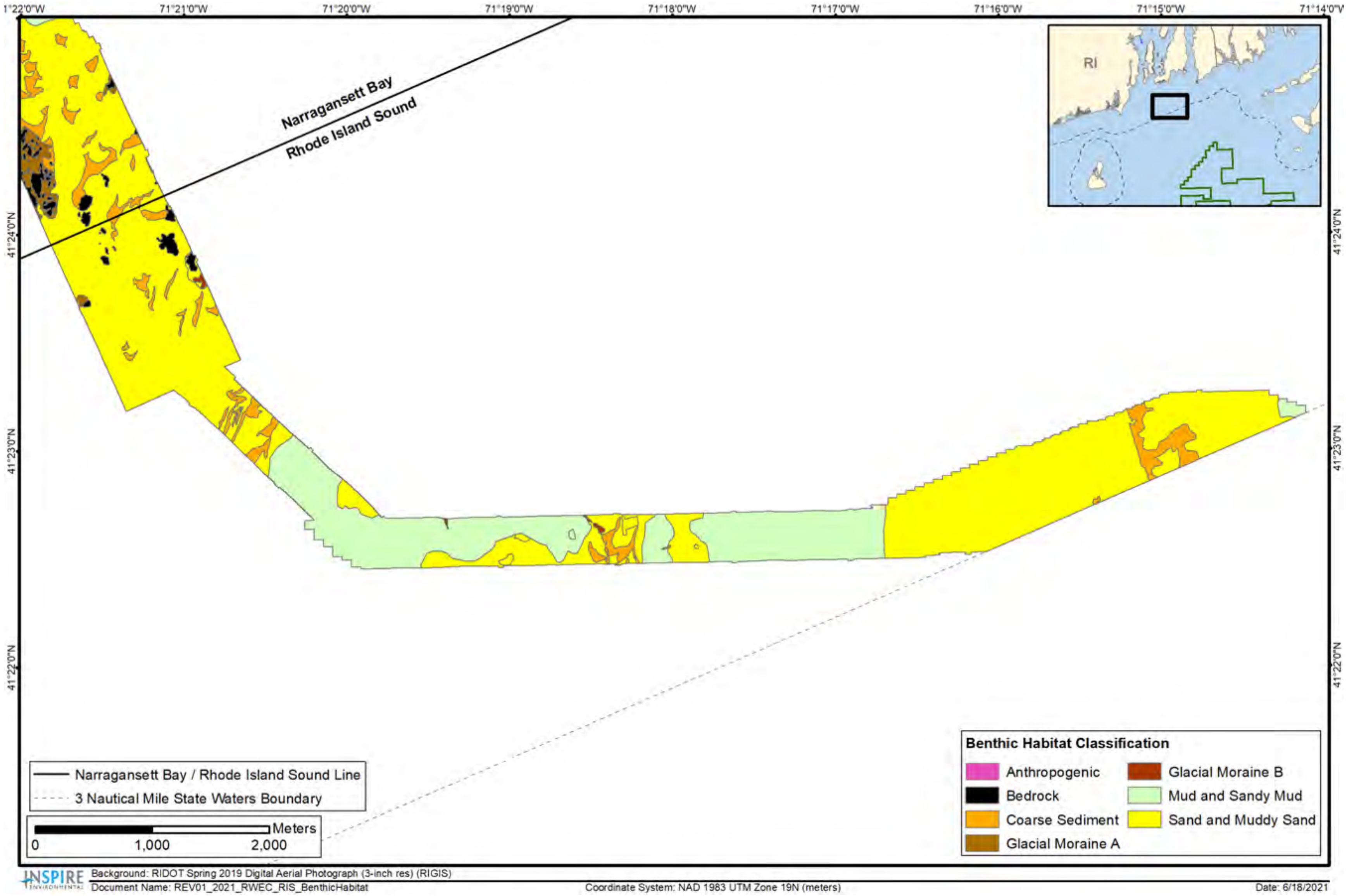

Figure 3-8. Benthic habitat types mapped along the RWEC-RI in RI Sound

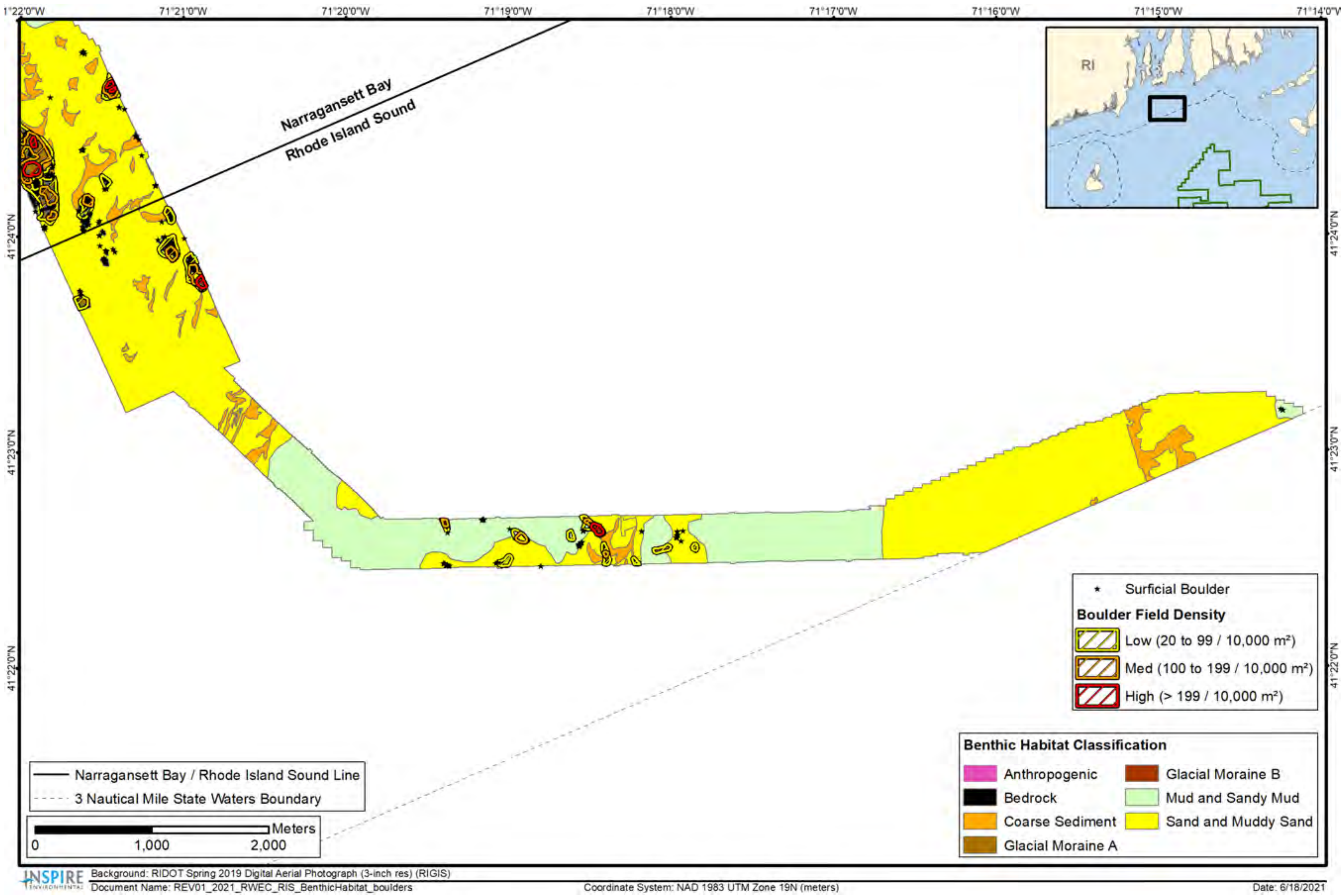

Figure 3-9. Benthic habitat types, boulder fields, and individual large boulders (>0.5 m) mapped along the RWEC-RI in RI Sound

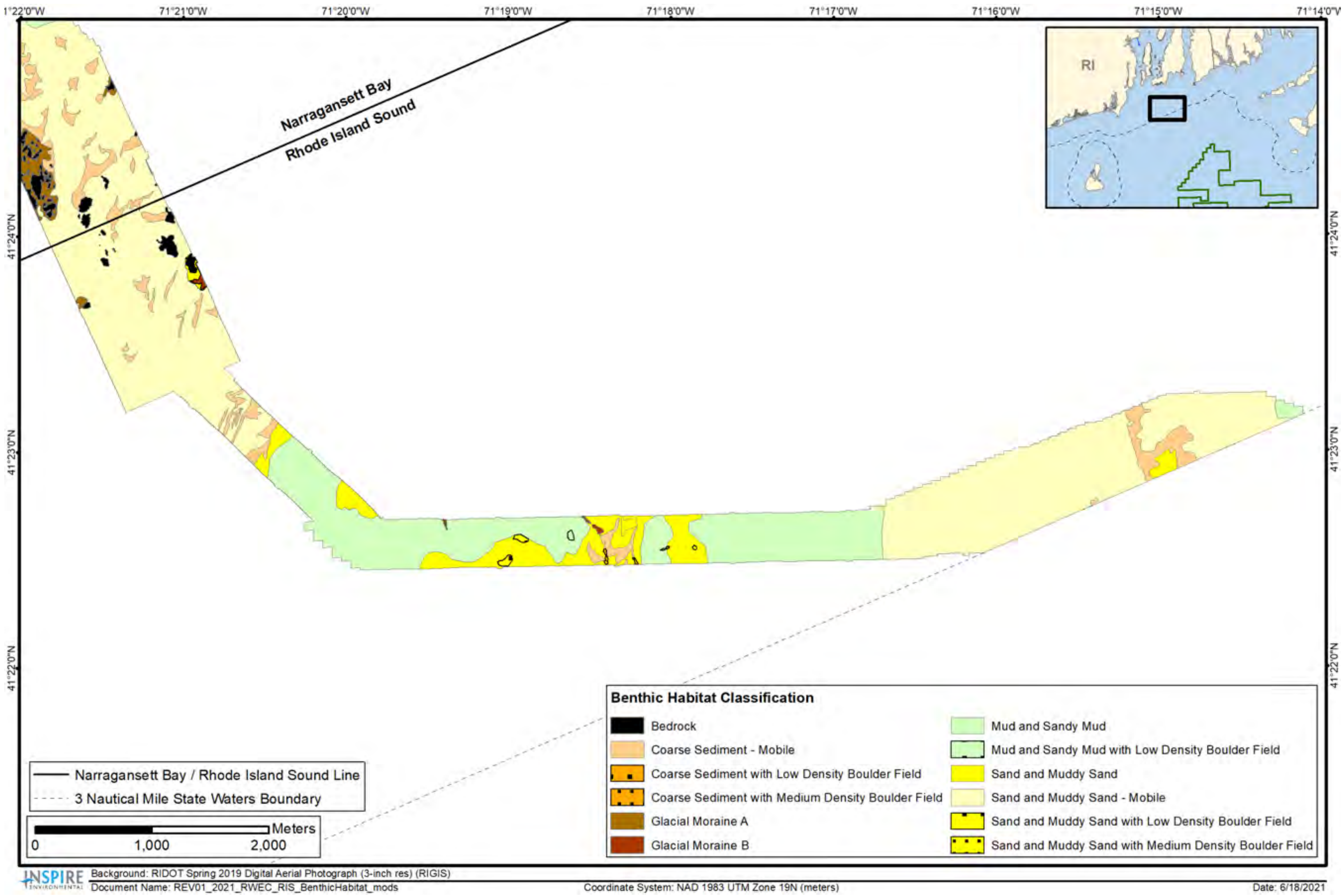

Figure 3-10. Benthic habitat types with modifiers along the RWEC-RI in RI Sound

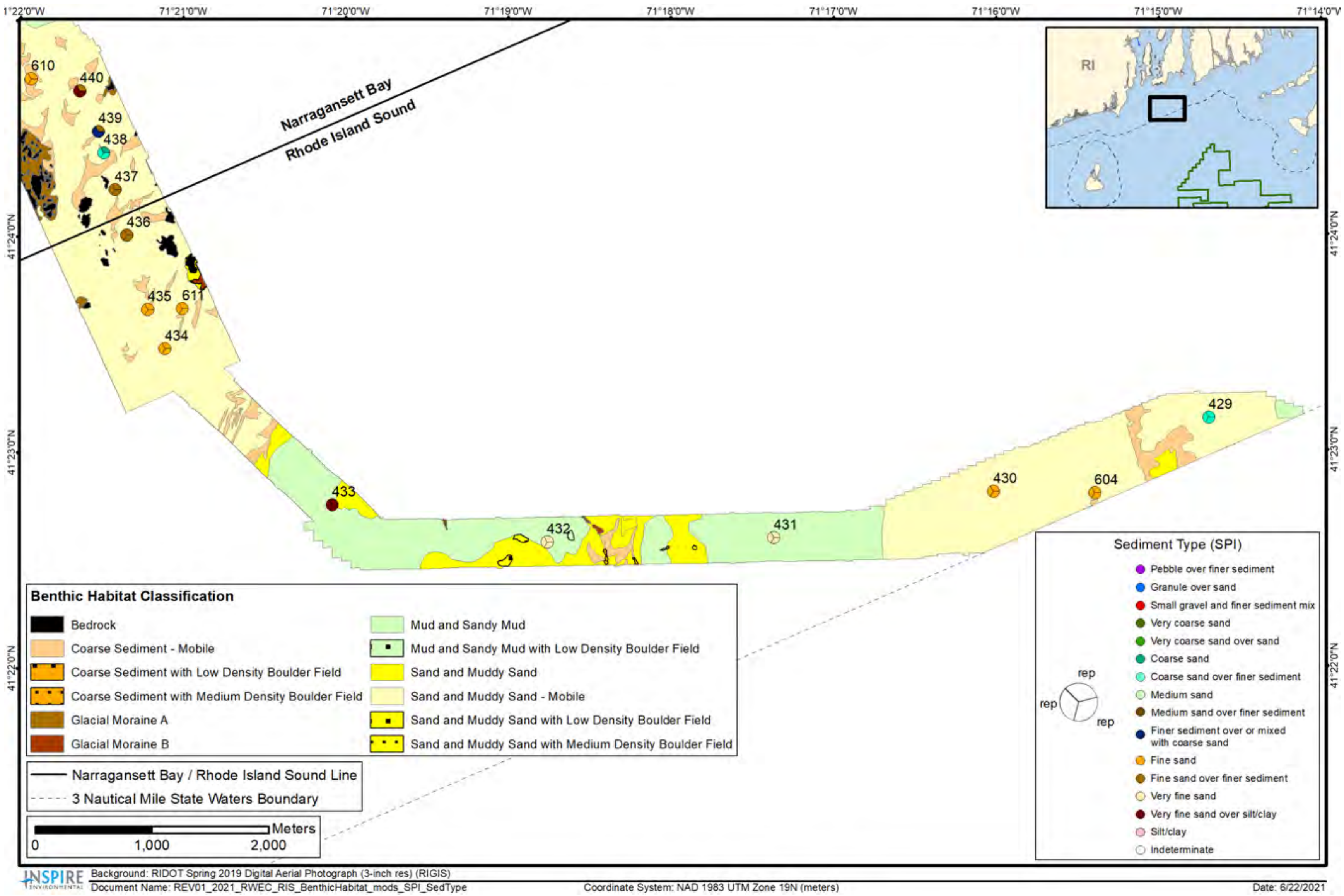

Figure 3-11. Benthic habitat types with modifiers and ground-truth sediment type from SPI along the RWEC-RI in RI Sound

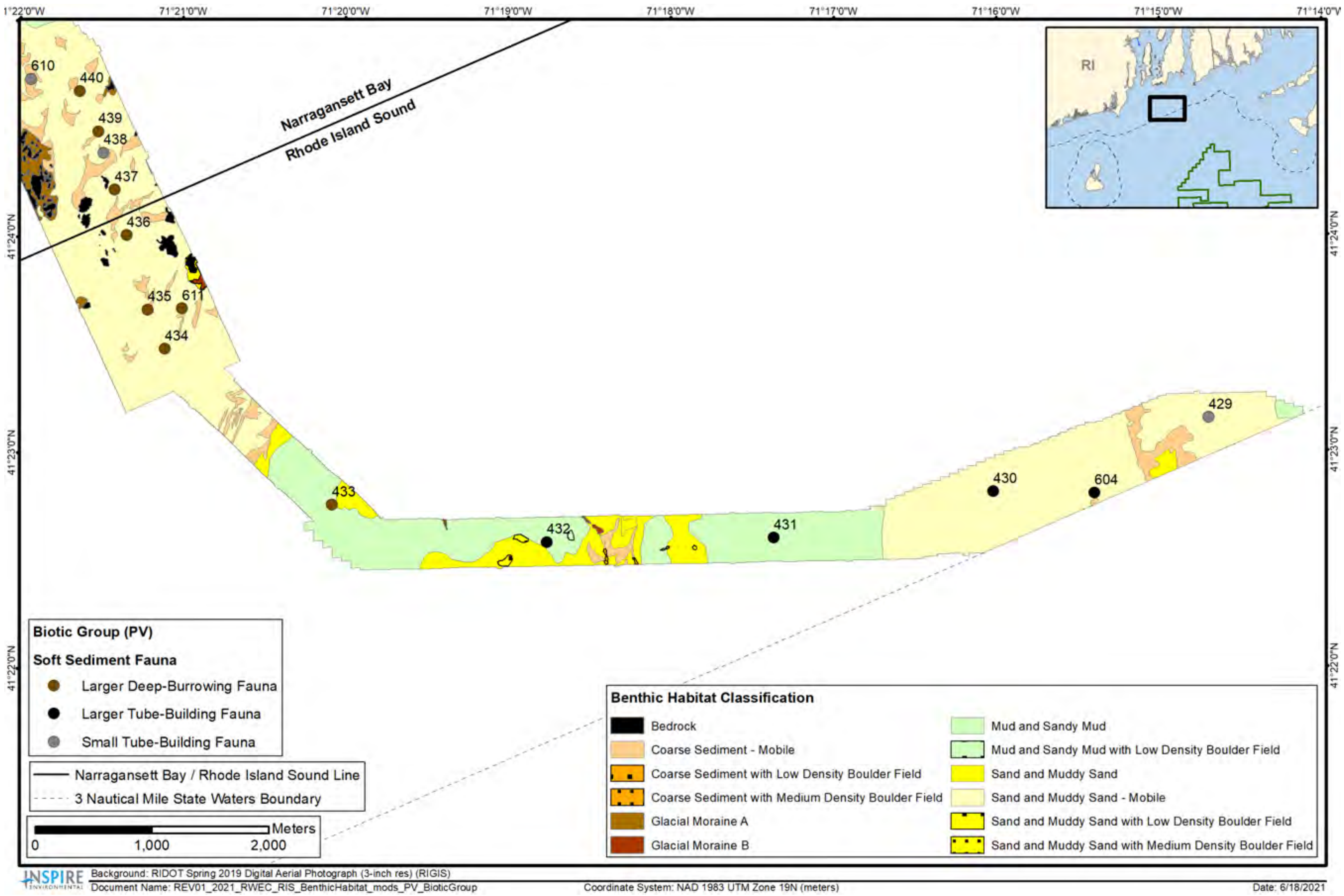

Figure 3-12. Benthic habitat types with modifiers and ground-truth CMECS Biotic Group along the RWEC-RI in RI Sound

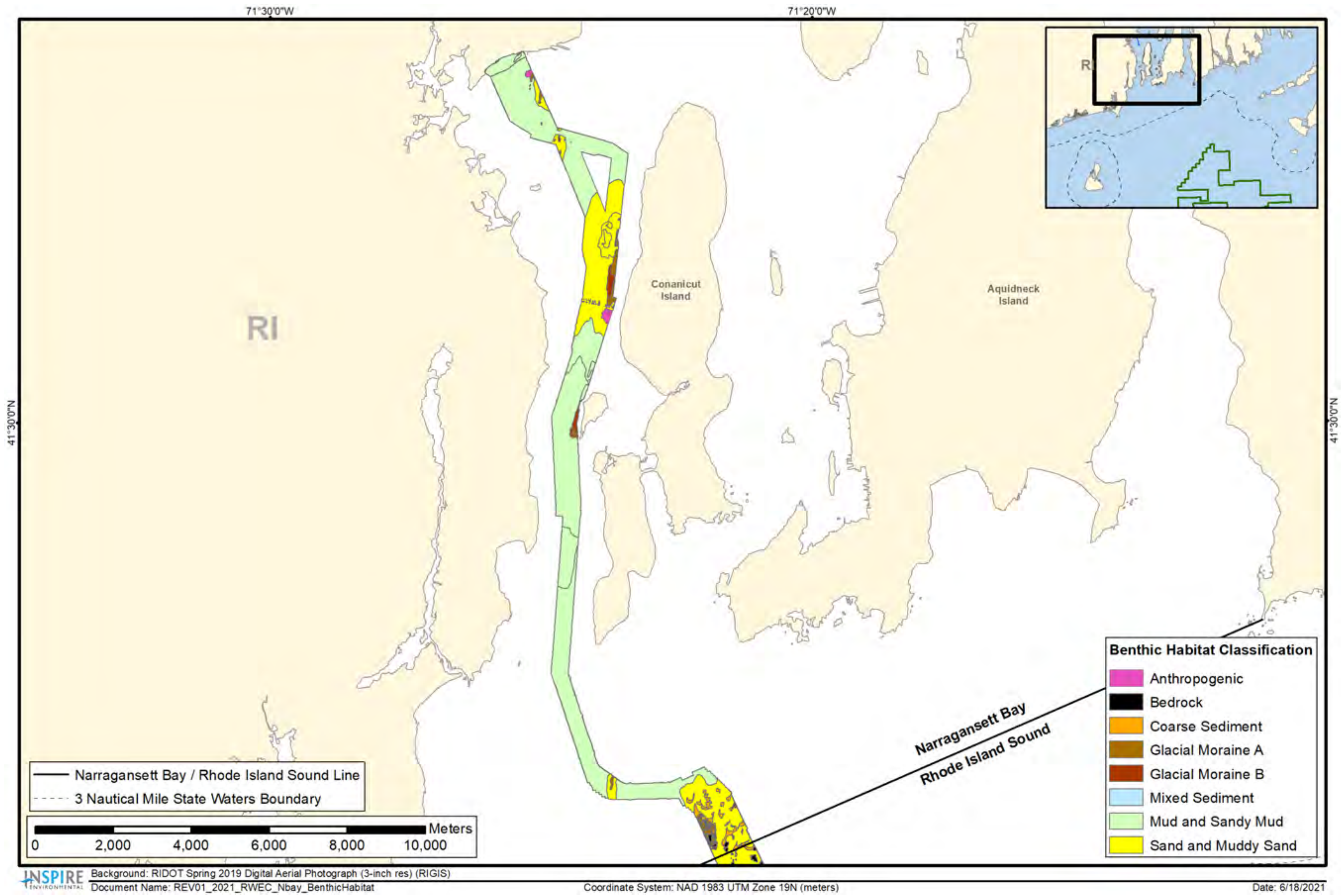

Figure 3-13. Benthic habitat types mapped along the RWEC-RI in Narragansett Bay

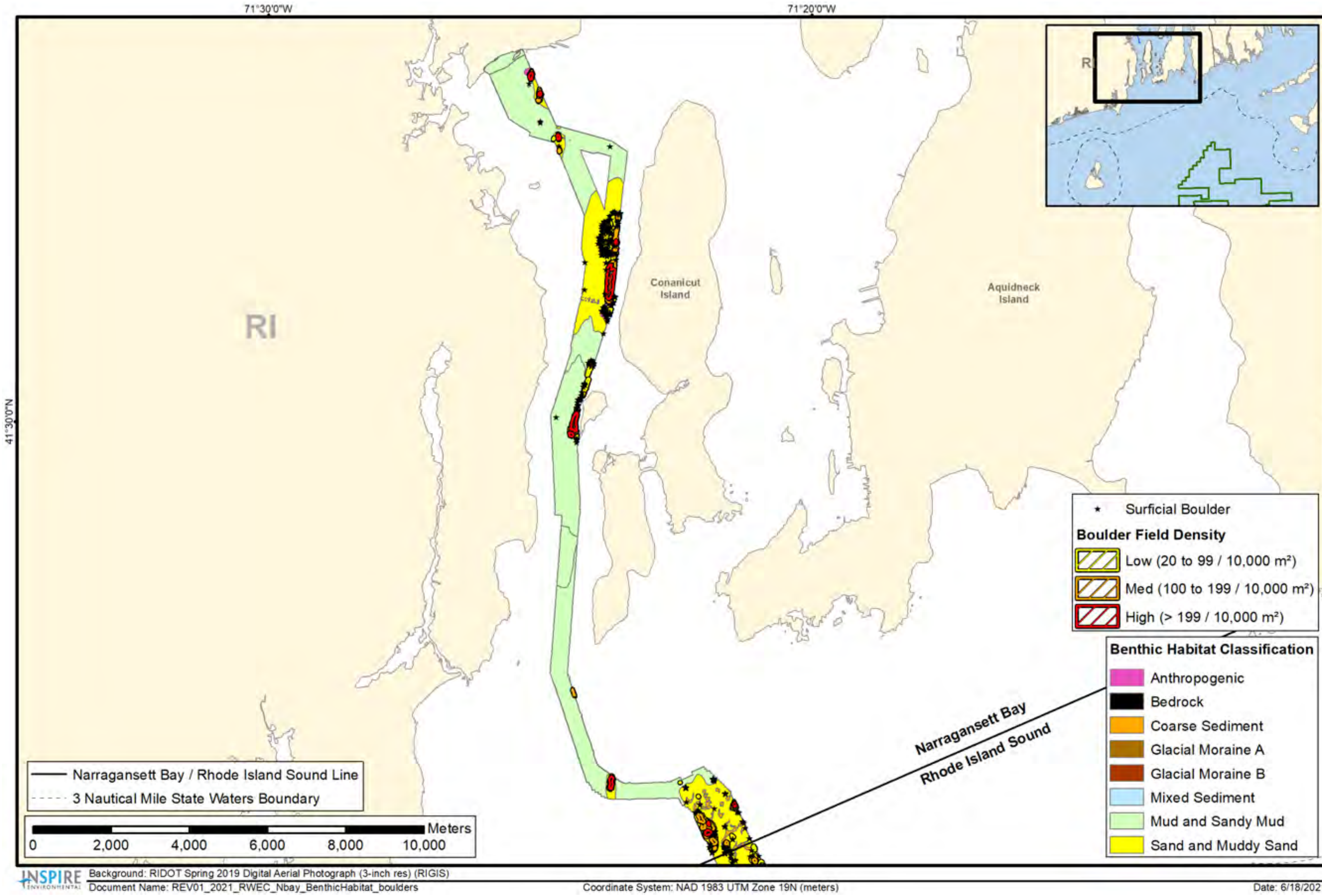

Figure 3-14. Benthic habitat types, boulder fields, and individual large boulders (>0.5 m) mapped along the RWEC-RI in Narragansett Bay

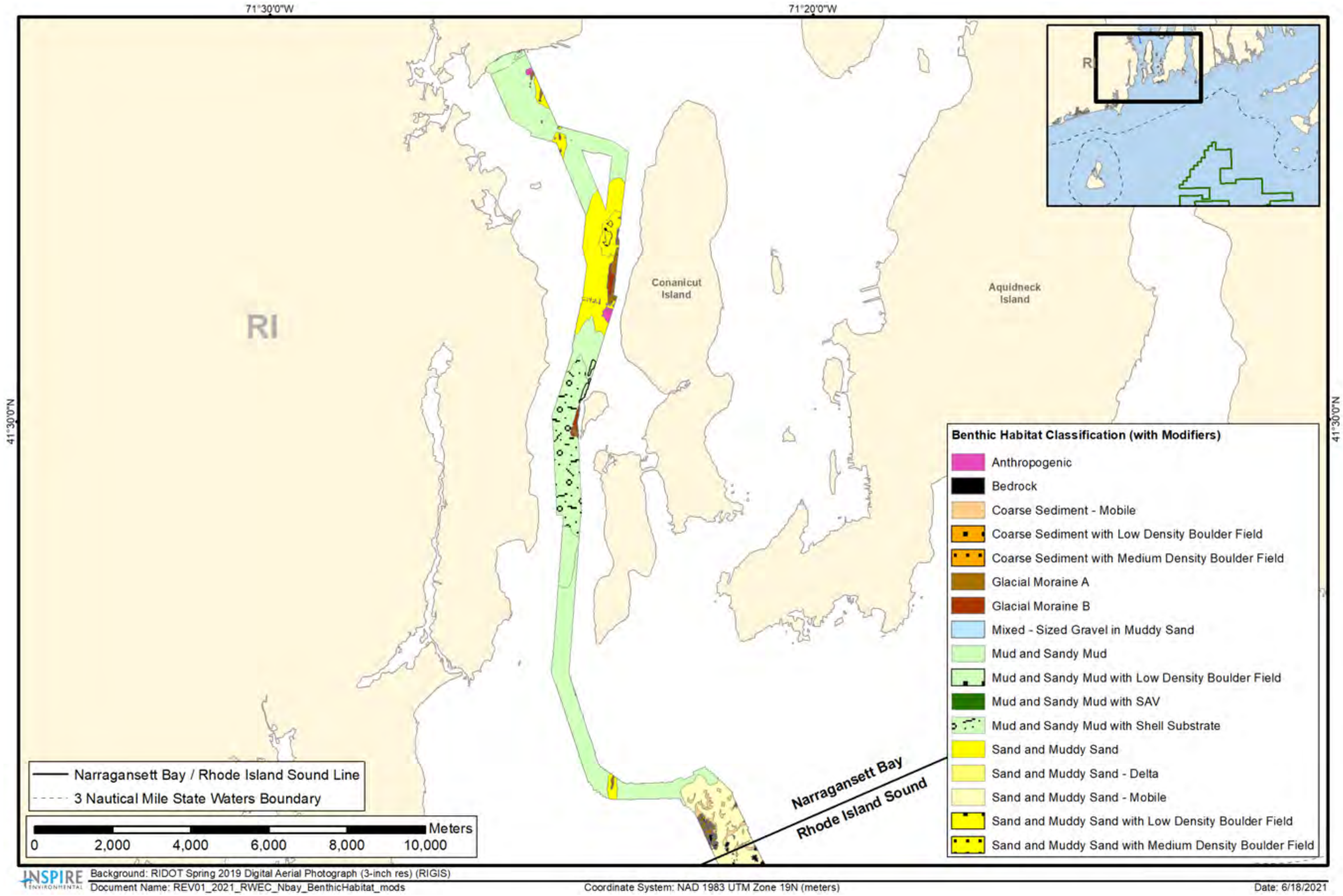

Figure 3-15. Benthic habitat types with modifiers along the RWEC-RI in Narragansett Bay

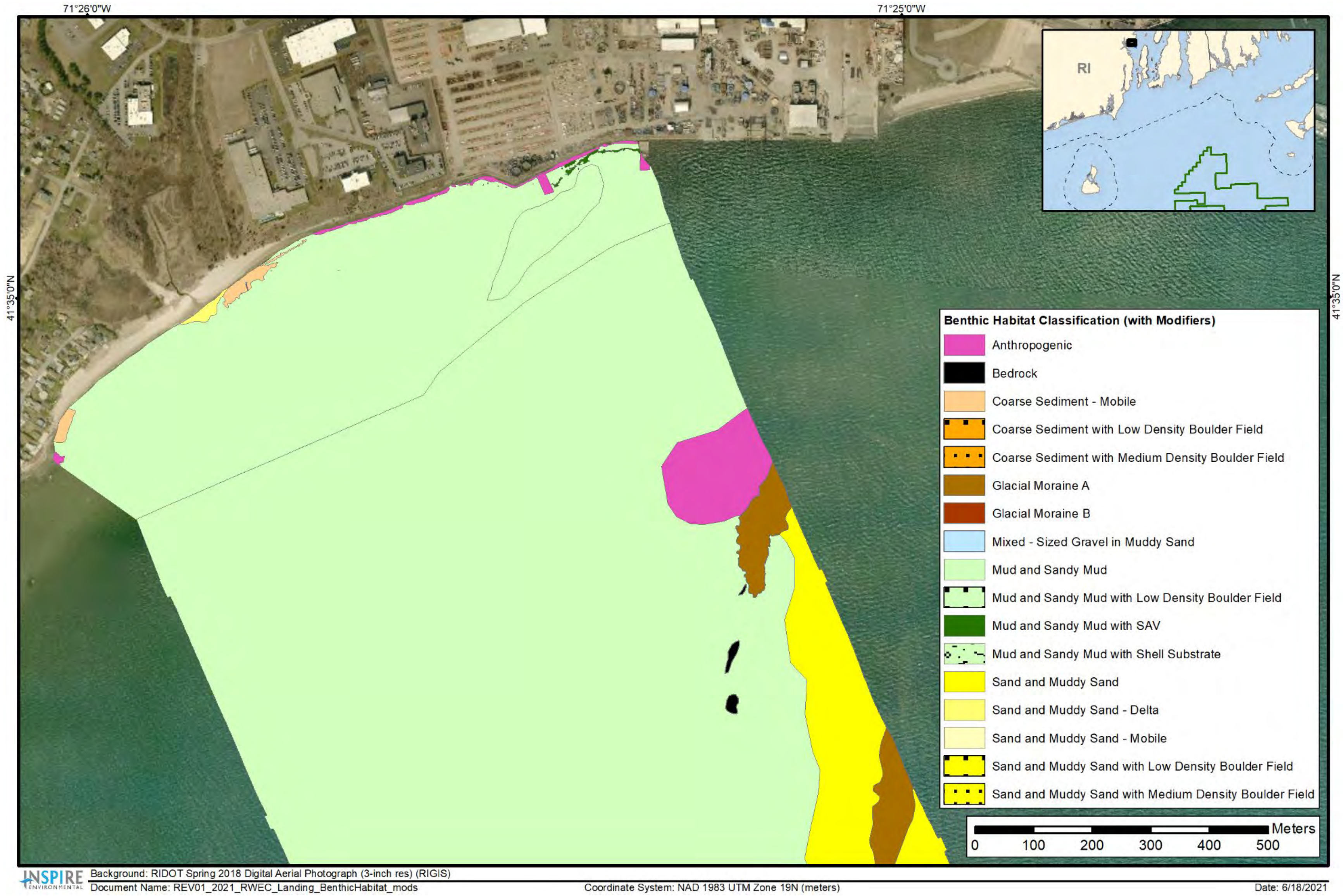

Figure 3-16. Benthic habitat types with modifiers along the RWEC-RI at the Quonset Point landfall

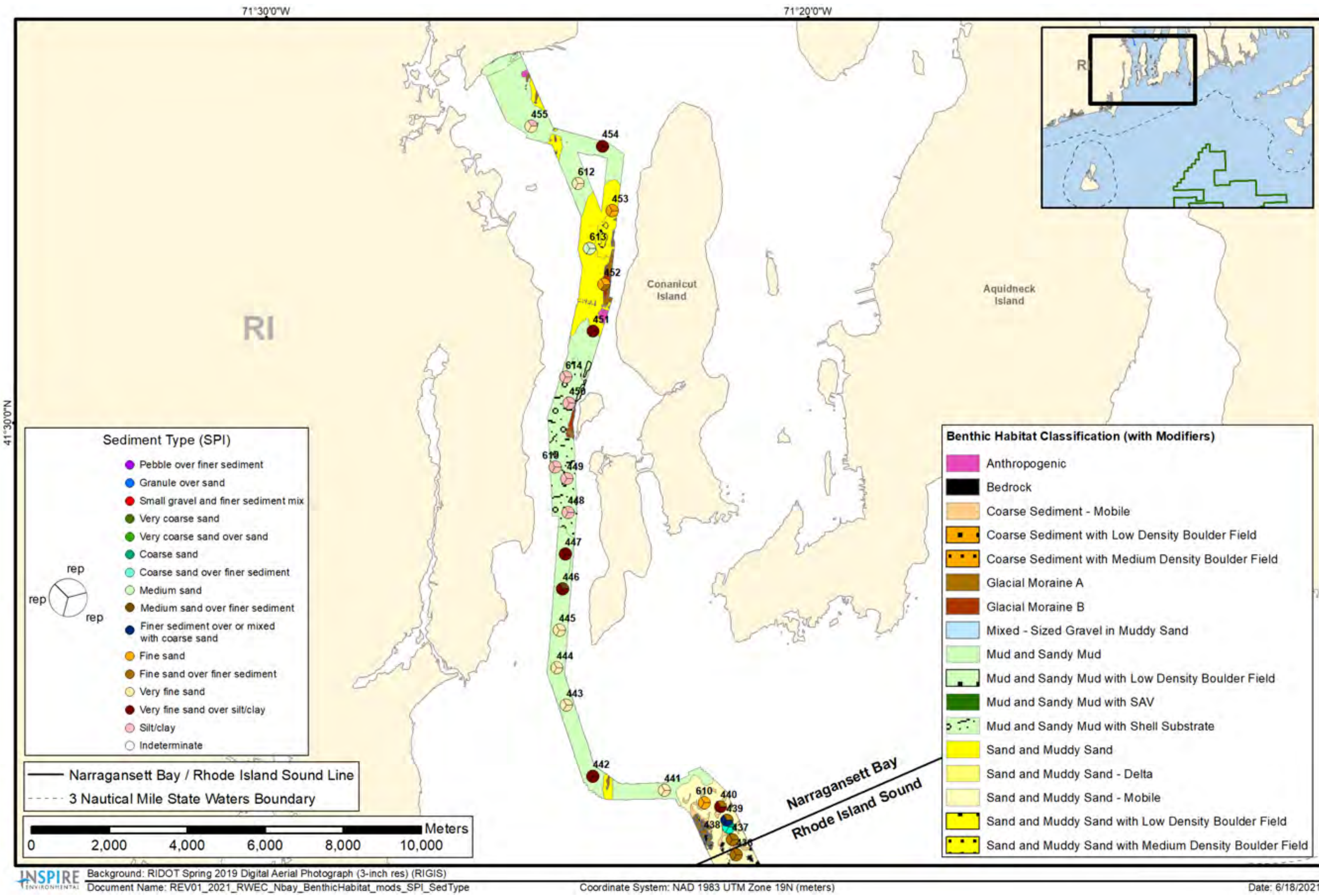

Figure 3-17. Benthic habitat types with modifiers and ground-truth sediment type from SPI along the RWEC-RI in Narragansett Bay

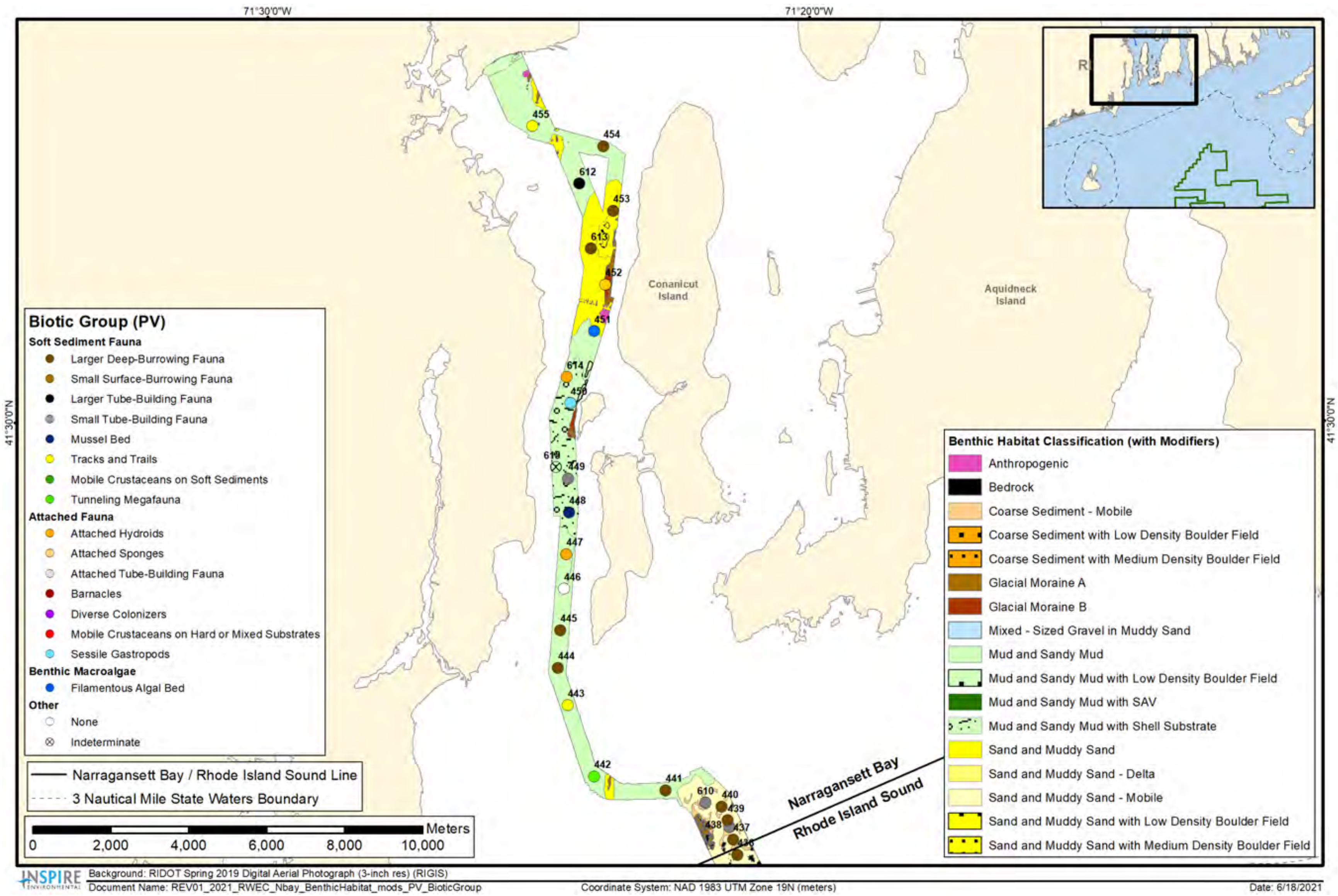

Figure 3-18. Benthic habitat types with modifiers and ground-truth CMECS Biotic Group along the RWEC-RI in Narragansett Bay

Benthic Habitats in Rhode Island State Waters

Revolution Wind Offshore Wind Farm

ATTACHMENTS

Prepared for:

Revolution Wind | Powered by Ørsted & Eversource

Revolution Wind, LLC

Submitted by:

INSPIRE ENVIRONMENTAL

INSPIRE Environmental
Newport, Rhode Island 02840

June 2021

Attachment A: Benthic Ground-Truth Data Analysis Results

Notes:

IND=Indeterminate

N/A=Not Applicable

1 Successional Stage: “on” indicates one Stage is found on top of another Stage (i.e., 1 on 3); “->” indicates one Stage is progressing to another Stage (i.e., 2 -> 3).

2 Variable determined from combined SPI and PV analysis

Area	Water Body	Station ID	Water Depth (m)	PV Replicate (n)	Mapped Habitat Type	PV Macrohabitat (# of reps)	PV CMECS Substrate Group	PV CMECS Substrate Subgroup	PV Max Gravel Measurement (mm)	PV Boulder Presence	PV Bedforms (# of reps)	PV Mean Bedform Wavelength (cm)	PV Biological Debris	PV CMECS Biotic Subclass	PV CMECS Co-occurring Biotic Subclasses	PV CMECS Biotic Group	PV CMECS Co-occurring Biotic Group	PV Maximum Attached Fauna Percent Cover	PV Burrow Presence	PV Tracks Presence	PV Fish Presence/Type
RWEC-RI	Rhode Island Sound	429	27.5	3	Sand and Muddy Sand - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Moon Snail Egg Case, Shell Hash, Small Shell Fragment(s)	Soft Sediment Fauna	Inferred Fauna	Small Tube-Building Fauna	None	None	No	Yes	None
RWEC-RI	Rhode Island Sound	430	28.2	3	Sand and Muddy Sand - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Shell Hash, Small Shell Fragment(s)	Soft Sediment Fauna	Inferred Fauna	Larger Tube-Building Fauna	Varies	None	Yes	Yes	None
RWEC-RI	Rhode Island Sound	431	32.4	3	Mud and Sandy Mud	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	None	Soft Sediment Fauna	Inferred Fauna	Larger Tube-Building Fauna	Larger Deep-Burrowing Fauna	None	Yes	Yes	None
RWEC-RI	Rhode Island Sound	432	34.1	3	Mud and Sandy Mud	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	None	Soft Sediment Fauna	Inferred Fauna	Larger Tube-Building Fauna	Larger Deep-Burrowing Fauna	None	Yes	Yes	None
RWEC-RI	Rhode Island Sound	433	33.7	3	Mud and Sandy Mud	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	None	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	Small Tube-Building Fauna	None	Yes	Yes	None
RWEC-RI	Rhode Island Sound	434	31.0	3	Sand and Muddy Sand - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Small Shell Fragment(s)	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	Larger Tube-Building Fauna	None	Yes	Yes	None
RWEC-RI	Rhode Island Sound	435	31.1	3	Sand and Muddy Sand - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Small Shell Fragment(s)	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	Larger Tube-Building Fauna	None	Yes	Yes	None
RWEC-RI	Rhode Island Sound	436	31.1	3	Sand and Muddy Sand - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Small Shell Fragment(s)	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	Larger Tube-Building Fauna	None	Yes	Yes	None
RWEC-RI	Narragansett Bay	437	30.5	3	Sand and Muddy Sand - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Small Shell Fragment(s)	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	Larger Tube-Building Fauna	None	Yes	Yes	None
RWEC-RI	Narragansett Bay	438	30.1	3	Coarse Sediment - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Large Shell Fragment(s), Small Shell Fragment(s)	Soft Sediment Fauna	Inferred Fauna	Small Tube-Building Fauna	None	None	Yes	Yes	None
RWEC-RI	Narragansett Bay	439	29.9	3	Sand and Muddy Sand - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Small Shell Fragment(s)	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	Varies	None	Yes	Yes	None
RWEC-RI	Narragansett Bay	440	29.4	3	Sand and Muddy Sand - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Moon Snail Egg Case	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	Tracks and Trails	None	Yes	Yes	None
RWEC-RI	Narragansett Bay	441	29.8	3	Mud and Sandy Mud	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	None	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	Tunneling Megafauna	None	Yes	Yes	None
RWEC-RI	Narragansett Bay	442	29.4	3	Mud and Sandy Mud	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	None	Soft Sediment Fauna	Inferred Fauna	Tunneling Megafauna	Tracks and Trails	None	Yes	Yes	None
RWEC-RI	Narragansett Bay	443	23.5	3	Mud and Sandy Mud	Sand Sheet (3)	Sand	Sand or finer	IND	No	Ripples (3)	11.93	None	Soft Sediment Fauna	Inferred Fauna	Tracks and Trails	Varies	None	Yes	Yes	None
RWEC-RI	Narragansett Bay	444	19.9	3	Mud and Sandy Mud	Sand Sheet (3)	Sand	Sand or finer	IND	No	Ripples (3)	IND	None	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	None	None	Yes	Yes	None

Area	Water Body	Station ID	Water Depth (m)	PV Replicate (n)	Mapped Habitat Type	PV Macrohabitat (# of reps)	PV CMECS Substrate Group	PV CMECS Substrate Subgroup	PV Max Gravel Measurement (mm)	PV Boulder Presence	PV Bedforms (# of reps)	PV Mean Bedform Wavelength (cm)	PV Biological Debris	PV CMECS Biotic Subclass	PV CMECS Co-occurring Biotic Subclasses	PV CMECS Biotic Group	PV CMECS Co-occurring Biotic Group	PV Maximum Attached Fauna Percent Cover	PV Burrow Presence	PV Tracks Presence	PV Fish Presence/Type
RWEC-RI	Narragansett Bay	445	17.6	2	Mud and Sandy Mud	Sand Sheet (2)	Sand	Sand or finer	IND	No	Ripples (1)	IND	Large Shell Fragment(s)	Soft Sediment Fauna	Attached Fauna	Larger Deep-Burrowing Fauna	None	Trace (<1%)	Yes	Yes	None
RWEC-RI	Narragansett Bay	446	14.7	3	Mud and Sandy Mud	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Large Shell Fragment(s), Small Shell Fragment(s)	Soft Sediment Fauna	Inferred Fauna	None	None	None	No	Yes	Northern Sea Robin
RWEC-RI	Narragansett Bay	447	15.0	3	Mud and Sandy Mud	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Large Shell Fragment(s)	Soft Sediment Fauna	Attached Fauna	Attached Hydroids	None	Sparse (1 to <30%)	Yes	Yes	None
RWEC-RI	Narragansett Bay	448	10.9	3	Mud and Sandy Mud with Shell Substrate	Mollusk Bed (or Shells) on Mud (3)	Shell Substrate	Shell Hash	IND	No	None	N/A	Large Mussel Shell Fragments	Soft Sediment Fauna	Attached Fauna	Mussel Bed	Varies	Moderate (30 to < 70%)	Yes	No	None
RWEC-RI	Narragansett Bay	449	13.8	3	Mud and Sandy Mud with Shell Substrate	Mollusk Bed (or Shells) on Mud (3)	Shell Substrate	Shell Hash	IND	No	None	N/A	Large Mussel Shell Fragments	Soft Sediment Fauna	Attached Fauna	Small Tube-Building Fauna	Filamentous Algal Bed	Sparse (1 to <30%)	No	No	None
RWEC-RI	Narragansett Bay	450	11.0	3	Mud and Sandy Mud with Shell Substrate	Mollusk Bed (or Shells) on Mud (3)	Shell Substrate	Crepidula Reef Substrate	IND	No	None	N/A	Large Shell Fragment(s)	Attached Fauna	None	Sessile Gastropods	Attached Hydroids	Complete (90-100%)	No	No	None
RWEC-RI	Narragansett Bay	451	25.5	3	Sand and Muddy Sand	IND (1), Patchy Cobbles on Sand (2)	Slightly Gravelly	Slightly Gravelly Sand	IND	No	None	N/A	Large Shell Fragment(s)	Benthic Macroalgae	Soft Sediment Fauna	Filamentous Algal Bed	Attached Sponges	Moderate (30 to < 70%)	IND	Yes	None
RWEC-RI	Narragansett Bay	452	21.5	3	Glacial Moraine B	Patchy Cobbles on Sand (2), Patchy Pebbles on Sand (1)	Slightly Gravelly	Slightly Gravelly Sand	114.61	No	None	N/A	Large Shell Fragment(s), Small Shell Fragment(s)	Attached Fauna	Soft Sediment Fauna	Attached Sponges	None	Sparse (1 to <30%)	No	Yes	None
RWEC-RI	Narragansett Bay	453	13.6	3	Sand and Muddy Sand	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Small Shell Fragment(s)	Soft Sediment Fauna	Benthic Macroalgae	Larger Deep-Burrowing Fauna	Filamentous Algal Bed	Sparse (1 to <30%)	Yes	No	None
RWEC-RI	Narragansett Bay	454	8.6	2	Mud and Sandy Mud	Sand Sheet (2)	Sand	Sand or finer	IND	No	None	N/A	None	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	None	None	Yes	Yes	None
RWEC-RI	Narragansett Bay	455	5.2	1	Mud and Sandy Mud	Sand Sheet (1)	Sand	Sand or finer	IND	No	None	N/A	None	Soft Sediment Fauna	Inferred Fauna	Tracks and Trails	Larger Deep-Burrowing Fauna	None	Yes	Yes	None
RWEC-RI	Rhode Island Sound	604	27.8	3	Sand and Muddy Sand - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Small Shell Fragment(s)	Soft Sediment Fauna	Inferred Fauna	Larger Tube-Building Fauna	None	None	No	Yes	None
RWEC-RI	Narragansett Bay	610	29.5	3	Coarse Sediment - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	None	Soft Sediment Fauna	Inferred Fauna	Small Tube-Building Fauna	Tracks and Trails	None	Yes	Yes	None
RWEC-RI	Rhode Island Sound	611	30.8	3	Sand and Muddy Sand - Mobile	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	None	Soft Sediment Fauna	Inferred Fauna	Larger Deep-Burrowing Fauna	Larger Tube-Building Fauna	None	Yes	Yes	None
RWEC-RI	Narragansett Bay	612	8.9	2	Mud and Sandy Mud	Sand Sheet (2)	Sand	Sand or finer	IND	No	None	N/A	None	Soft Sediment Fauna	Inferred Fauna	Larger Tube-Building Fauna	Tracks and Trails	None	Yes	Yes	None

Area	Water Body	Station ID	Water Depth (m)	PV Replicate (n)	Mapped Habitat Type	PV Macrohabitat (# of reps)	PV CMECS Substrate Group	PV CMECS Substrate Subgroup	PV Max Gravel Measurement (mm)	PV Boulder Presence	PV Bedforms (# of reps)	PV Mean Bedform Wavelength (cm)	PV Biological Debris	PV CMECS Biotic Subclass	PV CMECS Co-occurring Biotic Subclasses	PV CMECS Biotic Group	PV CMECS Co-occurring Biotic Group	PV Maximum Attached Fauna Percent Cover	PV Burrow Presence	PV Tracks Presence	PV Fish Presence/Type
RWEC-RI	Narragansett Bay	613	9.2	3	Sand and Muddy Sand	Sand Sheet (3)	Sand	Sand or finer	IND	No	None	N/A	Shell Hash	Soft Sediment Fauna	None	Larger Deep-Burrowing Fauna	IND	None	Yes	IND	None
RWEC-RI	Narragansett Bay	614	11.2	3	Mud and Sandy Mud with Shell Substrate	Mollusk Bed (or Shells) on Mud (3)	Shell Substrate	Shell Hash	IND	No	None	N/A	Large Shell Fragment(s), Shell Hash	Attached Fauna	None	Attached Hydroids	None	Sparse (1 to <30%)	No	No	None
RWEC-RI	Narragansett Bay	615	14.2	3	Mud and Sandy Mud with Shell Substrate	Mollusk Bed (or Shells) on Mud (3)	Shell Substrate	Shell Hash	IND	No	None	N/A	Large Mussel Shell Fragments	Attached Fauna	None	IND	None	Sparse (1 to <30%)	No	No	None

Area	Water Body	Station ID	SPI Replicate (n)	SPI Sediment Type (# of reps)	SPI Mean Prism Penetration Depth (cm)	SPI Mean Boundary Roughness (cm)	SPI Mean aRPD Depth (cm)	SPI Sediment Oxygen Demand Level	SPI Successional Stage (by replicate)[1]			SPI/PV Sensitive Taxa Type[2]	SPI/PV Species of Concern[2]	SPI/PV Presence of Tubes[2]	SPI/PV Amphipod Presence/Type[2]	SPI/PV Sea Pen Presence[2]	SPI/PV Other Epifauna Present[2]	SPI/PV Possible Non-Native *Botrylloides sp.*[2]
RWEC-RI	Rhode Island Sound	429	3	Coarse sand over finer sediment (3)	5.4	0.8	IND	Low	2	2	2 -> 3	None	None	Yes	Unidentified	No	Shrimp	No
RWEC-RI	Rhode Island Sound	430	3	Fine sand (3)	4.6	0.4	IND	Low	2 -> 3	2 -> 3	2 -> 3	None	None	Yes	None	No	None	No
RWEC-RI	Rhode Island Sound	431	3	Very fine sand (3)	13.4	0.6	1.80	Low	2 on 3	2 on 3	2 on 3	None	None	Yes	Ampeliscid, Podoceridae	No	None	No
RWEC-RI	Rhode Island Sound	432	3	Very fine sand (3)	13.8	1.5	2.08	Low	2 on 3	2 on 3	2 on 3	None	None	Yes	Ampeliscid, Podoceridae	No	None	No
RWEC-RI	Rhode Island Sound	433	3	Very fine sand over silt/clay (3)	14.7	1.1	1.63	Low	2 on 3	2 on 3	2 on 3	None	None	Yes	Podoceridae	No	Crab	No
RWEC-RI	Rhode Island Sound	434	3	Fine sand (3)	5.8	0.9	1.97	Low	2	2 -> 3	2 -> 3	None	None	Yes	Ampeliscid	No	Paguroid	No
RWEC-RI	Rhode Island Sound	435	3	Fine sand (3)	6.0	1.3	2.51	Low	2 -> 3	2 -> 3	2 -> 3	None	None	Yes	Ampeliscid, Podoceridae	No	Moon Snail, Paguroid	No
RWEC-RI	Rhode Island Sound	436	3	Fine sand over very fine sand (3)	8.2	1.0	2.95	Low	2 -> 3	2 -> 3	3	None	None	Yes	None	No	Gastropods, Paguroid, Unidentified Organism	No
RWEC-RI	Narragansett Bay	437	3	Fine sand over very fine sand (3)	9.1	1.9	3.16	Low	2 -> 3	2 -> 3	2 -> 3	None	None	Yes	Podoceridae	No	Gastropod(s)	No
RWEC-RI	Narragansett Bay	438	3	Coarse sand (1), Coarse sand over finer sediment (2)	5.3	1.3	IND	Low	2	2	2	None	None	Yes	Podoceridae	No	Gastropod(s), Paguroid(s)	No
RWEC-RI	Narragansett Bay	439	3	Fine sand over very fine sand (1), Finer sediment over coarse sand (2)	7.3	1.6	2.92	Low	2	2 -> 3	2 -> 3	None	None	Yes	Podoceridae	No	Gastropod(s), Moon Snail, Paguroid(s)	No
RWEC-RI	Narragansett Bay	440	3	Fine sand over very fine sand (1), Very fine sand over silt/clay (2)	18.0	1.2	2.00	Medium	1 on 3	1 on 3	1 on 3	None	None	Yes	None	No	Gastropod, Paguroid, Unidentified Organism	No
RWEC-RI	Narragansett Bay	441	3	Very fine sand (3)	16.7	1.1	2.30	Low	2 -> 3	2 on 3	2 on 3	None	None	Yes	Podoceridae	No	None	No
RWEC-RI	Narragansett Bay	442	3	Very fine sand over silt/clay (3)	14.7	2.5	1.77	Low	2 -> 3	2 on 3	2 on 3	None	None	Yes	Podoceridae	No	Crab(s)	No
RWEC-RI	Narragansett Bay	443	3	Very fine sand (3)	10.0	1.5	1.99	Low	1 on 3	1 on 3	1 on 3	None	None	Yes	None	No	Gastropod(s), Paguroid(s)	No
RWEC-RI	Narragansett Bay	444	3	Very fine sand (3)	10.8	0.7	2.26	Medium	2 -> 3	1 on 3	2 on 3	None	None	Yes	Unidentified	No	Paguroid(s), Shrimp	No

Area	Water Body	Station ID	SPI Replicate (n)	SPI Sediment Type (# of reps)	SPI Mean Prism Penetration Depth (cm)	SPI Mean Boundary Roughness (cm)	SPI Mean aRPD Depth (cm)	SPI Sediment Oxygen Demand Level	SPI Successional Stage (by replicate)[1]			SPI/PV Sensitive Taxa Type[2]	SPI/PV Species of Concern[2]	SPI/PV Presence of Tubes[2]	SPI/PV Amphipod Presence/Type[2]	SPI/PV Sea Pen Presence[2]	SPI/PV Other Epifauna Present[2]	SPI/PV Possible Non-Native *Botrylloides sp.*[2]
RWEC-RI	Narragansett Bay	445	3	Very fine sand (3)	8.4	1.1	1.84	Medium	2	2	2	None	None	Yes	Podoceridae	No	Barnacles, Gastropod(s), Paguroid(s)	No
RWEC-RI	Narragansett Bay	446	3	Medium sand over finer sediment (1), Very fine sand over silt/clay (2)	9.5	0.9	1.52	Medium	2 -> 3	1 on 3	2 on 3	None	None	Yes	None	No	Crab, Gastropod, Paguroid(s)	No
RWEC-RI	Narragansett Bay	447	3	Very fine sand over silt/clay (3)	9.3	0.8	1.22	Medium	2	2	1 on 3	None	None	Yes	None	No	Barnacles, Hydroids, Paguroid(s)	No
RWEC-RI	Narragansett Bay	448	3	Silt/clay (3)	8.2	1.2	0.98	Medium	2 -> 3	IND	IND	None	None	Yes	None	No	Barnacles, Gastropod, Hydroids, Mussels	No
RWEC-RI	Narragansett Bay	449	3	Silt/clay (3)	15.1	1.5	0.98	Medium	3	3	3	None	None	Yes	None	No	Crab, Hydroids	No
RWEC-RI	Narragansett Bay	450	3	Silt/clay (3)	11.8	3.3	IND	Medium	IND	IND	IND	None	None	No	None	No	Barnacles, Crepidula, Hydroids, Sponges	No
RWEC-RI	Narragansett Bay	451	3	Very fine sand over silt/clay (3)	11.6	1.3	1.06	Medium	1	2 -> 3	3	None	None	Yes	None	No	Gastropod, Sponge(s), Whelk	No
RWEC-RI	Narragansett Bay	452	3	Fine sand (2), Fine sand over silt/clay (1)	3.1	0.9	0.02	Medium	1	1	1	None	None	No	None	No	Barnacles, Barnacles, Gastropod(s), Sponge(s)	No
RWEC-RI	Narragansett Bay	453	3	Fine sand (3)	1.9	0.9	1.10	Low	1	IND	IND	None	None	No	None	No	None	No
RWEC-RI	Narragansett Bay	454	3	Very fine sand over silt/clay (3)	13.3	1.0	1.96	Low	2 -> 3	2 on 3	2 on 3	None	None	No	None	No	None	No
RWEC-RI	Narragansett Bay	455	3	Silt/clay (1), Very fine sand (2)	8.9	1.3	2.20	Medium	2	2 -> 3	2 on 3	None	None	Yes	None	No	None	No
RWEC-RI	Rhode Island Sound	604	3	Fine sand (3)	4.6	1.0	IND	Low	2	2	2	None	None	Yes	Ampeliscid	No	Gastropod(s)	No
RWEC-RI	Narragansett Bay	610	3	Fine sand (3)	5.1	1.7	IND	Low	2 -> 3	2 -> 3	2 -> 3	None	None	Yes	Podoceridae	No	Paguroid(s)	No
RWEC-RI	Rhode Island Sound	611	3	Fine sand (3)	5.3	1.6	4.62	Low	2 -> 3	2 -> 3	IND	None	None	Yes	Ampeliscid, Podoceridae	No	Gastropods, Paguroid	No
RWEC-RI	Narragansett Bay	612	3	Very fine sand (3)	11.7	1.1	2.10	Low	2 on 3	2 on 3	2 on 3	None	None	Yes	None	No	None	No

Area	Water Body	Station ID	SPI Replicate (n)	SPI Sediment Type (# of reps)	SPI Mean Prism Penetration Depth (cm)	SPI Mean Boundary Roughness (cm)	SPI Mean aRPD Depth (cm)	SPI Sediment Oxygen Demand Level	SPI Successional Stage (by replicate)[1]			SPI/PV Sensitive Taxa Type[2]	SPI/PV Species of Concern[2]	SPI/PV Presence of Tubes[2]	SPI/PV Amphipod Presence/Type[2]	SPI/PV Sea Pen Presence[2]	SPI/PV Other Epifauna Present[2]	SPI/PV Possible Non-Native *Botrylloides sp.*[2]
RWEC-RI	Narragansett Bay	613	3	Medium sand (3)	2.2	1.3	IND	None	IND	IND	IND	None	None	No	None	No	None	No
RWEC-RI	Narragansett Bay	614	3	Silt/clay (3)	9.4	0.7	2.18	High	3	3	IND	None	None	No	None	No	Hydroids, Sponges	No
RWEC-RI	Narragansett Bay	615	3	Silt/clay (3)	15.7	1.5	1.55	High	3	2 on 3	2 on 3	None	None	Yes	None	No	Hydroids, Jonah Crab	No

Appendix Q: Essential Fish Habitat Assessment Revolution Wind Offshore Wind Farm

Technical Report

Essential Fish Habitat Assessment

Revolution Wind Offshore Wind Farm

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October 2020

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List of Acronyms

ASMFC	Atlantic States Marine Fisheries Commission
CMECS	Coastal and Marine Ecological Classification Standard
EEZ	exclusive economic zone
EFH	essential fish habitat
ESA	Endangered Species Act
HAPC	Habitat Area of Particular Concern
ICCAT	International Commission for the Conservation of Atlantic Tunas
IPF	impact-producing factor
Lease	Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf OCS-A 0486
Lease Area	BOEM-designated Renewable Energy Lease Area OCS-A 0486
MHW	mean high water
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NOAA Fisheries	National Marine Fisheries Service
O&M	operations and maintenance
OCS	Outer Continental Shelf
OnSS	onshore substation
OSS	offshore substation
Project	Revolution Wind Farm Project
Project Area	Proposed Wind Farm Area, Export Cable Corridor, and all onshore project facility locations including the Onshore Transmission Cable Corridor, and Onshore Substation
RIGIS	Rhode Island Geographic Information System
RWEC	Revolution Wind Farm Export Cable
RWEC-RI	Revolution Wind Farm Export Cable-Rhode Island State Waters
RWEC-OCS	Revolution Wind Farm Export Cable-Outer Continental Shelf
RWF	Revolution Wind Farm
TJB	transition joint bay

U.S.C.	United States Code
WTG	wind turbine generator

1.0 INTRODUCTION

1.1 Description of the Proposed Action

Revolution Wind, LLC (Revolution Wind), a 50/50 joint venture between Orsted North America Inc. (Orsted NA) and Eversource Investment LLC (Eversource), proposes to construct and operate the Revolution Wind Farm Project (hereinafter referred to as the Project). The wind farm portion of the Project will be located in federal waters on the Outer Continental Shelf (OCS) in the designated Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0486 (Lease Area). The Lease Area is approximately 20 statute miles (mi) (17.4 nautical miles [nm], 30 kilometers [km]) south of the coast of Rhode Island (Figure 1.1-1).

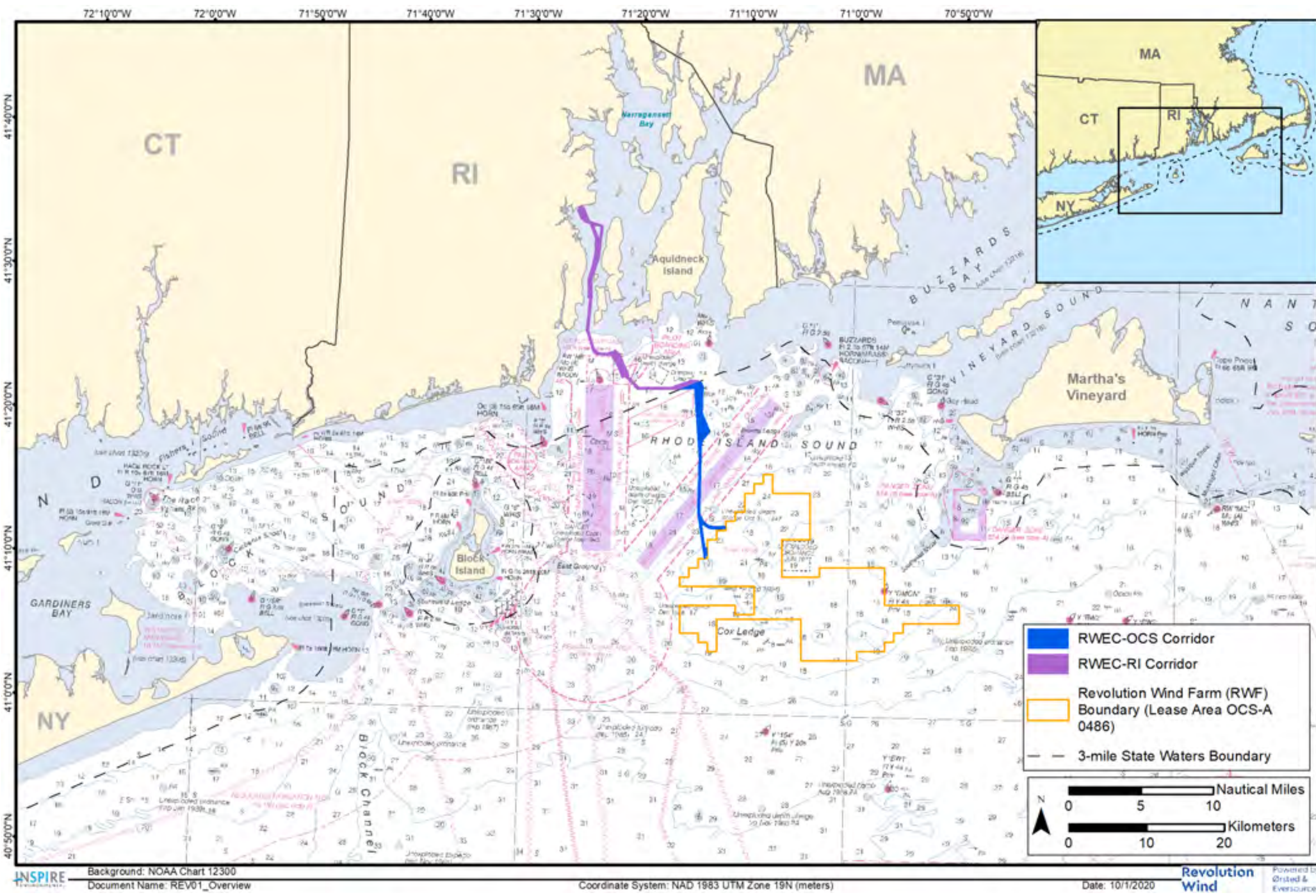

Figure 1.1-1 Map of the Project Area, including the Potential Export Cable Corridor and Revolution Wind Farm.

The Project will be comprised of both offshore and onshore components, which are described in detail in Section 3 of the Construction and Operations Plan.

Offshore:

- up to 100 Wind Turbine Generators (WTGs) connected by a network of Inter-Array Cables (IAC);
- up to two Offshore Substations (OSSs) connected by an OSS-Link Cable; and

- up to two submarine export cables (referred to as the RWEC), generally co-located within a single corridor.

Onshore:

- a landfall location located at Quonset Point in North Kingstown, Rhode Island (referred to as the Landfall Work Area);
- up to two underground transmission circuits (referred to as the Onshore Transmission Cable), co-located within a single corridor; and
- a new Onshore Substation (OnSS) located adjacent to the existing Davisville Substation with up to two interconnection circuits (overhead or underground) connecting the OnSS to the existing substation.

The Project's components are further grouped into four general categories: the Revolution Wind Farm (RWF), inclusive of the WTGs, OSSs, IAC, and OSS-Link Cable; the RWEC–OCS, inclusive of up to 25 mi (40 km) of the RWEC in federal waters; the RWEC–RI State Waters, inclusive of up to 23 mi (37 km) of the RWEC in state waters; and Onshore Facilities, inclusive of an up to 328-foot (ft) (100-meter [m]) segment of the RWEC, Landfall Work Area, Onshore Transmission Cable, and OnSS (including interconnection circuits). Power from the RWF will be delivered to the electric grid via two distinct transmission cable segments: the RWEC and the Onshore Transmission Cable. The intersect of the RWEC and Onshore Transmission Cable will occur at co-located transition joint bays (TJBs), which will be located at the Landfall Work Area. Multiple landfall sites are currently being evaluated within the Landfall Work Area.

The Project will be commissioned and operational by end of Q4 2023. Revolution Wind assumes all permits will be obtained in Q3 2022. It is further assumed construction will begin by the end of Q3 2022 with installation of the onshore components and initiation of seabed preparation activities (clearing of debris and obstructions).

1.2 Regulatory Context and Resource Definition

Coastal and marine natural resources in the United States are governed and managed by multiple entities at the federal, state, interstate, and tribal level. The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), passed in 1976, established eight regional fishery management councils for the conservation and management of fisheries from 3 to 200 miles (4.8 to 322 km, 2.6 to 133.8 nm) off the U.S. coast. Fisheries and stocks within 3 nm (5.6 km) of shore are managed by state governments. In the greater Atlantic region, management of certain fisheries that are shared coastal resources is coordinated through the Atlantic States Marine Fisheries Commission (ASMFC). The MSFCMA was revised and amended in 1996 with the passage of the Sustainable Fisheries Act to strengthen conservation and increase the focus on sustainability, in part by requiring the identification of essential fish habitat (EFH) (16 United States Code [U.S.C.] 1801-1884). The MSFCMA was again revised and reauthorized in 2007, with additional conservation and management requirements to further the effort against overfishing, support conservation, and improve fisheries science research (16 U.S.C. 1801-1884).

The MSFCMA was established, along with other goals, to promote the protection of EFH in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined in the MSFCMA as those waters (e.g., aquatic areas and their associated physical, chemical, and biological properties used by fish) and substrate (e.g., sediment, hard bottom, underlying structures, and associated biological communities) necessary for the spawning, feeding, or growth to maturity of managed fish species. Managed species include marine, estuarine, and anadromous finfish; mollusks; and crustaceans.

1.3 Regulatory Coordination and Required Permits

Federal agencies that authorize, fund, or undertake activities that may adversely affect EFH must consult with the National Oceanic Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries). An adverse effect includes direct or indirect physical, chemical, or biological alterations, including changes to waters or substrate, species and their habitat, other ecosystem components, or the quality and/or quantity of EFH. Although absolute criteria have not been established for conducting EFH consultations, the guidelines issued by NOAA Fisheries recommend consolidated EFH consultations with interagency coordination procedures required by other statutes, such as the National Environmental Policy Act (NEPA) or the Endangered Species Act (ESA), to reduce duplication and improve efficiency. Generally, the EFH consultation process includes the following steps:

1. Notification – The action agency provides notification of the action to NOAA Fisheries.
2. EFH Assessment – The action agency prepares and submits an EFH Assessment that includes both identification of affected EFH and an assessment of effects. Required elements of the assessment include a description of the proposed action; an analysis of the potential adverse effects of that action on EFH and the managed species; the federal action agency's conclusions regarding the effects of the action on EFH; and proposed environmental protection measures, if applicable.
3. EFH Conservation Recommendations – After reviewing the EFH Assessment, NOAA Fisheries provides recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.
4. Agency Response – Within 30 days of receiving the recommendations, the action agency must respond to NOAA Fisheries with information on how it will proceed with the action. The response must include a description of measures proposed by the agency to avoid, mitigate, or offset the impact of the activity on EFH. For any conservation recommendation that is not adopted, the action agency must explain its reason to NOAA Fisheries for not following the recommendation.

This technical report was prepared to provide federal permitting authorities (e.g., BOEM, ACOE) with the information necessary to complete EFH consultation with NOAA Fisheries, as well as to facilitate BOEM's review of the Project under NEPA.

1.4 Contents of This Technical Report

Section 2.0 of this technical report describes the species and life stages with designated EFH, as well as Habitat Areas of Particular Concern (HAPCs), that may occur within the RWF area and/or the RWEC corridor. Potential impacts and environmental protection measures are discussed in Section 3.0.

2.0 AFFECTED ENVIRONMENT

2.1 Methodology

EFH data and text descriptions were downloaded from the NOAA Habitat Conservation EFH Mapper, an online mapping application (NOAA Fisheries, 2019a) and supplemented with additional literature sources where necessary. EFH data were queried using GIS software based on RWF and RWEC Project components and manually verified. A 0.5-mile buffer centered on the RWEC route was assumed in order to query the data.

2.2 Baseline Conditions

2.2.1 Offshore

The RI-MA WEA is located offshore on the northeastern Atlantic continental shelf in Rhode Island Sound. The waters in the vicinity of the RWF and RWEC are transitional waters that separate Narragansett Bay and Long Island Sound from the outer continental shelf (OCS). Organisms that inhabit in these areas are adapted to survive in this dynamic environment. In general, the benthic communities of these OCS areas are diverse, with lower densities of organisms than in the northern portion of the Mid-Atlantic Bight and in deeper areas of the OCS (MMS, 2007). The RI-MA WEA is composed of a mix of soft and hard bottom environments defined by dominant sediment grain size and composition. Due to light requirements, SAV beds are limited to shallower depths and thus, do not occur within the RI-MA WEA. However, SAV beds are found in parts of Narragansett Bay, Rhode Island, through which the RWEC-RI transits before making landfall.

Based on data from site-specific benthic habitat surveys conducted for the Project (Benthic Assessment; INSPIRE Environmental, 2020), across the vast majority of the RWEC-OCS and the northern region of the RWF, the predominant habitat type was sand sheet, aside from a cluster of 4 stations in the northern center of the RWF that consisted of a variety of habitat types including patchy pebbles on sand with mobile gravel, patchy cobbles and boulders on sand, and sand with mobile gravel. Other regions of the RWF such as the southwest region of the RWF and the central and southern portions of the RWF, tended to have more heterogeneous habitat types composed of patchy pebbles on sand with mobile gravel, patchy cobbles on sand, and patchy boulders on sand. As a result of the more heterogeneous physical composition and generally coarser substrates, these benthic environments harbored more diverse epifaunal assemblages compared to the northern region of the RWF and the RWEC-OCS stations.

In general, stations sampled along the RWEC-RI were low in environmental complexity, consisting mainly of sand sheet habitat type. The exception was stations located in central Narragansett Bay, which were characterized by the Coastal and Marine Ecological Classification Standard (CMECS) Biotic Subclass Attached Fauna and included the habitat types of mollusk bed (or shells) on mud and patchy cobbles on sand. Along the RWEC-RI there were spatial trends associated with the observed biological and physical features. The up-estuary stations were generally characterized by finer substrate, dominated by soft-sediment fauna, higher turbidity, and more reduced sediments. The mid-bay stations were characterized by mussel and *Crepidula* beds with other attached organisms including barnacles, sponges, and macroalgae. The stations at the mouth of Narragansett Bay and the stations leading offshore to the 3-mile state water boundary were generally dominated by soft sediment infauna.

Benthic communities have experienced increased water temperatures in the Project Area in the past several decades, and average pH is expected to continue to decline as seawater becomes more saturated with carbon dioxide (Saba et al., 2016). Acidification of seawater is associated with decreased survival and health of organisms with calcareous shells (such as the Atlantic scallop, blue clam, and hard clam), but less is known about direct effects of acidification on cartilaginous and bony fishes.

Modeled scenarios of decreasing seawater pH predict a substantial decline in the harvestable stock of the Atlantic scallop, with collateral loss of economic value (Rheuban et al., 2018). Numerous benthic and pelagic species are predicted to shift their ranges northward and into deeper waters in response to increasing water temperatures

(Selden et al., 2018; Kleisner et al., 2017). The ranges of dozens of groundfish species in New England waters have shifted northward and into deeper waters in response to increasing water temperatures (Pinsky et al., 2013; Nye et al., 2009) and more species are predicted to follow (Selden et al., 2018; Kleisner et al., 2017). The black sea bass, identified as particularly sensitive to habitat alteration (Guida et al., 2017), has been increasing in abundance over the past several years, and is expected to continue its expansion in southern New England as water temperatures increase (Kuffner, 2018; McBride et al., 2018). Several pelagic forage species have been increasing in the Project Area, including butterfish, scup, squid (Collie et al., 2008) and Atlantic mackerel (McManus et al., 2018). Perhaps counterintuitively, distributions of other species are reported to be shifting southward, including spiny dogfish, little skate, and silver hake (Walsh et al., 2015). It has been suggested that the spiny dogfish may replace the Atlantic cod as a major predator in southern New England as the cod is driven north by warm waters that the spiny dogfish tolerates well (Selden et al., 2018). Further temperature increases in southern New England are expected to exceed the global ocean average by at least a factor of two, and ocean circulation patterns are projected to change (Saba et al., 2016). Distributional shifts are occurring in both demersal and pelagic species, perhaps mediated by changes in spawning locations and dates (Walsh et al., 2015). Southern species, including some highly migratory species such as mahi that prefer warmer waters, are expected to follow the warming trend and become more abundant in the area (Walsh et al., 2015; South Atlantic Fishery Management Council, 2003). Climate change may also be affecting the migrations of anadromous fish in the region. The herrings, shad, and sturgeon were identified as having high biological sensitivity to adverse effects of climate change (Hare et al., 2016). In addition to physiological effects of temperature and pH, anadromous fishes face a physical risk caused by flooding in their spawning rivers.

Modeling predicts that bottom temperatures in southern New England will become too warm to support larval development of the commercially valuable American lobster, causing this species to move offshore and northward (Rheuban et al., 2017). Lobster catches have declined in recent decades, which may be attributable to increases water temperatures and associated increases in shell disease (Groner et al., 2018; Jaini et al., 2018; Collie and King, 2016; Wahle et al., 2015). Egg-bearing female lobsters occur in warm coastal water in spring but may aggregate offshore for spawning where waters are cooler and strong currents are favorable for larval transport (Carloni et al., 2018). Larval lobster may be transported from Georges Bank to Rhode Island waters by currents along the continental shelf during the 2 to 9 weeks of development to recruitment size (Carloni et al., 2018).

2.2.2 Coastal

The RWEC will make landfall at Quonset Point in North Kingstown, Rhode Island, where multiple locations for the Landfall Work Area are being evaluated. Given that multiple locations are under consideration, a Landfall Envelope has been identified to characterize the range of baseline conditions that may be affected by the Landfall Work Area. Coastal habitats within the Landfall Envelope and vicinity include coastal beach, coastal dune, and tidal salt marsh habitats (Figure 2-2-1). These habitats were delineated, photographed, characterized, and mapped during 2019 and 2020 field surveys to identify baseline conditions (Onshore Natural Resources & Biological Assessment; VHB, 2020).

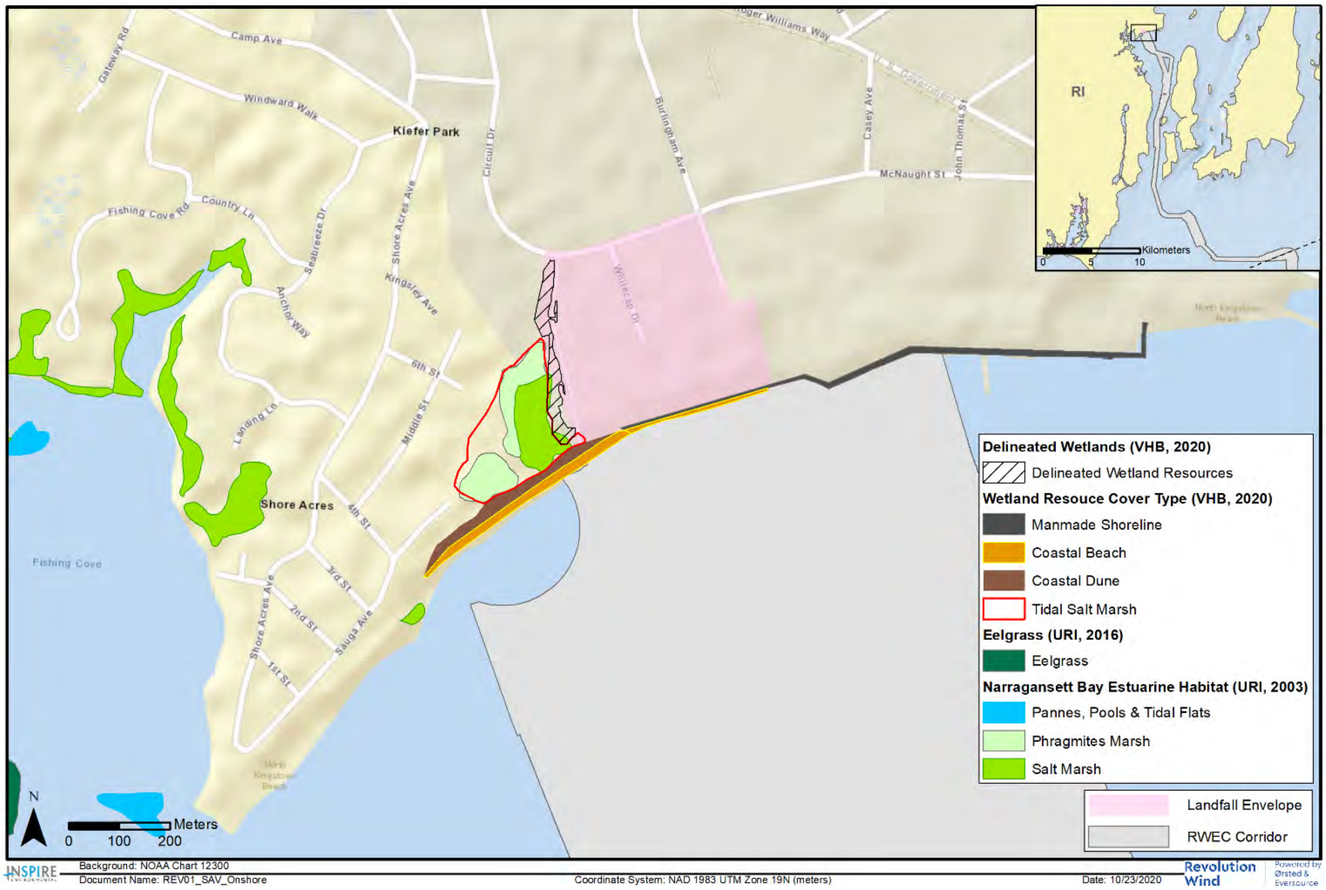

Figure 2.2-1 Tidally-influenced Habitats within the Project Area

Most of the coastal habitats in the area proximate to the Landfall Envelope are disturbed from previous anthropogenic uses. At Blue Beach, the open beach habitat consists of sand and the dune vegetation is made up of American beach grass (*Ammophila breviligulata*), seaside goldenrod (*Solidago sempervirens*), rough cocklebur (*Xanthium strumarium*), prickly lettuce (*Lactuca serriola*), switch grass (*Panicum virgatum*), spotted knapweed (*Centaurea stoebe*), orangegrass (*Hypericum gentianoides*), common evening-primrose (*Oenothera biennis*), and spearscale orache (*Atriplex patula*). Non-native plant species were observed within the coastal beach and coastal dune area, but none of these species are documented as invasive. The landward side of the coastal dune at Blue Beach transitions to tidal salt marsh. This wetland is likely infrequently inundated during extremely high tides and storm surge events. The central area of the marsh bordering Blue Beach is dominated by saltmeadow cordgrass (*Spartina patens*) and the perimeter is mostly composed of common reed (*Phragmites australis*), maritime marsh-elder (*Iva frutescens*) and groundsel tree (*Bacharis halimifolia*). The common reed that occurs along the perimeter of the tidal salt marsh is considered invasive. A tidal channel (potentially manmade) flows through the length of the saltmarsh and connects to the inland freshwater forested swamp near the Blue Beach access path from Circuit Drive.

Th eastern reach of Blue Beach has been altered with a seawall and riprap revetment such that the sandy beach is exposed only during low tides. Vegetation that occurs at the base of the seawall and along the top of the seawall includes spotted knapweed, common milkweed (*Asclepias syriaca*), prickly lettuce, and American pokeweed (*Phytolacca americana*). Spotted knapweed is a weedy invasive species that occurs along the top of the seawall.

2.2.3 Essential Fish Habitat Designations

Within the RWF area, 40 species of fish and invertebrates have designated EFH for various life stages (Table 2.2-1). Within the 0.5-mile (800-m) corridor around the RWEC centerline, 39 species of fish and invertebrates have designated EFH with the RWEC-OCS, and 32 species have designated EFH within the RWEC-RI. Full descriptions of each of these species and life stages are provided in Section 2.2.5.

Table 2.2-1 EFH Designations for Species in the RWF and RWEC

Table 2.2-1			
Species	**Life Stages within RWF**	**Life Stages within RWEC-OCS**	**Life Stages within RWEC-RI**
New England Finfish			
Atlantic cod (*Gadus morhua*)	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile Adult
Atlantic herring (*Clupea harengus*)	Larvae, Juvenile, Adult	Larvae, Juvenile, Adult	Larvae, Juvenile, Adult
Atlantic wolfish (*Anarhichas lupus*)	Egg, Larvae, Juvenile, Adult	-	-
Haddock (*Melanogrammus aeglefinus*)	Egg, Larvae, Juvenile	Larvae, Juvenile	-
Monkfish (*Lophius americanus*)	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult	Egg, Larvae
Ocean pout (*Zoarces americanus*)	Egg, Juvenile, Adult	Egg, Juvenile, Adult	Egg, Juvenile, Adult
Pollock (*Pollachius virens*)	Egg, Larvae, Juvenile	Egg, Larvae, Juvenile	Juvenile
Red hake (*Urophycis chuss*)	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult
Silver hake (*Merluccius bilinearis*)	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Adult
White hake (*Urophycis tenuis*)	Larvae, Juvenile	Larvae, Juvenile	Juvenile
Windowpane flounder (*Scophthalmus aquosus*)	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult
Winter flounder (*Pseudopleuronectes americanus*)	Larvae, Juvenile, Adult	Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult
Witch flounder (*Glyptocephalus cynoglossus*)	Egg, Larvae	Egg, Larvae	-
Yellowtail flounder (*Limanda ferruginea*)	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult	Juvenile, Adult
Mid-Atlantic Finfish			
Atlantic butterfish (*Peprilus triacanthus*)	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult
Atlantic mackerel (*Scomber scombrus*)	Egg, Larvae, Juvenile	Egg, Larvae, Juvenile	Egg, Larvae, Juvenile, Adult
Black sea bass (*Centropristis striata*)	Juvenile, Adult	Juvenile, Adult	Juvenile, Adult
Bluefish (*Pomatomus saltatrix*)	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult	Juvenile, Adult
Scup (*Stenotomus chrysops*)	Juvenile, Adult	Juvenile, Adult	Egg, Larvae, Juvenile, Adult
Summer flounder (*Paralichthys dentatus*)	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult	Larvae, Juvenile, Adult
Invertebrates			
Atlantic sea scallop (*Placopecten magellanicus*)	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult	Egg, Larvae, Juvenile, Adult
Atlantic surfclam (*Spisula solidissima*)	-	Adult	Juvenile, Adult
Longfin inshore squid (*Doryteuthis pealeii*)	Egg, Juvenile, Adult	Egg, Juvenile, Adult	Egg, Juvenile, Adult
Northern shortfin squid (*Illex illecebrosus*)	Adult	-	-
Ocean quahog (*Arctica islandica*)	Juvenile, Adult	Juvenile, Adult	-
Highly Migratory Species			
Albacore tuna (*Thunnus alalunga*)	Juvenile, Adult	Juvenile, Adult	Juvenile
Bluefin tuna (*Thunnus thynnus*)	Juvenile, Adult	Juvenile, Adult	Juvenile, Adult
Skipjack tuna (*Katsuwonus pelamis*)	Juvenile, Adult	Adult	Adult
Yellowfin tuna (*Thunnus albacares*)	Juvenile, Adult	Juvenile, Adult	Juvenile
Skates			

Table 2.2-1			
Species	**Life Stages within RWF**	**Life Stages within RWEC-OCS**	**Life Stages within RWEC-RI**
Little skate (*Leucoraja erinacea*)	Juvenile, Adult	Juvenile, Adult	Juvenile, Adult
Winter skate (*Leucoraja ocellata*)	Juvenile, Adult	Juvenile, Adult	Juvenile, Adult
Sharks			
Basking shark (*Cetorhinus maximus*)	Neonate, Juvenile, Adult	Neonate, Juvenile, Adult	-
Blue shark (*Prionace glauca*)	Neonate, Juvenile, Adult	Neonate, Juvenile, Adult	-
Common thresher shark (*Alopias vulpinus*)	Neonate, Juvenile, Adult	Neonate, Juvenile, Adult	Neonate, Juvenile, Adult
Dusky shark (*Carcharhinus obscurus*)	Neonate, Juvenile, Adult	Neonate, Juvenile, Adult	-
Sand tiger shark (*Carcharias taurus*)	Neonate, Juvenile	Neonate, Juvenile	Neonate, Juvenile
Sandbar shark (*Carcharhinus plumbeus*)	Juvenile, Adult	Juvenile, Adult	Juvenile, Adult
Shortfin mako shark (*Isurus oxyrinchus*)	Neonate, Juvenile, Adult	Neonate, Juvenile, Adult	-
Smoothhound shark complex (Atlantic stock) (*Mustelus canis*)	Neonate, Juvenile, Adult	Neonate, Juvenile, Adult	Neonate, Juvenile, Adult
Spiny dogfish (*Squalus acanthias*)	Sub-adult male, Sub-adult female, Adult male, Adult female	Sub-adult male, Sub-adult female, Adult male, Adult female	Sub-adult female, Adult male
White shark (*Carcharodon carcharias*)	Neonate, Juvenile, Adult	Neonate, Juvenile, Adult	Neonate

2.2.4 Habitat Areas of Particular Concern

Within the areas designated as EFH for various species, particular areas termed Habitat Areas of Particular Concern (HAPCs) are also identified. HAPCs are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation, but this designation does not confer any particular protections.

The RWEC-RI corridor crosses HAPC for juvenile Atlantic cod in Rhode Island state waters. The juvenile cod HAPC is a subset of the area designated as juvenile cod EFH, and is defined as the inshore areas of the Gulf of Maine and Southern New England between 0 to 66 feet (0 to 20 m), relative to mean high water, as shown in Map 245 of the Final Omnibus EFH Amendment 2 (New England Fishery Management Council [NEFMC], 2017). This HAPC contains structurally complex rocky-bottom habitat that provides juvenile cod with protection from predation and supports a wide variety of prey items (NEFMC, 2017).

Maps for summer flounder HAPC are not available for the Project Area, but it is defined as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. Juvenile and adult summer flounder EFH is present within the RWF area, RWEC-OCS, and RWEC-RI, but summer flounder HAPC, if present, is most likely to occur within Narragansett Bay and nearshore portions of the Project Area. The Project does not cross known areas of submerged aquatic vegetation, but during the site-specific benthic habitat surveys, isolated patches of attached macroflora were observed at four stations along the RWEC in Narraganset Bay. Based on GIS analysis of available eelgrass mapping for Narragansett Bay (Rhode Island Geographic Information System [RIGIS], 2017), a small section of eelgrass is present on the western side of Dutch Island, approximately 679 feet (207 m) from the proposed RWEC cable centerline. The next closest area of mapped eelgrass is on the western side of Conanicut Island, approximately 1,411 feet (430 m) from the RWEC cable centerline. See the Benthic Assessment (INSPIRE Environmental, 2020) for a detailed description of benthic habitats in the Project Area.

2.2.5 Essential Fish Habitat Species and Life Stages

2.2.5.1 New England Finfish Species

2.2.5.1.1 Atlantic Cod

Atlantic cod have two separate stocks managed by NOAA Fisheries, the Gulf of Maine stock, and the Georges Bank stock. Atlantic cod range from Greenland to Cape Hatteras, North Carolina, but are most common on Georges Bank and in the western Gulf of Maine (NOAA Fisheries, 2019b). Atlantic cod can be found at depths between 32 and 492 feet (10 and 150 m), and spawn near the seafloor from winter to early spring (NOAA Fisheries, 2019b). They are top predators in demersal habitats, and feed on a variety of invertebrates and fish. They prefer muddy, gravelly, or rocky substrates. Atlantic cod are historically an important commercial and recreational species and are still fished at low levels; however, as of the 2017 stock assessment, both stocks are considered overfished, and are currently subject to overfishing (Northeast Fisheries Science Center [NEFSC], 2017a). Atlantic cod EFH designations are listed below for the life stages found within the Project Area. Egg, larvae, juvenile, and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Eggs: EFH is pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region, as shown on Map 38 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), and in the high salinity zones of the bays and estuaries listed in Table 19 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017).

Larvae: EFH is pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region, as shown on Map 39 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), and in the high salinity zones of the bays and estuaries listed in Table 19 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017).

Juveniles: EFH is intertidal and subtidal benthic habitats in the Gulf of Maine, southern New England, and on Georges Bank, to a maximum depth of 394 feet (120 m) (see Map 40 in NEFMC [2017]), including high salinity zones in the bays and estuaries listed in Table 19 of NEFMC (2017). Structurally complex habitats, including eelgrass, mixed sand and gravel, and rocky habitats (gravel pavements, cobble, and boulder) with and without attached macroalgae and emergent epifauna, are essential habitats for juvenile cod. In inshore waters, young-of-the-year juveniles prefer gravel and cobble habitats and eelgrass beds after settlement, but in the absence of predators also utilize adjacent unvegetated sandy habitats for feeding. Survival rates for young-of-the-year cod are higher in more structured rocky habitats than in flat sand or eelgrass; growth rates are higher in eelgrass. Older juveniles move into deeper water and are associated with gravel, cobble, and boulder habitats, particularly those with attached organisms. Gravel is a preferred substrate for young-of-the-year juveniles on Georges Bank and they have also been observed along the small boulders and cobble margins of rocky reefs in the Gulf of Maine.

Adults: EFH is subtidal benthic habitats in the Gulf of Maine, south of Cape Cod, and on Georges Bank, between 98 and 525 feet (30 and 160 m) (see Map 41 in NEFMC [2017]), including high salinity zones in the bays and estuaries listed in Table 19 of NEFMC (2017). Structurally complex hard bottom habitats composed of gravel, cobble, and boulder substrates with and without emergent epifauna and macroalgae are essential habitats for adult cod. Adult cod are also found on sandy substrates and frequent deeper slopes of ledges along shore. South of Cape Cod, spawning occurs in nearshore areas and on the continental shelf, usually in depths less than 230 feet (70 m).

2.2.5.1.2 Atlantic Herring

Atlantic herring are managed in one stock complex encompassing Georges Bank and the Gulf of Maine, with two major spawning components. Atlantic herring are a small schooling fish found on both sides of the North Atlantic. In the western North Atlantic, Atlantic herring range from Labrador, Canada to Cape Hatteras, North Carolina (NOAA Fisheries, 2019c) and are highly concentrated in Georges Bank, the Gulf of Maine, and Nantucket Shoals (Reid et al., 1999). In the region of interest, Atlantic herring are typically present in the winter at average depths of about 120 to 360 feet (36 to 110 m) (Collette and Klein-MacPhee, 2002). They feed on zooplankton, krill, and fish larvae, and are an important species in the food web of the northwest Atlantic (NOAA Fisheries, 2019c). Spawning grounds are limited to rocky, gravelly, or pebbly bottom and on clay, from 12 to 180 feet (3 to 55 m) deep (Collette and Klein-MacPhee, 2002). Atlantic herring are an important commercial fishery in New England and their stock biomass is currently well above target levels (NOAA Fisheries, 2019c). According to the 2018 stock assessment, Atlantic herring are not overfished, and not currently subject to overfishing (NEFSC, 2018a).

The Atlantic herring EFH designations are reproduced below for the life stages found within the Project Area. Larvae, juvenile, and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Larvae: EFH is inshore and offshore pelagic habitats in the Gulf of Maine, on Georges Bank, and in the upper Mid-Atlantic Bight, as shown on Map 99 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), and in the bays and estuaries listed in Table 30 of NEFMC (2017). Atlantic herring have a very long larval stage, lasting 4–8 months, and are transported long distances to inshore and estuarine waters where they metamorphose into early stage juveniles in the spring.

Juveniles: EFH is intertidal and subtidal pelagic habitats to 984 feet (300 m) throughout the region, as shown on Map 100 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the bays and estuaries listed in Table 30 of NEFMC (2017). One and two-year old juveniles form large schools and make limited seasonal inshore-offshore migrations. Older juveniles are usually found in water temperatures of 37 to 59 °F (3 to 15 °C) in the northern part of their range and as high as 72 °F (22 °C) in the Mid-Atlantic. Young-of-the-year juveniles can tolerate low salinities, but older juveniles avoid brackish water.

Adults: EFH is subtidal pelagic habitats with maximum depths of 984 feet (300 m) throughout the region, as shown on Map 100 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the bays and estuaries listed in Table 30 of NEFMC (2017). Adults make extensive seasonal migrations between summer and fall spawning grounds on Georges Bank and the Gulf of Maine and overwintering areas in southern New England and the Mid-Atlantic region. They seldom migrate beyond a depth of about 328 feet (100 m) and—unless they are preparing to spawn—usually remain near the surface. They generally avoid water temperatures above 50 °F (10 °C) and low salinities. Spawning takes place on the bottom, generally in depths of 41–194 feet (5–90 m) on a variety of substrates.

2.2.5.1.3 Atlantic Wolffish

The Atlantic wolffish is found on both sides of the North Atlantic and infrequently in the Arctic. In the northwestern Atlantic, they range from Davis Strait, Canada, to Cape Hatteras, North Carolina (Fisheries and Oceans Canada, 2018a). In U.S. waters, the species is managed as a single stock. Atlantic wolffish prefer colder water temperatures and prey mainly on brittle stars, sea urchins, crabs, and shrimp (Fisheries and Oceans Canada, 2018a). Adult Atlantic wolffish generally move inshore to spawn during the spring and summer, establishing nesting sites on boulders and in rocky crevices, which are guarded by the males until the eggs hatch in late summer and early fall (Fisheries and Oceans Canada, 2018a). According to the 2017 stock assessment, Atlantic wolffish are overfished and not currently experiencing overfishing (NEFSC, 2017a).

The Atlantic wolffish EFH designations are reproduced below for the life stages found within the Project Area. Egg, larvae, juvenile, and adult life stages have EFH within the RWF area.

Eggs: EFH is subtidal benthic habitats at depths less than 328 feet (100 m) within the geographic area shown on Map 43 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017). Wolffish egg masses are hidden under rocks and boulders in nests.

Larvae: EFH is pelagic and subtidal benthic habitats within the geographic area shown on Map 43 of NEFMC (2017). Atlantic wolffish larvae remain near the bottom for up to six days after hatching, but gradually become more buoyant as the yolk sac is absorbed.

Juveniles: EFH is subtidal benthic habitats at depths of 230 to 604 feet (70 to 184 m) within the geographic area shown on Map 43 of NEFMC (2017). Juvenile Atlantic wolffish do not have strong substrate preferences.

Adults: EFH is subtidal benthic habitats at depths less than 568 feet (173 m) within the geographic area shown on Map 43 of NEFMC (2017). Adult Atlantic wolffish have been observed spawning and guarding eggs in rocky habitats in less than 98 feet (30 m) of water in the Gulf of St. Lawrence and Newfoundland and in deeper (164 to 328 feet [50 to100 m]) boulder reef habitats in the Gulf of Maine. Egg masses have been collected on the Scotian Shelf in depths of 328 to 426 feet (100 to 130 m), indicating that spawning is not restricted to coastal waters. Adults are distributed over a wider variety of sand and gravel substrates once they leave rocky spawning habitats, but are not caught over muddy bottom.

2.2.5.1.4 Haddock

In the western North Atlantic, haddock range from Newfoundland to Cape May, New Jersey, with the highest abundance on Georges Bank and in the Gulf of Maine (NOAA Fisheries, 2019d). Haddock in U.S. waters are managed as two stocks: the Gulf of Maine stock and the Georges Bank stock. Haddock are found at depths ranging from 59 to 1,148 feet (15 to 350 m) and there is a very minimal seasonal difference between depths aside from a slightly wider range of depths in the fall (Cargnelli et al., 1999a). Haddock prefer gravely, pebbly, clay, and sandy substrates and avoid ledges and large rocks (Collette and Klein-MacPhee, 2002). They spawn on eastern Georges Bank, to the east of Nantucket Shoals, and along the Maine coast between January and June (NOAA Fisheries, 2019d). Haddock prey items include mollusks, worms, crustaceans, sea stars, sea urchins, sand dollars, brittle stars, fish eggs, and occasionally small fish such as herring (NOAA Fisheries, 2019d). Adults sometimes eat small fish, especially herring. As of the 2017 stock assessment, the Georges Bank and Gulf of Maine stocks are not overfished and are not subject to overfishing (NEFSC, 2017a).

The haddock EFH designations are reproduced below for the life stages found within the Project Area. Egg, larvae, and juveniles have EFH within the RWF area, and larvae and juveniles have EFH within the RWEC-OCS corridor.

Eggs: EFH is pelagic habitats in coastal and offshore waters in the Gulf of Maine, southern New England, and on Georges Bank, as shown on Map 44 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017).

Larvae: EFH is pelagic habitats in coastal and offshore waters in the Gulf of Maine, the Mid-Atlantic, and on Georges Bank, as shown on Map 45 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017).

Juveniles: EFH is subtidal benthic habitats between 131 and 459 feet (40 and 140 m) in the Gulf of Maine, on Georges Bank and in the Mid-Atlantic region, and as shallow as 66 feet (20 m) along the coast of Massachusetts, New Hampshire, and Maine, as shown on Map 46 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017). Young-of-the-year juveniles settle on sand and gravel on Georges Bank, but are found predominantly on gravel pavement areas within a few months after settlement. As they grow, they disperse over a greater variety of substrate types on the bank. Young-of-the-year haddock do not inhabit shallow, inshore habitats.

2.2.5.1.5 Monkfish

Monkfish are found in the northwest Atlantic Ocean from the Grand Banks and northern Gulf of St. Lawrence south to Cape Hatteras, NC. In U.S. waters, the monkfish fishery is divided into two management areas, north and south of Georges Bank. According to the 2013 stock assessment, monkfish are not overfished and are not subject to overfishing in either management area (NEFSC, 2013). Monkfish can tolerate a wide range of temperatures and depths, and migrate seasonally to spawn and feed (NOAA Fisheries, 2019e). Monkfish are present from summer to fall from the tideline down to 2,160 feet (658 m) (Collette and Klein-MacPhee, 2002). Monkfish prefer hard sand, pebbly bottom, gravel, and broken shells for their habitats (Collette and Klein-MacPhee, 2002). Monkfish spawn from February to October, producing very large buoyant mucoidal egg “veils.” They are opportunistic feeders with prey including a wide range of benthic and pelagic fish and invertebrate species along with sea birds, and diving ducks. Monkfish ambush their prey through rapidly opening their mouth, creating a vacuum, and sucking the prey into their needle-like, backward curving teeth (NOAA Fisheries, 2019e). They also have a small, dangling appendage in the back of their mouth to attract small fish.

The monkfish EFH designations are reproduced below for the life stages found within the Project Area. Eggs, larvae, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor. In the RWEC-RI corridor, only EFH for eggs and larvae is present.

Eggs and Larvae: EFH is pelagic habitats in inshore areas, and on the continental shelf and slope throughout the Northeast region, as shown on Map 82 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017). Monkfish larvae are more abundant in the Mid-Atlantic region and occur over a wide depth range, from the surf zone to depths of 3,281 to 4,921 feet (1,000 to 1,500 m) on the continental slope. Monkfish egg veils and larvae are most often observed during the months from March to September.

Juveniles: EFH is subtidal benthic habitats in depths of 164 to 1,312 feet (50 to 400 m) in the Mid-Atlantic, between 66 and 1,312 feet (20 and 400 m) in the Gulf of Maine, and to a maximum depth of 3,281 feet (1,000 m) on the continental slope, as shown on Map 83 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017). A variety of habitats are essential for juvenile monkfish, including hard sand, pebbles, gravel, broken shells, and soft mud; they also seek shelter among rocks with attached algae. Juveniles collected on mud bottom next to rock-ledge and boulder fields in the western Gulf of Maine were in better condition than juveniles collected on isolated mud bottom, indicating that feeding conditions in these edge habitats are better. Young-of-the-year juveniles have been collected primarily on the central portion of the shelf in the Mid- Atlantic, but also in shallow nearshore waters off eastern Long Island, up the Hudson Canyon shelf valley, and around the perimeter of Georges Bank. They have also been collected as deep as 2,953 feet (900 m) on the continental slope.

Adults: EFH is subtidal benthic habitats in depths of 164 to 1,312 feet (50 to 400 m) in southern New England and Georges Bank, between 66 and 1,312 feet (20 and 400 m) in the Gulf of Maine, and to a maximum depth of 3,281 feet (1,000 m) on the continental slope, as shown on Map 84 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017). EFH for adult monkfish is composed of hard sand, pebbles, gravel, broken shells, and soft mud. They seem to prefer soft sediments (fine sand and mud) over sand and gravel, and, like juveniles, utilize the edges of rocky areas for feeding.

2.2.5.1.6 Ocean Pout

The ocean pout is currently managed in two stocks, northern and southern, and ranges from Labrador, Canada to Virginia (Steimle et al., 1999a). This finfish is typically present in southern New England from late summer to winter. According to the 2017 stock assessment, ocean pout is overfished and is not currently experiencing overfishing (NEFSC, 2017a). Ocean pout are found in habitats that contain sandy mud, “sticky” sand, broken bottom, or pebbles and gravel (Collette and Klein-MacPhee, 2002). Juveniles and adults feed by filtering sediment for prey items, which include polychaetes, mollusks, crustaceans, and echinoderms (Steimle et al., 1999a). They spawn in protected habitats, such as rock crevices and man-made artifacts, where they lay eggs and engage in nest-guarding behavior (Steimle et al., 1999a).

The ocean pout EFH designations are reproduced below for the life stages found within the Project Area. Eggs, juvenile, and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Eggs: EFH is hard bottom habitats on Georges Bank, in the Gulf of Maine, and in the Mid-Atlantic Bight (see Map 48 in NEFMC [2017]), as well as the high salinity zones of the bays and estuaries listed in Table 20 of NEFMC (2017). Eggs are laid in gelatinous masses, generally in sheltered nests, holes, or rocky crevices. EFH for ocean pout eggs occurs in depths less than 328 feet (100 m) on rocky bottom habitats.

Juveniles: EFH is intertidal and subtidal benthic habitats in the Gulf of Maine and on the continental shelf north of Cape May, New Jersey, on the southern portion of Georges Bank, and in the high salinity zones of a number of bays and estuaries north of Cape Cod, extending to a maximum depth of 394 feet (120 m) (see Map 49 and Table 20 in NEFMC [2017]). EFH for juvenile ocean pout occurs on a wide variety of substrates, including shells, rocks, algae, soft sediments, sand, and gravel.

Adults: EFH is subtidal benthic habitats between 66 and 459 feet (20 and 140 m) in the Gulf of Maine, on Georges Bank, in coastal and continental shelf waters north of Cape May, New Jersey, and in the high salinity zones of a number of bays and estuaries north of Cape Cod (see Map 50 and Table 20 in NEFMC, 2017). EFH for adult ocean pout includes mud and sand, particularly in association with structure-forming habitat types; i.e., shells, gravel, or boulders. In softer sediments, they burrow tail first and leave a depression on the sediment surface. Ocean pout congregate in rocky areas prior to spawning and frequently occupy nesting holes under rocks or in crevices in depths less than 328 feet (100 m).

2.2.5.1.7 Pollock

Pollock range throughout the northwestern Atlantic Ocean and are most commonly found on the western Scotian Shelf and in the Gulf of Maine (NOAA Fisheries, 2019f). They spawn multiple times per season between November through February over hard, stony, or rocky ocean bottoms in the Gulf of Maine and on Georges Bank. Smaller pollock in inshore waters prey on small crustaceans and fish, and larger pollock prey predominantly on fish, but their diet also includes euphausiids and mollusks (NOAA Fisheries, 2019f; Cargnelli et al., 1999b). Pollock are a schooling species with a semi-pelagic lifestyle, and they can be found throughout the water column (Cargnelli et al., 1999b). Pollock are managed as a single stock, and according to the 2017 stock assessment, they are not overfished and are not currently subject to overfishing (NEFSC, 2017a).

The pollock EFH designations are reproduced below for the life stages found within the Project Area. Eggs, larvae, and juvenile life stages have EFH within the RWF area and RWEC-OCS corridor. Within the RWEC-RI corridor, EFH is only present for juveniles.

Eggs: EFH is pelagic inshore and offshore habitats in the Gulf of Maine, on Georges Bank, and in southern New England, as shown on Map 51 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the bays and estuaries listed in Table 21 of (NEFMC, 2017).

Larvae: EFH is pelagic inshore and offshore habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region, as shown on Map 52 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the bays and estuaries listed in Table 21 of (NEFMC, 2017).

Juveniles: EFH is inshore and offshore pelagic and benthic habitats from the intertidal zone to 591 feet (180 m) in the Gulf of Maine, in Long Island Sound, and Narragansett Bay, between 131 and 591 feet (40 and 180 m) on western Georges Bank and the Great South Channel (see Map 53 in NEFMC [2017]), and in mixed and full salinity waters in a number of bays and estuaries north of Cape Cod (Table 21 in NEFMC [2017]). EFH for juvenile pollock consists of rocky bottom habitats with attached macroalgae (rockweed and kelp) that provide refuge from predators. Shallow water eelgrass beds are also essential habitats for young-of-the-year pollock in the Gulf of Maine. Older juveniles move into deeper water into habitats also occupied by adults.

2.2.5.1.8 Red Hake

Red hake are managed as two stocks, the Gulf of Maine and Northern Georges Bank (northern) stock, and the Southern Georges Bank and Mid-Atlantic (southern) stock (Steimle et al., 1999b; NOAA Fisheries, 2019g). Red hake range from Newfoundland to North Carolina, but are most abundant from the western Gulf of Maine through southern New England waters (NOAA Fisheries, 2019g). During warmer seasons, red hake are common at depths greater than 328 feet (100 m), and during colder months, their depth range is from 90 to 1,214 feet (30 to 370 m) (Steimle et al., 1999b). Red hake prey consists primarily of crustaceans and fish such as haddock, silver hake, sea robins, sand lance, mackerel, and small red hake (NOAA Fisheries, 2019g). This groundfish species prefers deep water environments with bottom habitat consisting of both soft and pebbly substrate. Spawning occurs uniformly from Georges Bank to Nova Scotia and typically occurs nearshore as early as June and continues through fall (Collette and Klein-MacPhee, 2002). According to the 2018 stock assessment, both the northern and southern stocks are not considered overfished and are not currently subject to overfishing (Alade and Traver, 2018).

The red hake EFH designations are reproduced below for the life stages found within the Project Area. Egg, larvae, juvenile, and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Eggs and Larvae: EFH is pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid- Atlantic, as shown on Map 77 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), and in the bays and estuaries listed in Table 27 of NEFMC (2017).

Juveniles: EFH is intertidal and subtidal benthic habitats throughout the region on mud and sand substrates, to a maximum depth of 262 feet (80 m), as shown on Map 77 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the bays and estuaries listed in Table 27 of NEFMC (2017). Bottom habitats providing shelter are essential for juvenile red hake, including mud substrates with biogenic depressions, substrates providing biogenic complexity (e.g., eelgrass, macroalgae, shells, anemone and polychaete tubes), and artificial reefs. Newly settled juveniles occur in depressions on the open seabed. Older juveniles are commonly associated with shelter or structure and often found inside live bivalves.

Adults: EFH is benthic habitats in the Gulf of Maine and the outer continental shelf and slope in depths of 164 to 2,461 feet (50 to 750 m) (see Map 78 in NEFMC [2017]) and as shallow as 66 feet (20 m) in a number of inshore estuaries and embayments (see Table 27 in NEFMC [2017]) as far south as Chesapeake Bay. Shell beds, soft sediments (mud and sand), and artificial reefs provide essential habitats for adult red hake. They are usually found in depressions in softer sediments or in shell beds and not on open sandy bottom. In the Gulf of Maine, they are much less common on gravel or hard bottom, but they are reported to be abundant on hard bottoms in temperate reef areas of Maryland and northern Virginia.

2.2.5.1.9 Silver Hake

Two stocks of silver hake are managed in U.S. waters, the Gulf of Maine and Northern Georges Bank (northern) stock and the Southern Georges Bank and Mid-Atlantic (southern) stock, which includes southern silver hake and offshore hake (NOAA Fisheries, 2019h). Silver hake are found from Cape Sable, Nova Scotia to Cape Hatteras, North Carolina and are concentrated in deep basins in the Gulf of Maine and along the continental slope in winter and spring. White hake are voracious nocturnal feeders, preying on fish, crustaceans and squid (NOAA Fisheries, 2019h; Lock and Packer, 2004). White hake spawn along the coast of the Gulf of Maine from Cape Cod to Grand Manan Island, on southern and southeastern Georges Bank, and in southern New England to the south of Martha’s Vineyard (NOAA Fisheries, 2019h). Peak spawning occurs from May to June in the southern area of their range, and from July to August in the northern area of their range (NOAA Fisheries, 2019h). The 2018 stock assessment concluded that the both the northern and southern stock are not overfished and are not currently subject to overfishing (Alade and Traver, 2018).

The silver hake EFH designations are reproduced below for the life stages found within the Project Area. Eggs, larvae, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor. Within the RWEC-RI corridor, EFH is designated for eggs, larvae, and adults.

Eggs and Larvae: EFH is pelagic habitats from the Gulf of Maine to Cape May, New Jersey, including Cape Cod and Massachusetts Bays (see Map 74 and Table 26 in NEFMC [2017]).

Juveniles: EFH is pelagic and benthic habitats in the Gulf of Maine, including the coastal bays and estuaries listed in Table 26 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), and on the continental shelf as far south as Cape May, New Jersey, at depths greater than 33 feet (10 m) in coastal waters in the Mid-Atlantic and between 131 and 1,312 feet (40 and 400 m) in the Gulf of Maine, on Georges Bank, and in the middle continental shelf in the Mid-Atlantic, on sandy substrates (see Map 75 in NEFMC [2017]). Juvenile silver hake are found in association with sand-waves, flat sand with amphipod tubes, and shells, and in biogenic depressions. Juveniles in the New York Bight settle to the bottom at mid-shelf depths on muddy sand substrates and find refuge in amphipod tube mats.

Adults: EFH is pelagic and benthic habitats at depths greater than 115 feet (35 m) in the Gulf of Maine and the coastal bays and estuaries listed in Table 26 of NEFMC (2017), between 230 and 1,312 feet (70 and 400 m) on Georges Bank and the outer continental shelf in the northern portion of the Mid-Atlantic Bight, and in some shallower locations nearer the coast, on sandy substrates (see Map 76 of NEFMC [2017]). Adult silver hake are often found in bottom depressions or in association with sand waves and shell fragments. They have also been observed at high densities in mud habitats bordering deep boulder reefs, resting on boulder surfaces, and foraging over deep boulder reefs in the southwestern Gulf of Maine. This species makes greater use of the water column (for feeding, at night) than red or white hake.

2.2.5.1.10 White Hake

White hake range from the Gulf of St. Lawrence to the Mid-Atlantic Bight, and the population is divided into two stocks: a Canadian stock primarily occurring in the Gulf of St. Lawrence and Scotian Shelf, and a U.S. stock primarily occurring in the Gulf of Maine and on Georges Bank. Their range also includes estuaries along the continental shelf to the submarine canyons of the upper continental slope, as well as the deep, muddy basins of the Gulf of Maine (Chang et al., 1999a). Early juveniles are pelagic before settling to muddy and fine-grained sandy bottom or eelgrass habitats. Older juveniles feed on polychaetes, shrimps, and other crustaceans. Adults are demersal, prefer fine grained, muddy substrates, and feed predominantly on fish (Chang et al., 1999a). The timing and extent of spawning in southern New England waters is not well defined, but is thought to occur in early spring in deep waters along the continental slope (Chang et al., 1999a). The most recent stock assessment for the U.S. stock of white hake concluded that the stock is not overfished and not currently subject to overfishing (NEFSC, 2017a).

The white hake EFH designations are reproduced below for the life stages found within the Project Area. Larvae and juvenile life stages have EFH within the RWF area and RWEC-OCS corridor. Within the RWEC-RI corridor, only EFH for juveniles is present.

Larvae: EFH is pelagic habitats in the Gulf of Maine, in southern New England, and on Georges Bank, as shown in Map 56 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017). Early stage white hake larvae have been collected on the continental slope, but cross the shelf-slope front and use nearshore habitats for juvenile nurseries. Larger larvae and pelagic juveniles have been found only on the continental shelf.

Juveniles: EFH is intertidal and subtidal estuarine and marine habitats in the Gulf of Maine, on Georges Bank, and in southern New England, including mixed and high salinity zones in a number of bays and estuaries north of Cape Cod (see Table 22 in NEFMC [2017]), to a maximum depth of 984 feet (300 m) (see Map 57 in NEFMC [2017]). Pelagic phase juveniles remain in the water column for about 2 months. In nearshore waters, EFH for benthic phase juveniles occurs on fine-grained, sandy substrates in eelgrass, macroalgae, and un-vegetated habitats. In the Mid-Atlantic, most juveniles settle to the bottom on the continental shelf, but some enter estuaries, especially those in southern New England. Older young-of-the-year juveniles occupy the same habitat types as the recently-settled juveniles but move into deeper water (>164 feet [50 m]).

2.2.5.1.11 Windowpane Flounder

The windowpane flounder range extends from the Gulf of St. Lawrence to Florida, but the species is most abundant from Georges Bank to Chesapeake Bay (Chang et al., 1999b). Windowpane flounder is managed as two stocks: the Gulf of Maine-Georges Bank (northern) stock and the Southern New England-Middle Atlantic Bight (southern) stock. Windowpane flounder spawning is thought to begin in February or March in inshore waters, peaking in the Mid-Atlantic Bight in May, and extending into Georges Bank during the summer (Chang et al., 1999b). Windowpane flounder typically prefer sandy bottom habitats and range from just below the tide line to 150 feet (46 m) deep (Collette and Klein-MacPhee, 2002). They feed on small crustaceans and various fish larvae, including hakes and tomcod (Chang et al., 1999b). The 2017 stock assessments concluded that the northern stock of windowpane flounder is overfished, but not currently experiencing overfishing, and the southern stock is not overfished and not experiencing overfishing (NEFSC, 2017a).

The windowpane flounder EFH designations are reproduced below for the life stages found within the Project Area. Egg, larvae, juvenile, and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Eggs and Larvae: EFH is pelagic habitats on the continental shelf from Georges Bank to Cape Hatteras and in mixed and high salinity zones of coastal bays and estuaries throughout the region (see Map 59, Map 60, and Table 23 in NEFMC [2017]).

Juveniles: EFH is intertidal and subtidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to northern Florida, as shown on Map 61 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including mixed and high salinity zones in the bays and estuaries listed in Table 23 of NEFMC (2017). EFH for juvenile windowpane flounder is found on mud and sand substrates and extends from the intertidal zone to a maximum depth of 197 feet (60 m). Young-of-the-year juveniles prefer sand over mud.

Adults: EFH is intertidal and subtidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to Cape Hatteras, as shown on Map 62 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including mixed and high salinity zones in the bays and estuaries listed in Table 23 of NEFMC (2017). Essential fish habitat for adult windowpane flounder is found on mud and sand substrates and extends from the intertidal zone to a maximum depth of 230 feet (70 m).

2.2.5.1.12 Winter Flounder

Winter flounder is managed as three stocks: the Gulf of Maine stock, Georges Bank stock, and the Southern New England/Mid-Atlantic stock (NOAA Fisheries, 2019i). Winter flounder range from the Gulf of St. Lawrence to North Carolina, and are found in estuaries and on the continental shelf. Winter flounder prefer muddy, sandy, cobbled, gravelly, or boulder substrate in mostly nearshore environments (Pereira et al., 1999). Winter flounder spawn over sandy bottoms and algal mats in shallow nearshore habitats during the winter and spring (NFMS, 2019i). They are opportunistic feeders, and prey items include polychaetes, amphipods, shrimp, clams, capelin eggs, and fish (Pereira et al., 1999; NOAA Fisheries, 2019i). The 2017 stock assessment concluded that spawning stock biomass of the Georges Bank stock has been increasing since 2005, and the stock is not overfished and not subject to overfishing (NEFSC, 2017a). The Southern New England/Mid-Atlantic stock is overfished, but not currently experiencing overfishing (NEFSC, 2017a). The results for the Gulf of Maine stock were highly uncertain. The authors were unable to determine an abundance estimate for the Gulf of Maine stock, but concluded that it is not currently subject to overfishing (NEFSC, 2017a).

The winter flounder EFH designations are reproduced below for the life stages found within the Project Area. Larvae, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor. Egg, larvae, juvenile, and adult life stages have EFH within the RWEC-RI corridor.

Eggs: EFH is subtidal estuarine and coastal benthic habitats from mean low water to 16 feet (5 m) from Cape Cod to Absecon Inlet (39° 22’ N), and as deep as 230 feet (70 m) on Georges Bank and in the Gulf of Maine (see Map 63 in NEFMC [2017]), including mixed and high salinity zones in the bays and estuaries listed in Table 24 of NEFMC (2017). The eggs are adhesive and deposited in clusters on the bottom. Essential habitats for winter flounder eggs include mud, muddy sand, sand, gravel, macroalgae, and submerged aquatic vegetation. Bottom habitats are unsuitable if exposed to excessive sedimentation which can reduce hatching success.

Larvae: EFH is estuarine, coastal, and continental shelf water column habitats from the shoreline to a maximum depth of 230 feet (70 m) from the Gulf of Maine to Absecon Inlet (39° 22’ N), and including Georges Bank, as shown on Map 65 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including mixed and high salinity zones in the bays and estuaries listed in Table 24 of NEFMC (2017). Larvae hatch in nearshore waters and estuaries or are transported shoreward from offshore spawning sites where they metamorphose and settle to the bottom as juveniles. They are initially planktonic but become increasingly less buoyant and occupy the lower water column as they get older.

Juveniles: EFH is estuarine, coastal, and continental shelf benthic habitats from the Gulf of Maine to Absecon Inlet (39° 22’ N), and including Georges Bank, as shown on Map 64 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), and in mixed and high salinity zones in the bays and estuaries listed in Table 24 of NEFMC (2017). Essential fish habitat for juvenile winter flounder extends from the intertidal zone (mean high water) to a maximum depth of 197 feet (60 m) and occurs on a variety of bottom types, such as mud, sand, rocky substrates with attached macroalgae, tidal wetlands, and eelgrass. Young-of-the-year juveniles are found inshore on muddy and sandy sediments in and adjacent to eelgrass and macroalgae, in bottom debris, and in marsh creeks. They tend to settle to the bottom in soft-sediment depositional areas where currents concentrate late-stage larvae and disperse into coarser-grained substrates as they get older.

Adults: EFH is estuarine, coastal, and continental shelf benthic habitats extending from the intertidal zone (mean high water) to a maximum depth of 230 feet (70 m) from the Gulf of Maine to Absecon Inlet (39° 22’ N), and including

Georges Bank, as shown on Map 65 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), and in mixed and high salinity zones in the bays and estuaries listed in Table 24 of NEFMC (2017). EFH for adult winter flounder occurs on muddy and sandy substrates, and on hard bottom on offshore banks. In inshore spawning areas, EFH includes a variety of substrates where eggs are deposited on the bottom.

2.2.5.1.13 Witch Flounder

Witch flounder are managed as a single stock and in U.S. waters, range from the Gulf of Maine to Cape Hatteras, North Carolina (Cargnelli et al., 1999c). Witch flounder spawn from April to November in the Gulf of Maine/Georges Bank region, and from April to August in the Mid-Atlantic Bight, peaking in the summer in both regions (Cargnelli et al., 1999c). Primary prey items include polychaetes, crustaceans, mollusks, and echinoderms. As of the 2017 stock assessment, witch flounder is overfished, overfishing status is unknown, and the condition of the stock is poor (NEFSC, 2017a).

The witch flounder EFH designations are reproduced below for the life stages found within the Project Area. EFH for eggs and larvae is present within the RWF area and RWEC-OCS corridor.

Eggs and Larvae: EFH is pelagic habitats on the continental shelf throughout the Northeast region, as shown on Map 66 and Map 67 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017).

2.2.5.1.14 Yellowtail Flounder

In U.S. waters, yellowtail flounder are managed as three stocks: the Gulf of Maine/Cape Cod stock, the Georges Bank stock, and the Southern New England/Mid-Atlantic stock. Yellowtail flounder range from Newfoundland to Chesapeake Bay (NOAA Fisheries, 2019j). These bottom-dwelling finfish prefer habitats with a mixture of sand and mud (Collette and Klein-MacPhee, 2002; Johnson et al., 1999), and spawn during the spring and summer (NFMS, 2019j). Adult prey items consist mainly of benthic macrofauna such as crustaceans and worms (NOAA Fisheries, 2019j; Johnson et al., 1999). As of the 2017 stock assessment (NEFSC, 2017a), all three stocks are overfished, currently subject to overfishing, and drastically below the biomass target level. (Johnson et al., 1999).

The yellowtail flounder EFH designations are reproduced below for the life stages found within the Project Area. Egg, larvae, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor. Juvenile and adult life stages have EFH within the RWEC-RI corridor.

Eggs: EFH is coastal and continental shelf pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region as far south as the upper Delmarva peninsula, as shown on Map 70 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the high salinity zones of the bays and estuaries listed in Table 25 of NEFMC (2017).

Larvae: EFH is coastal marine and continental shelf pelagic habitats in the Gulf of Maine, and from Georges Bank to Cape Hatteras, as shown on Map 71 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the high salinity zones of the bays and estuaries listed in Table 25 of NEFMC (2017).

Juveniles: EFH is subtidal benthic habitats in coastal waters in the Gulf of Maine and on the continental shelf on Georges Bank and in the Mid-Atlantic as shown on Map 72 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the high salinity zones of the bays and estuaries listed in Table 25 of NEFMC (2017). EFH for juvenile yellowtail flounder occurs on sand and muddy sand between 66 and 262 feet (20 and 80 m). In the Mid-Atlantic, young-of-the-year juveniles settle to the bottom on the continental shelf, primarily at depths of 131 to 230 feet (40 to 70 m), on sandy substrates.

Adults: EFH is subtidal benthic habitats in coastal waters in the Gulf of Maine and on the continental shelf on Georges Bank and in the Mid-Atlantic as shown on Map 73 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the high salinity zones of the bays and estuaries listed in Table 25 of NEFMC (2017). EFH for adult yellowtail flounder occurs on sand and sand with mud, shell hash, gravel, and rocks at depths between 82 and 295 feet (25 and 90 m).

2.2.5.2 Mid-Atlantic Finfish Species

2.2.5.2.1 Atlantic Butterfish

The Atlantic butterfish is a semi-pelagic fish that tends to form loose schools and ranges from Newfoundland to Florida (NOAA Fisheries, 2019k). They are most commonly found from the Gulf of Maine to Cape Hatteras, North Carolina (Cross et al., 1999; NFMS, 2019k). Butterfish are managed as one stock in the northern region (New England to Cape Hatteras) and two stocks south of Cape Hatteras. Butterfish are present in New England waters from spring to fall and are found from the surface to 180 feet (54 m) deep in the summer, but as deep as 690 feet (210 m) in the winter (Collette and Klein-MacPhee, 2002). Butterfish prefer sandy bottom environments rather than rocky environments. Spawning occurs on the continental shelf and in nearshore areas and is very common in Long Island Sound and the New York Bight (Cross et al., 1999). As of the 2018 stock assessment (Adams, 2018), Atlantic butterfish are not overfished and not subject to overfishing.

The Atlantic butterfish EFH designations are reproduced below for the life stages found within the Project Area. Egg, larvae, juvenile, and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Eggs: EFH is pelagic habitats in inshore estuaries and embayments from Massachusetts Bay to the south shore of Long Island, New York, in Chesapeake Bay, and on the continental shelf and slope, primarily from Georges Bank to Cape Hatteras, North Carolina. EFH for Atlantic butterfish eggs is generally found over bottom depths of 4,921 feet (1,500 m) or less where average temperatures in the upper 656 feet (200 m) of the water column are 43.7 to 70.7 °F (6.5 to 21.5 °C).

Larvae: EFH is pelagic habitats in inshore estuaries and embayments in Boston harbor, from the south shore of Cape Cod to the Hudson River, and in Delaware and Chesapeake bays, and on the continental shelf from the Great South Channel (western Georges Bank) to Cape Hatteras, North Carolina. EFH for Atlantic butterfish larvae is generally found over bottom depths between 134 and 1148 feet (41 and 350 m) where average temperatures in the upper 656 feet (200 m) of the water column are 47 to 71 °F (8.5 to 21.5 °C).

Juveniles: EFH is pelagic habitats in inshore estuaries and embayments from Massachusetts Bay to Pamlico Sound, North Carolina, in inshore waters of the Gulf of Maine and the South Atlantic Bight, and on the inner continental shelf and OCS from southern New England to South Carolina. EFH for juvenile Atlantic butterfish is generally found over bottom depths between 32 and 918 feet (10 and 280 m) where bottom water temperatures are between 43 and 80 °F (6.5 and 27 °C) and salinities are above 5 ppt. Juvenile butterfish feed mainly on planktonic prey.

Adults: EFH is pelagic habitats in inshore estuaries and embayments from Massachusetts Bay to Pamlico Sound, North Carolina, inshore waters of the Gulf of Maine and the South Atlantic Bight, on Georges Bank, on the inner continental shelf south of Delaware Bay, and on the OCS from southern New England to South Carolina. EFH for adult Atlantic butterfish is generally found over bottom depths between 32 and 820 feet (10 and 250 m) where bottom water temperatures are between 40 and 81 °F (4.5 and 27.5 °C) and salinities are above 5 ppt. Spawning probably does not occur at temperatures below 59 °F (15 °C). Adult butterfish feed mainly on planktonic prey, including squids and fishes.

2.2.5.2.2 Atlantic Mackerel

In the northwestern Atlantic, Atlantic mackerel range from Labrador to North Carolina (NOAA Fisheries, 2019l). They are a pelagic, schooling species and are managed as a single stock. Mackerel spawn off the coast (10 to 30 miles offshore) in deeper waters in two groups. The southern group primarily spawns in the Mid-Atlantic Bight from April to May, and the northern group spawns in the Gulf of St. Lawrence in June and July (NOAA Fisheries, 2019l). There is no known preferred breeding habitat (Collette and Klein-MacPhee, 2002). Atlantic mackerel prey on crustaceans (e.g., copepods, krill, and shrimp), fish, and ascidians (sea squirts) (NOAA Fisheries, 2019l). Prior to the 2018 stock assessment, the status of Atlantic mackerel was unknown (NOAA Fisheries, 2019l). The 2018 stock assessment concluded that Atlantic mackerel are overfished, subject to overfishing, and have been overfished for nearly a decade (NEFSC, 2018b).

The Atlantic mackerel EFH designations are reproduced below for the life stages found within the Project Area. Egg, larvae, and juvenile life stages have EFH within the RWF area and RWEC-OCS corridor. Egg, larvae, juvenile, and adult life stages have EFH within the RWEC-RI corridor.

Eggs: EFH is pelagic habitats in inshore estuaries and embayments from Great Bay, New Hampshire to the south shore of Long Island, New York, inshore and offshore waters of the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras, North Carolina (mostly north of 38°N). EFH for Atlantic mackerel eggs is generally found over bottom depths of 328 feet (100 m) or less with average water temperatures of 43 to 54 °F (6.5 to 12.5 °C) in the upper 59 feet (15 m) of the water column.

Larvae: EFH is pelagic habitats in inshore estuaries and embayments from Great Bay, New Hampshire to the south shore of Long Island, New York, inshore waters of the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras, North Carolina (mostly north of 38°N). EFH for Atlantic mackerel larvae is generally found over bottom depths between 68 and 328 feet (21 and 100 m) with average water temperatures of 42 to 52 °F (5.5 to 11.5 °C) in the upper 656 feet (200 m) of the water column.

Juveniles: EFH is pelagic habitats in inshore estuaries and embayments from Passamaquoddy Bay and Penobscot Bay, Maine to the Hudson River, in the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras, North Carolina. EFH for juvenile Atlantic mackerel is generally found over bottom depths between 32 and 360 feet (10 and 110 m) and in water temperatures of 41 to 68 °F (5 to 20 °C). Juvenile Atlantic mackerel feed primarily on small crustaceans, larval fish, and other pelagic organisms.

Adults: EFH is pelagic habitats in inshore estuaries and embayments from Passamaquoddy Bay, Maine to the Hudson River, and on the continental shelf from Georges Bank to Cape Hatteras, North Carolina. EFH for adult Atlantic mackerel is generally found over bottom depths less than 558 feet (170 m) and in water temperatures of 41 to 68 °F (5 to 20 °C). Spawning occurs at temperatures above 45 °F (7 °C), with a peak between 48 and 57 °F (9 and 14 °C). Adult Atlantic mackerel are opportunistic predators feeding primarily on a wider range and larger individuals of pelagic crustaceans than juveniles, but also on fish and squid.

2.2.5.2.3 Black Sea Bass

The black sea bass is a demersal finfish species that range from Nova Scotia to Florida and is managed as two stocks: Mid-Atlantic and South-Atlantic (NOAA Fisheries, 2019m). Black sea bass spend the summer in northern inshore waters at depths of less than 120 feet (37 m) and spend the winter in southern offshore waters at depths of 240 to 540 feet (73 to 165 m) (ASMFC, 2019a). Black sea bass prefer structured habitats such as reefs, pilings, jetties, shipwrecks, and lobster pots along the continental shelf (Steimle et al., 1999c; ASMFC, 2019a). Black sea bass spawn in May along the North Carolina coast, then spawn from the middle of May until the end of June in New Jersey, New York, and southern New England waters (Collette and Klein-MacPhee, 2002). Black sea bass consume a variety of prey items, but prefer crabs, shrimp, worms, small fish, and clams (NOAA Fisheries, 2019m). The most recent stock assessments for black sea bass concluded that both the Mid-Atlantic and South Atlantic stocks are not overfished and not subject to overfishing (NEFSC, 2017b; Southeast Data Assessment and Review [SEDAR], 2018).

The black sea bass EFH designations are reproduced below for the life stages found within the Project Area. Juvenile and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Juveniles: Offshore, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the exclusive economic zone [EEZ]), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90 percent of all the ranked squares of the area where juvenile black sea bass are collected in the NEFSC trawl survey. Inshore, EFH is the estuaries where black sea bass are identified as being common, abundant, or highly abundant in the Estuarine Living Marine Resources (ELMR) database for the "mixing" and "seawater" salinity zones. Juveniles are found in the estuaries in the summer and spring. Generally, juvenile black sea bass are found in waters warmer than 43 °F (6 °C) with salinities greater than 18 ppt and coastal areas between Virginia and Massachusetts, but winter offshore from New Jersey and south. Juvenile black sea bass are usually found in association with rough bottom, shellfish and eelgrass beds, and man-made structures in sandy-shelly areas; offshore clam beds and shell patches may also be used for over-wintering.

Adults: Offshore, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90 percent of all the ranked 10-minute squares of the area where adult black sea bass are collected in the NEFSC trawl survey. Inshore, EFH is the estuaries where adult black sea bass were identified as being common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. Black sea bass are generally found in estuaries from May through October. Wintering adults (November through April) are generally offshore, south of New York to North Carolina. Temperatures above 43 °F (6 °C) seem to be the minimum requirements. Structured habitats (natural and man-made), sand, and shell are usually the substrate preference.

2.2.5.2.4 Bluefish

Bluefish are a migratory species that is found throughout the world in most temperate coastal regions except the eastern Pacific. In the U.S., they range from Maine to eastern Florida and are managed as a single stock (NOAA Fisheries, 2019n). Bluefish generally school by size, concentrating between Maine and Cape Hatteras, North Carolina in the summer, and offshore between Cape Hatteras and Florida in the winter (ASMFC, 2019b). Bluefish spawn multiple times in spring and summer, with discrete groups spawning at different times (NOAA Fisheries, 2019n; ASMFC, 2019b). Bluefish are voracious, opportunistic predators, preying on squid and fish, particularly menhaden and smaller fish such as silversides (NOAA Fisheries, 2019n; ASMFC, 2019b). Based on the most recent stock assessment, bluefish are not overfished and not subject to overfishing (NEFSC, 2015).

The bluefish EFH designations are reproduced below for the life stages found within the Project Area. Egg, larvae, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor. Juvenile and adult life stages have EFH within the RWEC-RI corridor.

Eggs: North of Cape Hatteras, EFH is pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ) at mid-shelf depths, from Montauk Point, New York south to Cape Hatteras in the highest 90 percent of the area where bluefish eggs were collected in the Marine Resources Monitoring, Assessment, and Prediction (MARMAP) surveys. Bluefish eggs are generally not collected in estuarine waters and thus there is no EFH designation inshore. Generally, bluefish eggs are collected between April through August in temperatures greater than 64 °F (18 °C) and normal shelf salinities (>31 ppt).

Larvae: North of Cape Hatteras, EFH is pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ) most commonly above 59 feet (15 m), from Montauk Point, New York south to Cape Hatteras, in the highest 90 percent of the area where bluefish larvae were collected during the MARMAP surveys. EFH also includes the "slope sea" and Gulf Stream between latitudes 29° 00 N and 40° 00 N. Bluefish larvae are not generally collected inshore so there is not EFH designation inshore for larvae. Generally, bluefish larvae are collected April through September in temperatures greater than 64 °F (18 °C) in normal shelf salinities (>30 ppt).

Juveniles: North of Cape Hatteras, EFH is pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ) from Nantucket Island, Massachusetts south to Cape Hatteras, in the highest 90 percent of the area where juvenile bluefish are collected in the NEFSC trawl survey. EFH also includes the "slope sea" and Gulf Stream between latitudes 29° 00 N and 40° 00 N. Inshore, EFH is all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida. Generally juvenile bluefish occur in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from May through October, and South Atlantic estuaries March through December, within the "mixing" and "seawater" zones. Distribution of juveniles by temperature, salinity, and depth over the continental shelf is undescribed.

Adults: North of Cape Hatteras, EFH is the pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ), from Cape Cod Bay, Massachusetts south to Cape Hatteras, in the highest 90 percent of the area where adult bluefish were collected in the NEFSC trawl survey. Inshore, EFH is all major estuaries between

Penobscot Bay, Maine and St. Johns River, Florida. Adult bluefish are found in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from April through October, and in South Atlantic estuaries from May through January in the "mixing" and "seawater" zones. Bluefish adults are highly migratory, and distribution varies seasonally and according to the size of the individuals comprising the schools. Bluefish are generally found in normal shelf salinities (>25 ppt).

2.2.5.2.5 Scup

Scup are a migratory, schooling species found in the northwest Atlantic Ocean, primarily between Cape Cod, Massachusetts, and Cape Hatteras, North Carolina (NOAA Fisheries, 2019o). Scup are currently managed as two stocks, the Mid-Atlantic/New England stock, and the South Atlantic stock. Scup spend the winter in offshore waters between southern New Jersey and Cape Hatteras, migrating to more northern and inshore waters when water temperatures begin to rise in spring and summer (ASMFC, 2019c). Scup are known to congregate in nearshore areas of New England from early April to December, at depths between 270 and 420 feet (82 to 128 m) (Collette and Klein-MacPhee, 2002). Scup spawn over weedy or sandy areas in southern New England between Massachusetts Bay and the New York Bight between May and August, with peak spawning activity taking place in June (NOAA Fisheries, 2019o). Scup prefer smooth to rocky bottom habitats and usually form schools around such bottoms, feeding on demersal invertebrates. The 2017 stock assessment for the Mid-Atlantic/New England stock indicated that scup are not overfished and not currently subject to overfishing (NEFSC, 2017c). The population status of the South Atlantic stock has not been assessed (NOAA Fisheries, 2019o).

The scup EFH designations are reproduced below for the life stages found within the Project Area. Juvenile and adult life stages have EFH within the RWF area and RWEC-OCS corridor. Egg, larvae, juvenile, and adult life stages have EFH within the RWEC-RI corridor.

Eggs: EFH is estuaries where scup eggs were identified as common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. In general, scup eggs are found from May through August in southern New England to coastal Virginia, in waters between 55 and 73 °F (12 to 23 °C) and in salinities greater than 15 ppt.

Larvae: EFH is estuaries where scup were identified as common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. In general, scup larvae are most abundant nearshore from May through September, in waters between 55 and 73 °F (12 to 23 °C) and in salinities greater than 15 ppt.

Juveniles: Offshore, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90 percent of all the ranked 10-minute squares of the area where juvenile scup are collected in the NEFSC trawl survey. Inshore, EFH is the estuaries where scup has been identified as common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. In general, juvenile scup are found during the summer and spring in estuaries and bays between Virginia and Massachusetts, in association with various sands, mud, mussel, and eelgrass bed type substrates and in water temperatures greater than 45 °F (7 °C) and salinities greater than 15 ppt.

Adults: Offshore, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90 percent of all the ranked 10-minute squares of the area where adult scup are collected in the NEFSC trawl survey. Inshore, EFH is the estuaries where scup has been identified as common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. Generally, wintering adults (November through April) are usually offshore, south of New York to North Carolina, in waters above 45 °F (7 °C).

2.2.5.2.6 Summer Flounder

Summer flounder are found in inshore and offshore waters from Nova Scotia to the east coast of Florida, concentrating in the Mid-Atlantic region from Cape Cod, Massachusetts to Cape Fear, North Carolina (NOAA Fisheries, 2019p; ASMFC, 2019d). Summer flounder are managed as a single stock. Summer flounder move offshore in the fall to depths of 120 to 600 feet (37 to 183 m) to spawn (ASMFC, 2019d). Spawning peaks in October and November, and larvae migrate to inshore coastal and estuarine nursey areas (NOAA Fisheries, 2019p; ASMFC, 2019d). Adult summer flounder prefer sandy habitats, but can be found in a variety of habitat with both mud and sand substrates (Packer et al., 1999). Summer flounder are ambush predators, and prey opportunistically on fish and invertebrates including sea worms, squid, shrimp, and other crustaceans (ASFMC, 2019d). The 2019 stock assessment concluded that summer flounder are not overfished and not subject to overfishing (NEFSC, 2019).

The summer flounder EFH designations are reproduced below for the life stages found within the Project Area. Egg, larvae, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor. Larvae, juvenile, and adult life stages have EFH within the RWEC-RI corridor.

Eggs: North of Cape Hatteras, EFH is the pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90 percent of the all the ranked 10-minute squares for the area where summer flounder eggs are collected in the MARMAP survey. In general, summer flounder eggs are found between October and May, being most abundant between Cape Cod and Cape Hatteras, with the heaviest concentrations within 9 miles (14.5 km, 7.8 nm) of shore off New Jersey and New York. Eggs are most commonly collected at depths of 30 to 360 feet (9 to 110 m).

Larvae: North of Cape Hatteras, EFH is the pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90 percent of all the ranked 10-minute squares for the area where summer flounder larvae are collected in the MARMAP survey. Inshore, EFH is all the estuaries where summer flounder were identified as being present (rare, common, abundant, or highly abundant) in the ELMR database, in the "mixing" (defined in ELMR as 0.5 to 25.0 ppt) and "seawater" (defined in ELMR as greater than 25 ppt) salinity zones. In general, summer flounder larvae are most abundant nearshore (12 to 50 miles [19 to 80.5 km, 10.4 to 43.4 nm] from shore) at depths between 30 to 230 feet (9 to 70 m). They are most frequently found in the northern part of the Mid-Atlantic Bight from September to February, and in the southern part from November to May.

Juveniles: North of Cape Hatteras, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90 percent of all the ranked 10-minute squares for the area where juvenile summer flounder are collected in the NEFSC trawl survey. Inshore, EFH is all the estuaries where summer flounder were identified as being present (rare, common, abundant, or highly abundant) in the ELMR database for the "mixing" and "seawater" salinity zones. In general, juveniles use several estuarine habitats as nursery areas, including salt marsh creeks, seagrass beds, mudflats, and open bay areas in water temperatures greater than 37 °F (3 °C) and salinities from 10 to 30 ppt range.

Adults: North of Cape Hatteras, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90 percent of all the ranked 10-minute squares for the area where adult summer flounder are collected in the NEFSC trawl survey. Inshore, EFH is the estuaries where summer flounder were identified as being common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. Generally, summer flounder inhabit shallow coastal and estuarine waters during warmer months and move offshore on the outer continental shelf at depths of 500 feet (152 m) in colder months.

2.2.5.3 Invertebrates

2.2.5.3.1 Atlantic Sea Scallop

The Atlantic sea scallop is managed as a single stock that ranges from Newfoundland to Cape Hatteras, North Carolina (NOAA Fisheries, 2019q). Atlantic sea scallop occur along the continental shelf, typically at depths ranging from 59 to 360 feet (18 to 110 m), and are generally found in seabed areas with coarse substrates consisting of firm sand, gravel, shells, and rocks (Hart and Chute, 2004). The sea scallop spawning season is usually in the late summer or early fall, and spawning may also occur in the spring in the Mid-Atlantic Bight (NOAA Fisheries, 2019q). The 2018 stock assessment concluded that Atlantic sea scallop are not overfished and are not subject to overfishing (NEFSC, 2018a).

The Atlantic sea scallop EFH designations are reproduced below for the life stages found within the Project Area. Egg, larvae, juvenile, and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Eggs: EFH is benthic habitats in inshore areas and on the continental shelf as shown on Map 97 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), in the vicinity of adult scallops. Eggs are heavier than seawater and remain on the seafloor until they develop into the first free-swimming larval stage.

Larvae: EFH is benthic and water column habitats in inshore and offshore areas throughout the region, as shown on Map 97 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017). Any hard surface can provide an essential habitat for settling pelagic larvae ("spat"), including shells, pebbles, and gravel. They also attach to macroalgae and other benthic organisms such as hydroids. Spat attached to sedentary branching organisms or any hard surface have greater survival rates; spat that settle on shifting sand do not survive.

Juveniles: EFH is benthic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic, as shown on Map 97 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), in depths of 59 to 361 feet (18 to 110 m). Juveniles (0.2 to 0.5 inch [5 to 12 mm] shell height) leave the original substrate on which they settle (see spat, above) and attach themselves with byssal threads to shells, gravel, and small rocks (pebble, cobble), preferring gravel. As they grow older, they lose their byssal attachment. Juvenile scallops are relatively active and swim to escape predation. While swimming, they can be carried long distances by currents. Bottom currents stronger than 10 cm/sec retard feeding and growth. In laboratory studies, maximum survival of juvenile scallops occurred between 34 and 59 °F (1.2 and 15 °C) and above salinities of 25 ppt. On Georges Bank, age 1 juveniles are less dispersed than older juveniles and adults and are mainly associated with gravel-pebble deposits. Essential habitats for older juvenile scallops are the same as for the adults (gravel and sand).

Adults: EFH is benthic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic, as shown on Map 97 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017). Essential habitats for older juvenile and adult sea scallops are found on sand and gravel substrates in depths of 59 to 361 feet (18 to 110 m), but they are also found in shallower water and as deep as 591 feet (180 m) in the Gulf of Maine. In the Mid-Atlantic they are found primarily between 148 and 246 feet (45 and 75 m) and on Georges Bank they are more abundant between 197 and 295 feet (60 and 90 m). They often occur in aggregations called beds which may be sporadic or essentially permanent, depending on how suitable the habitat conditions are (temperature, food availability, and substrate) and whether oceanographic features (fronts, currents) keep larval stages in the vicinity of the spawning population. Bottom currents stronger than 25 cm/sec inhibit feeding. Growth of adult scallops is optimal between 50 and 59 °F (10 and 15 °C) and they prefer full strength seawater.

2.2.5.3.2 Atlantic Surfclam

The Atlantic surfclam ranges from the southern Gulf of St. Lawrence to Cape Hatteras, North Carolina. The species prefers sandy habitats along the continental shelf (Cargnelli et al., 1999d), and is most abundant on Georges Bank, the south shore of Long Island, and along the coasts of New Jersey and the Delmarva Peninsula (NOAA Fisheries, 2019r). Atlantic surfclam spawn in the late spring through the early fall (NOAA Fisheries, 2019r). According to the most recent stock assessment, Atlantic surfclam are not overfished and not subject to overfishing (NEFSC, 2016).

The Atlantic surfclam EFH designations are reproduced below for the life stages found within the Project Area. Adults have EFH designated within the RWEC-OCS corridor, and juveniles and adults have EFH designated within the RWEC-RI corridor.

Juveniles and Adults: EFH is throughout the substrate, to a depth of 3 feet (1 m) below the water/sediment interface, within federal waters from the eastern edge of Georges Bank and the Gulf of Maine throughout the Atlantic EEZ, in areas that encompass the top 90 percent of all the ranked 10-minute squares for the area where surfclams were caught in the NEFSC surfclam and ocean quahog dredge surveys. Surfclams generally occur from the beach zone to a depth of about 200 feet (656 m), but beyond about 125 feet (52 m) abundance is low.

2.2.5.3.3 Longfin Inshore Squid

The longfin squid is a pelagic, schooling species that ranges from Newfoundland to the Gulf of Venezuela. In U.S. waters, longfin inshore squid are managed as a single stock and are most abundant between Georges Bank and Cape Hatteras, North Carolina (NOAA Fisheries, 2019s). Longfin inshore squid have a very short life span (less than 1 year), and spawn year-round with peak productions in winter and summer (NOAA Fisheries, 2019s). Juvenile longfin inshore squid feed on plankton, and adults are aggressive hunters that feed on fish, crustaceans, and their own species (NOAA Fisheries, 2019s). The 2017 stock assessment concluded that longfin inshore squid are not overfished, but there was not enough information to determine whether the stock is experiencing overfishing (Hendrickson, 2017).

The longfin inshore squid EFH designations are reproduced below for the life stages found within the Project Area. Egg, juvenile, and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Eggs: EFH for longfin inshore squid eggs occurs in inshore and offshore bottom habitats from Georges Bank southward to Cape Hatteras. EFH for eggs is generally found where bottom water temperatures are between 50 and 73 °F (10 and 23 °C), salinities are between 30 and 32 ppt and depth is less than 164 feet (50 m). Longfin inshore squid eggs have also been collected in bottom trawls in deeper water at various places on the continental shelf. Like most loliginid squids, longfin inshore squid egg masses or “mops” are demersal and anchored to the substrates on which they are laid, which include a variety of hard bottom types (e.g., shells, lobster pots, piers, fish traps, boulders, and rocks), submerged aquatic vegetation (e.g., *Fucus* sp.), sand, and mud.

Juveniles (Pre-Recruits): EFH is pelagic habitats in inshore and offshore continental shelf waters from Georges Bank to South Carolina, in the southwestern Gulf of Maine, and in embayments such as Narragansett Bay, Long Island Sound, and Raritan Bay. EFH is generally found over bottom depths between 20 and 525 feet (6 and 160 m) where bottom water temperatures are 47 to 76 °F (8.5 to 24.5 °C) and salinities are 28.5 to 36.5 ppt. Pre-recruits migrate offshore in the fall where they overwinter in deeper waters along the edge of the shelf. They make daily vertical migrations, moving in the water column at night and down in the daytime. Small immature individuals feed on planktonic organisms while larger individuals feed on crustaceans and small fish.

Adults (Recruits): EFH is pelagic habitats in inshore and offshore continental shelf waters from Georges Bank to South Carolina, in inshore waters of the Gulf of Maine, and in embayments such as Narragansett Bay, Long Island Sound, Raritan Bay, and Delaware Bay. EFH is generally found over bottom depths between 20 and 656 feet (6 and 200 m) where bottom water temperatures are 47 to 57 °F (8.5 to 14 °C) and salinities are 24 to 36.5 ppt. Recruits inhabit the continental shelf and upper continental slope to depths of 1,312 feet (400 m). They migrate offshore in the fall and overwinter in warmer waters along the edge of the shelf. Like the pre-recruits, they make daily vertical migrations. Individuals larger than 4.7 inches (12 cm) feed on fish and those larger than 6.3 inches (16 cm) feed on fish and squid. Females deposit eggs in gelatinous capsules which are attached in clusters to rocks, boulders, and aquatic vegetation and on sand or mud bottom, generally in depths less than 164 feet (50 m).

2.2.5.3.4 Northern Shortfin Squid

The northern shortfin squid is a highly migratory species found in the northwest Atlantic Ocean between the Labrador Sea and the Florida Straits (Hendrickson and Holmes, 2004). In U.S. waters, northern shortfin squid are managed as a single stock. Northern shortfin squid have a very short life span (less than 1 year). The species migrates onto the continental shelf in the spring, and migrates offshore in the late autumn, presumably to a winter spawning site (Hendrickson and Holmes, 2004). Winter habitats of the species are not well known, and the only confirmed spawning area is located in the Mid-Atlantic Bight at depths of 371 to 1,237 feet (113 to 377 m) (Hendrickson and Holmes, 2004). It is unknown whether the stock of northern shortfin squid is overfished or experiencing overfishing, as relative abundance and biomass indices are highly variable and lacking a trend (Mid-Atlantic Fishery Management Council and NOAA Fisheries, 2018).

The northern shortfin squid EFH designation for adults is reproduced below; this is the only life stage with EFH within the RWF area. Northern shortfin squid EFH is not found within the RWEC-OCS or RWEC-RI corridor.

Adults (Recruits): EFH is pelagic habitats on the continental shelf and slope from Georges Bank to South Carolina, and in inshore and offshore waters of the Gulf of Maine. EFH for adult northern shortfin squid is generally found on the shelf over bottom depths between 135 and 1,312 feet (41 and 400 m) where bottom temperatures are 40.1 to 58.1 °F (4.5 to 14.5 °C) and salinities are 34.5 to 36.5 ppt. They have also been caught in bottom trawls as deep as 8,202 feet (2,500 m) in waters beyond the edge of the shelf and on Bear Seamount. Adults make daily vertical migrations, moving up in the water column at night and down in the daytime. They feed primarily on fish and euphausiids and are also cannibalistic (larger females consume smaller males).

2.2.5.3.5 Ocean Quahog

Ocean quahog are managed as a single stock and range from Newfoundland to Cape Hatteras. The highest concentrations of ocean quahog are found are south of Nantucket to the Delmarva Peninsula in offshore waters (Cargnelli et al., 1999e). The species prefers medium- to fine-grain sand, sandy mud, and silty sand (Cargnelli et al., 1999e). Ocean quahogs spawn once a year in the summer or fall, but the spawning season can be extended over several months (NOAA Fisheries, 2019t). The 2017 stock assessment concluded that ocean quahog are not overfished and not subject to overfishing (NEFSC, 2017d).

The ocean quahog EFH designations are reproduced below for the life stages found within the Project Area. Juvenile and adult life stages have EFH within the RWF area and RWEC-OCS corridor.

Juveniles and Adults: EFH is throughout the substrate, to a depth of 3 feet (1 m) below the water/sediment interface, within federal waters from the eastern edge of Georges Bank and the Gulf of Maine throughout the Atlantic EEZ, in areas that encompass the top 90 percent of all the ranked 10-minute squares for the area where ocean quahogs were caught in the NEFSC surfclam and ocean quahog dredge surveys. Distribution in the western Atlantic ranges in depths from 30 feet (9 m) to about 800 feet (244 m). Ocean quahogs are rarely found where bottom water temperatures exceed 60 °F (16 °C) and occur progressively further offshore between Cape Cod and Cape Hatteras.

2.2.5.4 Highly Migratory Species

2.2.5.4.1 Albacore Tuna

Albacore Tuna is a circumglobal, epipelagic species that is managed in three stocks: North Atlantic, South Atlantic, and Mediterranean (NOAA Fisheries, 2017). They travel in large schools that are sometimes mixed with other tuna species (NOAA Fisheries, 2019u). Albacore tuna forage down to depth of 1,640 feet (500 m), preying opportunistically on a wide variety of fishes and invertebrates (NOAA Fisheries, 2017). Albacore tuna spawn in the spring and summer in the western tropical areas of the Atlantic, and then they move northward and use the central and northern portions of the Atlantic as their wintering area (NOAA Fisheries, 2017). The most recent stock assessment concluded that the North Atlantic stock of albacore tuna is not overfished, has rebuilt to target population levels, and is not subject to overfishing (International Commission for the Conservation of Atlantic Tunas [ICCAT], 2016a).

The albacore tuna EFH designations are reproduced below for the life stages found within the Project Area. Juvenile and adult life stages have EFH within the RWF area and RWEC-OCS corridor. Within the RWEC-RI corridor, only juveniles have EFH.

Juveniles and Adults: EFH is offshore, pelagic habitats of the Atlantic Ocean from the outer edge of the U.S. EEZ through Georges Bank to pelagic habitats south of Cape Cod, and from Cape Cod to Cape Hatteras, North Carolina. EFH also includes offshore pelagic habitats near the outer U.S. EEZ between North Carolina and Florida, and offshore pelagic habitats associated with the Blake Plateau. EFH also includes offshore pelagic habitats in the western and central Gulf of Mexico.

2.2.5.4.2 Bluefin Tuna

Bluefin tuna are a highly migratory, epipelagic species managed in two stocks: western and eastern, separated by the 45° W meridian (NOAA Fisheries, 2017). In the western Atlantic, bluefin tuna range from Newfoundland to the Gulf of Mexico (NOAA Fisheries, 2019v). Bluefin tuna are thought to forage off the eastern U.S. and Canadian coasts from June through March, migrating to spawning grounds in the Gulf of Mexico, Bahamas, and the Straits of Florida in April and May, and then generally moving back to foraging grounds of the Gulf Stream and North American continental shelf and slope waters, including the South and Mid-Atlantic Bight, the Gulf of Maine, and the Nova Scotia Shelf (NOAA Fisheries, 2017). Adult bluefin tuna feed opportunistically on a variety of schooling fish, cephalopods, and benthic invertebrates, including silver hake, Atlantic mackerel, Atlantic herring, krill, sandlance, and squid (NOAA Fisheries, 2017). The 2017 stock assessment concluded that the western Atlantic bluefin tuna stock is not subject to overfishing, but the information was insufficient to determine whether the stock status is overfished (ICCAT, 2017; NOAA Fisheries, 2019v).

The bluefin tuna EFH designations are reproduced below for the life stages found within the Project Area. Juvenile and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Juveniles: EFH is coastal and pelagic habitats of the Mid-Atlantic Bight and the Gulf of Maine, between southern Maine and Cape Lookout, from shore (excluding Long Island Sound, Delaware Bay, Chesapeake Bay, and Pamlico Sound) to the continental shelf break. EFH in coastal areas of Cape Cod are located between the Great South Passage and shore. EFH follows the continental shelf from the outer extent of the U.S. EEZ on Georges Bank to Cape Lookout. EFH is associated with certain environmental conditions in the Gulf of Maine (61 to 66 °F (16 to 19 °C); 0 to 131 feet (0 to 40 m) deep). EFH in other locations associated with temperatures ranging from 39 to 79 °F (4 to 26 °C), often in depths of less than 66 feet (20 m) (but can be found in waters that are 131–328 feet (40–100 m) in depth in winter).

Adults: EFH is located in offshore and coastal regions of the Gulf of Maine the mid-coast of Maine to Massachusetts; on Georges Bank; offshore pelagic habitats of southern New England; from southern New England to coastal areas between the mouth of Chesapeake Bay and Onslow Bay, North Carolina; from coastal North Carolina south to the outer extent of the U.S. EEZ, inclusive of pelagic habitats of the Blake Plateau, Charleston Bump, and Blake Ridge. EFH also consists of pelagic waters of the central Gulf of Mexico from the continental shelf break to the seaward extent of the U.S. EEZ between Apalachicola, Florida and Texas.

2.2.5.4.3 Skipjack Tuna

The skipjack tuna is a circumglobal, epipelagic species that is managed as two stocks, eastern and western. Skipjack tuna in the western Atlantic range are found in tropical and warm-temperate waters from Newfoundland to Brazil (NOAA Fisheries, 2017). They are a schooling species, and have been known to associate with birds, drifting objects, whales, sharks, and other tunas (NOAA Fisheries, 2017). Skipjack tuna feed opportunistically on a variety of fishes, cephalopods, crustaceans, mollusks, and sometimes other skipjack tuna (NOAA Fisheries, 2017; NOAA Fisheries, 2019w). The species spawns throughout the year in warm equatorial waters and from spring to early fall in subtropical waters (NOAA Fisheries, 2017). Based on the 2014 stock assessment, western Atlantic skipjack tuna are not overfished and not subject to overfishing (ICCAT, 2014).

The skipjack tuna EFH designations are reproduced below for the life stages found within the Project Area. Juvenile and adult life stages have EFH within the RWF area. Within the RWEC-OCS corridor and RWEC-RI corridor, only adults have EFH.

Juveniles: EFH is offshore pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank (off Massachusetts), coastal and offshore habitats between Massachusetts and South Carolina, localized areas off Georgia and South Carolina, and from the Blake Plateau through the Florida Straits. EFH also includes offshore waters in the central Gulf of Mexico from Texas through the Florida Panhandle. In all areas, juveniles are found in waters greater than 66 feet (20 m).

Adults: EFH is coastal and offshore habitats between Massachusetts and Cape Lookout, North Carolina and localized areas in the Atlantic off South Carolina and Georgia, and the northern east coast of Florida. EFH in the Atlantic Ocean is also located on the Blake Plateau, in the Florida Straits through the Florida Keys, and areas in the central Gulf of Mexico, offshore in pelagic habitats seaward of the southeastern edge of the West Florida Shelf to Texas.

2.2.5.4.4 Yellowfin Tuna

The yellowfin tuna is a circumglobal, epipelagic species found in tropical and temperate waters (NOAA Fisheries, 2017). In the western Atlantic, yellowfin tuna are managed as a single stock and spawn from May to August in the Gulf of Mexico and from July to November in the southeastern Caribbean (NOAA Fisheries, 2019x). The species travel in schools, with juveniles found at the surface in mixed schools with other tuna species (NOAA Fisheries, 2017). Yellowfin tuna feed primarily in surface waters down to a depth of 328 feet (100 m), preying on a wide variety of fish and invertebrates (NOAA Fisheries, 2017). According to the 2016 stock assessment, Atlantic yellowfin tuna are not overfished and are not currently subject to overfishing (ICCAT, 2016b).

The yellowfin tuna EFH designations are reproduced below for the life stages found within the Project Area. Juvenile and adult life stages have EFH within the RWF area and RWEC-OCS corridor. Within the RWEC-RI corridor, only juveniles have EFH.

Juveniles: EFH is offshore pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank and Cape Cod, Massachusetts. EFH also includes offshore and coastal habitats from Cape Cod to the mid-east coast of Florida and the Blake Plateau, locally distributed areas in the Florida Straits and off the southwestern edge of the West Florida Shelf, the central Gulf of Mexico from the Florida Panhandle to southern Texas, and localized areas southeast of Puerto Rico.

Adults: EFH is offshore pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank and Cape Cod, Massachusetts. EFH also includes offshore and coastal habitats from Cape Cod to North Carolina, offshore pelagic habitats of the Blake Plateau. EFH in the Gulf of Mexico spans throughout much of the offshore pelagic habitat from the West Florida Shelf to the continental shelf off southern Texas.

2.2.5.5 Skates

2.2.5.5.1 Little Skate

The little skate is a demersal species that ranges from Nova Scotia to Cape Hatteras and is most abundant in the northern Mid-Atlantic Bight and on Georges Bank (Packer et al., 2003a). Little skate are managed as a single stock as part of the Northeast Skate Complex. The little skate is present in New England year-round, and mating may take place at any time throughout the year, although there is evidence that most egg cases are found fully or partially developed from late October to January and from June to July (Packer et al., 2003a). Little skate primarily prey on decapod crustaceans, amphipods, and polychaetes, and to a lesser extent, isopods, bivalves, and fishes (Packer et al., 2003a). According to the 2016 stock status update, little skate are not overfished and not experiencing overfishing (Sosebee, 2017).

The little skate EFH designations are reproduced below for the life stages found within the Project Area. Juvenile and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Juveniles: EFH is intertidal and subtidal benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 262 feet (80 m), as shown on Map 90 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), and including high salinity zones in the bays and estuaries listed in Table 28 of NEFMC (2017). EFH for juvenile little skates occurs on sand and gravel substrates, but they are also found on mud.

Adults: EFH is intertidal and subtidal benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 328 feet (100 m), as shown on Map 91 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), and including high salinity zones in the bays and estuaries listed in Table 28 of NEFMC (2017). EFH for adult little skates occurs on sand and gravel substrates, but they are also found on mud.

2.2.5.5.2 Winter Skate

Winter skate range from the Gulf of St. Lawrence in Canada to Cape Hatteras, North Carolina, and have concentrated populations on Georges Bank and the northern section of the Mid-Atlantic Bight (Packer et al., 2003b; NOAA Fisheries, 2019y). Winter skate are managed as a single stock as part of the Northeast Skate Complex (NOAA Fisheries, 2019y). Mating is thought to take place year-round, though female winter skates with fully formed egg capsules are more abundant in summer and fall (Packer et al., 2003b). Winter skate primarily prey on polychaetes and amphipods, followed by decapod crustaceans, isopods, bivalves, and fishes (Packer et al., 2003b). According to the most recent stock assessment, winter skate are not overfished and not experiencing overfishing (Sosebee, 2017).

The winter skate EFH designations are reproduced below for the life stages found within the Project Area. Juvenile and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Juveniles: EFH is subtidal benthic habitats in coastal waters from eastern Maine to Delaware Bay and on the continental shelf in southern New England and the Mid-Atlantic region, and on Georges Bank, from the shoreline to a maximum depth of 295 feet (90 m), as shown on Map 92 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the high salinity zones of the bays and estuaries listed in Table 28 of NEFMC (2017). EFH for juvenile winter skates occurs on sand and gravel substrates, but they are also found on mud.

Adults: EFH is subtidal benthic habitats in coastal waters in the southwestern Gulf of Maine, in coastal and continental shelf waters in southern New England and the Mid-Atlantic region, and on Georges Bank, from the shoreline to a maximum depth of 262 feet (80 m), as shown on Map 93 of the Final Omnibus EFH Amendment 2 (NEFMC, 2017), including the high salinity zones of the bays and estuaries listed in Table 28 of NEFMC (2017). EFH for adult winter skates occurs on sand and gravel substrates, but they are also found on mud.

2.2.5.6 Sharks

2.2.5.6.1 Basking Shark

The basking shark is a large, migratory species found in subpolar and cold temperate seas throughout the world (NOAA Fisheries, 2017). In the western Atlantic, basking sharks are found in coastal regions from April to October, with the highest abundance in May through August (NOAA Fisheries, 2017). Basking shark are filter-feeders that feed swimming forward with an opened mouth to filter planktonic prey. Little is known about the reproductive habits of basking shark, though aggregations of basking shark displaying courtship behaviors are thought to associate with persistent thermal fronts in areas of high prey density (NOAA Fisheries, 2017). Harvest of basking shark is prohibited in the U.S., and the species is listed as “Vulnerable” on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species (Fowler, 2009). A stock assessment has not been conducted for basking shark (NOAA Fisheries, 2017).

The basking shark EFH designations are reproduced below for the life stages found within the Project Area. Neonate, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor.

Neonate/Young-of-the-Year (YOY), Juveniles and Adults: At this time, insufficient data are available to differentiate EFH between size classes; therefore, EFH designations for all life stages have been combined and are considered the same. EFH is the Atlantic east coast from the Gulf of Maine to the northern Outer Banks of North Carolina, and from mid-South Carolina to coastal areas of northeast Florida. Aggregations of basking sharks were observed from the south and southeast of Long Island, east of Cape Cod, and along the coast of Maine, in the Gulf of Maine and near the Great South Channel, approximately 59 miles (95 km) southeast of Cape Cod, Massachusetts as well as approximately 47 miles (75 km) south of Martha’s Vineyard and 56 miles (90 km) south of Moriche’s Inlet, Long Island. These aggregations tend to be associated with persistent thermal fronts within areas of high prey density.

2.2.5.6.2 Blue Shark

The blue shark is a common pelagic shark that ranges widely in tropical, subtropical, and temperate waters (NOAA Fisheries, 2017). In the western Atlantic Ocean, they range from Newfoundland to Argentina (Fisheries and Oceans

Canada, 2018b). Blue shark migrate great distances and prefer deep, clear, blue waters, usually with temperatures between 50 and 68 °F (10 and 20 °C) and depths greater than 591 feet (180 m) (NOAA Fisheries, 2017). Blue sharks are thought to have an annual reproductive cycle, and nursery areas appear to be in open oceanic waters in the higher latitudes of the its range (NOAA Fisheries, 2017). Blue shark prey mostly on squid and pelagic schooling fishes, and are known to feed opportunistically on marine mammal and turtle carcasses (Fisheries and Oceans Canada, 2018b). The 2015 stock assessment concluded that blue shark are not overfished and not experiencing overfishing, though the authors acknowledged a high level of uncertainty in the results (ICCAT, 2015).

The blue shark EFH designations are reproduced below for the life stages found within the Project Area. Neonate, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor.

Neonates/YOY: EFH includes the Atlantic in areas offshore of Cape Cod through New Jersey, seaward of the 98 foot (30 m) bathymetric line (and excluding inshore waters such as Long Island Sound). EFH follows the continental shelf south of Georges Bank to the outer extent of the U.S. EEZ in the Gulf of Maine.

Juveniles and Adults: EFH includes localized areas in the Atlantic Ocean in the Gulf of Maine, from Georges Bank to North Carolina, South Carolina, Georgia, and off Florida.

2.2.5.6.3 Common Thresher Shark

The common thresher shark is a pelagic shark found in warm and temperate coastal and oceanic waters around the world, with higher abundance near land (NOAA Fisheries, 2017). In the northwest Atlantic Ocean, they are found from Newfoundland to Cuba. Common thresher shark prey on squid, pelagic crabs, and small fishes such as anchovy, sardines, hakes, and small mackerels (NOAA Fisheries, 2017). Common thresher shark mating is thought to occur in the late summer and fall, with females giving birth in spring (NOAA Fisheries, 2017; NOAA Fisheries, 2019z). A stock assessment has not been conducted for common thresher shark (NOAA Fisheries, 2019z).

The common thresher shark EFH designations are reproduced below for the life stages found within the Project Area. Neonate, juvenile, and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Neonate/YOY, Juveniles, and Adults: At this time, insufficient data are available to differentiate EFH between the juvenile and adult size classes; therefore, EFH is the same for those life stages. EFH is located in the Atlantic Ocean, from Georges Bank (at the offshore extent of the U.S. EEZ boundary) to Cape Lookout, North Carolina; and from Maine to locations offshore of Cape Ann, Massachusetts. EFH occurs with certain habitat associations in nearshore waters of North Carolina, especially in areas with temperatures from 65 to 70 °F (18.2 to 20.9 °C) and at depths from 15 to 45 feet (4.6 to 13.7 m).

2.2.5.6.4 Dusky Shark

The dusky shark is a migratory species found in warm and temperate waters over the continental shelf throughout the Atlantic, Pacific, and Indian Oceans (NOAA Fisheries, 2017). The reproductive habits of dusky shark are not well known, but the species is thought to give birth in Bulls Bay, South Carolina in April and May, and in the Chesapeake Bay, Maryland in June and July (NOAA Fisheries, 2017). The shallow, coastal waters of Massachusetts serve as nursery habitat for young dusky sharks. Dusky shark prey on a variety of fishes, squid, and other elasmobranchs such as dogfish, catsharks, skates, and rays (Fisheries and Oceans Canada, 2018c; Musick et al., 2009a). Harvest of dusky shark is prohibited in the U.S., and the species is listed as “Vulnerable” on the IUCN Red List of Threatened Species (Musick et al., 2009a). The most recent stock assessment concluded that dusky shark are overfished and subject to overfishing (SEDAR, 2016).

The dusky shark EFH designations are reproduced below for the life stages found within the Project Area. Neonate, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor.

Neonate/YOY: EFH in the Atlantic Ocean includes offshore areas of southern New England to Cape Lookout, North Carolina. Specifically, EFH is associated with habitat conditions including temperatures from 65 to 72 °F (18.1 to

22.2 °C), salinities of 25 to 35 ppt and depths at 14 to 51 feet (4.3 to 15.5 m). The seaward extent of EFH for this life stage in the Atlantic is 197 feet (60 m) in depth.

Juveniles and Adults: EFH is the coastal and pelagic waters inshore of the continental shelf break (< 656 feet [200 m] in depth) along the Atlantic east coast from habitats offshore of southern Cape Cod to Georgia, including the Charleston Bump and adjacent pelagic habitats. The inshore extent for these life stages is the 66 foot (20 m) bathymetric line, except in habitats of southern New England, where EFH is extended seaward of Martha's Vineyard, Block Island, and Long Island. EFH also includes pelagic habitats of southern Georges Bank and the adjacent continental shelf break from Nantucket Shoals and the Great South Channel to the eastern boundary of the United States EEZ. Adults are generally found deeper (to 6,562 feet [2,000 m]) than juveniles; however, there is overlap in the habitats utilized by both life stages. In the Gulf of Mexico, EFH includes offshore waters of the western and north Gulf, at and seaward of the continental shelf break, and in proximity to numerous banks along the continental shelf edge (e.g., Ewing and Sackett Bank). The continental shelf edge habitat from Desoto Canyon west to the Mexican border is important habitat for adult dusky sharks.

2.2.5.6.5 Sand Tiger Shark

Sand tiger shark are a large, coastal species found in tropical and warm temperate waters around the world, often in very shallow water (13 feet [4 m]) (NOAA Fisheries, 2017). In the northwestern Atlantic, mature sand tiger shark males and juveniles are found between Cape Cod and Cape Hatteras, and mature and pregnant females are found between Cape Hatteras and Florida (NOAA Fisheries, 2017). Sand tiger reproductive habits are not well known, but in the northwestern Atlantic they are thought to give birth in March and April. In the southern portions of its range, females are believed to give birth in the winter, with neonates migrating northward to summer nurseries such as Narragansett Bay (NOAA Fisheries, 2017). Sand tiger sharks feed on a variety of bony fishes, as well as other elasmobranchs. Harvest of sand tiger shark is prohibited in the U.S., and the species is listed as "Vulnerable" on the IUCN Red List of Threatened Species (Pollard and Smith, 2009).

The sand tiger shark EFH designations are reproduced below for the life stages found within the Project Area. Neonate and juvenile life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Neonate/YOY and Juveniles: Neonate EFH ranges from Massachusetts to Florida, specifically the Plymouth, Kingston, Duxbury Bay system, Sandy Hook, and Narragansett Bays as well as coastal sounds, lower Chesapeake Bay, Delaware Bay (and adjacent coastal areas), Raleigh Bay and habitats surrounding Cape Hatteras. Juvenile EFH includes habitats between Massachusetts and New York (Plymouth, Kingston, Duxbury Bay system), and between mid-New Jersey and the mid-east coast of Florida. EFH can be described via known habitat associations in the lower Chesapeake Bay and Delaware Bay (and adjacent coastal areas) where temperatures range from 66 to 77 °F (19 to 25 °C), salinities range from 23 to 30 ppt at depths of 9 to 23 feet (2.8 to 7.0 m) in sand and mud areas, and in coastal North Carolina habitats with temperatures from 66 to 81 °F (19 to 27 °C), salinities from 30 to 31 ppt, depths of 27 to 45 feet (8.2 to 13.7 m), in rocky and mud substrate or in areas surrounding Cape Lookout that contain benthic structure.

2.2.5.6.6 Sandbar Shark

The sandbar shark is a large, coastal species found in subtropical and warm temperate waters. In the northwestern Atlantic, sandbar shark range from Cape Cod to the western Gulf of Mexico (NOAA Fisheries, 2017). Sandbar sharks prefer bottom habitats and are most commonly found in 66 to 180 feet (20 to 55 m) of water, and occasionally at depths of about 656 feet (200 m) (NOAA Fisheries, 2017). The species preys on a variety of bony fishes, other elasmobranchs, mollusks, and crustaceans (Musick et al., 2009b). Sandbar sharks migrate seasonally, and males and females segregate during most of the year (NFMS, 2017). Mating and birthing activities are thought to peak between April and July, with most near-term pregnant and postpartum females observed in the Florida Keys (NOAA Fisheries, 2017). In U.S. waters, sandbar shark nursery areas consist of shallow coastal waters from Cape Canaveral, Florida to Martha's Vineyard, Massachusetts. The 2017 stock assessment indicated that sandbar shark are overfished and not experiencing overfishing (Southeast Data and Assessment Review, 2017).

The sandbar shark EFH designations are reproduced below for the life stages found within the Project Area. Juvenile and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Juveniles: EFH includes coastal portions of the Atlantic Ocean between southern New England (Nantucket Sound, Massachusetts) and Georgia in water temperatures ranging from 68 to 75 °F (20 to 24 °C) and depths from 7.9 to 21 feet (2.4 to 6.4 m). Important nurseries include Delaware Bay, Delaware, and New Jersey; Chesapeake Bay, Virginia; Great Bay, New Jersey; and the waters off Cape Hatteras, North Carolina. For all EFH, water temperatures range from 59 to 86 °F (15 to 30 °C), salinities range from 15 to 35 ppt, water depth ranges from 2.6 to 75 feet (0.8 to 23 m), and substrate includes sand, mud, shell, and rocky habitats. EFH in the Gulf of Mexico includes localized areas off Apalachicola Bay, Florida.

Adults: EFH in the Atlantic Ocean includes coastal areas from southern New England to the Florida Keys, ranging from inland waters of Delaware Bay and the mouth of Chesapeake Bay to the continental shelf break. EFH in the Gulf of Mexico includes coastal areas between the Florida Keys and Anclote Key, Florida; areas offshore of the Big Bend region; coastal areas of the Florida panhandle and Gulf coast between Apalachicola and the Mississippi River; and habitats surrounding the continental shelf between Louisiana and south Texas. Adults commonly use habitats in the West Florida Shelf, off Cape San Blas, and cool, deep, clear water offshore of Texas and Louisiana.

2.2.5.6.7 Shortfin Mako Shark

The shortfin mako shark is a highly migratory, pelagic species found in warm and warm-temperate waters around the world. In eastern U.S. waters, shortfin mako shark are found from New England to Florida, in the Gulf of Mexico, and in the Caribbean Sea. Shortfin mako prey on fast-moving fishes such as swordfish, tuna, and other sharks, as well as other bony fishes, marine mammals, crustaceans, and cephalopods (NOAA Fisheries, 2017; NOAA Fisheries, 2019aa). Shortfin mako reproductive habits and mating grounds are not well known, but mating is thought to occur from summer to fall and pregnant females have only been captured between 20 and 30° N or S latitude (NOAA Fisheries, 2017; NOAA Fisheries, 2019aa). According to the 2017 stock assessment, shortfin mako shark are overfished and subject to overfishing (ICCAT, 2017).

The shortfin mako shark EFH designations are reproduced below for the life stages found within the Project Area. Neonate, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor.

Neonate/YOY, Juveniles, and Adults: At this time, available information is insufficient for the identification of EFH by life stage, therefore all life stages are combined in the EFH designation. EFH in the Atlantic Ocean includes pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank (off Massachusetts) to Cape Cod (seaward of the 656-foot [200 m] bathymetric line); coastal and offshore habitats between Cape Cod and Cape Lookout, North Carolina; and localized habitats off South Carolina and Georgia. EFH in the Gulf of Mexico is seaward of the 656-foot (200 m) isobaths in the Gulf of Mexico, although in some areas (e.g., northern Gulf of Mexico by the Mississippi delta) EFH extends closer to shore. EFH in the Gulf of Mexico is located along the edge of the continental shelf off Fort Myers to Key West (southern West Florida Shelf), and extends from the northern central Gulf of Mexico around Desoto Canyon and the Mississippi Delta to pelagic habitats of the western Gulf of Mexico that are roughly in line with the Texas/Louisiana border.

2.2.5.6.8 Smoothhound Shark Complex (Atlantic Stock)

The smoothhound shark complex consists of three species: smooth dogfish (*Mustelus canis*), Florida smoothhound (*Mustelus norrisi*), and Gulf smoothhound (*Mustelus sinusmexicanus*). Due to the difficulty in differentiating these three species, EFH is designated for these sharks as a complex. However, smooth dogfish is the only smoothhound shark complex species found in the Atlantic, so for the purposes of this report, we focus solely on smooth dogfish.

Smooth dogfish is a common, demersal coastal shark species that ranges from Massachusetts to northern Argentina, typically inhabiting inshore waters down to 656 feet (200 m) (NOAA Fisheries, 2017). Smooth dogfish migrate seasonally, congregating between the Chesapeake Bay and southern North Carolina in the winter, and moving along the coast in the spring as waters warm (NOAA Fisheries, 2017). Smooth dogfish primarily consume large crustaceans such as crabs and American lobster. During the spring in New England waters, smooth dogfish are also known to feed on small bony fishes (NOAA Fisheries, 2017). Mating is through to occur between May and September, and research suggests that estuaries are critically-important nursery habitats in the Mid-Atlantic Bight (NOAA Fisheries, 2017). The 2015 stock assessment indicated that smooth dogfish are not overfished and not experiencing overfishing (Southeast Data and Assessment Review, 2015).

The smoothhound shark complex EFH designations are reproduced below for the life stages found within the Project Area. Neonate, juvenile, and adult life stages have EFH within the RWF area, RWEC-OCS corridor, and RWEC-RI corridor.

Neonate/YOY, Juveniles, and Adults: At this time, available information is insufficient for the identification of EFH for this life stage, therefore all life stages are combined in the EFH designation. Smoothhound shark EFH identified in the Atlantic is exclusively for smooth dogfish. EFH in Atlantic coastal areas ranges from Cape Cod Bay, Massachusetts to South Carolina, inclusive of inshore bays and estuaries (e.g., Pamlico Sound, Core Sound, Delaware Bay, Long Island Sound, Narragansett Bay, etc.). EFH also includes continental shelf habitats between southern New Jersey and Cape Hatteras, North Carolina.

2.2.5.6.9 Spiny Dogfish

The spiny dogfish is found in temperate and subarctic areas of the North Atlantic and North Pacific Oceans. In the northwest Atlantic, their range extends from Labrador to Florida, which the highest concentrations between Nova Scotia and Cape Hatteras, North Carolina (NOAA Fisheries, 2019ab). Spiny dogfish migrate seasonally, moving north in the spring and summer and south in the fall and winter (ASMFC, 2019e). In Southern New England, spiny dogfish abundance is highest in the fall (ASMFC, 2019e). Mating and birthing take place during the winter on offshore wintering grounds (ASMFC, 2019e; NOAA Fisheries, 2019ab). Spiny dogfish are opportunistic feeders, with smaller individuals primarily preying on crustaceans, and larger individuals preying on jellyfish, squid, and schooling fishes (NOAA Fisheries, 2019ab). The 2018 stock assessment concluded that Atlantic spiny dogfish are not overfished and not subject to overfishing (NOAA Fisheries, 2019ab).

The spiny dogfish EFH designations are reproduced below for the life stages found within the Project Area. Sub-adult male, sub-adult female, adult male, and adult female life stages have EFH within the RWF area and RWEC-OCS corridor. Sub-adult female and adult male life stages have EFH within the RWEC-RI corridor.

Sub-Adult Females: EFH is pelagic and epibenthic habitats throughout the region. Sub-adult females are found over a wide depth range in full salinity seawater (32–35 ppt) where bottom temperatures range from 44.6 to 59 °F (7 to 15 °C). Sub-adult females are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 59 °F (15 °C).

Sub-Adults Males: EFH is pelagic and epibenthic habitats, primarily in the Gulf of Maine and on the outer continental shelf from Georges Bank to Cape Hatteras. Sub-adult males are found over a wide depth range in full salinity seawater (32–35 ppt) where bottom temperatures range from 44.6 to 59 °F (7 to 15 °C). Sub-adult males are not as widely distributed over the continental shelf as the females and are generally found in deeper water. They are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 59 °F (15 °C).

Adult Females: EFH is pelagic and epibenthic habitats throughout the region. Adults are found over a wide depth range in full salinity seawater (32–35 ppt) where bottom temperatures range from 44.6 to 59 °F (7 to 15 °C). They are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 59 °F (15 °C).

Adult Males: EFH is pelagic and epibenthic habitats throughout the region. Adults are found over a wide depth range in full salinity seawater (32–35 ppt) where bottom temperatures range from 44.6 to 59 °F (7 to 15 °C). They are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 59 °F (15 °C).

2.2.5.6.10 White Shark

The white shark is a large species found in coastal and offshore waters of cold and temperate seas (NOAA Fisheries, 2017). In the northwestern Atlantic, white shark range sporadically from Newfoundland to the Gulf of Mexico, but are most abundant on the continental shelf between Cape Hatteras and Cape Cod (NOAA Fisheries, 2017). White shark are seasonally common in some locations, including New England in the summer (NOAA Fisheries, 2017). Juvenile white sharks prey primarily on fish, but shift to a diet of mostly marine mammals as they grow (NOAA Fisheries, 2017). The reproductive habits of white sharks and locations of nursery areas are not well known. Harvest of white shark is prohibited in the U.S., and the species is listed as “Vulnerable” on the IUCN Red List of Threatened Species (Fergusson et al., 2009).

The white shark EFH designations are reproduced below for the life stages found within the Project Area. Neonate, juvenile, and adult life stages have EFH within the RWF area and RWEC-OCS corridor. Within the RWEC-RI corridor, only neonates have EFH.

Neonate/YOY: EFH includes inshore waters out to 65 miles (105 km) from Cape Cod, Massachusetts, to an area offshore of Ocean City, New Jersey.

Juveniles and Adults: Known EFH includes inshore waters to habitats 65 miles (105 km) from shore, in water temperatures ranging from 48 to 82 °F (9 to 28 °C), but more commonly found in water temperatures from 57 to 73 °F (14 to 23 °C) from Cape Ann, Massachusetts, including parts of the Gulf of Maine, to Long Island, New York, and from Jacksonville to Cape Canaveral, Florida.

2.3 Summary of EFH in the Project Area

Tables 2.3-1 and 2.3-2 summarize early (i.e., eggs, larvae) and late (i.e., neonate, juveniles, adults) benthic life stages of species with designated EFH in the Project Area, provide a description of preferred habitat, and provide an assessment of whether the preferred habitat is present in the Project Area. Tables 2.3-3 and 2.3-4 summarize the early and late pelagic life stages of species with designated EFH in the Project Area.

Table 2.3-1 Habitat Preferences of Early Benthic Life Stages with EFH in the Project Area

Species	Life Stage	Location	Description of Preferred Habitat	Preferred Habitat Present in Project Area?
Finfish				
Atlantic wolffish	Egg	RWF	Subtidal benthic habitats. Egg masses are hidden under rocks and boulders in nests.	Yes
	Larvae	RWF	Pelagic and subtidal benthic habitats.	Yes
Ocean pout	Egg	RWF, RWEC-OCS, RWEC-RI	Hard bottom habitats – sheltered nests, holes, and crevices.	Limited
Winter flounder	Egg	RWEC-RI	Bottom habitats with a substrate of mud, muddy sand, sand, gravel, macroalgae, and submerged aquatic vegetation.	Yes
	Larvae	RWF, RWEC-OCS, RWEC-RI	Pelagic and bottom habitats.	Yes
Invertebrates				
Atlantic sea scallop	Egg	RWF, RWEC-OCS, RWEC-RI	Coarse substrates of gravel, shells, and rocks.	Yes
	Larvae	RWF, RWEC-OCS, RWEC-RI	Hard surfaces for pelagic larvae to settle, including shells, pebbles, and gravel. Larvae also attach to macroalgae and other benthic organisms such as hydroids.	Yes
Longfin inshore squid	Egg	RWF, RWEC-OCS, RWEC-RI	Egg masses or “mops” are laid on a variety of substrates, including hard bottom (shells, lobster pots, fish traps, boulders, and rocks), submerged aquatic vegetation (e.g. *Fucus*), sand, and mud.	Yes

Table 2.3-2 Habitat Preferences of Late Benthic Life Stages with EFH in the Project Area

Species	Life Stage	Location	Description of Preferred Habitat	Preferred Habitat Present in Project Area?
Finfish				
Atlantic cod	Juvenile	RWF, RWEC-OCS, RWEC-RI	Bottom habitats with a substrate of gravel or cobble, and boulder habitats, especially those with attached organisms.	Yes
	Adult	RWF, RWEC-OCS, RWEC-RI	Bottom habitats with a substrate of rocks, pebbles, gravel, or boulders. Also found on sandy substrates.	Yes
Atlantic wolffish	Juvenile	RWF	Subtidal benthic habitats. Juveniles do not have strong substrate preferences	Yes
	Adult	RWF	Subtidal benthic habitats, including a wide variety of sand and gravel substrates. Rocky spawning habitats.	Yes
Black sea bass	Juvenile	RWF, RWEC-OCS, RWEC-RI	Usually found in association with rough-bottom, shellfish and eelgrass beds, and man-made structures in sandy-shelly areas. Offshore clam beds and shell patches may also be used during the winter.	Yes
	Adult	RWF, RWEC-OCS, RWEC-RI	Usually structured habitats (natural and man-made), sand, and shell substrates.	Yes
Haddock	Juvenile	RWF, RWEC-OCS	Young-of-the-year juveniles settle on sand and gravel but are found predominantly on gravel pavement areas.	Yes

Table 2.3-2				
Species	**Life Stage**	**Location**	**Description of Preferred Habitat**	**Preferred Habitat Present in Project Area?**
			As they grow, they disperse over a greater variety of substrate types.	
Monkfish	Juvenile and Adult	RWF, RWEC-OCS	Bottom habitats with substrates of a sand-shell mix, algae-covered rocks, hard sand, pebbly gravel, or soft mud.	Yes
Ocean pout	Juvenile	RWF, RWEC-OCS, RWEC-RI	Bottom habitats on a wide variety of substrates, including shells, rocks, algae, soft sediments, sand, and gravel.	Yes
	Adult	RWF, RWEC-OCS, RWEC-RI	Mud and sand, particularly in association with structure-forming habitat types (i.e., shells, gravel, boulders).	Yes
Pollock	Juvenile	RWF, RWEC-OCS, RWEC-RI	Rocky bottom habitats with attached macroalgae (rockweed and kelp).	No
Red hake	Juvenile	RWF, RWEC-OCS, RWEC-RI	Intertidal and subtidal benthic habitats on mud and sand substrates. Bottom habitats providing shelter, including mud substrates with biogenic depressions, substrates providing biogenic complexity (e.g., eelgrass, macroalgae, shells, anemone and polychaete tubes), and artificial reefs. Newly settled juveniles occur in depressions on the open seabed. Older juveniles are commonly associated with shelter or structure and often found inside live bivalves.	Yes
	Adult	RWF, RWEC-OCS, RWEC-RI	Shell beds, soft sediments (mud and sand), and artificial reefs. Usually found in depressions in softer sediments or in shell beds and not on open sandy bottom.	Yes
Scup	Juvenile	RWF, RWEC-OCS, RWEC-RI	Associated with various sands, mud, mussel, and eelgrass bed substrates	Yes
	Adult	RWF, RWEC-OCS, RWEC-RI	Prefer smooth to rocky bottom habitats.	Yes
Silver hake	Juvenile	RWF, RWEC-OCS	Sandy substrates; found in association with sand waves, flat sand with amphipod tubes, and shells, and in biogenic depressions.	Yes
	Adult	RWF, RWEC-OCS, RWEC-RI	Pelagic and benthic habitats, including sandy substrates, bottom depressions, mud habitats bordering deep boulder reefs, boulder habitat, and associated with sand waves and shell fragments.	Yes
Summer flounder	Juvenile	RWF, RWEC-OCS, RWEC-RI	Prefer sandy or muddy bottom habitats. Use estuarine habitats as nursery areas, including salt marsh creeks, seagrass beds, mudflats, and open bay areas.	Yes
	Adult	RWF, RWEC-OCS, RWEC-RI	Prefer sandy or muddy bottom habitats. Inhabit shallow coastal and estuarine waters.	Yes
White hake	Juvenile	RWF, RWEC-OCS, RWEC-RI	Fine-grained, sandy substrates in eelgrass, macroalgae, and unvegetated habitats.	Yes
Windowpane flounder	Juvenile and Adult	RWF, RWEC-OCS, RWEC-RI	Bottom habitats with a substrate of mud or sand.	Yes
Winter flounder	Juvenile	RWF, RWEC-OCS, RWEC-RI	Variety of bottom types such as mud, sand, rocky substrates with attached macroalgae, tidal wetlands, and eelgrass. Young-of-the-year juveniles are found inshore on muddy and sandy sediments in and adjacent to eelgrass and macroalgae, in bottom debris, and in marsh creeks. They tend to settle to the bottom in soft-sediment depositional areas and disperse into coarser-grained substrates as they get older.	No

Table 2.3-2				
Species	**Life Stage**	**Location**	**Description of Preferred Habitat**	**Preferred Habitat Present in Project Area?**
	Adult	RWF, RWEC-OCS, RWEC-RI	Muddy and sandy substrates, and on hard bottom on offshore banks.	Yes
Yellowtail flounder	Juvenile	RWF, RWEC-OCS, RWEC-RI	Sand and muddy sand.	Yes
	Adult	RWF, RWEC-OCS, RWEC-RI	Sand and sand with mud, shell hash, gravel, and rocks.	Yes
Invertebrates				
Atlantic sea scallop	Juvenile	RWF, RWEC-OCS, RWEC-RI	Bottom habitats with a substrate of shells, gravel, and small rocks (pebble, cobble), preferring gravel.	Yes
	Adult	RWF, RWEC-OCS, RWEC-RI	Bottom habitats with sand and gravel substrates.	Yes
Atlantic surfclam	Juvenile	RWEC-RI	Sandy habitats along the continental shelf.	Yes
	Adult	RWEC-OCS, RWEC-RI	Sandy habitats along the continental shelf.	Yes
Ocean quahog	Juvenile and Adult	RWF, RWEC-OCS	Prefers medium to fine sandy bottom with mud and silt.	Yes
Skates				
Little skate	Juvenile and Adult	RWF, RWEC-OCS, RWEC-RI	Bottom habitats with a sandy or gravelly substrate, or mud.	Yes
Winter skate	Juvenile and Adult	RWF, RWEC-OCS, RWEC-RI	Bottom habitats with a substrate of sand and gravel or mud.	Yes
Sharks [1]				
Spiny dogfish	Sub-adult male, Adult female	RWF, RWEC-OCS	Pelagic and epibenthic habitats.	Yes
	Sub-adult female, Adult male	RWF, RWEC-OCS, RWEC-RI	Pelagic and epibenthic habitats.	Yes

[1] The neonate/young-of-the year life stage for shark species is more similar to a juvenile life stage than a larval life stage. Thus, neonate/young-of-the year is considered to be a "late" life stage for the purpose of this analysis.

Table 2.3-3 Early Pelagic Life Stages with EFH in the Project Area

Table 2.3-3		
Species	**Life Stage**	**Location**
Finfish		
Atlantic butterfish	Egg, Larvae	RWF, RWEC-OCS, RWEC-RI
Atlantic cod	Egg, Larvae	RWF, RWEC-OCS, RWEC-RI
Atlantic herring	Larvae	RWF, RWEC-OCS, RWEC-RI
Atlantic mackerel	Egg, Larvae	RWF, RWEC-OCS, RWEC-RI
Atlantic wolffish	Larvae	RWF
Bluefish	Egg, Larvae	RWF, RWEC-OCS
Haddock	Egg	RWF

Table 2.3-3		
Species	**Life Stage**	**Location**
	Larvae	RWF, RWEC-OCS
Monkfish	Egg, Larvae	RWF, RWEC-OCS, RWEC-RI
Pollock	Egg, Larvae	RWF, RWEC-OCS
Red hake	Egg, Larvae	RWF, RWEC-OCS, RWEC-RI
Scup	Egg, Larvae	RWEC-RI
Silver hake	Egg, Larvae	RWF, RWEC-OCS, RWEC-RI
Summer flounder	Egg	RWF, RWEC-OCS
	Larvae	RWF, RWEC-OCS, RWEC-RI
White hake	Larvae	RWF, RWEC-OCS
Windowpane flounder	Egg, Larvae	RWF, RWEC-OCS, RWEC-RI
Winter flounder	Larvae	RWF, RWEC-OCS, RWEC-RI
Witch flounder	Egg, Larvae	RWF, RWEC-OCS
Yellowtail flounder	Egg, Larvae	RWF, RWEC-OCS
Invertebrates		
Atlantic sea scallop	Larvae	RWF, RWEC-OCS, RWEC-RI

Table 2.3-4 Late Pelagic Life Stages with EFH in the Project Area

Table 2.3-4		
Species	**Life Stage**	**Location**
Finfish		
Atlantic butterfish	Juvenile, Adult	RWF, RWEC-OCS, RWEC-RI
Atlantic herring	Juvenile, Adult	RWF, RWEC-OCS, RWEC-RI
Atlantic mackerel	Juvenile	RWF, RWEC-OCS, RWEC-RI
	Adult	RWEC-RI
Bluefish	Juvenile, Adult	RWF, RWEC-OCS, RWEC-RI
Pollock	Juvenile	RWF, RWEC-OCS, RWEC-RI
Silver hake	Adult	RWF, RWEC-OCS, RWEC-RI
White hake	Juvenile	RWF, RWEC-OCS, RWEC-RI
Invertebrates		
Longfin inshore squid	Juvenile, Adult	RWF, RWEC-OCS, RWEC-RI
Northern shortfin squid	Adult	RWF
Highly Migratory Species		
Albacore tuna	Juvenile	RWF, RWEC-OCS, RWEC-RI
	Adult	RWF, RWEC-OCS
Bluefin tuna	Juvenile, Adult	RWF, RWEC-OCS, RWEC-RI
Skipjack tuna	Juvenile	RWF
	Adult	RWF, RWEC-OCS, RWEC-RI
Yellowfin tuna	Juvenile	RWF, RWEC-OCS, RWEC-RI
	Adult	RWF, RWEC-OCS
Sharks [1]		

Table 2.3-4		
Species	**Life Stage**	**Location**
Basking shark	Neonate, Juvenile, Adult	RWF, RWEC-OCS
Blue shark	Neonate, Juvenile, Adult	RWF, RWEC-OCS
Common thresher shark	Neonate, Juvenile, Adult	RWF, RWEC-OCS, RWEC-RI
Dusky shark	Neonate, Juvenile, Adult	RWF, RWEC-OCS
Sand tiger shark	Neonate, Juvenile	RWF, RWEC-OCS, RWEC-RI
Sandbar shark	Juvenile, Adult	RWF, RWEC-OCS, RWEC-RI
Shortfin mako shark	Neonate, Juvenile, Adult	RWF, RWEC-OCS
Smoothhound shark complex (Atlantic stock)	Neonate, Juvenile, Adult	RWF, RWEC-OCS, RWEC-RI
Spiny dogfish	Sub-adult male, Adult female	RWF, RWEC-OCS
	Sub-adult female, Adult male	RWF, RWEC-OCS, RWEC-RI
White shark	Neonate	RWF, RWEC-OCS, RWEC-RI
	Juvenile, Adult	RWF, RWEC-OCS

[1] The neonate/young-of-the year life stage for shark species is more similar to a juvenile life stage than a larval life stage. Thus, neonate/young-of-the year is considered to be a “late” life stage for the purpose of this analysis.

3.0 ENVIRONMENTAL CONSEQUENCES AND PROTECTION MEASURES

3.1 Impact Assessment

Potential impacts are characterized as direct or indirect and categorized by Project phase. Anticipated impacts are characterized as short-term or long-term. Consistent with NEPA (40 C.F.R. § 1508.8.), evaluations in this report consider both detrimental (or negative) and beneficial impacts of the Project.

- *Direct or Indirect*: Direct effects are those occurring at the same place and time as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity.
- *Short-term or Long-term Impacts*: Short- or long-term impacts do not refer to any defined period. In general, short-term impacts are those that occur only for a limited period or only during the time required for construction activities. Impacts that are short-lived, such as noise from routine maintenance work during operations, may also be short-term if the activity is short in duration and the impact is restricted to a short, defined period. Long-term impacts are those that are likely to occur on a recurring or permanent basis or impacts from which a resource does not recover quickly. In general, direct impacts associated with construction and decommissioning are considered short-term because they will occur within the approximate 1-year construction phase. Indirect impacts are determined to be either short-term or long-term depending on if resource recovery may take several years. Impacts associated with Operations & Maintenance (O&M) are considered long-term because they occur over the life of the Project (i.e., 25 years per the Lease but could be extended up to 35 years.
- *Proposed Environmental Protection Measures* – If measures are proposed to avoid or minimize potential impacts, the impact evaluation included consideration of these environmental protection measures.

Different impact-producing factors (IPFs) may result in varying levels of impact on EFH and the species/life stages that associate with those habitats. IPFs that could impact EFH include seafloor disturbance, sediment suspension and deposition, habitat alteration, noise, traffic, lighting, discharges and releases, and trash and debris.

Impacts on EFH vary by habitat, species, and life stage as discussed below, with some species/life stages being more vulnerable than others. The analysis of impacts on EFH are discussed separately for the RWF and RWEC in the following sections. The IPFs are further subdivided into IPFs during the construction and decommissioning phases of the Project and the O&M phase of the Project. The construction and decommissioning phases are grouped as activities and equipment usage are similar between these two phases.

3.1.1 Revolution Wind Farm

IPFs resulting in potential impacts on EFH in the RWF area are described in Table 3.1-1 for the construction and decommissioning phases and in Table 3.1-2 for the O&M phase. At the end of the Project's operational life, the Project will be decommissioned in accordance with a detailed decommissioning plan to be developed in compliance with applicable laws, regulations, and BMPs at that time. All of the impacts associated with these activities are anticipated to be similar to or less than those described for construction, unless otherwise noted.

Table 3.1-1 IPFs and Impact Characterization for EFH within the RWF during Construction and Decommissioning

Table 3.1-1						
IPF	**Project Activity**	**Impact Characterization for on EFH**				**Discussion**
		Benthic/ Demersal Early Life Stages [1]	**Pelagic Early Life Stages [1]**	**Benthic/ Demersal Late Life Stages [1]**	**Pelagic Late Life Stages [1]**	
Seafloor Disturbance	Seafloor preparation	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Impacts on EFH associated with seafloor preparation will primarily be associated with species that have benthic/demersal early life stages (eggs and larvae, Table 2.3-1) and later life stages (neonates, juveniles, and adults, Table 2.3-2) and prefer the types of habitats that will be disturbed by seafloor preparation. These activities could cause injury or mortality to benthic/demersal species, affect their habitat, and disrupt their spawning. Similarly, seafloor-disturbing activities could result in a small loss of spawning habitat for Atlantic cod, as studies completed in other regions suggest that cod often demonstrate spawning site fidelity, returning to the same fine-scale bathymetric locations year after year to spawn (Hernandez et al. 2013; Siceloff and Howell 2013; Zemeckis et al., 2014a). However, such homing behavior has not yet been documented amongst individual cod in southern New England, although conventional tagging studies suggest there is little dispersal during the winter spawning season (Cadrin et al., 2020). An active Atlantic cod winter spawning ground has been identified in a broad geographical area that includes Cox Ledge and surrounding locations (Zemeckis et al. 2014b; Dean et al., 2020). In southern New England, cod spawn primarily from December through May (Dean et al., 2020; Langan et al., 2020). There is currently a BOEM funded acoustic telemetry study to better understand the distribution and habitat use of spawning cod on and around Cox Ledge. Additionally, in a sampling effort on Cox Ledge by Kovach et al. (2010), the majority of Atlantic cod collected were in spawning condition. Atlantic cod were not among the consistently prevalent (top 25) species collected during multi-year sampling by otter trawl and beam trawl in areas that included Cox Ledge (Malek et al., 2014). Given the availability of similar surrounding habitat, Project activities are not expected to result in measurable impacts on spawning Atlantic cod. Non-lethal impacts on EFH are expected to be short-term as the direct effects will cease after seafloor preparation is completed in a given area and only a small portion of the available EFH in the area will be disturbed. Impacts on species with designated EFH that have pelagic early and/or later life stages within the RWF (Tables 2.3-3 and 2.3-4) are expected to be limited, as pelagic habitats will not be directly affected by seafloor preparation. However, these species may temporarily vacate the area of disturbance. Decommissioning activities are expected to cause similar impacts as construction, but these impacts would be shorter in duration. Impacts on EFH associated with boulder clearance and related seafloor preparation activities are expected to be direct and short-term. Boulders relocated during seafloor preparation will be in new locations and may be in new physical configurations in relation to other boulders. Concerning these spatial and physical attributes, the boulders are not expected to return to pre-project conditions. However, relatively rapid (< 1 year) recolonization of these boulders is expected (Guarinello and Carey, 2020) and will return these boulders to their pre-project habitat function. Additionally, if relocation results in aggregations of boulders, these new features could serve as high value refuge habitat for juvenile lobster and fish as they may provide more complexity and opportunity for refuge than surrounding patchy habitat.
	Impact pile driving and/or vibratory pile driving/foundation installation	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Direct impacts on EFH associated with seafloor disturbance from impact pile driving and/or vibratory pile driving and installation of the foundations (WTG and OSS) and scour protection are expected to result in similar direct impacts on EFH as seafloor preparation. Impacts on EFH will be primarily associated with species that have

Table 3.1-1

IPF	Project Activity	Impact Characterization for on EFH: Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	Discussion
						benthic/demersal life stages. Impact pile driving and/or vibratory pile driving and foundation installation could crush benthic/demersal species, particularly eggs and larvae, but also less mobile older life stages that do not vacate the area. **Minimal** impacts on EFH are expected for pelagic species because they are not expected to be near the seafloor during work activities or subject to crushing or injury through placement of the piles and foundations or removal of the foundations during decommissioning.
	RWF IAC and OSS-Link Cable installation	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Direct impacts on EFH associated with the IAC and OSS-Link Cable installation are expected to result in similar impacts as those discussed for seafloor preparation, as the IAC will be installed in the same area that will have been disturbed during seafloor preparation. Decommissioning activities are expected to cause similar impacts as construction, but these impacts would be shorter in duration. Additionally, fish eggs and larvae (ichthyoplankton), as well as zooplankton, are expected to be entrained during hydraulic dredging and jet trencher embedment of the IAC. Jet trencher and hydraulic dredging equipment use seawater to circulate through hydraulic motors and jets during installation. Although this seawater is released back into the ocean, it is assumed that all entrained eggs, larvae, and zooplankton will be killed. These losses are expected to be low and short-term. A previous assessment conducted for the South Fork Wind Farm found that the total estimated losses of zooplankton and ichthyoplankton from jet trencher entrainment were less than 0.001% of the total zooplankton and ichthyoplankton abundance present in the study area, which encompassed a linearly buffered region of 15 km around the SFEC and 25 km around the SFWF (INSPIRE Environmental, 2018). Only early life stages may be affected by jet plow entrainment; later life stages will not be affected. Limited research has been conducted on the potential impacts of hydraulic dredge entrainment, but because the volumes of water used by dredges are relatively small, the entrainment rates of ichthyoplankton are generally thought to be only a small proportion of the total local production (Reine and Clark, 1998; Reine et al., 1998). Egg and larval life stages are most likely to experience lethal impacts (Wenger et al., 2017), but later life stages could also be entrained by hydraulic dredging, with benthic species or species occurring in high densities having the highest risk (Drabble, 2012; Reine et al., 1998). However, the entrainment rates for mobile species are considered to be low, and mortality rates of entrained fish may also be low (Wenger et al., 2017; Drabble, 2012; Reine et al., 1998). Jet plow and hydraulic dredge entrainment losses are not expected to result in large losses of zooplankton, ichthyoplankton, or later life stages, and population-level impacts on EFH species are not anticipated.
	Vessel anchoring (including spuds)	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Direct impacts on EFH associated with vessel anchoring (including spuds) are similar to those discussed in seafloor preparation.
Habitat Alteration	Seafloor preparation Impact pile driving and/or vibratory pile driving/foundation installation	Indirect, long-term	Indirect, long-term	Indirect, long-term	Indirect, long-term	Indirect Impacts: Immediately following impact-producing activities, species with designated EFH are expected to move back into the area; however, in areas of sediment disturbance and/or areas with increased sedimentation, demersal/benthic habitat recovery and benthic infaunal and epifaunal species abundances may take up to 1 to 3 years to recover to pre-impact levels, based on the results of a number of studies on benthic recovery (e.g., AKRF, Inc. et al., 2012; Germano et al., 1994; Hirsch et al., 1978; Kenny and Rees, 1994). This recovery time may result in an indirect, long-term impact on designated EFH for species with benthic/demersal life stages. Recolonization of sediments by epifaunal and infaunal species

Table 3.1-1

IPF	Project Activity	Impact Characterization for on EFH				Discussion
		Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	
	RWF IAC and OSS-Link Cable installation Vessel anchoring (including spuds)					and the return of mobile fish and invertebrate species will allow this area to continue to serve as foraging habitat for EFH species. Pelagic species/life stages may be indirectly affected by the temporary reduction of benthic forage species, but these impacts are expected to be small given the availability of similar habitats in the area. Other species may be attracted to the disruption and prey on dislodged benthic species or other species injured or flushed during seafloor preparation, IAC and OSS-Link Cable installation, and vessel anchoring activities. During decommissioning, foundations and other facilities will be removed to a depth of 15 ft (4.6 m) below the mudline, unless otherwise authorized by BOEM (30 CFR § 585.910(a)). Decommissioning would result in the reversal of beneficial effects for species and life stages that inhabited the structures during the life of the Project. Over time, the disturbed area is expected to revert to pre-construction conditions, which would result in a beneficial impact for species and life stages that inhabit soft bottom habitats. Overall, habitat alteration from decommissioning is expected to cause minimal impacts because similar soft and hard bottom habitats are already present in and around the RWF (Benthic Assessment; INSPIRE Environmental, 2020), and the conversion of a relatively small area of habitat is unlikely to result in substantial effects, as any effect observed will be limited to the immediate vicinity of the individual structures.
Sediment Suspension and Deposition	Seafloor preparation Impact pile driving and/or vibratory pile driving/foundation installation RWF IAC and OSS-Link Cable installation Vessel anchoring (including spuds)	**Direct, short-term**	**Direct, short-term**	**Direct, short-term**	**Direct, short-term**	Direct Impacts: Seafloor-disturbing activities will result in temporary increases in sediment suspension and deposition. Sediment transport modeling was performed using RPS' Suspended Sediment Fate (SSFATE) model, which is a three-dimensional model developed jointly with the USACE and the Environmental Research Development Center. SSFATE is a well-known model that has been successfully applied in projects around the globe to simulate the sediment transport from dredging, cable and pipeline burial operations, sediment dumping, dewatering operations, and other sediment-disturbing activities. SSFATE computes TSS concentrations released into the water column and predicts the transport, dispersion, and settling of the suspended sediment. RPS also performed hydrodynamic modeling using their 3-dimensional HYDROMAP modeling system to simulate water levels, circulation patterns, and water volume flux through the study area and to provide hydrodynamic input (spatially and temporally varying currents) for input into the sediment transport model. The models, inputs, and results are described in detail in the Hydrodynamic and Sediment Transport Modeling Report (RPS, 2020). Several model simulations were run to evaluate the concentrations of suspended sediments, spatial extent and duration of sediment plumes, and the seafloor deposition resulting from cable burial activities. The grain size distributions used for modeling were based on samples collected during field studies performed for the project (Fugro, 2019), which indicate the sediments are predominately coarse grained in the RWF. For the RWF IAC, a representative segment of 7,392 ft (2,253 m) of installation was simulated and the modeling results indicate that sediment plumes with TSS concentrations exceeding the ambient conditions by 100 mg/L could extend up to 853 (260 m) feet from the cable centerline. The plume is expected to be mostly contained within the bottom of the water column. The model estimated that the elevated TSS concentrations would be of short duration and expected to return to ambient conditions in less than 4.8 hours following the cessation of cable burial activities. The modeling results indicate that sedimentation from IAC burial may exceed 0.4 inch (10 mm) of deposition up to 197 feet (60 m) from the cable and could cover up to 47 acres (190,202 m^2).

Table 3.1-1						
IPF	**Project Activity**	**Impact Characterization for on EFH**				**Discussion**
		Benthic/ Demersal Early Life Stages [1]	**Pelagic Early Life Stages [1]**	**Benthic/ Demersal Late Life Stages [1]**	**Pelagic Late Life Stages [1]**	
						Sediment suspension and deposition associated with decommissioning activities are expected to be similar to those from cable burial, but slightly lower in magnitude. Most marine species have some degree of tolerance to higher concentrations of suspended sediment because storms, currents, and other natural processes regularly result in increases in turbidity (MMS, 2009). However, these increases in sediment suspension and deposition may cause temporary impacts on benthic/demersal EFH. Direct impacts could include mortality, injury, or temporary displacement of the organisms living on, in, or near the seafloor. Sediment deposition on eggs or larvae may result in smothering, potentially resulting in mortality (MMS, 2007). Larger benthic organisms such as shellfish as may be able to extend feeding tubes and respiratory structures above the sediment (United Kingdom Department for Business Enterprise and Regulatory Reform, 2008). Maurer et al. (1986) found that several species of marine benthic infauna (including the clam *Mercenaria mercenaria*) exhibited little to no mortality when buried under up to 3 inches (8 cm) of various types of sediment (from predominantly silt-clay to pure sand). Demersal/benthic early life stages in or near the area of disturbance would likely be most affected, but these impacts are not expected to result in population-level effects. Pelagic species could also be affected, but are expected to temporarily vacate the area to avoid the disturbance and pelagic habitat quality is expected to quickly return to pre-disturbance levels.
Noise	Impact pile driving and/or vibratory pile driving	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: To evaluate the levels of underwater noise likely to be generated during construction, modeling was conducted using JASCO's Marine Operations Noise model (MONM) and Full Wave Range Dependent Acoustic Model (FWRAM). These models combine the outputs of the source model with the spatial and temporal environmental context (e.g., location, oceanographic conditions, and seabed type) to estimate acoustic sound fields. For impact hammering of monopile foundations, the physical injury peak sound pressure threshold of 206 dB (re 1 μPa) for finfish, is predicted to be exceeded within a maximum range of 337 ft (115 m) from the sound source. Accumulated sound exposure levels of 187 dB (re 1 $\mu Pa^2 \cdot sec$) and 183 dB (re 1 $\mu Pa^2 \cdot sec$) were predicted to be exceeded within a maximum distance of 5.9 miles (9,464 m) and 7.9 miles (12,673 m), respectively. The finfish behavioral disturbance threshold of 150 dB (re 1 μPa RMS) is predicted to be exceeded within a maximum distance of 6.6 miles (10,664 m) from the sound source. Full modeling results are available in the Underwater Acoustic Analysis (Denes et al., 2020). Sound exposure guidelines and regulations designed to protect finfish are described in terms of sound pressure levels, but the observable effects of high intensity noise sources on finfish may actually be caused by exposure to particle motion (Popper and Hawkins, 2018). However, the particle motion levels associated with a high intensity noise source are difficult to measure and isolate from sound pressure levels. There is currently very limited understanding of the potential effects of particle motion on finfish and invertebrates. All fishes (including elasmobranchs) detect and use particle motion, even for those fishes that are also sensitive to sound pressure (Popper and Hawkins, 2019). Fishes that do not possess a swim bladder (sharks, mackerel, flatfish), as well as fishes with a swim bladder distant from the ear (salmon, tuna, most teleosts) are thought to primarily be sensitive to particle motion (Hawkins et al., 2020). Fishes with the swim bladder close to the ear (Atlantic cod, eels) or where the swim bladder is connected to the ear (herrings) are able to detect sound pressure as well as particle motion (Hawkins et al., 2020). In these finfish, the swim bladder and other gas-filled organs may act as a type of acoustic transformer, converting

Table 3.1-1						
IPF	**Project Activity**	**Impact Characterization for on EFH**				**Discussion**
		Benthic/ Demersal Early Life Stages [1]	**Pelagic Early Life Stages [1]**	**Benthic/ Demersal Late Life Stages [1]**	**Pelagic Late Life Stages [1]**	
						sound pressure into particle motion (Popper and Hawkins, 2018). The movement of these organs may indirectly stimulate the otolith structures such that fishes experience particle motion both from the noise source and from this indirect signal (Popper and Hawkins, 2018). Cephalopods, including cuttlefish, octopus, and squid species, are likely sensitive to particle motion rather than sound pressure (e.g. Packard et al., 1990; Mooney et al., 2010), with the lowest particle motion thresholds reported at 1 to 2 Hz (Packard et al., 1990). Particle motion thresholds were measured for longfin squid between 100 and 300 Hz, with a threshold of 110 dB re 1 µPa reported at 200 Hz (Mooney et al., 2010). No other studies have measured particle motion. Cephalopods appear to be particularly sensitive to low frequency sound. Solé et al. (2017) estimated that trauma onset may begin to occur in cephalopods at sound pressure levels (SPL_{rms}) from 139 to 142 dB re 1 µPa at one-third octave bands centered at 315 Hz and 400 Hz. A recent study found impulsive pile driving noise resulted in a change in squid (*Doryteuthis pealeii*) behavior, with squid exhibiting body pattern changes, inking, jetting, and startle responses (Jones et al., 2020). Sessile invertebrates such as bivalves may respond to sound exposure by closing their valves (e.g. Kastelein, 2008; Roberts et al., 2015; Solan et al., 2016) much as they do when water quality is temporarily unsuitable. In one study, the duration of valve closure was shown to increase with increasing vibrational strength (Roberts et al., 2015). Clams may respond to anthropogenic noise by reducing activity and moving to a position above the sediment-water interface. In response to noise associated with pile driving at the RWF, it is expected that finfish and mobile macroinvertebrates would temporarily relocate during construction and would not be in the areas of greatest acoustic stressors. Slow start (ramp up) of pile driving equipment would allow mobile species to move out of the area and not be subject to mortality or injury but they may still experience some direct impact, such as behavioral responses. For exposed species, noise from impact pile driving and/or vibratory pile driving may temporarily reduce habitat quality. However, population-level impacts of impact pile driving and/or vibratory pile driving noise are not expected. Pile driving will be suspended during the winter months, thereby avoiding potential noise impacts that may disrupt the spawning activity of Atlantic cod. In conclusion, impact pile driving and/or vibratory pile driving is expected to result in a direct impact on EFH for both pelagic and demersal life stages, but this impact will be short-term as once pile driving is completed, the habitat suitability is expected to return to pre-pile driving conditions.
	Vessel noise, construction equipment noise, aircraft noise	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Short-term impacts on EFH could occur due to vessel noise, construction equipment noise (exclusive of impact pile driving and/or vibratory pile driving noise), and/or aircraft noise during construction and decommissioning. Sounds created by mechanical/hydro-jet plows, vessels, or aircraft are continuous or non-impulsive sounds, which have different characteristics underwater and impacts on marine life. Limited research has been conducted on underwater noise from mechanical/hydro-jet plows. Generally, the noise from this equipment is expected to be masked by louder sounds from vessels. Also, as most noise generated by these pieces of equipment will be below the sediment surface and associated with the high-pressure jets, noise levels are not expected to result in injury or mortality on EFH species, but may cause finfish to temporarily vacate the area. The duration of noise at a given location will be short, as vessels will only be present for a short period at any given location along the cable corridor.

Table 3.1-1						
IPF	Project Activity	Impact Characterization for on EFH				Discussion
		Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	
						Helicopters will be used for crew transfers between the WTGs and shore. Underwater noise associated with helicopters is generally brief as compared with the duration of audibility in the air (Richardson et al., 1995). Vessel noise may also cause mobile EFH species to temporarily vacate the area. Vessel sound source levels have been shown to cause several different effects in behavior, TTS, auditory masking, and blood chemistry. The most common behavioral responses are avoidance, alteration of swimming speed and direction, and alteration of schooling behavior (Vabø et al., 2002; Handegard and Tjøstheim, 2005; Sarà et al., 2007; Becker et al., 2013). These studies also demonstrated that the behavioral changes generally were temporary or that fish habituated to the noises. EFH species in the vicinity of Project vessels may be affected by vessel noise but the duration of the disturbance will occur over a very short period at any given location. Direct impacts on EFH may result from a temporary degradation of habitat for species that vacate the area due to elevated noise levels. However, the noise generated by vessel and aircrafts will be similar to the range of noise from existing vessel and aircraft traffic in the region, and are not expected to substantially affect the existing underwater noise environment.
Discharges and Releases	Hazardous materials spills Wastewater discharge	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Routine discharges of wastewater (e.g., gray water or black water) or liquids (e.g., ballast, bilge, deck drainage, stormwater) may occur from vessels, WTGs, or the OSS during construction and decommissioning; however, those discharges and releases are not anticipated to result in impacts because all vessel waste will be offloaded, stored, and disposed of in accordance with all applicable local, state and federal laws and regulations, such as the Environmental Protection Agency (EPA) and U.S. Coast Guard (USCG) requirements for discharges and releases to surface waters. In addition, compliance with applicable Project-specific management practices and requirements will minimize the potential for adversely impacting water quality and marine life. The construction/decommissioning of the RWF is not anticipated to lead to any spills of hazardous materials into the marine environment. Minor releases of hazardous materials could result in direct and indirect, short-term impacts on EFH. The impacts of spills are caused by either the physical nature of the material (e.g., physical contamination and smothering) or by its chemical components (e.g., toxic effects and bioaccumulation). Minor releases of hazardous materials could also result in indirect impacts on fish and invertebrate species if the spilled materials affect their eggs and food sources. Impacts would depend on the depth and volume of the spill, as well as the properties of the material spilled. All vessels participating in the construction of the RWF will comply with USCG requirements for management of onboard fluids and fuels, including maintaining and implementing spill prevention, control, and countermeasure (SPCC) plans. Vessels will be navigated by trained, licensed vessel operators who will adhere to navigational rules and regulations and vessels will be equipped with spill handling materials adequate to control or clean up an accidental spill. Best management practices (BMPs) for fueling and power equipment servicing will be incorporated into the Project's Emergency Response Plan and Oil Spill Response Plan (ERP/OSRP). Accidental releases are minimized by containment and clean-up measures detailed in the OSRP. Given these measures and the very low likelihood of an inadvertent release, impacts on EFH are not anticipated.

Table 3.1-1

IPF	Project Activity	Impact Characterization for on EFH				Discussion
		Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	
Marine Trash and Debris		Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: The release of trash and debris into offshore waters potentially may occur from any on-water activities. Certain types of trash and debris could be accidentally lost overboard during construction and decommissioning, with subsequent effects on EFH. USCG and EPA regulations require operators to develop waste management plans, post informational placards, manifest trash sent to shore, and use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Also, BOEM lease stipulations require adherence to Notice to Lessee (NTL) 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process. As such, measures will be implemented prior to and during construction to avoid, minimize, and mitigate impacts related to trash and debris disposal. Given these measures, impacts from trash and debris on EFH are not anticipated.
Traffic	See Seafloor Disturbance, Noise, Sediment Suspension and Deposition, and Lighting IPFs.					
Lighting	Construction and vessel lighting	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Artificial lighting during construction/decommissioning at the RWF will be associated with navigational and deck lighting on vessels from dusk to dawn. The response of fish species to artificial lights is highly variable and depends on a number of factors such as the species, life stage, and the intensity of the light. Small organisms are often attracted to lights, which in turn attract larger predators to feed on the prey aggregations. Other species may avoid artificially illuminated areas. Artificial lighting may disrupt the diel vertical migration patterns of fish and this may affect species richness and community composition (Nightingale et al., 2006; Phipps, 2001). It could also increase the risk of predation and disruption of predator/prey interactions and result in the loss of opportunity for dark-adapted behaviors including foraging and migration (Orr et al., 2013). Artificial lighting associated with construction and decommissioning would be temporary and limited relative to the surrounding areas. Lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations. Additionally, no underwater lighting is proposed. Artificial lighting is not expected to result in measurable impacts on EFH.

[1]Early life stages include eggs and larvae. Late life stages include neonates, juveniles, and adults.

Table 3.1-2 IPFs and Impact Characterization for EFH within the RWF during Operations and Maintenance

Table 3.1-2						
IPF	**Project Activity**	**Impact Characterization for EFH**				**Discussion**
		Benthic/ Demersal Early Life Stages [1]	**Pelagic Early Life Stages** [1]	**Benthic/ Demersal Late Life Stages** [1]	**Pelagic Late Life Stages** [1]	
Seafloor Disturbance	Foundations (WTG and OSS)	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Seafloor disturbance during O&M of the RWF may occur during non-routine maintenance of bottom-founded infrastructure (e.g., foundations, scour protection). These maintenance activities are expected to result in similar impacts on EFH as those discussed for construction/decommissioning (Table 3.1-1), although the extent of disturbance would be limited to specific areas.
	RWF IAC and OSS-Link Cable non-routine O&M	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Minimal impacts on EFH are expected from operation of the IAC and OSS-Link Cable themselves, as they will be buried beneath the seabed. However, non-routine maintenance may involve sediment-disturbing activities. These maintenance activities are expected to result in similar direct impacts on EFH as those discussed for construction/decommissioning (Table 3.1-1), although the extent of the disturbance would be limited to specific areas along the cable corridor.
	Vessel anchoring (including spuds)	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: During O&M, anchoring will be limited to vessels required to be onsite for an extended duration. Impacts on EFH resulting from potential vessel anchoring during O&M activities are expected to be similar to those discussed in Table 3.1-1.
Habitat Alteration	Foundations RWF IAC and OSS-Link Cable non-routine O&M	Indirect, long-term	Indirect, long-term	Indirect, long-term	Indirect, long-term	Indirect Impacts: Once constructed, the RWF will result in changes to seafloor topography and hydrodynamics because of the presence of foundations, scour protection, and cable protection. In previous assessments, offshore structures have not been shown to change the strength or direction of regional oceanic currents that transport eggs and larvae of marine fishes (RI CRMC, 2010; DONG Energy et al., 2006). Larval recruitment of EFH species from the water column is not anticipated to be affected by the RWF structures because the vertical foundations represent a miniscule surface area within the surrounding waters, and recruitment is generally influenced by numerous environmental signals other than the presence of physical structure (including stage of larval development, temperature, prey availability, and chemical odor of conspecifics) (McManus et al., 2018; Pineda et al., 2007). Foundations have been hypothesized as serving as attachment sites for eggs of squid and herrings in the North Sea, but data so far are lacking (Vandendriessche et al., 2016). Planktonic life stages of EFH species would not be directly affected by the introduction of foundations and scour protection. The seafloor overlaying the majority of buried IAC and OSS-Link Cable (where cable protection will not exist) is expected to return to pre-construction conditions over time and no long-term changes to sediment mobility and depositional patterns are expected. The presence of the foundations, associated scour protection, and cable protection may result in both negative and beneficial indirect impacts on EFH due to conversion of habitat from primarily soft-bottom to hard-bottom. Habitat conversion is expected to cause a shift in species assemblages towards those found in rocky reef/rock outcrop habitat; this is known as the “reef effect” (Wilhelmsson et al., 2006; Reubens et al., 2013). This effect is also well known from other anthropogenic structures in the sea, such as oil platforms, artificial reefs piers, and shipwrecks (Claudet and Pelletier, 2004; Wilhelmsson et al., 2006; Seaman, 2007; Langhamer and Wilhelmsson, 2009). The use of gravel, boulders, and/or concrete mats will create new hard substrate, and this substrate is expected to be initially colonized by barnacles, tube-forming species, hydroids, and other fouling species found on existing hard bottom habitat in the region. Mobile

Table 3.1-2						
IPF	Project Activity	Impact Characterization for EFH				Discussion
		Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	
						organisms, such as lobsters and crabs, may also be attracted to and occur in and around the foundation in higher numbers than surrounding areas. Monopiles attract a range of attached epifauna and epiflora, including barnacles and filamentous algae (Petersen and Malm, 2006). Jacket foundations (which may be used for the OSS) provide a more complex structure than monopile foundations, and may increase habitat complexity through more suitable fouling surfaces and increased protection from predators (MMS, 2009). As these foundations extend from below the seafloor to above the surface of the water, there is expected to be a zonation of macroalgae from deeper growing red foliose algae and calcareous algae, to kelps and other species, including those that may grow in subtidal, intertidal, and splash zone areas. Foundations and cable protection typically also have crevices that increase structural complexity of the area and attract finfish and invertebrate species seeking shelter. EFH for species that have life stages associated with soft-bottom habitats may experience long-term impacts, as available habitat will be slightly reduced. EFH for species and life stages that inhabit hard bottom habitats may experience a beneficial effect, depending on the quality of the habitat created by the foundations and scour protection, and the quality of the benthic community that colonizes that habitat. Overall, habitat alteration is expected to cause minimal impacts because similar soft and hard bottom habitats are already present in and around the RWF (Benthic Assessment; INSPIRE Environmental, 2020), and the conversion of a relatively small area of habitat is unlikely to result in substantial effects, as any "reef effect" observed will be limited to the immediate vicinity of the individual structures. Given the availability of similar surrounding habitat and the limited area of habitat conversion, O&M of the RWF is not expected to result in measurable impacts on spawning Atlantic cod. The potential effects of removal of Project structures during decommissioning are discussed in Table 3.1-1.
Sediment Suspension and Deposition	RWF IAC and OSS-Link Cable Vessel anchoring (including spuds)	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Increases in sediment suspension and deposition during the O&M phase will result from vessel anchoring and non-routine maintenance activities that require exposing the IAC and/or OSS-Link Cable. Direct impacts on EFH resulting from sediment suspension and deposition during the O&M phase are expected to be similar to those discussed for the construction and decommissioning phase (Table 3.1-1), but on a more limited spatial scale.
Noise	Vessel and aircraft noise	Direct, long-term	Direct, long-term	Direct, long-term	Direct, long-term	Direct Impacts: Impacts on EFH from ship and aircraft (i.e., helicopter) noise during O&M of the RWF are expected to be similar to those discussed for the construction/decommissioning phase (Table 3.1-1), though lesser in extent. The noise generated by vessel and aircrafts will be similar to the range of noise from existing vessel and aircraft traffic in the region, and are not expected to substantially affect the existing underwater noise environment.
	WTG operational noise	Direct, long-term	Direct, long-term	Direct, long-term	Direct, long-term	Direct Impacts: The underwater noise levels produced by WTGs are expected to be within the hearing ranges of fish. Depending on the noise intensity, these noises could disturb or displace fisheries species within the surrounding area or cause auditory masking (MMS, 2007). Noise levels from operation of the RWF WTGs are not expected to result in injury or mortality, and finfish may become habituated to the operational noise (Thomsen et al., 2006; Bergström et al., 2014). Lindeboom et al. (2011) found no difference in the residency times of juvenile cod around monopiles between periods of WTG operation or when WTGs were out-of-order. This study also found that sand eels did not avoid the wind farm. In a similar study, the abundance of cod, eel, shorthorn sculpin, and goldsinny wrasse, were found to be higher near WTGs, suggesting that potential noise impacts from operation did not override

Table 3.1-2

IPF	Project Activity	Impact Characterization for EFH: Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	Discussion
						the attraction of these species to the artificial reef habitat (Bergström et al., 2013). Based on the available literature, operational noise from the WTGs is expected to have minimal impacts on EFH.
Electric and Magnetic Fields	RWF IAC and OSS-Link Cable	Direct, long-term	Direct, long-term	Direct, long-term	Direct, long-term	Direct Impacts: Operation of the WTGs does not generate electric and magnetic fields (EMF); however, once the IAC and OSS-Link Cables become energized, the cables will produce a magnetic field, both perpendicularly and in a lateral direction around the cables. The cable will be shielded and, where feasible, buried beneath the seafloor and will otherwise be protected. Shielded electrical transmission cables do not directly emit electrical fields into surrounding areas, but are surrounded by magnetic fields that can cause induced electrical fields in moving water (Gill et al., 2012). Exposure to EMF could be short- or long-term, depending on the mobility of the species/life stage. A modeling analysis of the magnetic fields and induced electric fields anticipated to be produced during operation of the RWF IAC, OSS-Link Cable, and RWEC was performed and results are included in the Offshore Electric- and Magnetic-Field Assessment (Exponent, 2020). That assessment also summarizes data from field studies conducted to assess impacts of EMF on marine organisms. These studies constitute the best source of evidence to assess the potential impacts on finfish and invertebrate behavior or distribution in the presence of energized cables. Compared to fish and elasmobranchs, relatively little is known about the response of marine invertebrates to EMF. Field surveys on the behavior of large crab species and lobster at submarine cable sites (Love et al., 2017; Hutchison et al., 2018) indicate that the Project's calculated magnetic-field levels are not likely to impact the distribution and movement of large epibenthic crustaceans. Ancillary data and observations from these field studies also suggest that cephalopod behavior is similarly unaffected by the presence of 60-Hz AC cables. Based on the modeling results and existing evidence, the EMF associated with the cables will be below the detection capability of invertebrate species. The available laboratory-generated research regarding the effects of 50- or 60-Hz on fish behavior do not indicate that produced fields will have adverse effects on magnetosensitive and electrosensitive species. Controlled laboratory studies conducted with eel and salmon (Richardson et al., 1976; Armstrong et al., 2015; Orpwood et al., 2015) support the conclusion that EMF produced by 50-75 Hz AC cables do not alter the behavior of magnetosensitive fish species, indicating that high frequency EMF is not easily detected by magnetosensitive migratory fish species. Laboratory studies assessing the EMF detection abilities indicate that the EMF detection ability of elasmobranchs decreases as the source frequency increases over 20 Hz, and suggest that elasmobranchs are unlikely to easily detect electric fields produced by 50/60 Hz power sources (Andrianov et al., 1984; Kempster et al., 2013). In a laboratory study, demersal catshark were exposed to magnetic fields produced by a 50-Hz source and did not exhibit any significant behavioral changes (Orr, 2016). Field studies have also concluded that energized power cables neither attract nor repel elasmobranchs (Love et al., 2016). Based on the available information, EMF produced by 50/60 Hz power sources is unlikely to be detected by elasmobranchs, and is unlikely to cause changes in elasmobranch behavior or distribution. Love et al. (2016) conducted a series of surveys between 2010 and 2014 to track fish populations at both energized and unenergized 60-Hz submarine cables off the California

Table 3.1-2						
IPF	Project Activity	Impact Characterization for EFH				Discussion
		Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	
						coast. These studies were designed to assess whether EMF produced by the energized cable had any in situ effects on the distribution of marine species. Over three years of observations, no differences in fish communities at energized and unenergized cable sites were noted, indicating that EMF had no effect on fish distributions, although the physical structure of the unburied cables did attract a higher number of fish versus sediment bottoms, creating a "reef effect" (Love et al., 2016). Additionally, multiple fish surveys have been conducted at existing offshore windfarm sites. Results from these studies strongly indicate that operating windfarms and cables do not adversely affect the distributions of resident fish populations. Nearly 10 years of pre- and post-operational data from the Horns Rev Offshore Wind Farm site near Denmark indicate "no general significant changes in the abundance or distribution patterns of pelagic and demersal fish" (Leonhard et al., 2011), including species similar to those expected to inhabit the RWF. Researchers did note an increase in fish species associated with hard ground and vertical features, especially around WTG footings (Leonhard et al., 2011). Based on the modeling results and existing evidence, EMF associated with the IAC and OSS-Link Cable is not expected to adversely affect the populations or distributions of EFH species in the Project Area. These conclusions are consistent with the findings of a previous comprehensive review of the ecological impacts of marine renewable energy projects, where it was determined that there has been no evidence demonstrating that EMF at the levels expected from marine renewable energy projects will cause an effect (negative or positive) on any species (Copping et al., 2016). Moreover, a 2019 BOEM report that assessed the potential for AC EMF from offshore wind facilities to affect marine populations concluded that, for the southern New England area, no negative effects are expected for populations of key commercial and recreational fish species (Snyder et al., 2019). Based on this information, it is not expected that EFH species will be measurably affected by EMF from the cables.
Discharges and Releases	Hazardous materials spills Wastewater discharge	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: As discussed for the construction/decommissioning phase, routine discharges of wastewater or liquids (e.g., ballast, bilge, deck drainage, stormwater) are not anticipated to result in impacts because all vessel waste will be offloaded, stored, and disposed of in accordance with all applicable local, state and federal regulations. In addition, compliance with applicable Project-specific management practices and requirements will minimize the potential for adversely impacting water quality and marine life. The operation of the RWF is not anticipated to lead to any spills of hazardous materials into the marine environment. Per the information requirements outlined in 30 CFR 585.626, a list of solid and liquid wastes generated, including disposal methods and locations, as well as federally regulated chemical products, is found in the Project's ERP/OSRP. The WTG and the OSS will be designed for secondary levels of containment to prevent accidental discharges of hazardous materials to the marine environment. Most maintenance will occur inside the WTGs, thereby reducing the risk of a spill, and no oils or other wastes are expected to be discharged during maintenance activities. All vessels participating in O&M of the RWF will comply with USCG requirements for management of onboard fluids and fuels, including maintaining and implementing SPCC plans. Vessels will be navigated by trained, licensed vessel operators who will adhere to navigational rules and regulations and vessels will be equipped with spill handling materials adequate to control or clean up an accidental spill. Best management practices (BMPs) for

Table 3.1-2						
IPF	Project Activity	Impact Characterization for EFH				Discussion
		Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	
						fueling and power equipment servicing will be incorporated into the Project's ERP/OSRP. Accidental releases will be minimized by containment and clean-up measures detailed in the OSRP. Given these measures and the very low likelihood of an inadvertent release, potential impacts of a hazardous material spill on EFH are not anticipated.
Marine Trash and Debris		Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: As discussed in Table 3.1-1, vessels will adhere to the USCG and EPA marine trash regulations, as well as BOEM guidance, and trash and debris generated during O&M of the RWF will be contained on vessels or at staging areas until disposal at an approved facility. Measures will be implemented prior to and during construction to avoid, minimize, and mitigate impacts related to trash and debris disposal. Given these measures, potential impacts from trash and debris on EFH are not anticipated.
Traffic	See Seafloor Disturbance, Noise, Sediment Suspension and Deposition, and Lighting IPFs.					
Lighting	RWF operational lighting	Direct, long-term	Direct, long-term	Direct, long-term	Direct, long-term	Direct Impacts: Artificial lighting during O&M will be associated with vessels, the WTGs, and the OSS for operational safety and security purposes. The response of fish species to artificial lights is highly variable and depends on a number of factors such as the species, life stage, and the intensity of the light. Small organisms are often attracted to lights, which in turn attract larger predators to feed on the prey aggregations. Other species may avoid artificially illuminated areas. However, lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations. Because of the limited area that will have artificial lighting relative to the surrounding areas, and because no underwater lighting is proposed, overall impacts on EFH are expected to be minimal.

[1]Early life stages include eggs and larvae. Late life stages include neonates, juveniles, and adults.

3.1.2 Revolution Wind Export Cable

IPFs resulting in potential impacts on EFH associated with the RWEC are described in Table 3.1-3 for the construction and decommissioning phases and in Table 3.1-4 for the O&M phase. At the end of the Project's operational life, the Project will be decommissioned in accordance with a detailed decommissioning plan to be developed in compliance with applicable laws, regulations, and BMPs at that time. All of the impacts associated with these activities are anticipated to be similar to or less than those described for construction, unless otherwise noted. The impacts discussed in this section apply to both the RWEC-OCS and RWEC-RI, though the impacts would vary slightly by habitat composition, which differs slightly between the nearshore and offshore portions of the RWEC corridor.

Table 3.1-3 IPFs and Impact Characterization for EFH for the RWEC during Construction and Decommissioning

Table 3.1-3						
IPF	Project Activity	Impact Characterization for EFH				Discussion
		Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	
Seafloor Disturbance	Seafloor preparation	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Direct impacts on benthic species and life stages from seafloor preparation are expected to be similar to those discussed in Table 3.1-1, with the exception of shallower areas being affected as the RWEC-RI nears landfall. These shallower areas are expected to have slightly different species assemblages than the deeper offshore areas near the RWF. For example, winter flounder eggs present in the shallow portions of the RWEC-RI corridor could be affected by seafloor disturbance if construction activities take place during the spawning period (generally December 15-May 31). As discussed in Section 2.2, the up-estuary stations sampled during the benthic survey conducted for the Project were generally characterized by finer substrate, dominated by soft-sediment fauna, higher turbidity, and more reduced sediments. The mid-bay stations were characterized by mussel and *Crepidula* beds with other attached organisms including barnacles, sponges, and macroalgae. The stations at the mouth of Narragansett Bay and the stations leading offshore to the 3-mile state water boundary were generally dominated by soft sediment infauna. The results of the benthic survey (Benthic Assessment; INSPIRE Environmental, 2020) did not indicate the presence of beds for EFH shellfish species within the RWEC-RI corridor, however, the mussel and *Crepidula* beds could serve as foraging or nursery habitat for certain finfish species. Disturbance of this shellfish bed habitat is not anticipated to result in population-level effects on EFH species, as only a small area would be affected, and similar habitat is common within the Bay. Seafloor preparation is expected to have limited impacts on EFH for species that have pelagic early or later life stages. Decommissioning activities are expected to cause similar impacts as construction, but these impacts would be shorter in duration.
	RWEC installation	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Direct impacts on EFH associated with the RWEC installation/ decommissioning are expected to result in similar impacts as those for seafloor preparation. Construction of the RWEC landfall would be accomplished with either HDD methodology. A cofferdam may be used to allow for a dry environment during construction and for managing sediment, contaminated soils, and bentonite (from HDD operations). Impacts associated with the installation of a cofferdam (if necessary) would be similar to those discussed for seafloor preparation, but on a smaller scale. The cofferdam will be a temporary structure used during construction only. Therefore, no conversion of habitat is expected, and the cofferdam will be removed prior to the O&M phase. In addition, as described in Table 3.1-1, fish eggs and larvae (ichthyoplankton), as well as zooplankton, are expected to be entrained and killed during hydraulic dredging and jet trencher embedment of the RWEC. These losses are expected to be very low and short-term. A previous assessment conducted for the South Fork Wind Farm found that the total estimated losses of zooplankton and ichthyoplankton from jet trencher entrainment were less than 0.001% of the total zooplankton and ichthyoplankton abundance present in the study area, which encompassed a linearly buffered region of 15 km around the SFEC and 25 km around the SFWF (INSPIRE Environmental, 2018). Limited research has been conducted on the potential impacts of hydraulic dredge entrainment, but because the volumes of water used by dredges are relatively small, the entrainment rates of ichthyoplankton are generally thought to be only a small proportion of the total fish production (Reine and Clark, 1998;

Table 3.1-3						
IPF	**Project Activity**	**Impact Characterization for EFH**				**Discussion**
		Benthic/ Demersal Early Life Stages [1]	**Pelagic Early Life Stages** [1]	**Benthic/ Demersal Late Life Stages** [1]	**Pelagic Late Life Stages** [1]	
						Reine et al., 1998). Jet plow and hydraulic dredge entrainment losses are not expected to result in large losses of zooplankton, ichthyoplankton, or later life stages, and population-level impacts on EFH species are not anticipated. A small amount of tidal salt marsh, and coastal beach/dune habitat may be affected during installation of the RWEC-RI. At this time, multiple landfall options are being considered within the Landfall Work Area, so it is not possible to quantify the areal extent of temporary or permanent impacts on these habitats. However, the Landfall Work Area would total up to 2.5 acres and would be sited to avoid and minimize impacts on wetland resources to the maximum extent practicable. If the Landfall Work Area is situated near the western end of the Landfall Envelope, use of the HDD method would minimize impacts on coastal habitats. Disturbance of tidally-influenced habitats could result in a direct, long-term impact on EFH for species that utilize these habitats, though this impact would be limited given the availability of similar habitat in the general area. Additionally, the tidal salt marsh at Blue Beach is located above MHW and is likely infrequently inundated only during extremely high tides and storm surge events. The perimeter of the salt marsh is mostly composed of invasive common reed (*Phragmites australis*) and is unlikely to function as high-quality habitat for EFH species.
	Vessel anchoring (including spuds)	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Direct impacts on EFH associated with vessel anchoring (including spuds) are similar to those discussed in seafloor preparation.
Habitat Alteration	Seafloor Preparation RWEC installation Vessel anchoring (including spuds)	Indirect, long-term	Indirect, long-term	Indirect, long-term	Indirect, long-term	Indirect Impacts: As discussed for the construction/decommissioning of the RWF (Table 3.1-1), in areas of sediment disturbance and/or areas with increased sedimentation, benthic habitat recovery and benthic infaunal and epifaunal species abundances may take up to 1 to 3 years to recover to pre-impact levels, based on the results of a number of studies on benthic recovery (e.g., AKRF, Inc. et al., 2012; Germano et al., 1994; Hirsch et al., 1978; Kenny and Rees, 1994). This recovery time may result in an indirect, long-term impact on designated EFH for species with benthic/demersal life stages. Recolonization of sediments by epifaunal and infaunal species and the return of mobile fish and invertebrate species will allow this area to continue to serve as foraging habitat for EFH species. Pelagic species/life stages may be indirectly affected by the temporary reduction of benthic forage species, but these impacts are expected to be very limited given the availability of similar habitats in the area. Other species may be attracted to the disruption and prey on dislodged benthic species or other species injured or flushed during seafloor preparation, RWEC installation, and vessel anchoring activities. During decommissioning, facilities will be removed to a depth of 15 ft (4.6 m) below the mudline, unless otherwise authorized by BOEM (30 CFR § 585.910(a)). Decommissioning would result in the reversal of beneficial effects for species and life stages that inhabited the cable protection (concrete mattresses or rock structures) during the life of the Project. Over time, the disturbed area is expected to revert to pre-construction conditions, which would result in a beneficial impact for species and life stages that inhabit soft bottom habitats. Overall, habitat alteration from decommissioning is expected to cause minimal impacts because similar soft and hard bottom habitats are already present in and around the RWEC corridor (Benthic Assessment; INSPIRE Environmental, 2020), and the conversion of a relatively small area of habitat is unlikely to result in substantial effects, as any effect observed will be limited to the immediate vicinity of the individual structures.

Table 3.1-3						
IPF	**Project Activity**	**Impact Characterization for EFH**				**Discussion**
		Benthic/ Demersal Early Life Stages [1]	**Pelagic Early Life Stages** [1]	**Benthic/ Demersal Late Life Stages** [1]	**Pelagic Late Life Stages** [1]	
Sediment Suspension and Deposition	Seafloor Preparation RWEC installation Vessel anchoring (including spuds)	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: As discussed in Table 3.1-1, seafloor-disturbing activities will result in temporary increases in sediment suspension and deposition. Sediment transport modeling was performed using RPS' SSFATE model to evaluate the concentrations of suspended sediments, spatial extent and duration of sediment plumes, and the seafloor deposition resulting from Project cable burial activities. The modeling results indicate that sediment plumes with TSS concentrations exceeding the ambient conditions by 100 mg/L could extend up to 4,528 feet (1,380 m) from the RWEC-RI centerline in state waters, and up to 1,542 feet (470 m) from RWEC-OCS centerline in federal waters. The plume is expected to be mostly contained within the bottom of the water column, though in shallower waters it may occupy most of the water column due to the water depth. For the RWEC-OCS, predicted TSS concentrations above ambient for any single circuit installation do not persist in any given location for greater than 24 hours, and in most locations (>75 % of the affected area) concentrations return to ambient within 8 hours. This maximum was predicted to occur along a part of the route that will only see one circuit installation. The maximum duration above ambient along the portion of the RWEC where two circuits will be installed was predicted to be 14 hours per circuit. This corresponds to a total of 28 hours above ambient, however the two 14-hour periods will likely be separated by time. For installation of one circuit of the RWEC-RI, predicted TSS concentrations above ambient do not persist in any given location for greater than 16.3 hours, and in most locations (>75 % of the affected area) concentrations return to ambient within 4 hours). For installation of two circuits, the maximum plume exposure is doubled at 32.6 hours, however, the two 16.3-hour periods will likely be separated by time. The modeling results indicate that sedimentation from RWEC burial may exceed 0.4 inch (10 mm) of deposition up to 919 feet (280 m) from the cable centerline in state waters and up to 328 feet (100 m) in federal waters. This thickness of sedimentation could cover up to 1,126 acres (4,556,760 m^2) in state waters, and 1,020 acres (4,127,794 m^2) in federal waters. For the cable landfall, TSS concentrations exceeding ambient conditions by 100 mg/L could extend up 580 ft (177 m) from the centerline and plume concentrations above ambient could persist for 256 hours for the HDD. This duration is longer relative to the water jet assisted cable installation due to the slower installation rate of the activity and since both trenching and backfilling for two circuits are included. Sedimentation greater than 0.4 in (10 mm) may extend up to 509 ft (155 m) from the centerline and could cover up to 19 acres (76,890 m^2). The models, inputs, and results are described in detail in the Hydrodynamic and Sediment Transport Modeling Report (Exponent, 2020). Sediment suspension and deposition associated with decommissioning activities are expected to be similar, but slightly lower in magnitude. Similar to those discussed in Table 3.1-1, direct impacts on EFH from sediment suspension and deposition are expected to be similar to those discussed for construction of the RWF, with greater impacts on sessile and slow-moving benthic species/life stages compared to mobile and pelagic species/life stages. Winter flounder eggs are a sensitive resource within Narragansett Bay. Previous experiments have shown that a viable hatching rate of winter flounder eggs is reduced when the eggs are buried by as little as one half of one egg diameter, approximately 0.05 centimeter of sediment (Berry et al., 2003). In other laboratory experiments, winter flounder eggs were found to be affected by a sedimentation level of 0.065 centimeter, and almost complete mortality was observed when deposition exceeded 0.25 centimeter (Berry et al.,

Table 3.1-3						
IPF	Project Activity	Impact Characterization for EFH				Discussion
		Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	
						2011), Winter flounder eggs could be affected by construction of the RWEC-RI if sedimentation is experienced in these shallow waters during the spawning period (generally December 15 to May 31). Given the high natural mortality that occurs during the early life history stages, adverse effects of burial at the population level are expected to be limited and only measurable in the immediate vicinity of the construction workspace. Revolution Wind will employ best management practices to minimize potential sedimentation impacts on winter flounder eggs in shallow waters. Revolution Wind will also coordinate with applicable regulatory agencies to define and comply with seasonal restrictions to minimize impacts on winter flounder and other sensitive finfish species.
Noise	Vibratory pile driving (cofferdam)	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: The cofferdam at the RWEC landfall, if required, may be installed as either a sheet piled structure into the sea floor or a gravity cell structure placed on the sea floor using ballast weight. Sheet pile installation would require the use of a vibratory hammer to drive the sidewalls and endwalls into the seabed, which may take approximately up to 3 days. Vibratory devices use oscillatory hammers or spinning counterweights that vibrate the pile and cause the sediment surrounding the pile to liquefy, allowing the pile to move easily into or out of the sediment. Vibratory pile driving is considered a continuous low-frequency noise source because the device continuously vibrates until the pile reached the desired depth. Vibratory devices generally have sound source levels 10 to 20 dB lower than impact hammers, and the sound level generated rises relatively slowly (California Department of Transportation, 2009). Vibratory pile driving associated with the cofferdam is not anticipated to result in exceedance of the injury threshold for fish, however, noise from pile driving may temporarily reduce habitat quality, result in behavioral changes, or cause mobile species to temporarily vacate the area. Noise impacts on EFH species from vibratory pile driving may result in limited short-term impacts, as the habitat suitability is expected to return to pre-pile driving conditions shortly after cessation of the pile driving activity.
	Vessel noise, construction equipment noise, aircraft noise	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Direct impacts on EFH resulting from vessel, construction equipment, and aircraft noise during construction and decommissioning are expected to be similar to those discussed in Table 3.1-1.
Discharges and Releases	Hazardous materials spills Wastewater discharges	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Impacts associated with wastewater discharges or an inadvertent release of hazardous material during construction or decommissioning of the RWEC are expected to be similar to those discussed in Table 3.1-1.
Marine Trash and Debris		Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Impacts associated with marine trash and debris are expected to be similar to those discussed in Table 3.1-1.
Traffic	See Seafloor Disturbance, Noise, Sediment Suspension and Deposition, and Lighting IPFs.					
Lighting	Vessel and construction lighting	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: During construction and decommissioning activities, lighting will be associated with the vessels that will be installing or decommissioning the RWEC. Direct impacts on EFH from artificial lighting are expected to be short-term because the vessels are expected to pass quickly along the RWEC corridor during cable installation. As discussed in

Table 3.1-3						
IPF	Project Activity	Impact Characterization for EFH				Discussion
		Benthic/ Demersal Early Life Stages [1]	Pelagic Early Life Stages [1]	Benthic/ Demersal Late Life Stages [1]	Pelagic Late Life Stages [1]	
						Table 3.1-1, artificial lighting associated with cable installation would be temporary and limited relative to the surrounding areas. Lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations. Additionally, no underwater lighting is proposed. Impacts on EFH due to artificial lighting are expected to be minimal.

[1]Early life stages include eggs and larvae. Late life stages include neonates, juveniles, and adults.

Table 3.1-4 IPFs and Impact Characterization for EFH for the RWEC during Operations and Maintenance

Table 3.1-4						
IPF	**Project Activity**	**Impact Characterization for EFH**				**Discussion**
		Benthic/ Demersal Early Life Stages [1]	**Pelagic Early Life Stages** [1]	**Benthic/ Demersal Late Life Stages** [1]	**Pelagic Late Life Stages** [1]	
Seafloor Disturbance	RWEC non-routine O&M	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Minimal impacts on EFH are expected from operation of the RWEC, as it will be buried beneath the seabed, where feasible, and will otherwise be protected. Seafloor disturbance during O&M of the RWEC will be limited to non-routine maintenance that may require uncovering and reburial of the cables, as well as maintenance of cable protection where present. These maintenance activities are expected to result in similar direct impacts on EFH as those discussed for construction/decommissioning (Table 3.1-1), although the extent of disturbance would be limited to specific areas along the RWEC corridor.
	Vessel anchoring (including spuds)	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Impacts on EFH resulting from potential vessel anchoring during O&M activities are expected to be similar to those discussed in Table 3.1-1.
Habitat Alteration	RWEC O&M	Indirect, long-term	Indirect, long-term	Indirect, long-term	Indirect, long-term	Indirect Impacts: Cable protection (e.g., concrete mattresses) may be placed in select areas along the RWEC. The introduction of engineered concrete mattresses or rock to areas of the seafloor can cause local disruptions to circulation, currents, and natural sediment transport patterns, though these impacts as expected to be limited given the miniscule surface area associated with the cable protection compared to the surrounding waters. Under normal circumstances, these segments of the RWEC are expected to remain covered as accretion of sediment covers the cable and associated cable protection (where applicable). In non-routine situations, these segments may be uncovered, and re-burial might be required (for buried portions of the RWEC). The seafloor overlaying the majority of buried RWEC (where cable protection will not exist) is expected to return to pre-construction conditions over time and no long-term changes to sediment mobility and depositional patterns are expected. Indirect impacts on EFH associated with O&M activities for the RWEC are expected to result in similar impacts as those discussed for the IAC and OSS-Link Cable in Table 3.1-1, but will be limited in spatial extent. The protection of the cable may result in the long-term conversion of soft-bottom habitat to hard-bottom habitat. Similar to the foundations, this cable protection may have a long-term impact on EFH for species associated with soft-bottom habitats and a long-term beneficial impact on EFH for species associated with hard-bottom habitats, depending on the quality of the habitat created by the cable protection, and the quality of the benthic community that colonizes that habitat. The potential effects of removal of Project structures during decommissioning are discussed in Table 3.1-2.
Sediment Suspension and Deposition	RWEC non-routine O&M Vessel anchoring (including spuds)	Direct, short-term	Direct, short-term	Direct, short-term	Direct, short-term	Direct Impacts: Increases in sediment suspension and deposition during the O&M phase may result from vessel anchoring and non-routine maintenance activities that require exposing portions of the RWEC. Direct impacts on EFH resulting from sediment suspension and deposition during the O&M phase are expected to be similar to those discussed for the construction and decommissioning phase (Table 3.1-1), but on a more limited spatial scale.
Noise	Vessel and aircraft noise	Direct, long-term	Direct, long-term	Direct, long-term	Direct, long-term	Direct Impacts: Impacts on EFH from ship and aircraft noise during O&M of the RWEC are expected to be similar to those discussed for the construction/decommissioning phase (Table 3.1-1), though lesser in extent.
Electric and Magnetic Fields	RWEC operations	Direct, long-term	Direct, long-term	Direct, long-term	Direct, long-term	Direct Impacts: Once the RWEC becomes energized, the cables will produce a magnetic field, both perpendicularly and in a lateral direction around the cables. The cable will be shielded, where feasible, and buried beneath the seafloor, and will otherwise be protected. Shielded electrical transmission cables do not directly emit electrical fields into surrounding areas, but are surrounded by magnetic fields that can cause induced electrical fields in

Table 3.1-4						
IPF	**Project Activity**	**Impact Characterization for EFH**				**Discussion**
		Benthic/ Demersal Early Life Stages [1]	**Pelagic Early Life Stages [1]**	**Benthic/ Demersal Late Life Stages [1]**	**Pelagic Late Life Stages [1]**	
						moving water (Gill et al., 2012). Exposure to EMF could be short- or long-term, depending on the mobility of the species. A modeling analysis of the magnetic fields and induced electric fields anticipated to be produced during operation of the RWF IAC, OSS-Link Cable, and RWEC was performed and results are included in the Offshore Electric- and Magnetic-Field Assessment (Exponent, 2020). That assessment also summarizes data from field studies conducted to assess impacts of EMF on marine organisms. As discussed for the RWF IAC and OSS-Link Cable in Table 3.1-2, behavioral effects and/or changes in EFH species abundance and distributions due to EMF are not expected. These conclusions are consistent with the findings of a previous comprehensive review of the ecological impacts of marine renewable energy projects, where it was determined that there has been no evidence demonstrating that EMF at the levels expected from marine renewable energy projects will cause an effect (negative or positive) on any species (Copping et al., 2016). Moreover, a 2019 BOEM report that assessed the potential for AC EMF from offshore wind facilities to affect marine populations concluded that, for the southern New England area, no negative effects are expected for populations of key commercial and recreational fish species (Snyder et al., 2019). Based on this information, it is not expected that EFH species will be measurably affected by EMF from the cables.
Discharges and Releases	Hazardous materials spills Wastewater discharges	**Direct, short-term**	**Direct, short-term**	**Direct, short-term**	**Direct, short-term**	<u>Direct Impacts</u>: Impacts associated with wastewater discharges or an inadvertent release of hazardous material during O&M of the RWEC are expected to be similar to those discussed in Table 3.1-1.
Marine Trash and Debris		**Direct, short-term**	**Direct, short-term**	**Direct, short-term**	**Direct, short-term**	<u>Direct Impacts</u>: Impacts associated with marine trash and debris are expected to be similar to those discussed in Table 3.1-1.
Traffic	See Seafloor Disturbance, Noise, Sediment Suspension and Deposition, and Lighting IPFs.					
Lighting	Vessel lighting	**Direct, long-term**	**Direct, long-term**	**Direct, long-term**	**Direct, long-term**	<u>Direct Impacts</u>: Artificial lighting during O&M of the RWEC will be associated only with vessels. However, lighting will be limited to the minimum necessary to ensure safety and to comply with applicable regulations. Because of the limited area that will have artificial lighting relative to the surrounding areas, and because no underwater lighting is proposed, overall impacts on EFH are expected to be minimal.

[1]Early life stages include eggs and larvae. Late life stages include neonates, juveniles, and adults.

3.2 Summary of Impacts

3.2.1 Summary of Impacts on EFH from RWF IPFs

Based on the IPFs discussed in Tables 3.1-1 and 3.1-2, species with a completely pelagic lifestyle are generally expected to be less negatively affected than demersal or benthic species. Overall, during construction, O&M, and decommissioning of the RWF, impacts on EFH species with benthic/demersal life stages are expected to be exposed to direct impacts from noise associated with impact pile driving and/or vibratory pile driving of foundations, other noise sources, seafloor disturbance, and sediment suspension/deposition, and indirect impacts from habitat alteration. EFH species with pelagic life stages are expected to be exposed to direct impacts from impact pile driving and/or vibratory pile driving noise and other construction/decommissioning noise sources, and indirect impacts from habitat alteration. Potential impacts from other IPFs are anticipated to be minimal. Potential long-term impacts may result from the conversion of soft-bottom habitat to hard-bottom habitat associated with the WTG foundations, scour protection, and protection of the OSS-Link Cable and IAC. These long-term impacts would be reversed following decommissioning of the Project. None of the IPFs are expected to result in population-level effects on EFH species, due to the limited scale and intensity of the Project activities, the availability of similar habitat in the surrounding area, and the implementation of avoidance, minimization, and mitigation measures.

3.2.1.1 EFH Species Least Likely to Experience Impacts

Of the species with EFH designated within the RWF area, those that are least likely to experience impacts have both pelagic early and late life stages, only have EFH associated with pelagic environments, and/or do not have preferred habitat present in the RWF area. They include the species and life stages listed in Table 3.2-1 below.

Table 3.2-1 EFH Species Least Likely to Experience Impacts – RWF

Table 3.2-1					
Species	**Egg**	**Larvae**	**Neonate**	**Juvenile**	**Adult**
New England Finfish					
Atlantic herring (*Clupea harengus*)		●		●	●
Pollock (*Pollachius virens*)				●	
Winter flounder (*Pseudopleuronectes americanus*)	●				
Witch flounder (*Glyptocephalus cynoglossus*)	●	●			
Mid-Atlantic Finfish					
Atlantic butterfish (*Peprilus triacanthus*)	●	●		●	●
Atlantic mackerel (*Scomber scombrus*)	●	●		●	
Bluefish (*Pomatomus saltatrix*)	●	●		●	●
Invertebrates					
Northern shortfin squid (*Illex illecebrosus*)					●
Highly Migratory Species					
Albacore tuna (*Thunnus alalunga*)				●	●
Bluefin tuna (*Thunnus thynnus*)				●	●
Skipjack tuna (*Katsuwonus pelamis*)				●	●
Yellowfin tuna (*Thunnus albacares*)				●	●
Sharks					
Basking shark (*Cetorhinus maximus*)			●	●	●
Blue shark (*Prionace glauca*)			●	●	●
Common thresher shark (*Alopias vulpinus*)			●	●	●
Dusky shark (*Carcharhinus obscurus*)			●	●	●
Sand tiger shark (*Carcharias taurus*)			●	●	

Table 3.2-1					
Species	**Egg**	**Larvae**	**Neonate**	**Juvenile**	**Adult**
Sandbar shark (*Carcharhinus plumbeus*)				●	●
Shortfin mako shark (*Isurus oxyrinchus*)			●	●	●
Smoothhound shark complex (Atlantic stock) (*Mustelus canis*)			●	●	●
White shark (*Carcharodon carcharias*)			●	●	●

3.2.1.2 EFH Species Most Likely to Experience Impacts

Of the species with EFH designated within the RWF area that also have preferred habitat present, those with benthic/demersal early and/or late life stages are the most likely to experience impacts as a result of construction, O&M, and/or decommissioning of the RWF. The species and associated life stages most likely to experience some level of short-term or long-term, direct or indirect impact are listed in Table 3.2-2 below.

Conversion of soft-bottom habitat to hard-bottom habitat associated with the WTGs, scour protection, and protection of the OSS-Link Cable and IAC may have a long-term beneficial effect species with life stages with a preference for hard-bottom habitats (e.g., gravel, rock, boulders, artificial reefs), depending on the quality of the newly-created hard-bottom habitat, and the quality of the benthic community that colonizes that habitat. These species and life stages that may experience a long-term, beneficial effect are listed in Table 3.2-3.

Note that some species could experience both negative and beneficial impacts at different phases of the Project. Thus, the same species and life stages may appear in both Table 3.2-2 and Table 3.2-3.

Table 3.2-2 EFH Species Most Likely to Experience Negative Impacts – RWF

Table 3.2-2					
Species	**Egg**	**Larvae**	**Neonate**	**Juvenile**	**Adult**
New England Finfish					
Atlantic cod (*Gadus morhua*)				●	●
Atlantic wolfish (*Anarhichas lupus*)	●	●		●	●
Haddock (*Melanogrammus aeglefinus*)				●	
Monkfish (*Lophius americanus*)				●	●
Ocean pout (*Zoarces americanus*)	●			●	●
Red hake (*Urophycis chuss*)				●	●
Silver hake (*Merluccius bilinearis*)				●	●
White hake (*Urophycis tenuis*)				●	
Windowpane flounder (*Scophthalmus aquosus*)				●	●
Winter flounder (*Pseudopleuronectes americanus*)		●		●	●
Yellowtail flounder (*Limanda ferruginea*)				●	●
Mid-Atlantic Finfish					
Black sea bass (*Centropristis striata*)				●	●
Scup (*Stenotomus chrysops*)				●	●
Summer flounder (*Paralichthys dentatus*)				●	●
Invertebrates					
Atlantic sea scallop (*Placopecten magellanicus*)	●	●		●	●
Longfin inshore squid (*Doryteuthis pealeii*)	●				

Table 3.2-2					
Species	**Egg**	**Larvae**	**Neonate**	**Juvenile**	**Adult**
Ocean quahog (*Arctica islandica*)				●	●
Skates					
Little skate (*Leucoraja erinacea*)				●	●
Winter skate (*Leucoraja ocellata*)				●	●
Sharks					
Spiny dogfish (*Squalus acanthias*)				● [1]	●

[1] Includes sub-adult males and sub-adult females.

Table 3.2-3 EFH Species That May Experience Beneficial Effects – RWF

Table 3.2-3					
Species	**Egg**	**Larvae**	**Neonate**	**Juvenile**	**Adult**
New England Finfish					
Atlantic cod (*Gadus morhua*)				●	●
Atlantic wolfish (*Anarhichas lupus*)	●				●
Haddock (*Melanogrammus aeglefinus*)				●	
Monkfish (*Lophius americanus*)				●	●
Ocean pout (*Zoarces americanus*)	●			●	●
Pollock (*Pollachius virens*)				●	
Red hake (*Urophycis chuss*)				●	●
Silver hake (*Merluccius bilinearis*)					●
Yellowtail flounder (*Limanda ferruginea*)					●
Mid-Atlantic Finfish					
Black sea bass (*Centropristis striata*)				●	●
Scup (*Stenotomus chrysops*)					●
Invertebrates					
Atlantic sea scallop (*Placopecten magellanicus*)	●	●		●	●
Longfin inshore squid (*Doryteuthis pealeii*)	●				
Skates					
Little skate (*Leucoraja erinacea*)				●	●
Winter skate (*Leucoraja ocellata*)				●	●

3.2.2 Summary of Impacts on EFH from RWEC IPFs

Based on the IPFs discussed in Tables 3.1-3 and 3.1-4, species with a completely pelagic lifestyle are generally expected to be less negatively affected than demersal or benthic species. Overall, during construction, O&M, and decommissioning of the RWEC, impacts on EFH species with benthic/demersal life stages are expected to be exposed to direct impacts from seafloor disturbance, sediment suspension/deposition, and noise IPFs, and indirect impacts from habitat alteration. EFH species with pelagic life stages are expected to be exposed to direct impacts from noise. Potential impacts from other IPFs are anticipated to be minimal. Potential long-term impacts may result from the conversion of soft-bottom habitat to hard-bottom habitat associated with the protection of the RWEC. These long-term impacts would be reversed following decommissioning of the Project. None of the IPFs are expected to result in population-level effects on EFH species, due to the limited scale and intensity of the Project activities, the availability of similar habitat in the surrounding area, and the implementation of avoidance, minimization, and mitigation measures.

3.2.2.1 EFH Species Least Likely to Experience Impacts

Of the species with EFH designated within the RWEC area, those that are least likely to experience impacts have both pelagic early and late life stages, only have EFH associated with pelagic environments, and/or do not have preferred habitat present in the RWF area. They include the species and life stages listed in Table 3.2-4 below.

Table 3.2-4 EFH Species Least Likely to Experience Impacts – RWEC

Table 3.2-4					
Species	**Egg**	**Larvae**	**Neonate**	**Juvenile**	**Adult**
New England Finfish					
Atlantic herring (*Clupea harengus*)		●		●	●
Pollock (*Pollachius virens*)				●	
Witch flounder (*Glyptocephalus cynoglossus*)	●	●			
Mid-Atlantic Finfish					
Atlantic butterfish (*Peprilus triacanthus*)	●	●		●	●
Atlantic mackerel (*Scomber scombrus*)	●	●		●	●
Bluefish (*Pomatomus saltatrix*)	●	●		●	●
Highly Migratory Species					
Albacore tuna (*Thunnus alalunga*)				●	●
Bluefin tuna (*Thunnus thynnus*)				●	●
Skipjack tuna (*Katsuwonus pelamis*)					●
Yellowfin tuna (*Thunnus albacares*)				●	●
Sharks					
Basking shark (*Cetorhinus maximus*)			●	●	●
Blue shark (*Prionace glauca*)			●	●	●
Common thresher shark (*Alopias vulpinus*)			●	●	●
Dusky shark (*Carcharhinus obscurus*)			●	●	●
Sand tiger shark (*Carcharias taurus*)			●	●	
Sandbar shark (*Carcharhinus plumbeus*)				●	●
Shortfin mako shark (*Isurus oxyrinchus*)			●	●	●
Smoothhound shark complex (Atlantic stock) (*Mustelus canis*)			●	●	●
White shark (*Carcharodon carcharias*)			●	●	●

3.2.2.2 EFH Species Most Likely to Experience Impacts

Of the species with EFH designated within the RWEC area that also have preferred habitat present, those with benthic/demersal early and/or late life stages are the most likely to experience impacts as a result of construction, O&M, and/or decommissioning of the RWEC. The species and associated life stages most likely to experience some level of short-term or long-term, direct or indirect impact are listed in Table 3.2-5 below.

Conversion of soft-bottom habitat to hard-bottom habitat associated with the cable protection may have a long-term beneficial effect on species with life stages with a preference for hard-bottom habitats (e.g., gravel, rock, boulders, artificial reefs), depending on the quality of the newly-created hard-bottom habitat, and the quality of the benthic community that colonizes that habitat. These species and life stages that may experience a long-term, beneficial effect are listed in Table 3.2-6.

Note that some species could experience both negative and beneficial impacts at different phases of the Project. Thus, the same species and life stages may appear in both Table 3.2-5 and Table 3.2-6.

Table 3.2-5 EFH Species Most Likely to Experience Negative Impacts – RWEC

Table 3.2-5					
Species	**Egg**	**Larvae**	**Neonate**	**Juvenile**	**Adult**
New England Finfish					
Atlantic cod (*Gadus morhua*)				●	●
Haddock (*Melanogrammus aeglefinus*)				●	
Monkfish (*Lophius americanus*)				●	●
Ocean pout (*Zoarces americanus*)	●			●	●
Red hake (*Urophycis chuss*)				●	●
Silver hake (*Merluccius bilinearis*)				●	●
White hake (*Urophycis tenuis*)				●	
Windowpane flounder (*Scophthalmus aquosus*)				●	●
Winter flounder (*Pseudopleuronectes americanus*)	●			●	●
Yellowtail flounder (*Limanda ferruginea*)				●	●
Mid-Atlantic Finfish					
Black sea bass (*Centropristis striata*)				●	●
Scup (*Stenotomus chrysops*)				●	●
Summer flounder (*Paralichthys dentatus*)				●	●
Invertebrates					
Atlantic sea scallop (*Placopecten magellanicus*)	●	●		●	●
Atlantic surfclam (*Spisula solidissima*)				●	●
Longfin inshore squid (*Doryteuthis pealeii*)	●				
Ocean quahog (*Arctica islandica*)				●	●
Skates					
Little skate (*Leucoraja erinacea*)				●	●
Winter skate (*Leucoraja ocellata*)				●	●
Sharks					
Spiny dogfish (*Squalus acanthias*)				● [1]	●

[1] Includes sub-adult males and sub-adult females.

Table 3.2-6 EFH Species That May Experience Beneficial Effects – RWEC

Table 3.2-6					
Species	**Egg**	**Larvae**	**Neonate**	**Juvenile**	**Adult**
New England Finfish					
Atlantic cod (*Gadus morhua*)				●	●
Haddock (*Melanogrammus aeglefinus*)				●	
Monkfish (*Lophius americanus*)				●	●
Ocean pout (*Zoarces americanus*)	●			●	●
Pollock (*Pollachius virens*)				●	
Red hake (*Urophycis chuss*)				●	●
Silver hake (*Merluccius bilinearis*)					●
Yellowtail flounder (*Limanda ferruginea*)					●
Mid-Atlantic Finfish					
Black sea bass (*Centropristis striata*)				●	●
Scup (*Stenotomus chrysops*)					●
Invertebrates					
Atlantic sea scallop (*Placopecten magellanicus*)	●	●		●	●
Longfin inshore squid (*Doryteuthis pealeii*)	●				
Skates					
Little skate (*Leucoraja erinacea*)				●	●
Winter skate (*Leucoraja ocellata*)				●	●

3.3 Proposed Environmental Protection Measures

To ensure that impacts associated with the RWF and RWEC are minimized, Revolution Wind will implement the following environmental protection measures to reduce potential impacts on finfish and EFH. These measures are based on protocols and procedures successfully implemented for similar offshore projects.

- To the extent feasible, installation of the IACs, OSS-Interlink Cable, and RWEC will occur using equipment such mechanical cutter, mechanical plow, or jet plow.
- To the extent feasible, the IAC, OSS-Link Cable, and RWEC will target a burial depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment.
- Dynamic Positioning (DP) vessels will be used for installation of the IAC, OSS-Link Cable, and RWEC to the extent practicable. DP vessels minimize seafloor impacts, as compared to use of a vessel relying on multiple anchors.
- A plan for vessels will be developed prior to construction to identify no-anchor areas to avoid documented sensitive resources.
- Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region.

- Revolution Wind will require all construction and operations vessels to comply with regulatory requirements related to the prevention and control of spills and discharges.
- Accidental spill or release of oils or other hazardous materials offshore will be managed through the Project's ERP/OSRP.
- A ramp-up or soft-start will be used at the beginning of each pile segment during impact pile driving and/or vibratory pile driving to provide additional protection to mobile species in the vicinity by allowing them to vacate the area prior to the commencement of pile-driving activities.
- Construction and operational lighting will be limited to the minimum necessary to ensure safety and compliance with applicable regulations.
- All vessels will comply with USCG and EPA regulations that require operators to develop waste management plans, post informational placards, manifest trash sent to shore, and use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Vessels will also comply with BOEM lease stipulations that require adherence to Notice to Lessee (NTL) 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process.

4.0 CONCLUSIONS

Project-related impacts on EFH would vary for different species and life stages based on several factors including their lifestyle, degree of dependence on the substrate, diet, habitat preferences, and the amount of suitable habitat present in the area. Most of the potential impacts on EFH will be temporary and reversible as natural processes are expected to return the disturbed areas to pre-construction conditions apart from new manmade structures on the seafloor and in the water column. In addition, the extent of anticipated habitat impact is small relative to the availability of similar habitat in the region.

Construction impacts will largely be associated with the disturbance of benthic habitats in the Project Area. Based on the results of a number of studies on benthic recovery (e.g., AKRF, Inc. et al., 2012; Germano et al., 1994; Hirsch et al., 1978; Kenny and Rees, 1994), the affected benthic communities in the disturbed area are expected to re-establish within 1 to 3 years as native assemblages recolonize the affected area or a new community develops as a result of immigration of organisms from nearby areas or from larval settlement. Regardless of foundation type(s) installed, existing habitats will be converted to hard substrate with installation of the WTG foundations (inclusive of scour protection) and with the installation of cable protection along the IAC, OSS-Link Cable, and RWEC. However, following construction, these areas of new hard substrate may be suitable for colonization by sessile benthic species and may provide additional habitat for fish and invertebrate species that inhabit hard bottom habitats. Beneficial effects for these species would be dependent on their habitat preferences, the quality of the newly-created hard-bottom habitat, and the quality of the benthic community that colonizes the new habitat. These long-term impacts would be reversed following decommissioning of the Project. Additional impacts on EFH from operations and maintenance of the RWF and RWEC would be primarily associated with routine and non-routine maintenance activities that may require excavation of sediment within a small area. The temporary displacement of these sediments would impact benthic and demersal EFH in the vicinity, but the impact would be limited considering the small area affected and the long period of time between maintenance activities. Operational impacts of vessel noise, traffic, and lighting are considered to be minimal relative to existing marine use activities in the area.

Decommissioning activities associated with the Project, similar to construction activities, will result in temporary disturbances to EFH and EFH species, but effects and recovery rates are expected to be similar to those described for construction.

The overall impacts on EFH associated with the construction, operation, and decommissioning of the RWF and RWEC are considered to be limited and are not likely to result in population-level effects on EFH species or life stages.

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Appendix R: Assessment of Impacts to Marine Mammals, Sea Turtles, and ESA-Listed Fish Species Revolution Wind Offshore Wind Farm

Technical Report

Assessment of Impacts to Marine Mammals, Sea Turtles, and ESA-Listed Fish Species Revolution Wind Offshore Wind Farm

October 2020
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Revolution Wind | Powered by Ørsted & Eversource

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Acronyms

AEP	auditory evoked potential
AMAPPS	Atlantic Marine Assessment Program for Protected Species
ASMFC	Atlantic States Marine Fisheries Commission
ASSRT	Atlantic Sturgeon Status Review Team
BIWF	Block Island Wind Farm
BOEM	Bureau of Ocean Energy Management
CETAP	Cetacean and Turtle Assessment Program
CFR	Code of Federal Regulation
COP	Construction and Operations Plan
CPA	closest point of approach
dB	decibel
DP	dynamic positioning
DPS	distinct population segment
EA	environmental assessment
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
$ER_{95\%}$	95th percentile exposure-based ranges
ESA	Endangered Species Act
EZ	exclusion zone
FHWG	Fisheries Hydroacoustic Working Group
HF	high-frequency
HRG	high-resolution geophysical
IAC	inter-array cable
IPF	impact producing factor
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
JASCO	JASCO Applied Sciences
Lease Area	Lease Area OCS-A 0486
LF	low-frequency
μPa	micropascal
MEC	munitions and explosives of concern
MF	mid-frequency
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MZ	monitoring zone
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMS	noise mitigation system

NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NYSDEC	New York State Department of Environmental Conservation
NYSERDA	New York State Energy Research and Development Authority
O&M	operation and maintenance
OnSS	onshore substation
OCS	Outer Continental Shelf
Orsted NA	Orsted North America Inc.
OSRP	Oil Spill Response Plan
OSS	offshore substation
OW	otariid pinnipeds in water
PAM	passive acoustic monitoring
PBR	potential biological removal
PCW	phocid carnivores in water
PK	zero-to-peak sound pressure level
PPW	phocid pinnipeds in water
Project	Revolution Wind Farm Project
PSMMP	Protected Species Mitigation and Monitoring Plan
PSO	protected species observer
PTS	permanent threshold shift
re	referenced to
Revolution Wind	Revolution Wind, LLC
RI-MA WEA	Rhode Island-Massachusetts Wind Energy Area
RWEC	Revolution Wind Farm Export Cable
RWEC - OCS	Revolution Wind Farm Export Cable on the Outer Continental Shelf
RWEC - RI	Revolution Wind Farm Export Cable in Rhode Island state waters
RWF	Revolution Wind Farm
SAR	stock assessment report
SEL	sound exposure level
SEL_{24h}	sound exposure level over 24 hours
SL	source level
SMA	Seasonal Management Area
SPL	root-mean-square sound pressure level
TEWG	Turtle Expert Working Group
TTS	temporary threshold shift
UME	Unusual Mortality Event
U.S.	United States
USFWS	U.S. Fish and Wildlife Service
UXO	unexploded ordnance
VHF	very high-frequency
VLF	very low-frequency
WTG	wind turbine generator

1.0 INTRODUCTION

Revolution Wind, LLC (Revolution Wind) (formerly DWW REV I, LLC), a 50/50 joint venture between Orsted North America Inc. (Orsted NA) and Eversource Investment LLC, proposes to construct, own, and operate the Revolution Wind Farm Project (hereinafter referred to as the Project). The wind farm portion of the Project will be located in federal waters on the Outer Continental Shelf (OCS) in the designated Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0486 (Lease Area). The Lease Area is approximately 30 km south of the coast of Rhode Island (**Figure 1.1-1** in **Section 1.1** of the Project's Construction and Operations Plan [COP]). Other components of the Project will be located in state waters of Rhode Island and onshore in North Kingstown, Rhode Island. The proposed interconnection location for the Project is the existing Davisville Substation, which is owned and operated by National Grid and located in North Kingstown, Rhode Island.

The Project will specifically include the following offshore and onshore components:

- Up to 100 wind turbine generators (WTGs) connected by a network of Inter-Array Cables (IACs);
- Up to two offshore substations (OSSs) connected by an OSS-Link Cable;
- Up to two submarine export cables (referred to as the Revolution Wind Export Cable [RWEC]), generally co-located within a single corridor;
- A landfall location located at Quonset Point in North Kingstown, Rhode Island (referred to as the Landfall Work Area);
- Up to two underground transmission circuits (referred to as the Onshore Transmission Cable), co-located within a single corridor; and
- A new Onshore Substation (OnSS) located adjacent to the existing Davisville Substation with up to two interconnection circuits (overhead or underground) connecting the OnSS to the existing substation.

The Project's components are further grouped into four general categories: the Revolution Wind Farm (RWF), inclusive of the WTGs, OSSs, IAC, and OSS-Link Cable; the RWEC – OCS inclusive of up to 40 km of the RWEC in federal waters; the RWEC – RI, inclusive of up to 37 km of the RWEC in state waters; and Onshore Facilities, inclusive of an up to 100-m segment of the RWEC, Landfall Work Area, Onshore Transmission Cable, and OnSS (including interconnection circuits). These categories collectively are referred to in this report as the Project Area.

1.1 Contents of Technical Report

This Technical Report is intended to provide the reader with a substantial overview of the baseline conditions in the Project Area as they pertain to marine mammals, sea turtles, and fish species listed under the Endangered Species Act (ESA). The Technical Report is designed to provide supplemental information for the Project-related impact producing factors (IPFs) discussed in **Sections 4.3.3.2**, **4.3.4.2**, and **4.3.5.2** of the Project's COP that have the potential to result in greater than negligible impacts on marine mammals, sea turtles, or Atlantic sturgeon. For the purposes of this report, negligible impacts are defined as those that, if perceptible, would not result in measurable impacts on the potentially affected resources. IPFs which may result in greater than negligible impacts were determined to be habitat alteration, underwater noise, and vessel traffic. (see **Table 1.2-1**). The underwater noise IPF is treated in more detail in this report because the affected resources are known to be vulnerable to potential impacts from underwater noise. The assessment of underwater noise impacts resulting from the construction for the Project are largely based on the underwater acoustic analysis conducted by JASCO Applied Sciences (JASCO) (Denes et al., 2020). Impact assessments for underwater noise produced during operations and maintenance (O&M), and decommissioning are based on literature and assessment of similar activities. A summary of the proposed environmental protection measures, which will be implemented during Project activities to reduce the potential for impacts, is also provided in **Section 5.5**.

1.2 Regulatory Context and Resource Definition

The Project's COP provides the basis for assessed environmental and socioeconomic effects resulting from the Proposed Activities (**Section 3.0** of the COP) during construction, O&M, and decommissioning of the Project. It is prepared in accordance with 30 Code of Federal Regulation (CFR) Part 585, BOEM's Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (BOEM, 2016), and other BOEM policy, guidance, and regulations (**Section 1.1** of the COP). The underwater acoustic propagation and animal exposure modeling results presented in the Underwater Acoustic Analysis report (Denes et al., 2020), in combination with the assessment provided in this Technical Report, are intended to provide BOEM with the necessary information to evaluate their permitted actions under the National Environmental Policy Act (NEPA) and Marine Mammal Protection Act (MMPA). As discussed in **Section 1.4** of the Project's COP, NEPA requires that Federal actions undertake an environmental assessment (EA) to produce an Environmental Impact Statement (EIS) to determine impacts to resources.

The resources of interest in this Technical Report include marine mammals, sea turtles, and ESA-listed fish species. All marine mammals are protected under the MMPA; some species are also listed as Endangered under the ESA (**Section 2.2.1**). Sea turtle and fish species included in this assessment are listed as either Endangered or Threatened under the ESA (**Section 2.2.2** and **Section 2.2.3**). The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share regulatory responsibility for these species under the MMPA and ESA. The MMPA requires any Project Activities that may produce noise be assessed for the potential "take" of marine mammals, as defined in the MMPA, and provided to NMFS for approval. ESA species will also be assessed under Section 7 inter-agency consultations between BOEM and NMFS for all activities that have the potential to affect listed species. The information presented in both the Project's COP and this Technical Report will provide the basis for these MMPA and ESA consultations.

1.3 Significance Threshold

Resources may be vulnerable to one or more IPF. Each IPF that has the potential to impact marine mammals, sea turtles, or Atlantic sturgeon were assessed in **Sections 4.3.3.2**, **4.3.4.2**, and **4.3.5.2** of the Project's COP. In the analysis for the Technical Report, IPFs associated with each resource were first categorized as: 1) having greater than negligible impacts (i.e., measurable, either negative or beneficial) and require analysis; 2) having negligible impacts to a resource (i.e., an impact that if perceptible, is not measurable); or 3) no expected impacts on the resource (i.e., no perceptible impact to a resource is evident). Those IPFs assessed in the COP which had the potential to result in greater than negligible impacts to the resources are further discussed in this Technical Report (**Table 1.2-1**). Supplementary information regarding the affected resources and potential impacts is provided to further support the impact assessment provided in the COP. There are multiple sources of noise during all phases of RWF development; however, not all sources have equivalent impact potential on a given resource. Therefore, each source is discussed separately in the Technical Report to allow the reader an understanding of the underwater noise components that contribute to the overall impact determination for the underwater noise IPF.

Table 1.2-1. Summary of impact producing factors (IPFs) included in the Technical Report for marine mammals, sea turtles, and fish during construction, operation, or decommissioning of the Revolution Wind Farm and Revolution Wind Farm Export Cable.

Resource	IPF							
	Habitat Alteration	Underwater Noise						Vessel Traffic
		DP Vessel Noise	Impact Pile Driving Noise	Vibratory Pile Driving Noise	Geophysical Survey Noise	WTG Operational Noise	Aircraft Noise	
Marine Mammals	+/++	+	+	-	-	+	-	+
Sea Turtles	+/++	-	+	-	-	-	-	+
Atlantic Sturgeon	-	-	+	-	-	-	-	+

+ indicates a greater than negligible impact; ++ indicates a potential beneficial impact; - indicates negligible or no impact expected; DP = dynamic positioning; WTG = wind turbine generator.

Broad significance criteria were developed for the three resources addressed in this Technical Report. In order to assess the potential impacts, the IPFs were characterized as either direct or indirect, and short-term or long-term (as defined in **Section 4.0** of the Project's COP) primarily using the following four parameters:

- Detectability (i.e., measurable or detectable impact);
- Duration (i.e., short-term, long-term);
- Spatial extent (i.e., localized, extensive); and
- Severity (i.e., severe, less than severe).

Elements such as distribution, range, life history, sensitivity to the IPF, and potential outcomes of the impact were considered for each resource. The significance evaluations in **Sections 4.3.3.2**, **4.3.4.2**, and **4.3.5.2** of the Project's COP considered the potentially affected environment and the degree of the impact following NEPA regulations (40 CFR § 1501.3). The potentially affected area for a particular IPF considers the extent (i.e., national, regional, or local) of the effect and any special circumstances affecting resources within this area (e.g., ESA-listings or designated habitat). The degree of an impact considers the severity of the effect based on whether impacts are short-term or long-term, beneficial or adverse. The evaluation process also assessed the risk or likelihood (i.e., likely, not likely) of an effect to occur based on species' expected presence and perception of an IPF by the resource.

During the preparation of the impact assessment, each impact determination was accompanied by a statement or statements explaining how the impact determination was reached. The determinations were based on the best available information. Data or information from referenced journals used to support each determination were cited, as applicable, and professional judgement by experienced subject matter experts and impact analysts was considered in each evaluation. The impact assessment in **Section 5.0** of this Technical Report provides additional information intended to justify the assessment in **Sections 4.3.3.2**, **4.3.4.2**, and **4.3.5.2** of the Project's COP, with a focus on the duration of impacts (i.e., short-term, long-term) and identifying if impacts were direct or indirect, as defined in **Section 4.0** of the Project's COP. The impact determination process was designed to assess impacts at a population-scale rather than an individual-scale. Potential impacts to species listed as Endangered or Threatened under the ESA and marine mammal stocks listed as strategic by NMFS were given greater "weight" than impacts to non-listed species or non-strategic marine mammal stocks.

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2.0 UNDERWATER NOISE AS AN IPF

This document follows International Organization for Standardization (ISO) 18405:2017 (ISO, 2017) for all acoustic terminology. Acoustic terminology used in this report are provided in **Table 2.0-1**.

Table 2.0-1. Acoustic terminology used in this report based on International Organization for Standardization 18405 (ISO, 2017).

Metric Name	Abbreviation	Units
Root-mean-square sound pressure level	SPL	dB re 1 μPa
Zero-to-peak sound pressure level	PK	dB re 1 μPa
Sound exposure level	SEL	dB re 1 μPa^2 s
Sound exposure level over 24 hours	SEL_{24h}	dB re 1 μPa^2 s
Source level	SL	dB re 1 μPa m

dB = decibel; μPa = micropascal; re = referenced to.

Underwater noise generated by construction, operations, and decommissioning of an offshore wind farm can be assessed in the framework of impacts that may have physical or behavioral consequences for the animal exposed to the noise; or impacts that result in changes to the acoustic habitats (**Section 2.2**) from the introduction of man-made noise sources into the marine environment. Noise generated by human activities may be introduced into the environment for a specific purpose (e.g., navigational sonar, seismic exploration), or as an indirect by-product of activities such as shipping, pile driving, and other industrial activities. The propagation characteristics of these various noise sources are determined by the local physical and environmental conditions, while the perception of the noise by an animal "receiver" will be largely dependent upon individual hearing sensitivities. Outside of physiological effects, impacts on marine species from man-made noise are largely influenced by the context within which the noise is perceived by the animal.

2.1 Sources of Noise in the Project Area

Noise contributing to the acoustic habitat of the Rhode Island-Massachusetts Wind Energy Area (RI-MA WEA) is produced by both natural processes and offshore human activities within this region. Ambient noise sources can typically be divided into three general categories: physical, biological, and anthropogenic.

Physical Noise

The dominant cause of naturally occurring noise in the ocean resulting from physical processes occurs at or near the ocean surface in the form of wind and wave activity. As shown in **Figure 2.1-1**, noise produced by wind and waves are generally correlated with one another and fall within the 100 Hz to 100 kHz frequency band. Ambient noise levels tend to increase with increasing wind speed and wave height (Urick, 1962; Wenz, 1964; Erbe, 2011). In the frequency band between 3 and 30 MHz, "thermal noise" caused by the random motion of water molecules is the primary source contributing to ambient noise levels (Urick, 1962; Wenz, 1964; Hildebrand, 2009). Natural noise sources, especially noise from wave and tidal action, contribute to higher ambient noise levels typically found in shallower coastal environments.

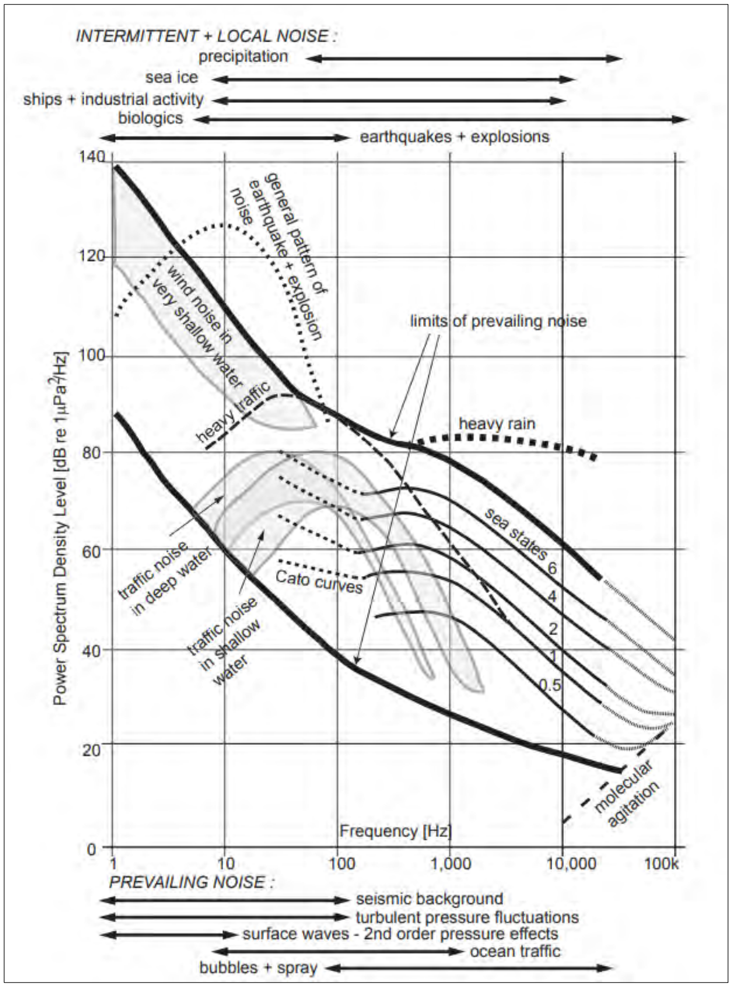

Figure 2.1-1. Wenz curve showing frequency and amplitude range of common sources of noise in the ocean. Figure from Erbe (2011) based on work from Wenz (1964).

Precipitation falling on the ocean's surface also contributes to natural noise in ocean environments. In general, noise from rain or hail is an important component of total noise at frequencies >500 Hz during periods of precipitation (**Figure 2.1-1**). Rain can increase natural ambient noise levels by up to 35 decibels (dB) across a broad range of frequencies from several hundred Hz to more than 20 kHz (National Research Council [NRC], 2003; Richardson et al., 1995). Heavy precipitation associated with large storms can generate noise at frequencies as low as 100 Hz and can significantly affect ambient noise levels at considerable distances from the storm's center (NRC, 2003). Movement of sediment by ocean currents across the ocean bottom can also be a significant source of ambient noise at frequencies from 1 kHz to over 200 kHz (NRC, 2003).

Biological Noise

Biological noise is created by marine animals and can contribute significantly to ambient noise levels in certain areas of the ocean. Marine mammals are major contributors, but noise produced by some crustaceans (e.g., snapping shrimp [Alpheidae]) and vocalizing fish can also be significant (NRC, 2003; Richardson et al., 1995).

Surveys conducted in the RI-MA WEA indicate that delphinids are the most commonly observed species in this region. Vocalizations from these mid- to high- frequency species can influence the local ambient noise conditions for short periods of time (Varga et al., 2017). Reported mid-frequency species include common bottlenose dolphins (*Tursiops truncatus*), common dolphins (*Delphinus delphis*), Risso's dolphins (*Grampus griseus*), Atlantic white-sided dolphins (*Lagenorhynchus acutus*), Atlantic spotted dolphins (*Stenella frontalis*), and long-finned pilot whales (*Globicephala melas*) (BOEM, 2013; Kraus et al., 2016). These species were observed during all seasons, with the highest number of recorded sightings in summer and fall. Harbor porpoises (*Phocoena phocoena*), the only high frequency species likely to occur in the Project Area, were also observed in this region, primarily in winter and spring (Kraus et al., 2016).

Acoustic detections of large whale species indicated that fin whales (*Balaenoptera physalus*) were the most commonly detected cetacean species in the RI-MA WEA, but humpback (*Megaptera novaeangliae*), minke (*Balaenoptera acutorostrata*), blue (*Balaenoptera musculus*), and North Atlantic right whale (*Eubalaena glacialis*) calls were also detected (BOEM, 2013; Kraus et al., 2016). Large whale vocalizations were primarily detected in the winter and spring, but fin and humpback whales were detected in all seasons, and minke whales showed a peak acoustic presence in May (BOEM, 2013; Kraus et al., 2016). Although there were no confirmed acoustic detections during the recording period, visual surveys indicated that sei whales (*Balaenoptera borealis*) were also present in the spring and summer, and sperm whales (*Physeter macrocephalus*) in the summer and autumn (Kraus et al., 2016). Baleen whale vocalizations have a marked effect on long term spectral average data with increases of up to 15 dB above ambient noise levels attributed to seasonal congregations of whales (Haver et al., 2018).

Fish vocalizations were also a substantial source of biological noise observed in this region. Series of buzzes, grunts, and thumps from unidentified fish species were heard primarily between December and February (Martin et al., 2014). The only identifiable fish call was detected between June and August, described as a jack-hammer sound, that was thought to correspond to striped cusk eel (*Ophidion marginatum*) vocalizations (Martin et al., 2014).

<u>*Anthropogenic noise*</u>

Vessels are a primary source of anthropogenic noise and contribute to ambient ocean noise, predominantly in low-frequency (LF) bands under 500 Hz (Hildebrand, 2009; NRC, 2003). A large portion of the noise from vessels comes from engine noise and propeller cavitation (Richardson et al., 1995). In the open water, vessel noise can influence ambient noise levels at distances of thousands of kilometers; however, the effects of vessel noise in shallower shelf and coastal waters are more variable due to physical and geological properties of the seabed, sea surface, and water column which influence reflection, refraction, and absorption and thus propagation, of noise in the water.

Underwater noise sources associated with Project Activities include impact and vibratory pile driving, geophysical surveys, and Project-related aircraft operations during the construction phase; vessels with and without dynamic positioning (DP) thrusters used during all Project phases; and WTG operations during the O&M phase. The potential for impacts on marine species from noise produced by these activities is highly dependent on the equipment scenarios and the context in which species perceive or are exposed to each noise source or activity.

The following sections provide further information about Project-related noise sources, and the corresponding acoustic characteristics and measurements based on previous assessments and published literature for all noise-producing Project Activities, and the results presented in the underwater acoustic analysis report (Denes et al., 2020) for impact pile driving activities.

2.1.1 Vessel Noise

Vessel noise is characterized as low frequency, typically <1,000 Hz with peak frequencies between 10 and 50 Hz, non-impulsive rather than impulsive like impact pile driving, and continuous, meaning there are no substantial pauses in the noise that vessels produce. The acoustic signature produced by a vessel varies based on the type of vessel (e.g., tanker, bulk carrier, tug, container ship) and vessel characteristics (e.g., engine specifications, propeller dimensions and number, length, draft, hull shape, gross tonnage, speed). Large shipping vessels and tankers produce lower frequency noise with a primary energy near 40 Hz and underwater source levels (SLs) for these commercial vessels can range from 177 to 188 dB referenced to (re) 1 micropascal (μPa) m (McKenna et al., 2012). Smaller vessels typically produce higher frequency noise (1,000 to 5,000 Hz) at SLs between 150 and 180 dB re 1 μPa m (Kipple and Gabriele, 2003, 2004). Vessels using DP thrusters are known to generate substantial underwater noise with SLs ranging from 150 to 180 dB re 1 μPa m depending on operations and thruster use (BOEM, 2013; McPherson et al., 2016). While vessel noise was not modeled for this Project, qualitative information about vessel noise which may be produced during Project activities is provided in the underwater acoustic analysis report (Denes et al., 2020).

2.1.2 Aircraft Noise

As discussed in **Section 4.1.4.1** of the Project's COP, helicopters will be used during construction and O&M activities to support crew transfers. Noise produced in air can be transmitted into the water column. Noise from a Bell 212 helicopter measured from a hydrophone deployed at 18 m depth showed frequencies ranged up to 340 Hz with received root-mean-square sound pressure levels (SPL) in the 10 to 500 Hz frequency band of approximately 106 dB re 1 μPa (Patenaude et al., 2002). Received SPL were generally higher at 3 m depth than 18 m depth by an average of 2.5 dB and decreased further as the altitude of the helicopter increased and speed decreased (Patenaude et al., 2002).

2.1.3 Impact Pile Driving Noise

Impact pile driving produces high intensity sound pulses at levels capable of producing injury to marine animals (Halvorsen et al., 2012a,b; NMFS, 2018; Popper et al., 2014). Subsequent effects from impact pile driving noise are dependent upon the physical characteristics of the environment, which influence noise propagation, receiver species, and the implementation and effectiveness of environmental protection measures (**Section 5.5**) such as noise attenuation systems. Impact pile driving noise produced from foundation installation is expected to fall predominately within LF bandwidths (below 1,000 Hz); however, Bailey et al. (2010) measured broadband noise within 1 km of impact pile driving in the Moray Firth off the coast of Ireland.

Noise produced during impact pile driving is a primary concern with respect to underwater noise impacts from RWF construction. Revolution Wind will use hydraulic (impact) hammers to install monopile foundations for the WTGs and either jacket or monopile foundations for the OSSs.

Environmental and seabed conditions, hammer type, and the size and type of pile will affect noise propagation and the estimated ranges to regulatory criteria. Due to the complexity of noise propagation generated from impact pile driving activities, modeled distances to acoustic thresholds often differ from field-measured distances and highlight the site-specific nature of noise propagation and impact radii during pile installation. While models and measurements from one project are not fully applicable across other similar projects, they do provide general information useful for predicting potential impacts during similar activities.

Modeled and *in situ* underwater noise measurements for jacket pile installation of the Block Island Wind Farm showed variability by distance and sample methods (Amaral et al., 2018). Similarly, Patricio et al. (2014) measured noise produced during impact pile driving for the Westernmost Rough Wind farm and compared modeled results to field measurements. The study found that modeled distances to injury criteria thresholds ranged from 15 to 300 m from the pile, while distances based on field measurements ranged from 200 to 1,500 m from the pile for cetaceans. Field measurements of offshore wind pile driving in Europe were summarized by Bellmann et al. (2020) and provide some of the most relevant information regarding sound levels expected during impact pile driving at RWF. Results from the Bellmann et al. (2020) measurements showed that piles without a noise mitigation system (NMS)(e.g., bubble curtain) produced noises with frequencies predominately within 32 Hz to 2 kHz and produced measured cumulative 24-h sound exposure levels (SEL_{24h}) up to 175 dB re 1 μPa^2 s at 750 m from the pile. When a single or combined NMS was applied to monopile installation, noise reductions ranging from 3 dB to 17 dB were achieved depending on the NMS combination, with some frequency-dependent reductions of >20 dB (Bellmann et al., 2020).

To help identify the potential for impacts to marine species, site-specific acoustic propagation modeling was conducted for impact pile driving for the Project, as described by Denes et al. (2020), and results of this modeling effort, as they are applied to impact assessment in this Technical Report are summarized in **Section 4.2**.

2.1.4 Vibratory Pile Driving Noise

Vibratory pile driving produces a non-impulsive, intermittent noise with maximum sound levels lower than those generated by impact pile driving (Popper et al., 2014). Measurements from vibratory pile driving of sheet piles during construction activities for bridges and piers indicate that SPL produced by this activity can range from 130 to 170 dB re 1 μPa depending on the measured distance from the source and physical properties of the location (Buehler et al., 2015; Illingworth & Rodkin, 2017). At approximately 10 m from the source, the average SPL was approximately 155 dB re 1 μPa, while measurements taken 200 m away were closer to 140 dB re 1 μPa (Illingworth & Rodkin, 2017). SEL over 1 s measured at 10 m from the source were approximately 162 dB re 1 μPa^2 s (Buehler et al., 2015).

2.1.5 Geophysical Survey Noise

Prior to construction of the RWF and RWEC, geophysical surveys will be conducted to identify any seabed debris or munitions and explosives of concern and unexploded ordnances (MEC/UXOs) (**Section 3.3** of the Project's COP). Equipment used to conduct MEC/UXO surveys may include multi-beam echosounders, side-scan sonars, shallow penetration sub-bottom profilers, medium penetration sub-bottom profilers, and marine magnetometers or gradiometers. Equipment will be comparable to those used during high-resolution geophysical (HRG) site investigation surveys conducted in the region (CSA Ocean Sciences Inc., 2018, 2020; Feehan and Daniels, 2018). Estimated distances to SPL of 160 dB re 1 μPa resulting from HRG equipment ranged from a maximum of 141 m to less than 5 m depending on the source (CSA Ocean Sciences Inc., 2018, 2020).

As discussed in **Section 3.3.3.2** of the Project's COP, avoidance is the preferred approach for MEC/UXOs, and in any situation in which avoidance is not possible, the confirmed MEC/UXO may be removed through *in situ* disposal or physical relocation. The removal method used will depend on the location, size, and condition of the MEC/UXO, and will be made in consultation with specialists and the appropriate agencies. *In situ* disposal will be done using methods such as deflagration or cutting of the MEC/UXO and relocation will be accomplished through a "Lift and Shift" operation, both of which are expected to be low-noise methods (**Section 3.3.3.2** of the Project's COP). The risk mitigation measures in place will be used to avoid munitions and prevent the potential for underwater explosions if removal of any MEC/UXOs is warranted; therefore, only noise associated with the HRG surveys is evaluated for impact assessment.

2.1.6 Wind Turbine Generator Operational Noise

WTGs primarily produce two types of noise: aerodynamic turbine blade noise and mechanical noise (Minerals Management Service [MMS], 2007). Mechanical noise may be transmitted underwater through the turbine towers and foundations producing underwater SPL noise levels between 80 and 150 dB re 1 μPa and can increase noise in frequencies below 100 Hz by 3 to 10 dB (Bergström et al., 2014; HDR, 2019). A study by Miller and Potty (2017) measured an SPL of 100 dB re 1 μPa 50 m from a set of five GE Haliade 150-6 MW wind turbines with a peak signal frequency 72 Hz. Other studies estimated SLs of operational noise from WTGs ranging from 125 to 130 dB re 1 μPa m across all octave bands (Lindeboom et al., 2011; Tougaard et al., 2009). Maximum SPL occurred in the 25 Hz one-third octave band for a 450-kW turbine during normal operations (Lindeboom et al., 2011; Tougaard et al., 2009).

In a compilation of case studies published by BOEM in 2017 (English et al., 2017), similar noise levels were identified:

- The one-third octave SPL were measured between 90 to 115 dB re 1 μPa 110 m from a 1.5-MW turbine in Sweden (Thomsen et al., 2006). The frequency range was 20 to 1,000 Hz with peak energy levels occurring at 50, 160, and 200 Hz.
- Pangerc et al. (2016) found the main signal associated with 3.6 MW turbine operations had a mean-square power spectral density level that peaked at 126 dB re 1 μPa^2 Hz^{-1} at the 162 Hz one-third octave band, and a broadband SPL of 128 dB re 1 μPa 50 m from the source at wind speeds of 10 m/s.
- Collett and Mason (2014) found that noise from operating 6 MW turbines dropped to ambient levels at approximately 100 m from the turbine.
- Noise associated with the 6 MW turbines at the Block Island Wind Farm were below SPL of 120 dB re 1 μPa measured 50 m from the turbines, except at wind speeds exceeding 13 m/s (HDR, 2019).

While underwater noise from turbines has been measured within the hearing frequency of marine animals, impacts at the anticipated noise levels would be limited to audibility, and perhaps some degree of behavioral response or auditory masking (MMS, 2007). Behavioral responses include changes in foraging, socialization, or movement, while auditory masking could impact foraging and predator avoidance. Due to the long-expected duration of this source and the low likelihood of impacts to marine animals, turbine noise was not included in the acoustic model presented by Denes et al. (2020). However, potential impacts from this noise source using published literature are discussed in **Section 3.3**.

2.2 Acoustic Habitat within the Project Area

The term acoustic habitat is defined here as the environment within which an animal perceives and transmits acoustic cues important for foraging, reproduction, socialization, and predator avoidance. Various natural and anthropogenic activities contribute noise to the ocean, creating a complex acoustic habitat. An animal's acoustic habitat is made up of concomitant noises generated biologically (biophony), physically (geophony), or anthropogenically (anthrophony) that create regional ambient noise conditions through which discrete signals must be sent and gathered by animals adapted to living in acoustically-dominated habitats. Changes in the acoustic habitat can therefore change an animal's ability to function within its environment. Acoustic habitats are not stagnant and will vary both temporally and spatially on large and small scales. Variations in the ambient noise level as a function of frequency can change by as much as 10 to 20 dB from day-to-day based on variations in the noise sources (Richardson et al., 1995; Kraus et al., 2016). Large- and small-scale temporal fluctuations (e.g., daily, seasonal) in the acoustic habitat and species vocalization patterns may influence or directly affect temporal patterns in animal communication systems and detections of other acoustic cues.

Marine animals can perceive underwater noise over a broad range of frequencies from about 10 Hz to more than 200 kHz. Where there is an overlap in the frequencies produced by anthropogenic noise sources and core frequencies used or produced by marine life, there is the potential for noise to interfere with their biological functions. The primary acoustic habitat for any species will fall within the bounds of that species' specific vocal and hearing ranges, and it is those primary acoustic habitats that were assessed when characterizing potential impacts. While many species hearing sensitivities overlap, there is evidence that acoustic habitats may be partitioned by species to maximize access to the necessary acoustic habitat (Gottesman et al., 2020). Resource partitioning may be viewed on a frequency-band or temporal basis as well as an energy basis (Ruppé et al., 2015; Gottesman et al., 2020). Ruppé et al. (2015) documented apparent resource partitioning in the acoustic communication behavior of a community of nocturnal marine fishes, in which 17 distinctive sounds that differed in peak frequency and pulsing characteristics were recorded. Furthermore, the sounds produced by soniferous species during the day did not overlap with those produced by nocturnal species and were far less diverse, indicating that the acoustic habitat use was maximized when visual resource use was less important (Hastings and Širović, 2015).

Acoustic habitats can be represented by plotting the ratios of sound energy within selected frequency bandwidths for the habitat of interest. The acoustic habitat and changes within that habitat are demonstrated by shifts in the dominant frequency range and by increases or decreases in sound energy within selected bandwidths. Modeled soundscapes and sound maps, such as those provided in National Oceanographic and Atmospheric Administration's (NOAA's) sound data mapping products (NOAA, 2019), are generated by incorporating environmental (e.g., bathymetric, oceanographic), biological, and anthropogenic noise data then modeling the noise propagation over space and time. These models represent the basis for assessing acoustic habitats and are the baseline for a potential impact analysis to species due to the introduction of acoustic sources, such as those expected during offshore wind farm construction and operations, within that environment.

The ambient noise analysis for the RI-MA WEA was provided by Kraus et al. (2016) through the deployment of passive acoustic recorders from 2011 through 2015, and with dedicated recorders deployed specifically within the RI-MA WEA between 2013 and 2015. The acoustic data were analyzed for both ambient noise levels and biological signals. In the analyses, Kraus et al. (2016) built power spectral densities, which provided the received SPL within selected frequency bands, and the cumulative distribution, which provided the percentage of time that noise within a selected frequency band reached specific SPL. The cumulative distribution enables analysis of the acoustic habitat available within a species' specific vocal range. Kraus et al. (2016) used a frequency band of 20 to 447 Hz to capture the acoustic habitat of LF cetaceans. By correlating the ambient SPL within this band with the average SPL of the LF cetacean calls, some predictions can be made regarding acoustic habitat availability and potential masking.

As shown in **Figure 2.2-1**, Kraus et al. (2016) found that the power spectrum levels above 200 Hz did not differ greatly among the nine recording sites; however, sites that were closest to shipping lanes showed an increase in power spectrum levels for spectral content below 100 Hz. The site labeled RI-3, centrally located within the Project Lease Area, had one of the lowest overall ambient noise levels with an increase around the 20 Hz frequency band, which was attributed to persistent fin whale vocal pulses. For frequencies between 70.8 and 224 Hz, the RI-3 site recorded SPL of 95 dB re 1 μPa or less for 40% of the recoding time, and SPL of 104 dB re 1 μPa or greater for only 10% of the recording time.

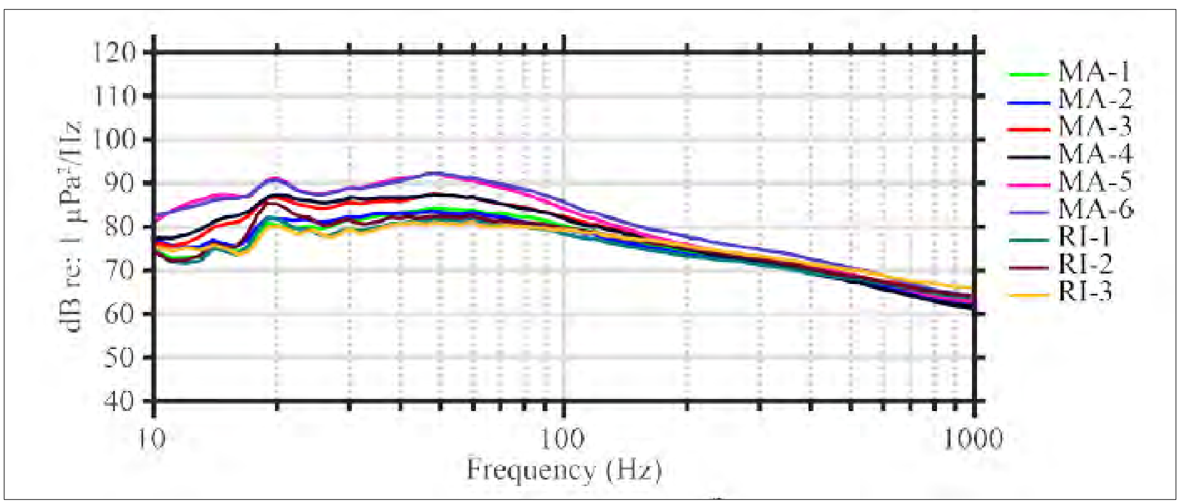

Figure 2.2-1. Power spectral density plot showing the 50th percentile power spectrum levels for each recording site within the Rhode Island-Massachusetts Wind Energy Area between November 2011 and March 2015. The yellow line labeled RI-3 represents the hydrophone located centrally within the Project Lease Area. From: Kraus et al. (2016).

Amaral et al. (2018) collected ambient noise measurements during quiet periods of impact pile driving activities for the Block Island Wind Farm (BIWF) offshore Rhode Island. Results show SPL range from 107.4 dB re 1 µPa 30 km east of the BIWF site to 118.7 dB re 1 µPa within 1 km of the site (Amaral et al., 2018). Power spectral density plots (**Figure 2.2-2**) showed higher noise levels in frequencies between 30 and 300 Hz attributed to vessel and equipment noise from BIWF construction activities (Amaral et al., 2018).

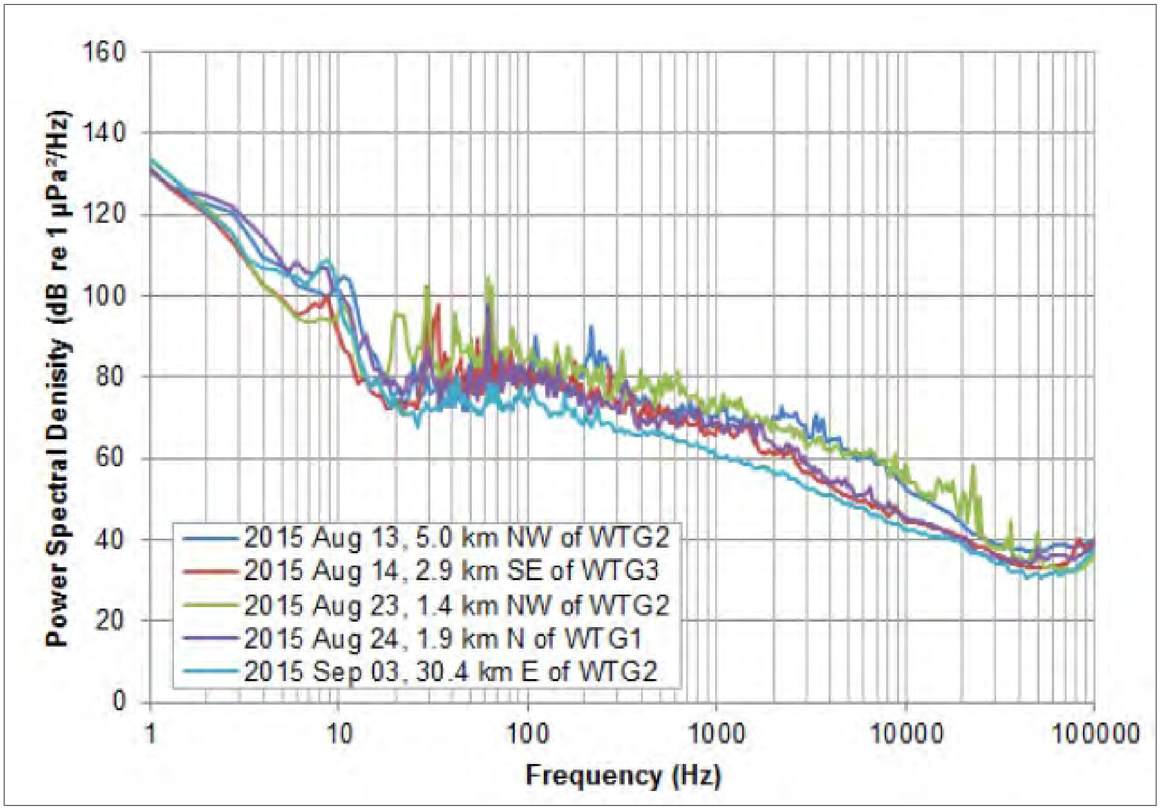

Figure 2.2-2. Power spectral density plot of ambient noise measurements collected within the vicinity of the Block Island Wind Farm. From Amaral et al. (2018).

2.3 Potential Impacts from Underwater Noise

Two primary components of underwater noise important for impact assessment include pressure and particle motion. Pressure can be characterized as the compression and rarefaction of the water as the noise wave propagates through it. Particle motion is the displacement, or back and forth motion, of the water molecules that creates the compression and rarefaction. Both factors contribute to the potential for impacts to affected resources from underwater noise. However, marine mammal and sea turtle hearing is based on the detection of sound pressure, and there is no evidence to suggest either group is able to detect particle motion for the purposes of hearing and noise detection (Bartol and Bartol, 2012; Nedelec et al., 2016). All discussions of particle motion are therefore focused on fish and invertebrate species.

All fishes can detect and use particle motion (Popper and Hawkins, 2019). The organ located in the inner ear of fishes contains a dense structure called the otolith (i.e., ear stone), which lies near the auditory sensory macula (i.e., layer of sensory hair cells). The otolith organ acts as an accelerometer and enables detection of particle motion. Particularly fish with primitive swim bladders that are not involved in hearing, like Atlantic sturgeon, particle motion is thought to play a key role in detection of underwater noise (Hawkins and Chapman, 2020). However, measurements of sensitivity to particle motion and pressure were rarely performed simultaneously, leaving a data gap in the understanding of particle motion sensitivity in fish

(Popper and Hawkins, 2018). Additionally, particle motion levels associated with a high intensity noise sources are often difficult to measure and isolate from sound pressure levels (Popper and Hawkins, 2018). There is currently very limited understanding of the potential effects of particle motion on fish and invertebrates, and it is expected that particle motion associated with impulsive noise sources, such as impact pile driving, will have similar effects to pressure waves in fish species.

Currently, there are no accepted thresholds for particle motion for any noise-producing Project Activities from which the potential for impact may be assessed. Therefore, information available on particle motion detection in fish and invertebrate species is provided in the following subsections for reference, but the impact assessment in **Section 5.0** of this report focuses on the pressure component of underwater noise.

Underwater noise is the primary IPF expected to result from construction of the RWF and RWEC. Acoustic impacts can be generalized for marine mammals, sea turtles, and Atlantic sturgeon based on the type of source (i.e., impulsive versus non-impulsive). The general impacts of hearing threshold shifts, acoustic injury (i.e., barotrauma), auditory masking, stress and behavioral responses, and reduction in prey availability are discussed in the sections below. While most available references focus on impacts on marine mammal species, the general impact categories also apply to sea turtles and Atlantic sturgeon.

2.3.1 Hearing Threshold Shifts

The minimum sound level an animal can hear at a specific frequency is called a hearing threshold. Sound levels above a hearing threshold are accommodated until a certain level of noise intensity or duration is reached, after which the ear's hearing sensitivity decreases (i.e., the hearing threshold increases) (Southall et al., 2007). This process is referred to as a threshold shift, meaning that only noises louder than a certain level will be heard within a given frequency range following the shift. Threshold shifts can be temporary (TTS) or permanent (PTS) and are defined as follows (Au and Hastings, 2008; NMFS, 2018; Southall et al., 2007):

- TTS – also known as auditory fatigue, is the milder form of hearing impairment, or threshold shift, that is non-permanent and reversible. It results from exposure to high intensity noises for short durations or lower intensity noises for longer durations. Both conditions are species-specific, and lead to an elevation in the hearing threshold, meaning it is more difficult for an animal to hear noises. TTS can last for minutes, hours, or days; the magnitude of the TTS depends on the level (frequency and intensity), energy distribution, and duration of the noise exposure, among other considerations.
- PTS – is a permanent elevation in hearing threshold (i.e., permanent loss of hearing), which is considered an auditory injury. PTS is attributed to exposure to very high peak sound pressure levels (PK) and rapid increases in intensity, or very prolonged or repeated exposures to noise strong enough to elicit TTS. Permanent damage to the inner ear such as irreparable damage to sensory hair cells in the cochlea is associated with noise-induced PTS. Because few direct data are currently available regarding noise levels that might induce PTS in marine mammals, sea turtles, and fish, PTS onset thresholds are inferred from TTS onset data (NMFS, 2018; Popper et al., 2014). For impulsive sources, dual metric criteria, PK and cumulative 24-h sound exposure level (SEL_{24h}), are often used to define PTS onsets, as well as the incorporation of applicable frequency weighting functions (e.g., M-weighting for marine mammals) to account for the differential hearing abilities in the different functional hearing groups or species (NMFS, 2018; Popper et al., 2014).

Auditory impairment, either temporary or permanent, is a possibility when animals are exposed to underwater noise. The minimum PK or SEL_{24h} necessary to reach the onset of PTS is higher than the level that indicates onset of TTS, although data are insufficient to determine the precise difference. Data indicate that TTS onset in animals is more closely correlated with the received SEL_{24h} than with the PK and that received sound energy over time, not just the single strongest pulse, should be considered a primary measure of potential impact (NMFS, 2018; Southall et al., 2007).

2.3.2 Barotrauma

Acoustic injury can occur in marine mammals, sea turtles, and fish exposed to rapid pressure changes that can theoretically be realized within close proximity to an impulsive noise source such as impact pile driving. However, barotrauma is typically only associated with explosives when considering impacts to marine mammals and sea turtles; therefore, it is only discussed within the context of impacts on fish for this Technical Report as they are the only species that could potentially be within the proximity of impact pile driving to receive the pressure changes necessary to induce barotrauma during Project construction.

Acoustic injury to fish from exposure to impulsive noise would likely be associated with barotrauma (Carlson, 2012; Halvorsen et al., 2012a, b). Barotrauma results from rapid and instantaneous changes in the ambient pressure level in the water as well as within the fluids and tissue of the animal, causing physical injury to soft tissue and organs. Barotrauma injuries in fish involve the swim bladder or dissolved gases in the blood and tissues. It can cause ruptured capillaries and internal hemorrhaging to the organs, fins, or eyes, hematoma, and a deflated or ruptured swim bladder. Depending on the affected tissues or organs, the resulting injuries may be mild (e.g., external fin hematoma; deflated, but not ruptured swim bladder), moderate (e.g., renal, intestinal, muscular hematoma), or lethal (e.g., pericardial or cerebral hemorrhage, gill embolism, ruptured swim bladder) (Brown et al., 2012; Christian, 1973; Gaspin, 1975; Goertner, 1978; Rummer and Bennett, 2005; Yelverton et al., 1975).

Some fishes, such as sturgeon and salmonids, can voluntarily release the gas from their swim bladder. The ability to rapidly vent swim bladder gas means that when the swim bladder is under pressure during an acoustic event, these fishes can decrease the volume of swim bladder gas, thereby partially protecting themselves from barotrauma injuries (Brown et al., 2016).

A controlled exposure laboratory study by Halvorsen et al. (2012a) exposed several fish species to an underwater SEL_{24h} ranging from 204 to 216 dB re 1 μPa^2 s. At SEL_{24h} >210 dB re 1 μPa^2 s, lake sturgeon (*Acipenser fulvescens*), whose swim bladder is not involved in hearing like Atlantic sturgeon, experienced recoverable barotrauma injuries characterized by hematomas on the swim bladder, kidney, and intestine, and a partially deflated swim bladder, but showed no external or mortal injuries. Conversely, Nile tilapia (*Oreochromis niloticus*) have a swim bladder that is involved in hearing, and they were shown to be more vulnerable to barotrauma at a relatively lower SEL_{24h}. They exhibited recoverable injuries including gonadal and swim bladder hematoma at 207 to 210 dB re 1 μPa^2 s, and lethal injuries such as a ruptured swim bladder and renal hemorrhage at 213 to 216 dB re 1 μPa^2 s. By contrast, no internal or external barotrauma injuries were observed at any of the SEL_{24h} for hogchoker (*Trinectes maculatus*), a flatfish that lacks a swim bladder (Halvorsen et al., 2012a). Although this study was conducted in a controlled laboratory setting, it replicated acoustic conditions in the field.

Barotrauma injuries may be more extensive in fish exposed to fewer hammer blows at higher energy versus a greater number of hammer blows at lower energy, even when the SEL_{24h} are equivalent. In a study by Halvorsen et al. (2012b), juvenile Chinook salmon (*Oncorhynchus tshawytscha*) were exposed to underwater SEL_{24h} ranging from 204 to 220 dB re 1 μPa^2 s and PK ranging from 199 to 213 dB re 1 μPa. The fish exposed to SEL_{24h} between 213 and 220 dB re 1 μPa^2 s and PK between 210 and 213 dB re 1 μPa exhibited a greater number of barotrauma injuries, specifically those that were classified as moderate or having the potential to cause lethal effects.

Overall, it is more likely that fish will experience sub-lethal impacts that increase the possibility for delayed mortality (Hawkins et al., 2014). Because the majority of Project construction sources produce LF noise that is within the sensitive hearing range of most fish, and most of the sources are non-impulsive, the potential for fish to experience TTS, masking, and behavioral impacts is higher than acoustic injury or mortality.

2.3.3 Auditory Masking

In addition to affecting hearing through physical injury, noise can partially or completely reduce an individual's ability to effectively transmit and receive acoustic signals important for detecting predator, prey, conspecific signals, and environmental features associated with spatial orientation (Clark et al., 2009). This phenomenon is defined as auditory masking, where a reduction in the detectability of a sound signal of interest (e.g., communication calls, echolocation) occurs due to the presence of another sound, which is usually part of ambient noise in the environment, that often occurs for sounds with similar frequency ranges. Under normal circumstances, in the absence of high ambient noise levels, an animal would hear a sound signal if it is above its absolute hearing threshold. Auditory masking prevents part or all of a sound signal from being heard and decreases the distances over which sounds can be detected by an animal (i.e., reduction in communication space). These effects could cause a long-term decrease in an animal's efficiency at foraging, navigating, or communicating (International Council for the Exploration of the Sea [ICES], 2005). For some marine mammal species, specifically common bottlenose dolphins, beluga whales (*Delphinapterus leucas*), and killer whales (*Orcinus orca*), empirical evidence confirms that the degree of masking depends strongly on the relative directions at which noise arrives and the characteristics of the masking noise (Bain et al., 1993; Bain and Dahlheim, 1994; Dubrovskiy, 1990; Penner et al., 1986).

Ambient noise from natural and anthropogenic sources can result in masking for marine animals, effectively interfering with the ability of an animal to detect a sound signal that it otherwise would hear. Spectral, temporal, and spatial overlap between the masking sound and the signal of interest determines the extent of interference, the greater the spectral and temporal overlap, the greater the potential for masking. As discussed in **Section 2.1**, naturally occurring ambient noise is produced by various sources, including environmental noise from wind, waves, and precipitation; thermal noise resulting from molecular agitation (at frequencies above 30 kHz); and biological noise produced by animals (Richardson et al., 1995). Biological sounds are commonly produced by fish, for example, which create LF sounds (50 to 2,000 Hz, most often from 100 to 500 Hz) that can be a significant component of local acoustic habitats (Martin et al., 2014; Zelick et al., 1999). Anthropogenic sources known to contribute to ambient noise levels can include vessels, sonar (military and commercial), geophysical surveys, acoustic deterrent devices, construction noise, and scientific research sensors. Ambient noise is highly variable in the shallower waters over continental shelves where many anthropogenic activities occur, effectively enabling anthropogenic noise to cover a wide range of sound levels and frequencies in these habitats (Desharnais and Hazen, 1999).

In coastal waters, noise from boats and ships, particularly commercial vessels, is the predominant source of anthropogenic noise (Parks et al., 2011). Over the past 50 years, commercial shipping, the largest contributor of anthropogenic noise (McDonald et al., 2008), has increased the ambient noise levels in the deep ocean at LFs by 10 to 15 dB re 1 μPa (Hatch and Wright, 2007). This increase in LF ambient noise coincides with a significant increase in the number and size of vessels making up the world's commercial shipping fleet (Hildebrand, 2009). Tournadre (2014) estimated from satellite altimetry data that, globally, vessel traffic grew by approximately 60% from 1992 to 2002 at a nearly constant rate of approximately 6% per year; however, after 2002, the rate of increase in vessel traffic rose steadily to more than 10% by 2011, except in 2008 and 2009 when traffic remained steady. The highest estimated rate of growth in vessel traffic was in the Indian and western North Pacific Oceans, especially in the continental seas along China; the rate of growth in shipping in the Atlantic Ocean and Mediterranean Sea, however, decreased after 2008.

2.3.4 Stress and Behavioral Responses

Stress and behavioral changes are the result of marine animals responding to extreme or excessive disturbances in their environment, either of natural or anthropogenic origin. Stress responses can be manifested as a physiological reaction such as changes in an animal's blood chemistry while behavioral responses involve changes in an animal's normal actions.

Marine mammals have been shown to respond to environmental stress by releasing hormones into their bloodstream and measuring changes in an animal's blood chemistry can determine whether there is a stress response. Stress responses in marine mammals are immediate, acute, and characterized by the release of neurohormones such as norepinephrine, epinephrine, and dopamine (Office of Naval Research, 2009). The NRC (2003) examined acoustically induced stress in marine mammals and determined that a one-time exposure to noise was less likely to have detrimental population-level effects than repeated exposure over extended periods of time. Various researchers have summarized the available evidence regarding stress induced events in marine mammals (e.g., Cowan and Curry, 2008; Eskesen et al., 2009; Mashburn and Atkinson, 2008; Romano et al., 2004).

Romano et al. (2004) examined the levels of three stress-related blood hormones (norepinephrine, epinephrine, and dopamine) in a beluga whale after exposure to varying PK signals produced by a seismic water gun between 198 and 226 dB re 1 µPa. Hormone levels were measured after a control, low-level sound, and a high-level sound exposure. No significant differences in the hormone blood concentrations were found between the control and low-level sound exposure, but elevated levels of all three hormones were measured in response to the high-level sound exposure. Furthermore, a regression analysis demonstrated a linear trend between increased hormone levels in the blood and sound levels. They also noted that no quantitative approach to estimating changes in mortality or fecundity due to stress has been identified, but qualitative effects may include increased susceptibility to disease and early termination of pregnancy.

Following the terrorist attacks of September 11, 2001, shipping traffic dramatically decreased in the Bay of Fundy, Canada, resulting in a 6-dB decrease in ambient underwater noise levels, including a significant reduction in frequencies below 150 Hz associated with vessel traffic. Decreased baseline levels of stress-related hormone metabolites in North Atlantic right whales were also observed during this period, which was thought to be the result of reduced noise levels (Rolland et al., 2012). This reduction in ambient noise levels associated with shipping was the first evidence that exposure to LF noise from shipping may be associated with chronic stress in whales, particularly North Atlantic right whales (Rolland et al., 2012).

Anthropogenic noise in aquatic environments has also been demonstrated to elicit a stress response in fish. This response has been measured in terms of short-term (i.e., <1 h) indicators such as a startle response, increased gill ventilation, increased heart rate and blood pressure, increased plasma cortisol and glucose levels, and increased oxygen intake, as well as long-term (i.e., days to months) indicators including reduced foraging, growth and reproductive fitness, diminished immune response, and increased vulnerability to predation (Bruintjes et al., 2016a,b; Sierra-Flores et al., 2015; Simpson et al., 2016; Smith et al., 2004). Increased levels of cortisol have been reported in giant kelpfish (*Heterostichus rostratus*) in response to vessel noise, and cod (*Gadus* spp.) exposed to linear frequency sweeps of sufficient amplitude (Slabbekoorn et al., 2019). Temporary stressors such as impact pile driving and vessel noise may cause a short-term stress response in fish, but the potential for these activities to cause longer term growth and fitness consequences has not been demonstrated in a field setting. In general, fish may acclimate to long-term exposure to acoustic stressors (Schreck, 2000). Goldfish (*Carassius auratus*) exposed to long-term, continuous noise sources, such as the hum or vibration of vessel traffic at SPL of 160 to 170 dB re 1 µPa, exhibited a short-term stress response characterized by increased cortisol and glucose levels, but they did not exhibit a long-term stress response (Smith et al., 2004). Additionally, Neo et al. (2014) indicated that the temporal nature of the noise may influence the rate of recovery following behavioral disturbance. Both intermittent (e.g., pile driving) and continuous (e.g., vessel traffic, drilling) noises elicited behavioral changes in fish, but the time it took to return to normal baseline behavior was longer in response to intermittent noises compared to continuous noises (Neo et al., 2014).

Disturbances can also cause subtle to extreme changes in normal behavior, with some behavioral responses resulting in biologically significant consequences. Behavioral responses including startle, avoidance (i.e., changes in swim speed and direction), displacement, diving, and vocalization alterations have been observed in marine animals. In some cases, these have occurred at ranges of tens to hundreds of kilometers from the noise source (Gordon et al., 2004; Miller et al., 2014; Tyack, 2008). However, behavioral observations are variable, some findings are contradictory, and the biological significance of the effects are not fully quantified (Gordon et al., 2004). Behavioral reactions of animals to noise are difficult to predict because reactions depend on numerous factors, including the species being evaluated; the animal's state of maturity, prior experience with or exposure to anthropogenic noises, current activity patterns, and reproductive state; time of day; and weather state (Wartzok et al., 2004). There is also the potential for differences in observed responses among individuals of the same species (Castellote et al., 2014). If a marine mammal reacts to underwater noise by changing its behavior or moving to avoid the noise, the impacts of that change may not be important to the individual, the stock, or the population as a whole. However, if a noise source displaces animals from an important feeding or breeding area, impacts on individuals and the population could be significant.

For marine mammals, assessing the severity of behavioral effects associated with anthropogenic noise exposure presents unique challenges due to the inherent complexity of behavioral responses and the contextual factors affecting them, both within and between individuals and species. Severity of responses can vary depending on characteristics of the noise source including whether it is moving or stationary, the number and spatial distribution of noise source(s), its similarity to predator sounds, and other relevant factors (Barber et al., 2010; Bejder et al., 2009; Ellison et al., 2012; NRC, 2005; Richardson et al., 1995; Southall et al., 2007).

Many examples have been reported of individuals of the same species exposed to the same noise reacting differently (Nowacek et al., 2004), as well as different species reacting differently to the same noises (Bain and Williams, 2006). Odontocetes appear to exhibit a greater variety of reactions to anthropogenic noise than mysticetes. Odontocete reactions can vary from approaching vessels (e.g., bow riding) to strong avoidance. Richardson et al. (1995) noted that most small and medium-sized odontocetes exposed to prolonged or repeated underwater noises are unlikely to be displaced unless the overall received SPL is at least 140 dB re 1 μPa.

Limited data exist on sound levels that may induce stress or behavioral changes in sea turtles, and no data exist on population impacts from acoustic disturbance in sea turtles (Nelms et al., 2016). Lavender et al. (2011) collected behavior audiograms from sea turtles and found that loggerheads (*Caretta caretta*) may be more sensitive to behavioral disturbance from underwater noise than electrophysiological studies suggest. Avoidance responses by sea turtles to seismic signals have been observed at received SPL between 166 and 179 dB re 1 μPa (McCauley et al., 2000); however, these studies were done in a caged environment, so the extent of avoidance could not be fully monitored. During experiments using airguns to repel sea turtles from dredging operations, Moein et al. (1995) observed a habituation effect to seismic noises; the animals stopped responding to the signal after three presentations, although it was not clear whether this was a result of behavioral habituation or physical effects from TTS or PTS. The potential effects of impulsive noise on sea turtles are likely to be varied and sometimes cryptic (Nelms et al., 2016). The frequency and duration of exposure are not discussed in the available literature; however, this topic is important when determining the level of risk to sea turtles.

2.3.5 Reduction of Prey Availability

There are limited data on hearing mechanisms and potential effects of noise on prey species of marine mammals and sea turtles (i.e., crustaceans, cephalopods, fish). These species have been increasingly researched as concern has grown related to noise impacts on the food web. Invertebrates appear to be able to detect both sound pressure and particle motion (André et al., 2016; Budelmann, 1992; Solé et al., 2016, 2017) and are most sensitive to LF noises (Budelmann and Williamson, 1994; Lovell et al., 2005a,b; Mooney et al., 2010; Packard et al., 1990). Reduction of prey fish availability could affect marine mammals and sea turtles if rising sound levels affect fish populations and alter prey abundance, behavior, and distribution (McCauley et al., 2000; Popper and Hastings, 2009; Slabbekoorn et al., 2010).

Cephalopods (i.e., octopus, squid) and decapods (i.e., lobsters, shrimps, crabs) are capable of sensing both particle motion and sound pressure at lower frequencies. Packard et al. (1990) showed that three species of cephalopod (common cuttlefish [*Sepia officinalis*], common octopus [*Octopus vulgaris*], and European squid [*Loligo vulgaris*]) were sensitive to particle motion rather than sound pressure, with the highest sensitivity to particle motion reported at 1 to 2 Hz. In longfin squid (*Loligo pealeii*), Mooney et al.

(2010) also observed responses to particle motion at lower frequencies between 100 and 300 Hz and also observed responses to sound pressure at 200 Hz. These data indicate that some prey species may be responding to both the particle motion and pressure component of LF noises, but thresholds for physiological or behavioral responses to particle motion in invertebrates are not currently available.

Potential onset thresholds for both physiological and behavioral respones to the pressure component of underwater noise are available in published literature. Solé et al. (2017) showed that SPL ranging from 139 to 142 dB re 1 µPa at one-third octave bands centered at 315 Hz and 400 Hz may be suitable threshold values for trauma onset from sound pressure in cephalopods. Hearing thresholds for sound pressure at higher frequencies have been reported, such as 134 and 139 dB re 1 µPa at 1,000 Hz for the oval squid (*Sepioteuthis lessoniana*) and the common octopus, respectively (Hu et al., 2009). Cephalopods have also exhibited behavioral responses to low frequency noises (<1,000 Hz) including inking, locomotor responses, body pattern changes, and changes in respiratory rates (Kaifu et al., 2008; Hu et al., 2009). McCauley et al. (2000) reported that of caged squid exposed to seismic airguns showed behavioral responses such as inking. Wilson et al. (2007) exposed two groups of longfin squid in a tank to killer whale echolocation clicks at SPL from 199 to 226 dB re 1 µPa, which resulted in no apparent behavioral effects or any acoustic debilitation. However, both the McCauley et al. (2000) and Wilson et al. (2007) experiments used caged squid, so it is unclear how unconfined animals would react. André et al. (2011) exposed four cephalopod species (European squid, common cuttlefish, common octopus, and Southern shortfin squid [*Ilex coindetii*]) to 2 h of continuous noise from 50 to 400 Hz at received SPL of 157 dB re 1 µPa, and reported lesions occurring on the sensory hair cells of the statocyst that increased in severity with time, suggesting that cephalopods are particularly sensitive to LF noise. Similarly, Solé et al. (2013) conducted an LF (50 to 400 Hz) controlled exposure experiment on two deep-diving squid species (Southern shortfin squid and European squid), which resulted in lesions on the statocyst epithelia. Solé et al. (2013) described their findings as "morphological and ultrastructural evidence of a massive acoustic trauma induced by…low-frequency sound exposure." In experiments conducted by Samson et al. (2014), common cuttlefish exhibited escape responses (i.e., inking, jetting) when exposed to frequencies between 80 and 300 Hz with SPL above 140 dB re 1 µPa, and they habituated to repeated 200 Hz noises. The intensity of the cuttlefish response with the amplitude and frequency of the noise stimulus suggest that cuttlefish possess loudness perception with a maximum sensitivity of approximately 150 Hz (Samson et al., 2014). Jones et al. (2020) exposed longfin inshore squid (*Doryteuthis pealeii*) to playbacks of impact pile driving recorded at the Block Island Wind Farm ranging from approximately 190 to 194 dB re 1 µPa, which were meant to match sound levels recorded 500 m from the piles. Most of the squid tested showed alarm behavior (e.g., inking, jetting, body pattern change), but the proportion of the trial in which squid exhibited these behaviors decreased substantially following the first 30 impulses of the playback, indicating the squid may become habituated to the noise (Jones et al., 2020).

Several species of aquatic decapod crustaceans are also known to produce sounds. Popper et al. (2001) reviewed behavioral, physiological, anatomical, and ecological aspects of noise and vibration detection by decapod crustaceans and noted that many decapods also have an array of hair-like receptors within and upon the body surface that potentially respond to water- or substrate-borne displacements as well as proprioceptive organs that could serve secondarily to perceive vibrations. They concluded that many are able to detect substratum vibrations at sensitivities sufficient to tell the proximity of mates, competitors, or predators (Popper et al., 2001). However, the acoustic sensory system of decapod crustaceans remains poorly studied (Popper et al., 2001). Lovell et al. (2005a,b, 2006) reported potential auditory-evoked responses from prawns (*Palaemon serratus*) that showed auditory sensitivity of noises from 100 to 3,000 Hz. Filiciotto et al. (2016) also reported behavioral responses to vessel noise within this frequency range. Lovell et al. (2005b) found that the greatest sensitivity for prawns was an SPL of 106 dB re 1 µPa at 100 Hz, noting that this was the lowest frequency at which they tested and that prawns might be more sensitive at frequencies below this.

Marine fish are typically sensitive to the 100 to 500 Hz range, which is within the range of noise produced by impact pile driving, and several studies have demonstrated that seismic airguns and impulsive sources might affect the behavior of at least some species of fish. For example, field studies by Engås et al. (1996) and Løkkeborg et al. (2012) showed that the catch rate of haddock (*Melanogrammus aeglefinus*) and Atlantic cod (*Gadus morhua*) significantly declined over 5 days immediately following seismic surveys, after which the catch rate returned to normal. Other studies found only minor responses by fish to noise created during or following seismic surveys, such as a small decline in lesser sand eel (*Ammodytes marinus*) abundance that quickly returned to pre-seismic levels (Hassel et al., 2004) or no permanent changes in the behavior of marine reef fishes (Wardle et al., 2001). However, both Hassel et al. (2004) and Wardle et al. (2001) noted that when fish sensed the airgun firing, they performed a startle response and sometimes fled.

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3.0 DESCRIPTION OF AFFECTED RESOURCES

The expected occurrence of each species in the Project Area is based on information provided in EAs conducted by BOEM offshore Rhode Island and Massachusetts (BOEM, 2013, 2014); regional surveys such as the Northeast Large Pelagic Survey, the Atlantic Marine Assessment Program for Protected Species (AMAPPS), or the Cetacean and Turtle Assessment Program (CETAP) (CETAP, 1982; Kraus et al., 2016; Palka et al., 2017); stock information from NMFS and USFWS available for the region; density and other available information from published literature. Vulnerability of each species to potential impacts is determined based on the status of the stock (i.e., ESA- or MMPA-listing) and relevant publications indicating responses from previous exposures to similar activities. Available information was applicable to both the RWF and RWEC (including both the RWEC – OCS and RWEC – RI), so assessment methods did not differ between to the two Project Components. As discussed in the Project's COP (**Sections 4.3.3.1**, **4.3.4.1**, and **4.3.5.1**), impacts associated with the Onshore Facilities are not expected to occur to affected resources, and this Project Component will not be discussed further.

3.1 Marine Mammals

There are 36 marine mammal species in the Western North Atlantic OCS Region whose ranges include the Northeastern U.S. region where the Project will be located (BOEM, 2013, 2014). The marine mammal assemblage comprises cetaceans (whales, dolphins, and porpoises), pinnipeds (seals), and sirenians (manatee).

There are 31 cetacean species, including 25 members of the suborder Odontoceti (toothed whales, dolphins, and porpoises) and 6 of the suborder Mysticeti (baleen whales) within the region.

Along with cetaceans, there are also four phocid species (true seals) that are known to occur in the region, including harbor seals (*Phoca vitulina*), gray seals (*Halichoerus grypus*), harp seals (*Pagophilus groenlandica*), and hooded seals (*Cystophora cristata*) (Hayes et al., 2020). Finally, one species of sirenian, the Florida manatee (*Trichechus manatus latirostris*), is an occasional visitor to the region during the summer months (USFWS, 2019).

The protection status, stock identification, and abundance estimates of each marine mammal species with geographic ranges that include the Northeastern U.S. region are provided in **Table 3.1-1**. Density data are also available from Roberts et al. (2018) and Roberts (2020) for this region, but are not provided at this time because these data may be updated between now and final submission of the COP used by BOEM to prepare the EIS. Density estimates for the Project Area will be provided prior to this final COP submission. **Table 3.1-1** evaluates the potential occurrence of marine mammals in the Project Area based on five categories defined as follows:

- **Common** – Occurring consistently in moderate to large numbers;
- **Regular** – Occurring in low to moderate numbers on a regular basis or seasonally;
- **Uncommon** – Occurring in low numbers or on an irregular basis;
- **Rare** – Records for some years but limited; and
- **Not expected** – Range includes the Project Area, but due to habitat preferences and distribution information, species are not expected to occur in the Project Area although records may exist for adjacent waters.

Table 3.1-1. Marine mammals with geographic ranges that include the Northeastern U.S. region and their relative occurrence in the Project Area (Bureau of Ocean Energy Management, 2013, 2014; U.S. Fish and Wildlife Service [USFWS], 2019; National Marine Fisheries Service [NMFS], 2020a).

Common Name	Scientific Name	Stock	Current Population Status	Relative Occurrence in the RWF	Relative Occurrence in the RWEC – OCS	Relative Occurrence in the RWEC – RI	Best Abundance Estimate[1]
Order Cetacea							
Suborder Mysticeti (baleen whales)							
Fin whale	*Balaenoptera physalus*	Western North Atlantic	ESA Endangered MMPA Depleted and Strategic RI State Endangered	Common	Common	Common	6,802
Sei whale	*Balaenoptera borealis*	Nova Scotia	ESA Endangered MMPA Depleted and Strategic	Regular	Uncommon	Uncommon	6,292
Blue whale	*Balaenoptera musculus*	Western North Atlantic	ESA Endangered MMPA Depleted and Strategic	Rare	Not Expected	Not Expected	402
North Atlantic right whale	*Eubalaena glacialis*	Western North Atlantic	ESA Endangered MMPA Depleted and Strategic RI State Endangered	Common	Common	Common	412
Minke whale	*Balaenoptera acutorostrata*	Canadian East Coast	MMPA Non-strategic	Common	Common	Common	21,968
Humpback whale[2]	*Megaptera novaeangliae*	Gulf of Maine	MMPA Non-strategic[2] RI State Endangered	Common	Common	Common	1,393
Suborder Odontoceti (toothed whales, dolphins, and porpoises)							
Sperm whale	*Physeter macrocephalus*	North Atlantic	ESA Endangered MMPA Depleted and Strategic	Common	Common	Regular	4,349
Pygmy sperm whale	*Kogia breviceps*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	7,750
Dwarf sperm whale	*Kogia sima*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	7,750
Northern bottlenose whale	*Hyperoodon ampullatus*	Western North Atlantic	MMPA Non-strategic	Not Expected	Not Expected	Not Expected	Unknown
Cuvier's beaked whale	*Ziphius cavirostris*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	5,744
Mesoplodont beaked whales	*Mesoplodon spp.*	Western North Atlantic	MMPA Depleted	Rare	Rare	Rare	10,107
Killer whale	*Orcinus orca*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	Unknown

Common Name	Scientific Name	Stock	Current Population Status	Relative Occurrence in the RWF	Relative Occurrence in the RWEC – OCS	Relative Occurrence in the RWEC – RI	Best Abundance Estimate[1]
False killer whale	*Pseudorca crassidens*	Western North Atlantic	MMPA Strategic	Rare	Rare	Rare	1,791
Pygmy killer whale	*Feresa attenuata*	Western North Atlantic	MMPA Non-strategic	Not Expected	Not Expected	Not Expected	Unknown
Short-finned pilot whale	*Globicephala macrorhynchus*	Western North Atlantic	MMPA Strategic	Rare	Rare	Rare	28,924
Long-finned pilot whale	*Globicephala melas*	Western North Atlantic	MMPA Strategic	Common	Uncommon	Uncommon	39,215
Melon-headed whale	*Peponocephala electra*	Western North Atlantic	MMPA Non-strategic	Not Expected	Not Expected	Not Expected	Unknown
Risso's Dolphin	*Grampus griseus*	Western North Atlantic	MMPA Non-strategic	Common	Uncommon	Uncommon	35,493
Common dolphin	*Delphinus delphis*	Western North Atlantic	MMPA Non-strategic	Common	Common	Common	172,974
Fraser's dolphin	*Lagenodelphis hosei*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	Unknown
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Western North Atlantic	MMPA Non-strategic	Common	Common	Common	93,233
White-beaked dolphin	*Lagenorhynchus albirostris*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	536,016
Pantropical spotted dolphin	*Stenella attenuata*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	6,593
Clymene dolphin	*Stenella clymene*	Western North Atlantic	MMPA Non-strategic	Not Expected	Not Expected	Not Expected	4,237
Striped dolphin	*Stenella coeruleoalba*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	67,036
Atlantic spotted dolphin	*Stenella frontalis*	Western North Atlantic	MMPA Non-strategic	Uncommon	Uncommon	Uncommon	39,921
Spinner dolphin	*Stenella longirostris*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	4,102
Rough toothed dolphin	*Steno bredanensis*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	136
Common bottlenose dolphin	*Tursiops truncatus*	Western North Atlantic, offshore	MMPA Non-strategic	Common	Common	Common	62,851
		Western North Atlantic, northern migratory coastal	MMPA Depleted and strategic	Rare	Rare	Rare	6,639
Harbor Porpoise	*Phocoena*	Gulf of Maine/Bay of Fundy	MMPA Non-strategic RI State SGCN	Common	Common	Common	95,543

Common Name	Scientific Name	Stock	Current Population Status	Relative Occurrence in the RWF	Relative Occurrence in the RWEC – OCS	Relative Occurrence in the RWEC – RI	Best Abundance Estimate[1]
Order Carnivora							
Suborder Pinnipedia							
Harbor seal	*Phoca vitulina*	Western North Atlantic	MMPA Non-strategic RI State SGCN	Regular	Regular	Regular	75,834
Gray seal	*Halichoerus grypus*	Western North Atlantic	MMPA Non-strategic	Regular	Regular	Regular	27,131
Harp seal	*Pagophilus groenlandica*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	Unknown
Hooded seal	*Cystophora cristata*	Western North Atlantic	MMPA Non-strategic	Rare	Rare	Rare	Unknown
Order Sirenia							
Florida manatee[3]	*Trichechus manatus latirostris*	-	ESA Threatened MMPA Depleted and Strategic	Rare	Rare	Rare	13,000[4]

- = not applicable; ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act; Project Area = includes the Revolution Wind Farm (RWF), Revolution Wind Export Cable (RWEC) – Outer Continental Shelf (OCS) and RWEC – Rhode Island (RI) state waters, and Onshore Facilities; SGCN = Species of Greatest Conservation Need.
[1]Best abundance estimate from the Draft 2020 Marine Mammal Stock Assessment Report, published by NMFS (NMFS, 2020a).
[2]Globally there are 14 Distinct Population Segments of humpback whale, four of which are listed as Endangered under the ESA. The Gulf of Maine population which is expected to occur in the Project Area is not listed under the ESA.
[3]Under management jurisdiction of USFWS rather than NMFS and therefore not included in Draft 2020 Stock Assessment Report.
[4]Current range-wide estimate from USFWS (2019).

Of the 36 marine mammal species with geographic ranges that include the Northeastern U.S. region, 15 species can be reasonably expected to reside, traverse, or routinely visit the Project Area in densities that could result in impacts from Proposed Activities, and therefore, be considered *potentially affected species*. Species not expected or rare are not carried forward in this Technical Report. The following affected species are those that have a common, uncommon, or regular relative occurrence in the Project Area, or have a very wide distribution with limited distribution or abundance details.

- Fin whale;
- Sei whale;
- North Atlantic right whale;
- Minke whale;
- Humpback whale;
- Sperm whale;
- Long-finned pilot whale
- Atlantic spotted dolphin;
- Atlantic white-sided dolphin;
- Common dolphin;
- Risso's dolphin;
- Common bottlenose dolphin;
- Harbor porpoise;
- Harbor seal; and
- Grey seal.

The following subsections summarize data on the status and trends, distribution and habitat preferences, behavior and life history, and auditory capabilities of ESA-listed and non-listed marine mammals expected to occur in the Project Area as available in published literature and reports, including NMFS marine mammal stock assessment reports (SARs). Expected occurrence for each species within the RWF area and RWEC corridor, including both the RWEC – OCS and RWEC – RI areas, was assessed separately.

3.1.1 ESA-listed Species

Six species known to occur in the Western North Atlantic are listed under the ESA; these include the fin whale (Endangered), sei whale (Endangered), blue whale (Endangered), North Atlantic right whale (Endangered), sperm whale (Endangered), and Florida manatee (Threatened). Of these six species, only the fin whale, sei whale, North Atlantic right whale, and sperm whale are expected to occur in the Project Area and are considered potentially affected species. These species are highly migratory and do not spend extended periods of time in a localized area. The following sections provide further information regarding species behavior and expected occurrence in the RWF and two RWEC areas (RWEC – OCS and RWEC – RI).

Fin Whale

Fin whales have a wide distribution and can be found in the Atlantic and Pacific Oceans in both the Northern and Southern Hemisphere (NMFS, 2020a). The population is divided by ocean basins; however, these boundaries are arbitrary as they are based on historical whaling patterns rather than biological evidence (NMFS, 2020a). In the Northeastern U.S., fin whales are the most commonly sighted species and account for 47% of the large whale sightings in the region (CETAP, 1982). They have been observed in all four seasons, and their distribution ranges from the Mid-Atlantic coast to Nova Scotia in Western North Atlantic OCS waters (Kenney and Vigness-Raposa, 2010).

Fin whales are often confused with other balaenopterid whales (e.g., blue whale, sei whale) during field surveys, but can be distinguished by the white, v-shaped patterns on their back behind the head (Jefferson et al., 1993). Fin whales also produce characteristic vocalizations that can be distinguished during passive acoustic monitoring (PAM) surveys (BOEM, 2013; Erbe et al., 2017). The most commonly observed calls are the "20-Hz signals," a short downsweep falling from 30 to 15 Hz over a 1-sec period. Fin whales can also produce higher frequency sounds up to 310 Hz, and SLs as high as 195 dB re 1 µPa m have been reported, making it one of the most powerful biological sounds in the ocean (Erbe et al., 2017). Anatomical modeling based on fin whale ear morphology suggests their greatest hearing sensitivity is between 20 Hz and 20 kHz (Cranford and Krysl, 2015; Southall et al., 2019).

Fin whales are listed as Endangered under the ESA and by the state of Rhode Island, and are listed as Vulnerable by the International Union for Conservation of Nature (IUCN) Red List (NMFS, 2020a; Rhode Island Department of Environmental Management [RI DEM], 2020; IUCN, 2021). The best abundance estimate available for the Western North Atlantic stock is 6,802 based on data from 2016 NOAA shipboard and aerial surveys and the 2016 Canadian Northwest Atlantic International Sightings Survey (NAISS) that extended from Newfoundland to Florida (NMFS, 2020a). A population trend analysis does not currently exist for this species because of insufficient data; however, based on photographic identification, the gross annual reproduction rate is 8% with a mean calving interval of 2.7 years (Agler et al., 1993; NMFS, 2020a). This stock is listed as strategic and depleted under the MMPA due to its Endangered status (NMFS, 2020a). Potential biological removal (PBR) for this stock is 11, and annual human-caused mortality and serious injury for the period between 2014 and 2018 was estimated to be 2.35 per year. This estimate includes incidental fishery interactions (i.e., bycatch/entanglement) and vessel collisions, but other threats to fin whales include contaminants in their habitat and potential climate-related shifts in distribution of prey species (NMFS, 2020a). There is no designated critical habitat for this species in or near the Project Area.

<u>RWF</u>

Two well-known feeding grounds for fin whales are present near the RWF. These include the Great South Channel and Jeffrey's Ledge and waters directly east of Montauk, New York (Kenney and Vigness-Raposa, 2010; NMFS, 2020a). The highest occurrences of fin whales in this region are identified south of Montauk Point, New York to south of Nantucket, Massachusetts (Kenney and Vigness-Raposa, 2010). **Figure 3.1-1** shows visual detections by month in the RI-MA WEA (Kraus et al., 2016), and **Figure 3.1-2** shows the number of detections of fin whales Southern New England based on 10 years of passive acoustic data (Davis et al., 2020). Results of data collected in region 7 (Southern New England where the Project Area is located) indicate the greatest number of detections from August through April with a decrease in fin whale presence in the summer (Davis et al., 2020), whereas visual detections are greatest in the summer (Kraus et al., 2020). Because of these high occurrences within the OCS waters and offshore near the OCS break where surveys occurred, it is likely that fin whales will be present within the RWF area, potentially occurring during all seasons.

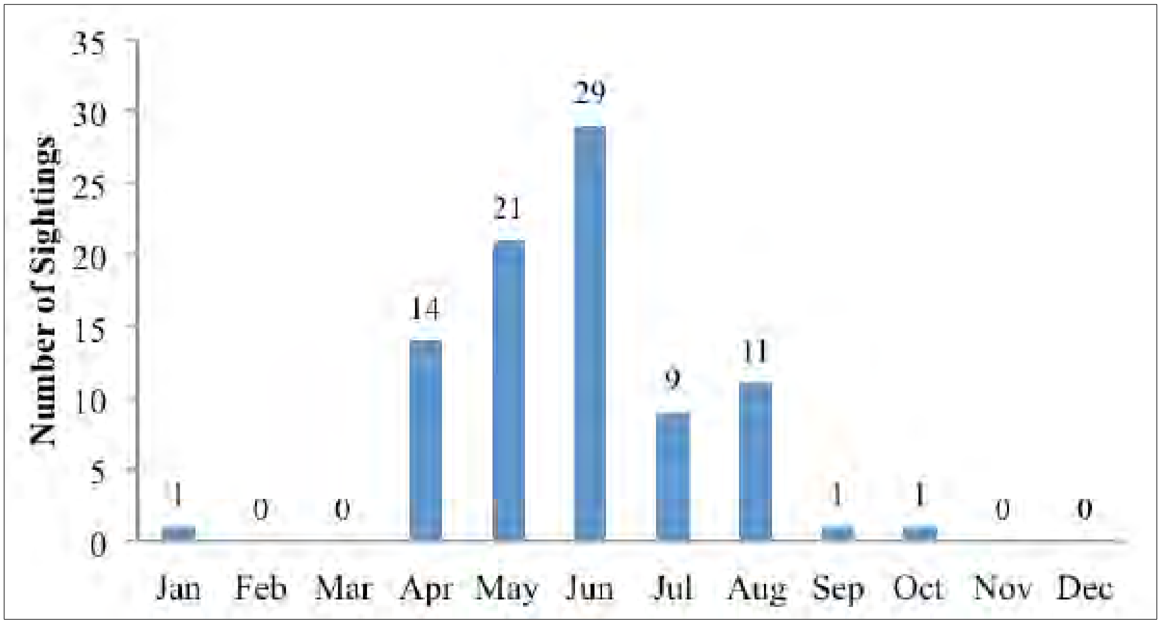

Figure 3.1-1. **Visual detections of fin whales by month for all survey years between October 2011 and June 2015. From: Kraus et al. (2016).**

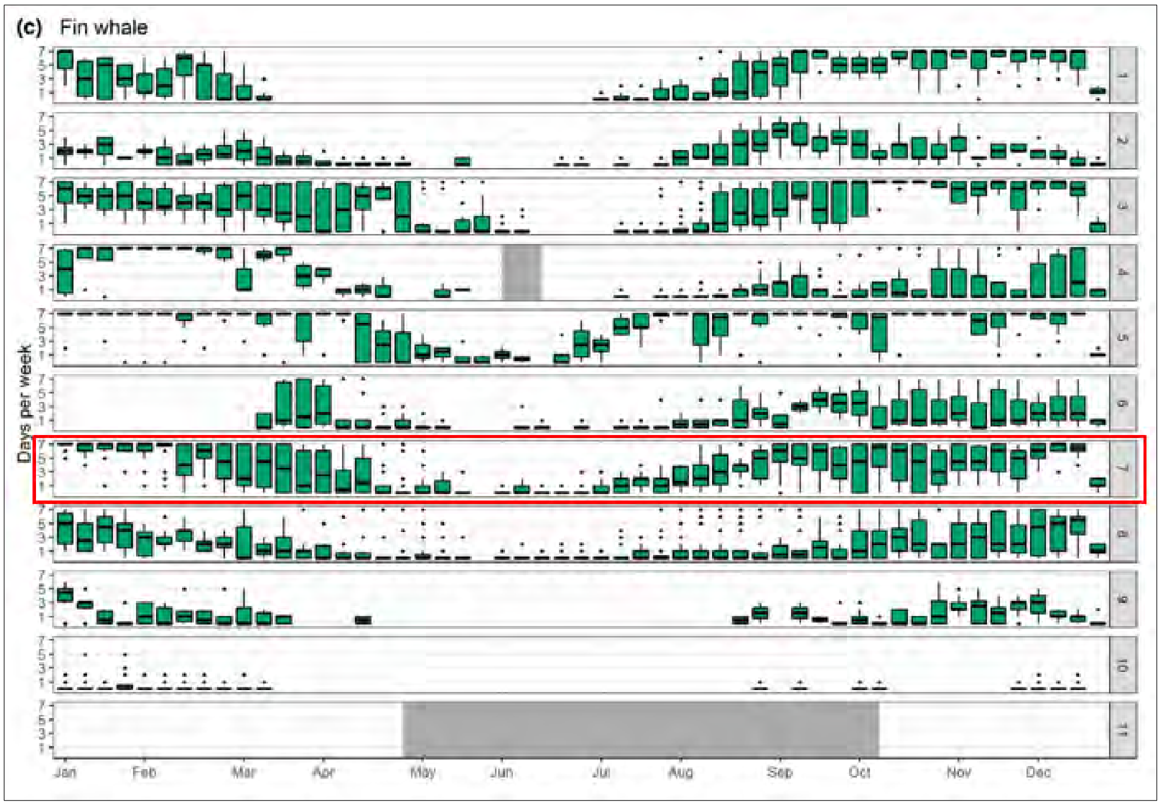

Figure 3.1-2. **Acoustic detections of fin whales from 10 years of passive acoustic data collected along the U.S. East Coast. Region 7 (red box) is Southern New England which contains the Project Area. Gray blocks indicate weeks where no data were collected. Adapted from: Davis et al. (2020).**

RWEC

Fin whales are common in Rhode Island state waters and adjacent OCS waters in this area, and aggregations of fin whales are often reported between Block Island, Rhode Island, and Montauk Point, New York (Kenney and Vigness-Raposa, 2010). They are typically centered along the 100-m isobath off the U.S. East Coast, but sightings have occurred in both shallower and deeper waters and they have been observed in Rhode Island state waters (Kenney and Vigness-Raposa, 2010; RI DEM, 2020). Because of their regular occurrence in this area, a large number of whale watching boats also frequent this area (Kenney and Vigness-Raposa, 2010). Fin whale sightings are greatest in the spring and summer, but they are known to occur in all four seasons in inner shelf waters (Kenney and Vigness-Raposa, 2010). Therefore, it is highly likely that fin whales will be encountered within the RWEC – OCS and RWEC – RI.

Sei Whale

Sei whales occur in all the world's oceans and migrate between feeding grounds in temperate and sub-polar regions to winter grounds in lower latitudes (Kenney and Vigness-Raposa, 2010; NMFS, 2020a). In the Western North Atlantic, most of the population is concentrated in northerly waters along the Scotian Shelf. Sei whales are observed in the spring and summer, utilizing the northern portions of the U.S. Atlantic Exclusive Economic Zone (EEZ) as feeding grounds, including the Gulf of Maine and Georges Bank. The highest concentration is observed during the spring along the eastern margin of Georges Bank and in the Northeast Channel area along the southwestern edge of Georges Bank. The winter habitat for this population remains unknown, but recent PAM data detected sei whale vocalizations from late fall through winter in Southern George's Bank region, with sporadic detections in the Southeast U.S. around Cape Hatteras and Blake Plateau (NMFS, 2020a). In general, sei whales are observed offshore with periodic incursions into more shallow waters for foraging (NMFS, 2020a).

Sei whales can often be confused with fin whales during field surveys; however, they do not have the characteristic v-shaped patterns on their backs that are present on fin whales, and their skin is often mottled with scars thought to be caused by lamprey bites (Jefferson et al., 1993). Although uncertainties still exist with distinguishing sei whale vocalizations during PAM surveys, they are known to produce short duration (0.7 to 2.2 sec) upsweeps and downsweeps between 20 and 600 Hz. SLs for these calls can range from 147 to 183 dB re 1 µPa m (Erbe et al., 2017). No auditory sensitivity data are available for this species (Southall et al., 2019).

Sei whales are listed as Endangered under the ESA and by the IUCN Red List (NMFS, 2020a; IUCN, 2021). Prior to 1999, sei whales in the Western North Atlantic were considered a single stock, but following the suggestion of the Scientific Committee of the International Whaling Commission (IWC), two separate stocks were identified for this species; a Nova Scotia stock and a Labrador Sea stock. Only the Nova Scotia stock can be found in U.S. waters, and the current abundance estimate for this population is 6,292 derived from recent surveys conducted between Halifax, Nova Scotia and Florida (NMFS, 2020a). Population trends are not available for this stock because of insufficient data (NMFS, 2020a). This stock is listed as strategic and depleted under the MMPA due to its Endangered status (NMFS, 2020a). The PBR for this stock is 6.2, and annual human-caused mortality and serious injury from 2014 to 2018 was estimated to be 1.20 per year (NMFS, 2020a). Like fin whales, major threats to sei whales include fishery interactions, vessel collisions, contaminants, and climate-related shifts in prey species (NMFS, 2020a). There is no designated critical habitat for this species in or near the Project Area.

RWF

CETAP surveys observed sei whales along the OCS edge only during the spring (237 sightings) and summer (101 sightings) (CETAP, 1982). This agrees with the Kraus et al. (2016) study, where sei whales were also only observed in the RI-MA WEA during the spring and summer (**Figure 3.1-3**). No sightings were reported during the fall and winter. A small cluster of five individuals was reported south of Montauk Point, New York, and Block Island, Rhode Island, in July 1981, August 1982, and May 2003 (Kenney and Vigness-Raposa, 2010). Davis et al. (2020) found detections of sei whales nearly year-round in Southern

New England, but the greatest number of detections were observed between March and July (**Figure 3.1-4**). Therefore, sei whales may be present seasonally in the RWF, primarily in the spring and summer.

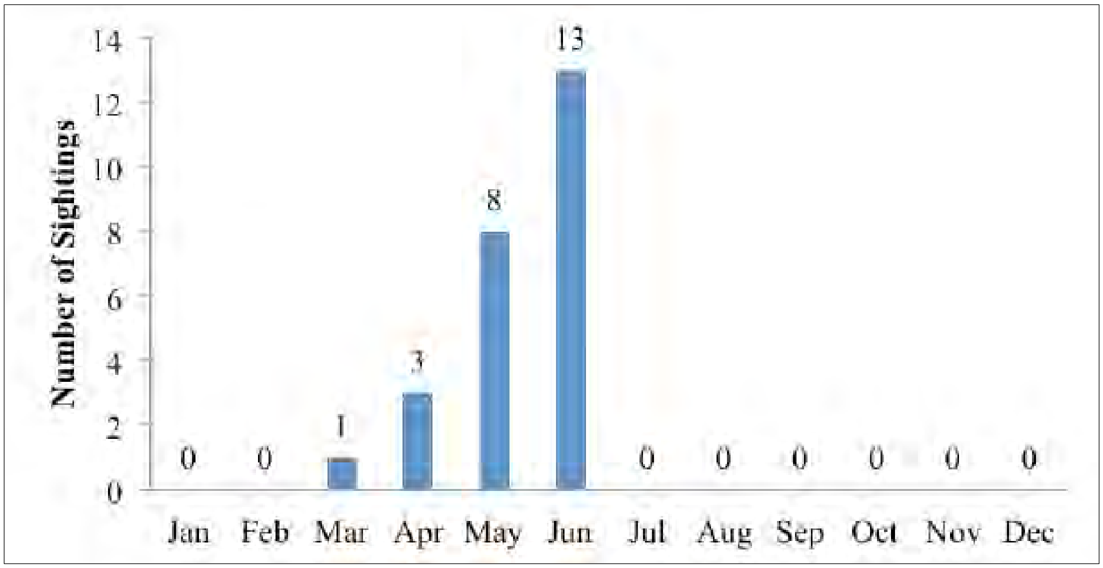

Figure 3.1-3. Visual detections of sei whales by month for all survey years between October 2011 and June 2015. From: Kraus et al. (2016).

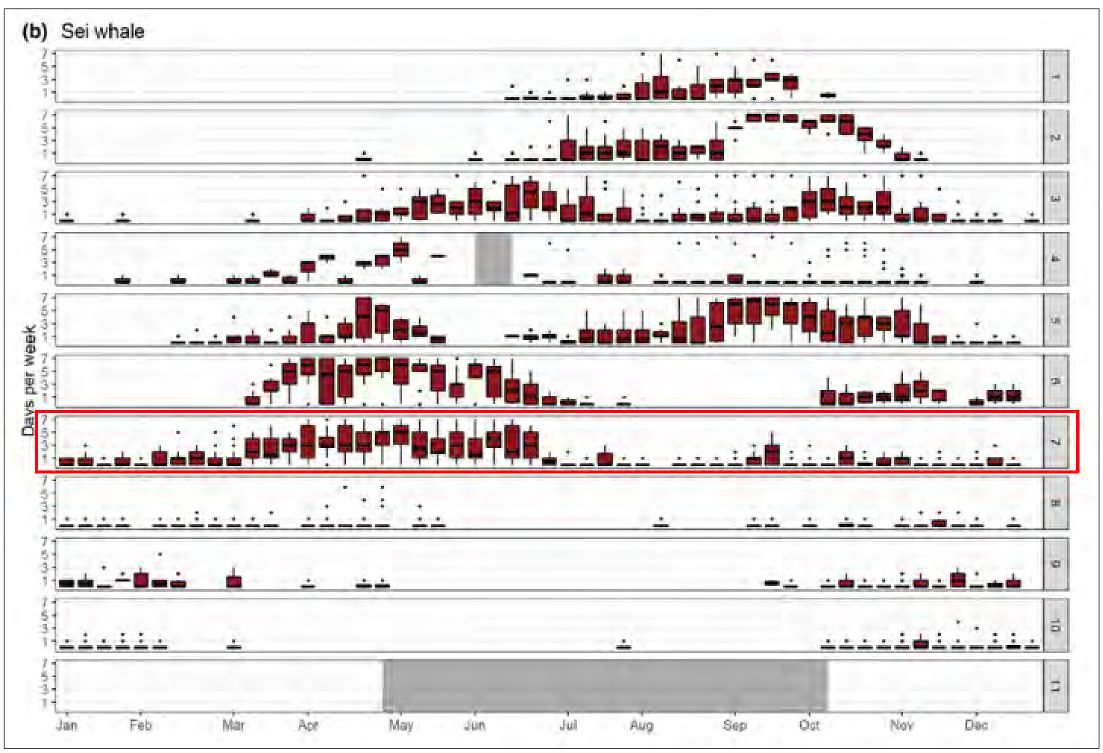

Figure 3.1-4. Acoustic detections of sei whales from 10 years of passive acoustic data collected along the U.S. East Coast. Region 7 (red box) is Southern New England which contains the Project Area. Gray blocks indicate weeks where no data were collected. Adapted from: Davis et al. (2020).

RWEC

Sei whales are associated with the deeper waters along the continental shelf edge and are observed in shallower waters when foraging. In the spring and summer, sei whales are seen in feeding habitats in Nova Scotia and Cape Cod north of the RWEC corridor (NMFS, 2020a). Sei whales are therefore not likely to enter shallower waters off Rhode Island and are not expected to occur in the RWEC - OCS or RWEC – RI.

North Atlantic Right Whale

The North Atlantic right whale occurs in all the world's oceans from temperate to subpolar latitudes. The primary habitat for this species is coastal or continental shelf waters ranging from calving grounds in the Southeastern U.S. to feeding grounds in the Northeastern U.S. (NMFS, 2020a). Acoustic surveys have also demonstrated their presence year-round in the Gulf of Maine, off New Jersey, and off Virginia (NMFS, 2020a). Important feeding habitats include coastal waters off Massachusetts, Georges Bank, the Great South Channel, Gulf of Maine, Bay of Fundy, and the Scotian Shelf. All waters within the Gulf of Maine are designated as a Foraging Area Critical Habitat (NMFS, 2020a).

One of the most distinguishing features of the right whale is the whitish callosities, or areas of roughened skin, covering their head, which can be up to one-third of their body length and their prominently curved jawline (Jefferson et al., 1993). Right whale vocalizations most frequently observed during PAM studies include upsweeps rising from 30 to 450 Hz, often referred to as "upcalls," and broadband (30 to 8,400 Hz) pulses, or "gunshots," with SLs between 172 and 187 dB re 1 µPa m (Erbe et al., 2017). However, recent studies have shown that mother-calf pairs reduce the amplitude of their calls in the calving grounds, possibly to avoid detection by predators (Parks et al. 2019). Modeling conducted using right whale ear morphology suggest that the best hearing sensitivity for this species is between 16 Hz and 25 kHz (Southall et al., 2019; Ketten et al., 2014).

The North Atlantic right whale is listed as Endangered under the ESA and by the state of Rhode Island, and are listed as Critically Endangered by the IUCN Red List (NMFS, 2020a; RI DEM, 2020; IUCN, 2021). Right whales are considered to be the most critically Endangered large whales in the world (NMFS, 2020a). The Western North Atlantic population size was estimated to be 412 individuals in the most recent draft 2020 SAR, which used data from the photo-identification database maintained by the New England Aquarium that were available in October 2019 (NMFS, 2020a). A population trend analysis conducted on the abundance estimates from 1990 to 2011 suggest an increase at about 2.8% per year from an initial abundance estimate of 270 individuals in 1998 (NMFS, 2020a). However, modeling conducted by Pace et al. (2017) showed a decline in annual abundance after 2011, further evidenced by the decrease in the abundance estimate from 451 in 2018 (NMFS, 2020a) to the current 2020 estimate of 412 (NMFS, 2020a). Highly variable data exists regarding the productivity of this stock. Over time, there have been periodic swings of per capita birth rates (NMFS, 2020a). Net productivity rates do not exist as the Western North Atlantic stock lacks any definitive population trend (NMFS, 2020a). The average annual human-related mortality/injury rate exceeds that of the calculated PBR of 0.8, and due to its listing as Endangered under the ESA this population is classified as strategic and depleted under the MMPA (NMFS, 2020a). Estimated human-caused mortality and serious injury between 2014 and 2018 was 8.15 whales per year (NMFS, 2020a). The predominant threats to North Atlantic right whales are entanglement and vessel collisions. Available data from 2000 to 2017 suggest an increase in the percent of injuries and mortalities (per capita) caused by entanglement, and while there no discernible trend in vessel strikes over the years, the annual rate of mortality and serious injury from 2014 to 2018 due to vessel strikes was 1.3 whales per year (NMFS, 2020a). There have been elevated numbers of mortalities reported since 2017 and continuing to through 2020 totaling 34 dead North Atlantic right whales which prompted NMFS to designate an Unusual Mortality Event (UME) for North Atlantic right whales (NMFS, 2021a). Although the majority (62%) of the mortalities occurred in Canadian waters, the U.S. population is not separated from those in Canada, and therefore the effects of mortality affect the population considered in the assessment process. Of these documented mortalities, 41% were of undetermined cause; however, of the remainder of the mortalities (59%) were determined to be the result of human interaction with ten mortalities resulting from vessel strikes and eight resulting from gear entanglement (NMFS, 2021a).

RWF

Kraus et al. (2016) only observed North Atlantic right whales in the RI-MA WEA during the winter and spring (**Figure 3.1-5**). Davis et al. (2017) analyzed 10 years of passive acoustic data and found a similar trend in the data collected in Southern New England where North Atlantic right whale detections began to increase in the winter through early summer (**Figure 3.1-6**).However, the North Atlantic right whale has the potential to occur within the waters off Rhode Island and Massachusetts any time of the year. Typically, right whale sightings begin in December and continue through April. A total of 77 individuals were sighted in the WEA from October 2011 to June 2015. The greatest numbers are seen in March. The Muskeget Channel and south of Nantucket, both located within the RI-MA WEA, were also identified as right whale hotspots during the spring (Kraus et al., 2016).

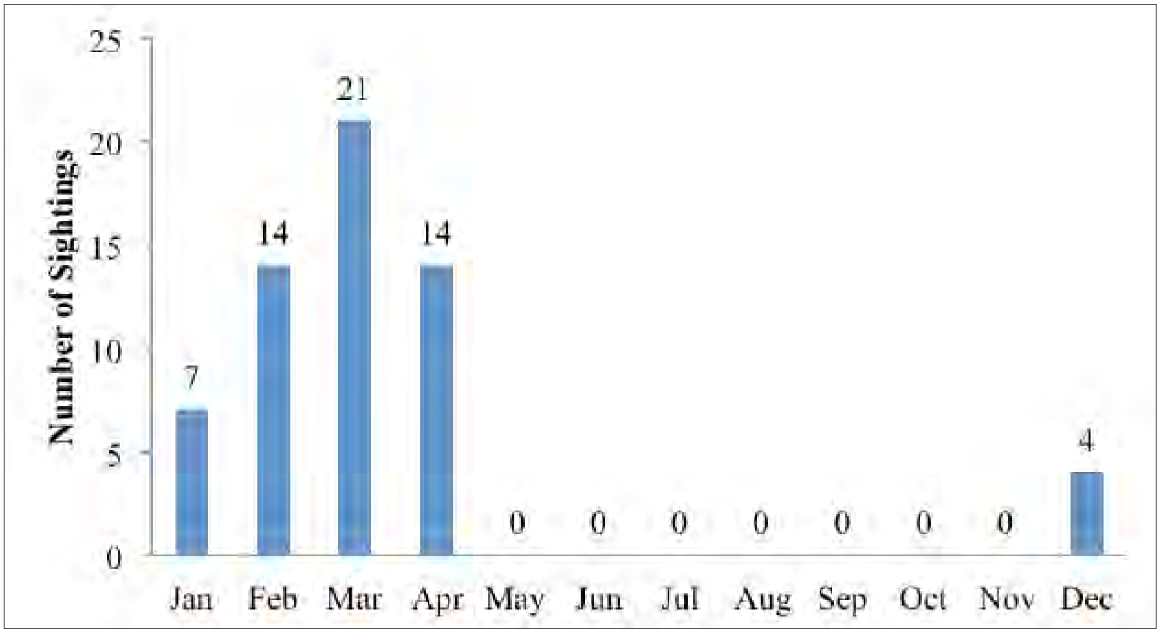

Figure 3.1-5. Visual detections of North Atlantic right whales by month for all survey years between October 2011 and June 2015. From: Kraus et al. (2016).

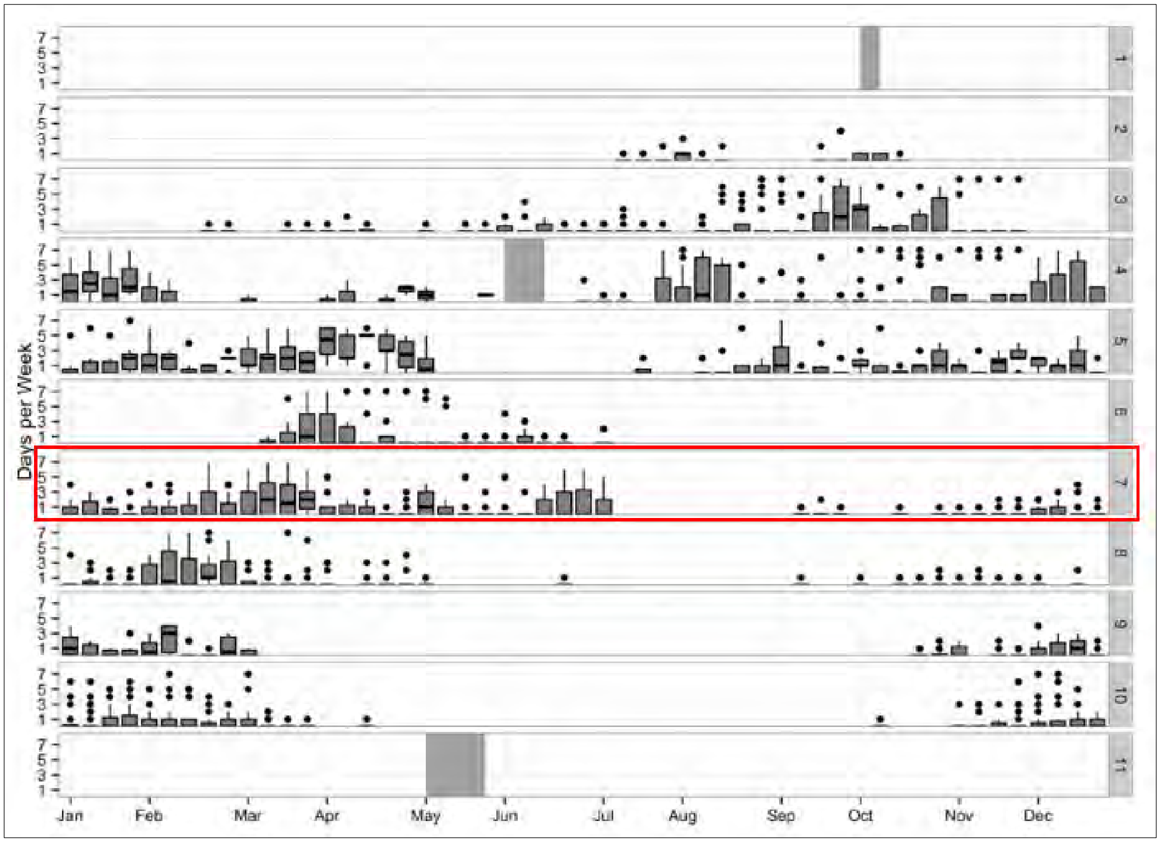

Figure 3.1-6. Acoustic detections of North Atlantic right whales from 10 years of passive acoustic data collected along the U.S. East Coast. Region 7 (red box) is Southern New England which contains the Project Area. Gray blocks indicate weeks where no data were collected. Adapted from: Davis et al. (2017).

Kraus (2018) provided recent right whale survey information for crew training prior to the 2017 South Fork Wind Farm site characterization surveys. North Atlantic right whale sighting results from 2011 to 2015 are presented in **Figure 3.1-7**. Kraus (2018) also presented the sighting locations from 2017 that reported skim (surface) feeding activity by right whales (**Figure 3.1-8**). Skim feeding is an important activity identified in impact assessments because first, it demonstrates a critical behavior (feeding) that could be disrupted by introduced noise; and second, it represents a vulnerable time for right whales to be exposed to ship strikes because they are active at or near the surface.

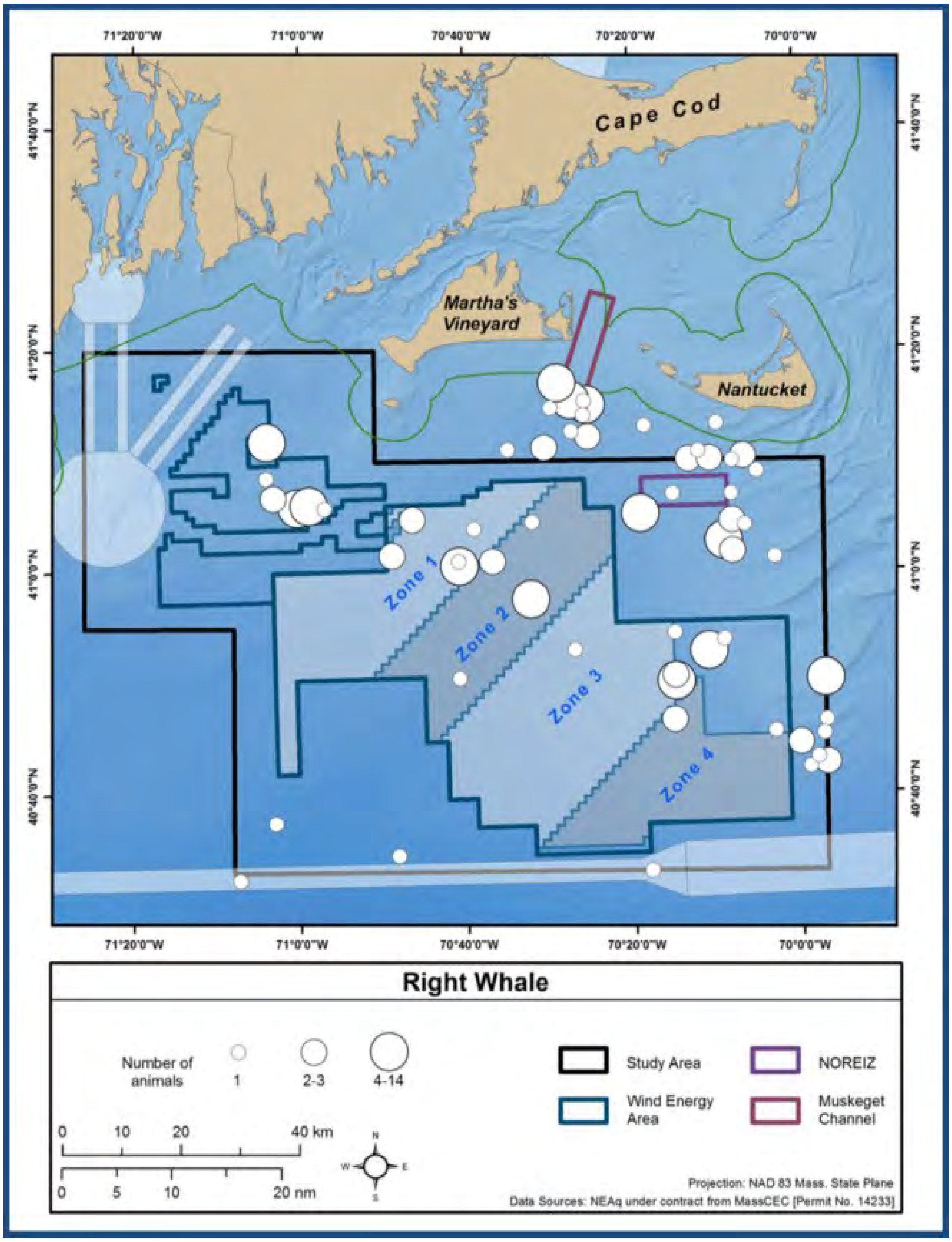

Figure 3.1-7. North Atlantic right whale sighting data from 2011 to 2015. Figure and data from Kraus (2018). NOREIZ = Northeast Offshore Renewable Energy Innovation Zone.

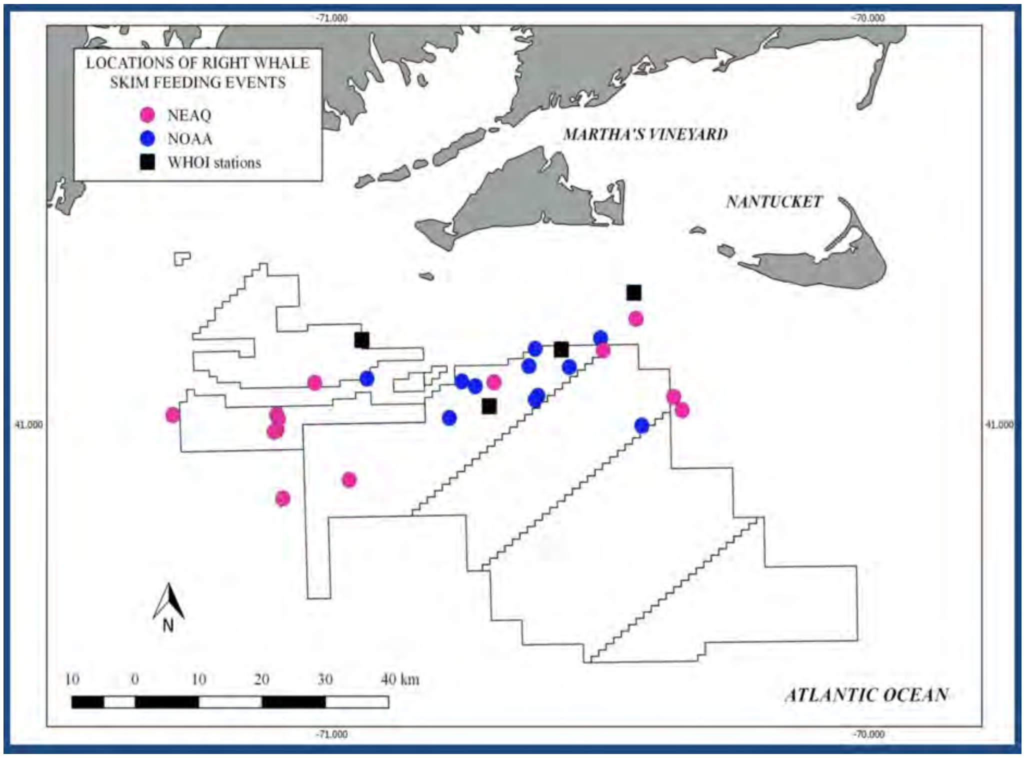

Figure 3.1-8. The 2017 North Atlantic right whale sightings that reported skim (surface) feeding activity. Figure from Kraus (2018). NEAQ = New England Aquarium; NOAA = National Oceanic and Atmospheric Administration.

Seasonal management areas (SMAs) also exist within the vicinity of the RWF, including the Great South Channel SMA (April 1–July 31), Cape Cod Bay SMA (January 1–May 15), Off Race Point SMA (March 1-April 30), and Block Island SMA (November 1–April 30) (NMFS, 2021b); therefore, right whales are likely to occur within the RWF.

RWEC

North Atlantic right whales are known to occur within both Rhode Island state and adjacent OCS waters year-round. The Gulf of Maine has been designated as a critical habitat area; therefore, they may migrate through the RWEC corridor as they travel to this feeding habitat. Kraus et al. (2016) reported a seasonal cluster of right whales south of Martha's Vineyard, Massachusetts, and east of Nantucket, Massachusetts, during the winter. This area is also designated as the Block Island SMA from November 1 through April 20, which contains the RWEC corridor. Therefore, it is likely right whales would occur within both the RWEC – OCS and RWEC – RI.

Sperm Whale

Sperm whales can be found throughout the world's oceans. They can be found near the edge of the ice pack in both hemispheres and are also common along the equator. The North Atlantic stock is distributed mainly along the continental shelf-edge, over the continental slope, and mid-ocean regions, where they prefer water depths of 600 m or more and are less common in waters <300 m deep (Waring et al., 2015; Hayes et al., 2020). In the winter, sperm whales are observed east and northeast of Cape Hatteras. In the spring, sperm whales are more widely distributed throughout the Mid-Atlantic Bight and southern portions of George's Bank (Hayes et al., 2020). In the summer, sperm whale distribution is similar to the spring, but they are more widespread in Georges Bank and the Northeast Channel region and are also observed inshore of the 100-m isobath south of New England (Hayes et al., 2020). Sperm whale occurrence on the continental shelf in areas south of New England is at its highest in the fall (Hayes et al., 2020).

Sperm whales can easily be distinguished in visual surveys by their large, blunt head, narrow underslung jaw, and characteristic blow shape resulting from the S-shaped blowhole set at the front-left of the head (Jefferson et al., 1993). Unlike mysticete whales that produce various types of calls used solely for communication, sperm whales produce clicks that are used for echolocation and foraging as well as communication (Erbe et al., 2017). Sperm whale clicks have been grouped into five classes based on the click rate, or number of clicks per second; these include "squeals," "creaks," "usual clicks," "slow clicks," and "codas." In general, these clicks are broadband sounds ranging from 100 Hz to 30 kHz with peak energy centered around 15 kHz. Depending on the class, SLs for sperm whale calls range between approximately 166 and 236 dB re 1 µPa m (Erbe et al., 2017). Hearing sensitivity data for this species are currently unavailable (Southall et al., 2019).

The Western North Atlantic stock is considered strategic under the MMPA due to its listing as Endangered under the ESA, and the global population is listed as Vulnerable on the IUCN Red List (Hayes et al., 2020; IUCN, 2021). The best and most recent abundance estimate based on 2016 surveys conducted between the lower Bay of Fundy and Florida is 4,349 (Hayes et al., 2020). No population trend analysis is available for this stock. Thousands of sperm whales were killed during the early 18th Century. A moratorium on sperm whale hunting was adopted in 1986 and currently no hunting is allowed for any purposes in the North Atlantic. Occasionally, sperm whales will become entangled in fishing gear or be struck by ships off the east coast of the U.S. However, this rate of mortality is not believed to have biologically significant impacts. The current PBR for this stock is 6.9, and because the total estimated human-caused mortality and serious injury is <10% of this calculated PBR, it is considered insignificant (Hayes et al., 2020). Between 2013 and 2017, 12 sperm whale strandings were documented along the U.S. East Coast, but none of the strandings showed evidence of human interactions (Hayes et al., 2020). Other threats to sperm whales include contaminants, climate-related changes in prey distribution, and anthropogenic noise, although the severity of these threats on sperm whales is currently unknown (Hayes et al., 2020). There is no designated critical habitat for this population in the Project Area.

RWF

Sperm whales were the fifth most commonly sighted large whale in the CETAP study area and were observed in all four seasons. The study sighted 341 individuals, which accounted for only 8% of the total large whale sightings during their survey period (CETAP, 1982). Kraus et al. (2016) reported sightings of sperm whales in the RI-MA WEA during the summer and fall months; five individuals in August 2012, one in September 2012, and three in June 2015. There have also been occasional strandings in Massachusetts and Long Island (Kenney and Vigness-Raposa, 2010). Although accounts of sperm whales in the area are low, their occurrence within the RWF and surrounding waters is possible.

RWEC

CETAP reported that the distribution of sperm whales primarily centers at about the 1,000-m depth contour. However, their distribution can also extend shoreward, inshore of the 100-m contour, particularly in the summer and fall (CETAP, 1982; Hayes et al., 2020). Although relatively infrequent, sightings have been reported in waters as shallow as 60 m. Southern New England is one of the few locations in the world in which sperm whales frequent inshore areas (Kenney and Vigness-Raposa, 2010). Many reported sightings take place in a narrow band just south of Block Island, Rhode Island, Martha's Vineyard, Massachusetts, and Nantucket, Massachusetts, from May through November, in which the RWEC corridor would intersect. This high occurrence of sperm whales is believed to be related to the presence of spawning squid (CETAP, 1982). Therefore, given their preference for deeper waters sperm whales are likely to occur in the RWEC – OCS, but may also occur seasonally within the RWEC – RI in the summer and fall when they enter shallower state waters in search of food.

3.1.2 Non-ESA listed Species

Of the 30 non-listed species whose ranges include the Northeastern U.S., 11 are expected to be present in the Project Area and are considered potentially affected species. The following sections provide further information regarding species behavior and expected occurrence in the RWF and two RWEC areas (RWEC – OCS and RWEC – RI).

Minke Whale

Minke whales prefer the colder waters in northern and southern latitudes, but they can be found in every ocean in the world. Available data suggest that minke whales are distributed in shallower waters along the continental shelf between the spring and fall and are located in deeper oceanic waters between the winter and spring (NMFS, 2020a). They are most abundant in New England waters in the spring, summer, and early fall (NMFS, 2020a).

A prominent morphological feature of the minke whale is the large, pointed median ridge on top of the rostrum. The body is dark gray to black with a pale belly, and frequently shows pale areas on the sides that may extend up onto the back. The flippers are smooth and taper to a point, and the middle third of each flipper has a conspicuous bright white band that can be distinguished during visual surveys (Kenney and Vigness-Raposa, 2010). In the North Atlantic, minke whales commonly produce pulse trains lasting 10 to 70 sec with a frequency range between 10 and 800 Hz. SLs for this call type have been reported between 159 and 176 dB re 1 µPa m (Erbe et al., 2017). Some minke whales also produce a unique “boing” sound which is a train of rapid pulses often described as an initial pulse followed by an undulating tonal (Erbe et al., 2017; Rankin and Barlow, 2005). The “boing” ranges from 1 to 5 kHz with an SLs of approximately 150 dB re 1 µPa m (Erbe et al., 2017). Auditory sensitivity for this species based on anatomical modeling of minke whale ear morphology is best between 10 Hz and 34 kHz (Southall et al., 2019; Ketten et al., 2014).

Minke whales are not listed under the ESA or classified as strategic under the MMPA and are list as Least Concern on the IUCN Red List (NMFS, 2020a; IUCN, 2021). The best available current global abundance estimates for the common minke whale, compiled by the IUCN Red List, is around 200,000 (Cooke, 2018). The most recent population estimate for the Canadian East Coast stock which occurs in the Project Area is 24,202 minke whales, derived from surveys conducted by NOAA and the Department of Fisheries and Oceans Canada between Labrador and central Virginia (NMFS, 2020a). There are no current population trends or net productivity rates for this species due to insufficient data. The PBR for this stock is estimated to be 170 (NMFS, 2020a). The estimated annual human-caused mortality and serious injury from 2014 to 2018 was 10.55 per year attributed to fishery interactions, vessel strikes, and non-fishery entanglement in both the U.S. and Canada (NMFS, 2020a), and a UME was declared for this species in January 2017 (NMFS, 2021c). Minke whales may also be vulnerable to climate-related changes in prey distribution, although the extent of this effect on minke whales remains uncertain (NMFS, 2020a). No designated critical habitat for this stock currently exists in the Project Area.

RWF

During previous studies conducted in the RI-MA WEA, 103 minke whales were sighted within the area (Kraus et al., 2016). Spring observations included the most individuals followed by summer, and fall (**Figure 3.1-9**). Minke whales are therefore likely to occur in the spring and summer within the RWF area.

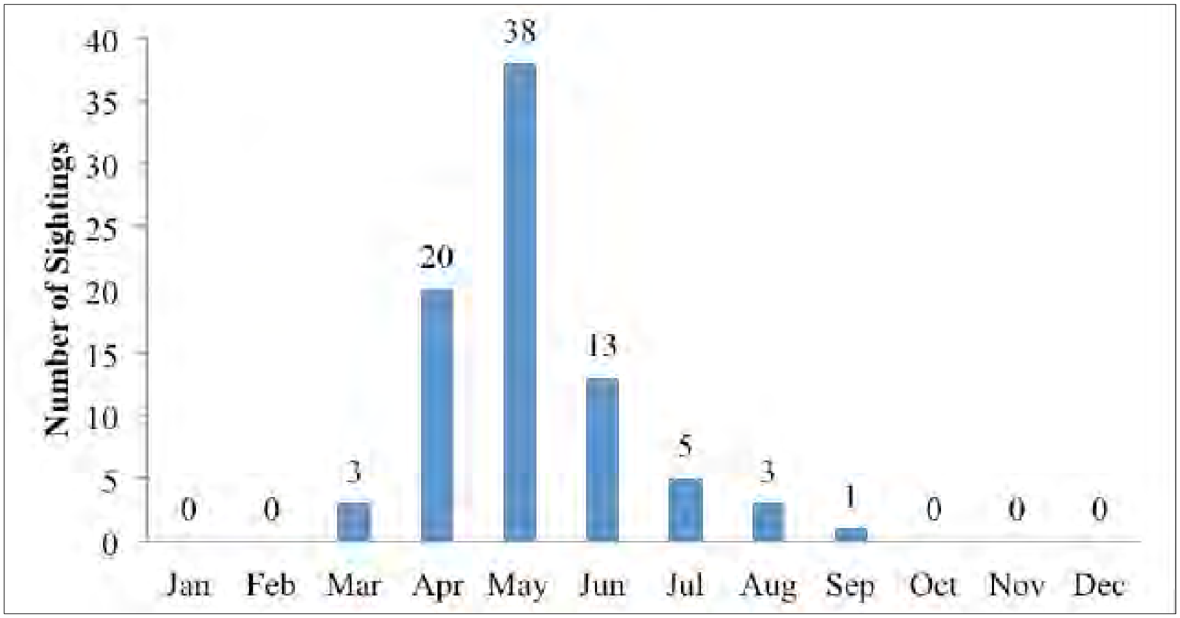

Figure 3.1-9. Visual detections of minke whales by month for all survey years between October 2011 and June 2015. From: Kraus et al. (2016).

<u>*RWEC*</u>

Minke whales have been sighted offshore Rhode Island in both state and OCS waters in all four seasons (Kenney and Vigness-Raposa, 2010). A large proportion of these sightings were reported from whale watching boats. A dense concentration was seen between Block Island, Rhode Island, and Montauk Point, New York, in the spring and summer (Kenney and Vigness-Raposa, 2010), making it likely that this species could occur within both the RWEC – OCS and RWEC – RI.

Humpback Whale

The humpback whale can be found worldwide in all major oceans from the equator to sub-polar latitudes. In the summer, humpbacks are found in higher latitudes feeding in the Gulf of Maine and Gulf of Alaska. During the winter months, humpbacks migrate to calving grounds in subtropical or tropical waters, such as the Dominican Republic in the Atlantic and Hawaiian Islands in the Pacific (Hayes et al., 2020). Humpback whales from the North Atlantic feeding areas mate and calve in the West Indies (Hayes et al., 2020). In the summer, humpback whales in the Western North Atlantic are typically observed in the Gulf of Maine and along the Scotian Shelf, and there have also been numerous winter sightings in the Southeastern U.S. (NMFS, 2020a). Feeding behavior has also been observed in New England off Long Island, New York, and survey data from NOAA suggests a potential increase in humpback whale abundance off New Jersey and New York (NMFS, 2020a).

Humpback whales are easily identified in field surveys by their long flippers, which can be up to one-third of their total body length, as well as the bumps covering their head and flippers (Jefferson et al., 1993). During migration and breeding seasons, male humpback whales are often recorded producing vocalizations arranged into repetitive sequences termed “songs” that can last for hours or even days. These songs have been well studied in the literature to document changes over time and geographic differences; generally, the bandwidth of these songs range from 20 Hz to over 24 kHz. Most of the energy is focused between 50 and 1,000 Hz and reported SLs range from 151 to 189 dB re 1 μPa m (Erbe et al., 2017). Other calls produced by humpbacks, both male and female, include pulses, moans, and grunts used for foraging and communication. These calls are lower frequency (under 2 kHz) with SLs ranging from 162 to 190 dB re 1 μPa m (Erbe et al., 2017; Thompson et al., 1986). Anatomical modeling based on humpback whale ear morphology indicate that their best hearing sensitivity is between 18 Hz and 15 kHz (Southall et al., 2019; Ketten et al., 2014).

NMFS revised the listing status for humpback whales under the ESA in 2016 (81 FR 62259). Globally, there are 14 distinct population segments (DPSs) recognized for humpback whales, four of which are listed as Endangered. The Gulf of Maine stock (formerly known as the Western North Atlantic stock) which occurs in the Project Area is not considered strategic under the MMPA and does not coincide with any ESA-list DPS (NMFS, 2020a). The global population is listed as Least Concern under the IUCN Red List, and are considered endangered by the state of Rhode Island given the previous status under the ESA and the current status of some DPSs (RI DEM, 2020; IUCN, 2021). The best available abundance estimate of the Gulf of Maine stock is 1,393, derived from modeled sighting histories constructed using photo-identification data collected through October 2016 (NMFS, 2020a). Available data indicate that this stock is characterized by a positive population trend, with an estimated increase in abundance of 2.8% per year (NMFS, 2020a). The PBR for this stock is 22, and the estimated annual human-caused mortality and serious injury between 2014 and 2018 was 15.25 whales per year (NMFS, 2020a). While the current annual mortality and serious injury is below the calculated PBR, this estimate only includes detected mortalities and serious injuries. Detected mortality is estimated to only be 20% of all mortality, which could indicate the total mortality in humpbacks has or will exceed PBR, a prediction further supported by the UME declared for this species in 2016 (NMFS, 2020a; NMFS, 2021d). Major threats to humpback whales include vessel strikes, entanglement, and climate-related shifts in prey distribution (NMFS, 2020a). There is no designated critical habitat for this stock in the Project Area.

RWF

Kraus et al. (2016) reported humpback whale sightings in the RI-MA WEA during all seasons, with peak abundance during the spring and early summer, but their presence within the region varies between years. Increased stocks of sand lance (*Ammodytes* spp.) appear to correlate with the years in which most whales were observed, suggesting that humpback whale distribution and occurrences could largely be influenced by prey availability (Kenney and Vigness-Raposa, 2010). The greatest number of sightings of humpbacks in the RI-MA WEA occurred during April (33 sightings); their presence increased starting in March and continued through July. Seasonal abundance estimates of humpback whales in the RI-MA WEA range from 0 to 41 (Kraus et al., 2016), with higher estimates observed during the spring and summer (**Figure 3.1-10**). Acoustic detections within Southern New England analyzed by Davis et al. (2020) found the greatest number of acoustic detections in the winter and spring with a similar increase in detection in March which continues through July (**Figure 3.1-11**). Based on these data, humpback whales are likely to occur in the RWF area, predominantly during winter, spring, and early summer.

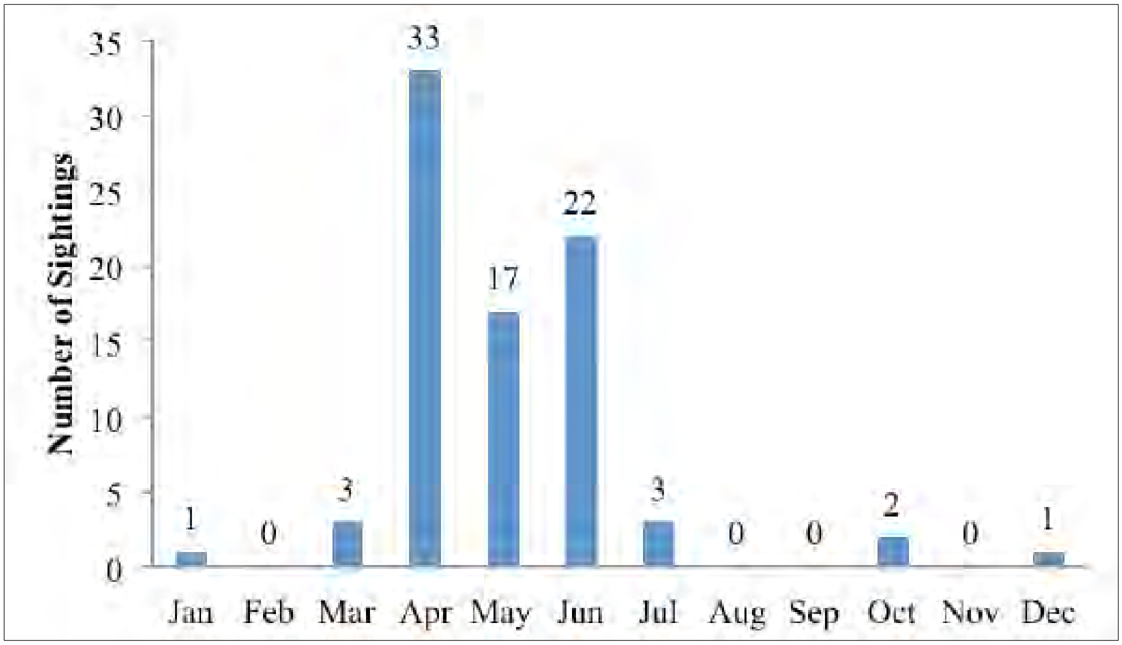

Figure 3.1-10. Visual detections of humpback whales by month for all survey years between October 2011 and June 2015. From: Kraus et al. (2016).

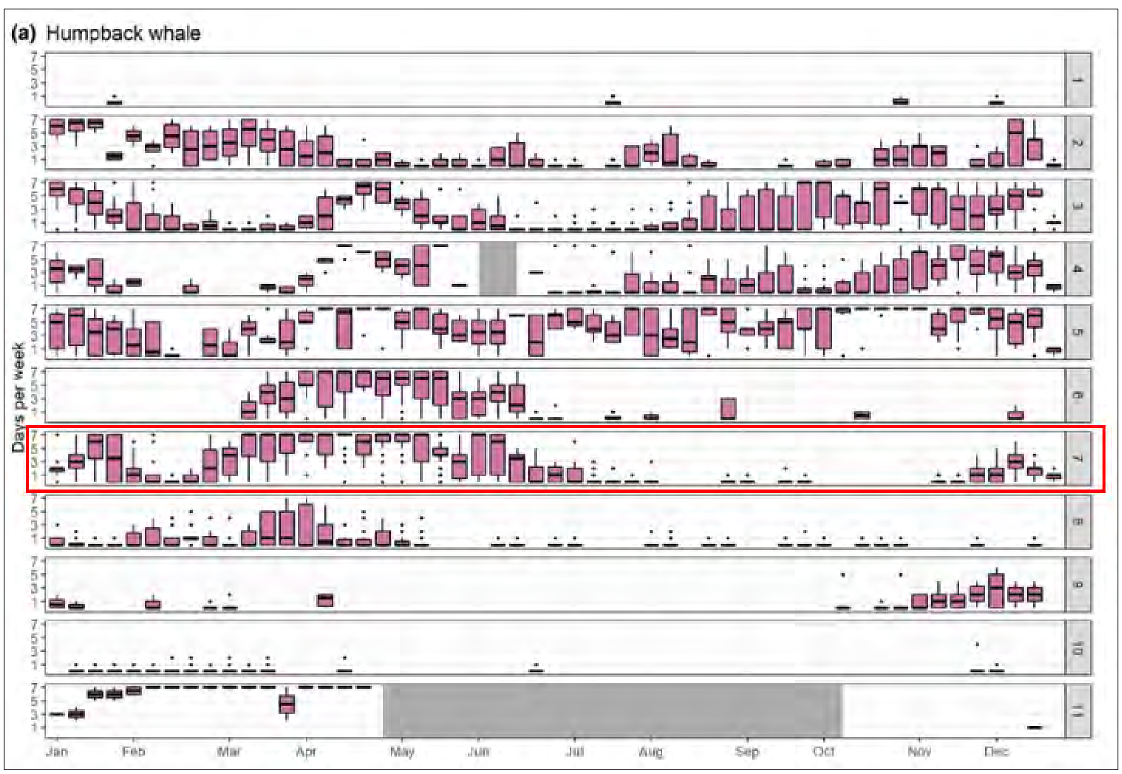

Figure 3.1-11. Acoustic detections of humpback whales from 10 years of passive acoustic data collected along the U.S. East Coast. Region 7 (red box) is Southern New England which contains the Project Area. Gray blocks indicate weeks where no data were collected. Adapted from: Davis et al. (2020).

RWEC

In the 1980s, numerous sightings of humpbacks were reported between Long Island, New York, and Martha's Vineyard, Massachusetts, by Montauk and Galilee whale watching boats. Montauk boats reported 2 sightings in 1986 and 63 sightings in 1987 (Kenney and Vigness-Raposa, 2010). Recently, multiple humpbacks were reported feeding off Long Island, New York, during July 2016 and near New York City during November and December 2016 (Hayes et al., 2020). Humpback strandings were also reported along the southern shore of eastern Long Island, New York, in February 1992, November 1992, October 1993, August 1997, and April 2004.

Humpbacks are known occur within Rhode Island state and adjacent OCS waters; however, their presence is relatively unpredictable and may be strongly influenced by prey availability (Kenney and Vigness-Raposa, 2010). They are expected to have a greater presence in the RWEC – OCS compared to the RWEC – RI, but have been observed in state waters and are therefore likely to be encountered in the RWEC – RI. During most years, their occurrence within the RWEC - RI would be uncommon; however, they may become locally abundant in certain years.

Long-finned Pilot Whale

There are two species of pilot whale in the Western North Atlantic, long-finned and short-finned (*Globicephala macrorhynchus*). Because it is difficult to differentiate between these two species in the field, sightings are usually reported to genus level only (CETAP, 1982; Hayes et al., 2020). However, short-finned pilot whales are a southern or tropical species and pilot whale sightings above approximately 42° N are most likely long-finned pilot whales. Short-finned pilot whale occurrence in the Project Area is considered rare (CETAP, 1982; Hayes et al., 2020). Long-finned pilot whales are distributed along the continental shelf waters off the Northeastern U.S. in the winter and early spring. By late spring, pilot whales migrate into more northern waters including Georges Bank and the Gulf of Maine and will remain there until fall.

Both short-finned and long-finned pilot whales are similar in coloration and body shape; however, long-finned pilot whales can be distinguished by their long flippers, which are 18 to 27% of the body length with a pointed tip and angled leading edge (Jefferson et al., 1993). Like dolphin species, long-finned pilot whales can produce whistles and burst-pulses used for foraging and communication. Whistles typically range in frequency from 1 to 11 kHz while burst-pulses cover a broader frequency range from 100 Hz to 22 kHz (Erbe et al., 2017). Auditory evoked potential (AEP) measurements conducted by Pacini et al. (2010) indicate that the hearing sensitivity for this species ranges from <4 kHz to 89 kHz.

Long-finned pilot whales are not listed under the ESA and are classified as Least Concern by the IUCN Red List (Hayes et al., 2020; IUCN, 2021). The best available estimate of long-finned pilot whales in the Western North Atlantic is 39,215 based on recent surveys covering waters between Labrador and Central Virginia (Hayes et al., 2020). A trend analysis has not been conducted for this stock due to the relatively imprecise abundance estimates (Hayes et al., 2020). The PBR for this stock is 306, and the annual human-caused mortality and serious injury was estimated to be 21 whales between 2013 and 2017 (Hayes et al., 2020). Long-finned pilot whales have a propensity to mas strand in U.S. waters, although the role of human activity in these strandings remains unknown (Hayes et al., 2020). Threats to this population include entanglement in fishing gear, contaminants, climate-related shifts in prey distribution, and anthropogenic noise (Hayes et al., 2020). There is no designated critical habitat for this stock in the Project Area.

RWF

CETAP surveys reported long-finned pilot whales as the third most commonly sighted small whale in their study area with 12,438 individuals (CETAP, 1982). Long-finned pilot whales have been observed in OCS waters off Rhode Island in all four seasons, with peak occurrences in the spring. There are 43 records of long-finned pilot whales and 226 records of non-specific pilot whales in this area. Nine sightings during the summer and three sightings in the spring were reported from whale watching data for pilot whales (Kenney and Vigness-Raposa, 2010).

Within the RI-MA WEA, no sightings of pilot whales were observed during the summer, fall, or winter (Kraus et al., 2016). Long-finned pilot whales are relatively common in the area; therefore, they may potentially occur in the RWF area. However, the likelihood of occurrences would only be in the spring.

RWEC

Long-finned pilot whales prefer deep pelagic temperate to subpolar oceanic waters; therefore, they are not likely to occur within the RWEC – OCS or RWEC – RI (Hayes et al., 2020).

Atlantic Spotted Dolphin

Atlantic spotted dolphins are found in tropical and warm temperate waters. In the Western North Atlantic, their distribution ranges from the Northeastern U.S. to the Gulf of Mexico and the Caribbean to Venezuela (Hayes et al., 2020). They are regularly seen in continental shelf and slope waters. There are two Atlantic spotted dolphin ecotypes which may be distinct sub-species. The larger heavily spotted ecotype inhabits OCS waters inside or near the 200-m isobath south of Cape Hatteras. The smaller form is less spotted and is found further offshore and only occurs in the Atlantic. Recent genetic data also suggests that they may be genetically distinct populations (Hayes et al., 2020). Both ecotypes can occur in the Northeastern U.S.; however, they are difficult to differentiate at sea and are therefore not distinguished in this assessment.

Young Atlantic spotted dolphins start out with no spotting and resemble slender bottlenose dolphins. Large spotting develops as the animals age making it easier to distinguish them in visual surveys (Jefferson et al., 1993). Atlantic spotted dolphins have an estimated auditory bandwidth of 150 Hz to 160 kHz and vocalizations typically range from 100 Hz to 130 kHz (Department of the Navy, 2007; Southall et al., 2007). No auditory sensitivity data are available for this species (Southall et al., 2019).

Atlantic spotted dolphins are not listed under the ESA and are classified as Least Concern by the IUCN Red List (Hayes et al., 2020; IUCN, 2021). The best population estimate available for this species is 39,921 based on surveys conducted in summer 2016 between the lower Bay of Fundy and Florida (Hayes et al., 2020). A population trend analysis of available abundance estimates from 2004, 2011, and 2016 indicate a linear decrease in abundance, however interannual variability in abundance is a key uncertainty in this trend analysis (Hayes et al., 2020). The PBR for this stock is 320, and the estimated annual human-caused mortality and serious injury from 2013 to 2017 was presumed to be zero (Hayes et al., 2020). Twenty-one Atlantic spotted dolphins were reported stranded between North Carolina and Florida during this period; however, no definitive evidence of human interaction was found (Hayes et al., 2020). Major threats to this population include anthropogenic noise; offshore development, particularly south of Cape Hatteras where this species inhabits inshore shelf waters; contaminants; and climate-related shifts in prey distribution (Hayes et al., 2020). There is no designated critical habitat for this stock in the Project Area.

RWF

There are few reported occurrences of general spotted dolphins (*Stenella* spp.) in the Project Area. CETAP described spotted dolphins as the seventh most commonly sighted cetaceans in the study area, with 126 sightings over the course of a 3-year study. The 1982 CETAP data observed 40 individuals south of Block Island, Rhode Island (CETAP, 1982). NMFS shipboard surveys conducted during June to August between central Virginia and the Lower Bay of Fundy reported 542 to 860 individual sightings from two separate visual teams (Palka et al., 2017). Atlantic spotted dolphins tend to be a more subtropical and offshore species, so while they may be encountered in the RWF area, this would be an uncommon occurrence.

RWEC

Atlantic spotted dolphins north of Cape Hatteras tend to be observed offshore over and beyond the continental slope; therefore, their presence in the RWEC – OCS or RWEC – RI would be uncommon.

Atlantic White-sided Dolphin

Atlantic white-sided dolphins migrate between the temperate and polar waters of the North Atlantic Ocean, but usually maintain migration routes over the deeper-sloped continental shelves. This is the most abundant dolphin in the Gulf of Maine and the Gulf of St. Lawrence; they are rarely seen off the coast of Nova Scotia (Kenney and Vigness-Raposa, 2010). Behaviorally, this species is highly social, but not as demonstrative as some other common dolphins. They typically form pods of around 30 to 150 individuals but have also been seen in very large pods of 500 to 2,000 individuals (Hayes et al., 2020). It is common to find these pods associated with the presence of other white-beaked dolphins, pilot whales, fin whales, and humpback whales.

The Atlantic white-sided dolphin gets its name from the distinctive white stripe on its side, which starts just below the dorsal fin and runs into a yellow/ochre blaze continuing onto the tailstock, which is easily seen when the animal is bow-riding or porpoising. It has a whitish lower jaw, throat, and belly to genital region, with a dark eye patch and face-flipper stripe (Cipriano, 2002; Jefferson et al., 1993). Like most dolphin species, Atlantic white-sided dolphins produce clicks, buzzes, calls, and whistles. Their clicks are broadband sounds ranging from 30 to 40 kHz that can contain frequencies over 100 kHz and are often produced during foraging and for orientation within the water column. Buzzes and calls are not as well studied, and they may be used for socialization as well as foraging. Whistles are primarily for social communication and group cohesion and are characterized by a downsweep followed by an upsweep with an approximate starting frequency of 20 kHz and ending frequency of 17 kHz (Hamran, 2014). No hearing sensitivity data are currently available for this species (Southall et al., 2019).

Atlantic white-sided dolphins are not listed under the ESA or considered a strategic stock under the MMPA and are classified as Least Concern on the IUCN Red List (Hayes et al., 2020; IUCN, 2021). The best abundance estimate currently available for the Western North Atlantic stock is 93,233 based on surveys conducted between Labrador to Florida (Hayes et al., 2020). A trend analysis is not currently available for this stock due to insufficient data (Hayes et al., 2020). The PBR for this stock is 544 and the annual rate of human-caused mortality and serious injury from 2013 to 2017 was estimated to be 26 dolphins. This estimate is based on observed fishery interactions, but Atlantic white-sided dolphins are also threatened by contaminants in their habitat, and climate-related shifts in prey distribution (Hayes et al., 2020). There is no designated critical habitat for this stock in the Project Area.

RWF

Seasonal abundances off the Northeast U.S. in spring through fall are estimated to be 38,000 to 42,000 animals (CETAP, 1982; Kenney and Vigness-Raposa, 2010). Over the course of BOEM's study in the RI-MA WEA, 185 individual Atlantic white-sided dolphins were sighted within the Lease Area; most were observed during summer (112 sightings) followed by fall (70 sightings) (Kraus et al., 2016). Atlantic white-sided dolphins are one of the most likely delphinids that would occur seasonally within the RWF area.

RWEC

Atlantic white-sided dolphins are one of the three odontocetes primarily inhabiting OCS waters shoreward of the 100-m depth contour (CETAP, 1982; Hayes et al., 2020). Most of the sightings (90%) were seen within an estimated depth range of 38 to 271 m. Sightings are concentrated in coastal waters near Cape May, New Jersey, and in shallow waters within the Gulf of Maine (CETAP, 1982). The Gulf of Maine population is commonly seen from the Hudson Canyon to Georges Bank. Sightings south of Georges Bank and Hudson Canyon occur year-round; however, at lower densities (Hayes et al., 2020).

Offshore Rhode Island, Atlantic white-sided dolphins are common in OCS waters, with a slight tendency to occur in shallower state waters in the spring (Kenney and Vigness-Raposa, 2010). Records indicate that there is an aggregation of sightings southeast of Montauk Point, New York, during the spring and summer. Strandings of white-sided dolphins in Rhode Island are relatively rare; from 2001 to 2005, there was an average of 1.2 strandings per year (Kenney and Vigness-Raposa, 2010). Atlantic white-sided dolphins occur in seasonably high numbers in nearshore areas during the spring and summer; therefore, they could potentially occur within the RWEC – OCS and RWEC – RI.

Common Dolphin

The common dolphin has a wide distribution and can be found in both tropical and temperate areas of the Pacific and Atlantic Oceans in both nearshore and offshore waters (Perrin, 2002). Two common dolphin species were previously recognized: the long-beaked common dolphin (*Delphinus capensis*) and the short-beaked common dolphin (*Delphinus delphis)*; however, Cunha et al. (2015) summarized the relevant data and analyses along with additional molecular data and analysis, and recommended that the long-beaked common dolphin not be further used for the Atlantic Ocean. This taxonomic convention was adopted by the Society or Marine Mammalogy. This highly social and energetic species usually travels in large pods consisting of 50 to >1,000 individuals (Hammond et al., 2008b). The common dolphin can frequently be seen performing acrobatics and interacting with large vessels and other marine mammals.

Common dolphins have a very distinct color pattern that takes the form of an hourglass on its side, and most individuals also have a prominent white patch on the dorsal fin (Jefferson et al., 2008). Common dolphin clicks are broadband sounds between 17 and 45 kHz with peak energy between 23 and 67 kHz. Burst-pulse sounds are typically between 2 and 14 kHz while the key frequencies of common dolphin whistles are between 3 and 24 kHz (Erbe et al., 2017). No hearing sensitivity data are available for this species (Southall et al., 2019).

The common dolphin is not listed under the ESA and is classified as Least Concern by the IUCN Red List (NMFS, 2020a; IUCN, 2021). The current best abundance estimate for the Western North Atlantic stock is 172,947 based on recent surveys conducted between Newfoundland and Florida (NMFS, 2020a). A trend analysis was not conducted for this stock because of the imprecise abundance estimate and long survey intervals (NMFS, 2020a). The common dolphin faces anthropogenic threats because of its utilization of nearshore habitat and highly social nature, but it is not considered a strategic stock under the MMPA because the average annual human-caused mortality and serious injury does not exceed the calculated PBR of 1,452 for this stock (NMFS, 2020a). Historically, this species was hunted in large numbers for food and oil. Currently, they continue to suffer incidental mortality from vessel collisions and Eastern North American fishing activities within the Atlantic, most prominently yellowfin tuna (*Thunnus albacares*) nets, driftnets, and bottom-set gillnets (Kraus et al., 2016; NMFS, 2020a). The annual estimated human-caused mortality and serious injury for 2014 to 2018 was 399, which included fishery-interactions and research takes (NMFS, 2020a). Other threats to this species include contaminants in their habitat and climate-related changes in prey distribution (NMFS, 2020a). There is no designated critical habitat for this stock in the Project Area.

<u>*RWF*</u>

Kraus et al. (2016) observed 3,896 common dolphins within the RI-MA WEA. Most were observed during summer surveys followed by fall, winter, then spring (**Figure 3.1-12**). This was the highest number of individual sightings of all the small cetaceans; therefore, it is anticipated to be one of the most frequent delphinids to occur seasonally within the RWF area.

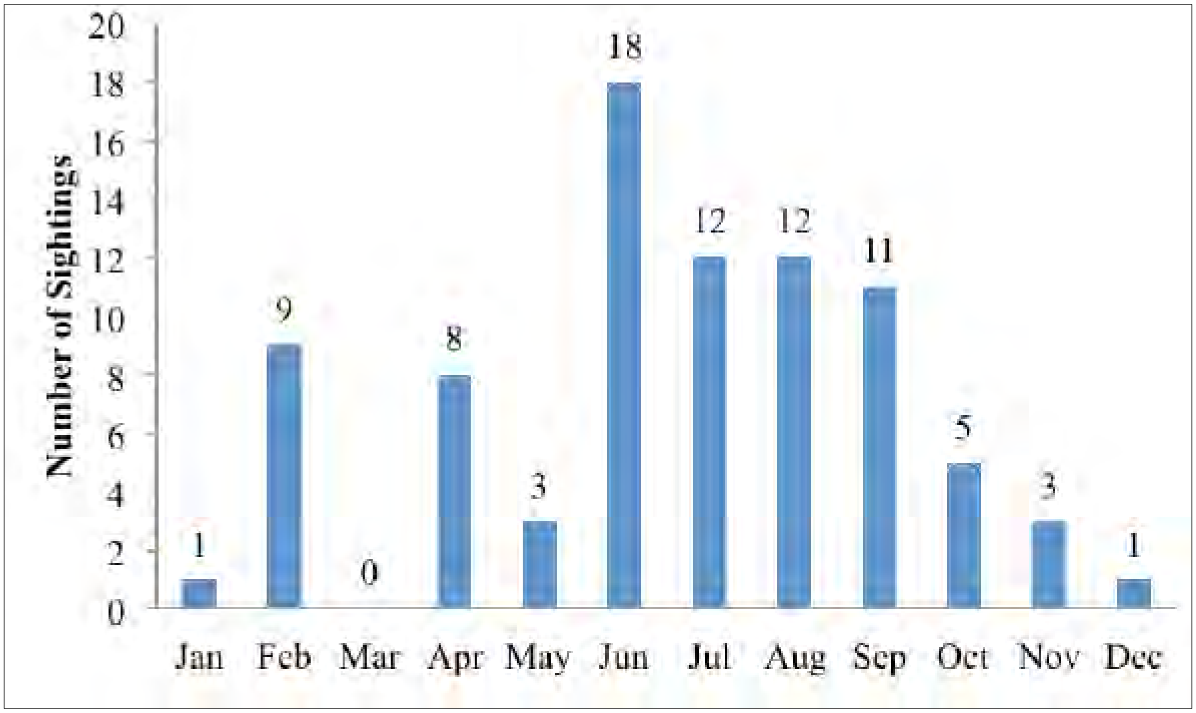

Figure 3.1-12. Visual detections of common dolphin by month for all survey years between October 2011 and June 2015. From: Kraus et al. (2016).

<u>RWEC</u>

Since the common dolphin has a wide distribution and can be found in both nearshore and offshore waters of the Pacific and Atlantic Oceans, they could potentially occur within both the RWEC – OCS and RWEC —RI (Perrin, 2002).

Risso's Dolphin

Risso's dolphins are found in temperate, subtropical, and tropical waters. In the Western North Atlantic, their range extends from Florida to Eastern Newfoundland. Off the Northeastern U.S. Coast, Risso's dolphins are primarily concentrated along the continental shelf edge, but they can also be found swimming in shallower waters to the mid-shelf (Hayes et al., 2020).

Unlike most other dolphins, Risso's dolphins have blunt heads without distinct beaks. Coloration for this species ranges from dark to light grey. Adult Risso's dolphins are typically covered in white scratches and spots that can be used to identify this species in field surveys (Jefferson et al., 1993). Whistles for this species have frequencies ranging from around 4 kHz to over 22 kHz with estimated SLs between 163 and 210 dB re 1 μPa m (Erbe et al., 2017). Studies using both behavioral and AEP methods have been conducted for this species, which show greatest auditory sensitivity between <4 kHz to >100 kHz (Nachtigall et al., 1995; Nachtigall et al., 2005).

Risso's dolphins are not listed under the ESA and are classified as a species of Least Concern on the IUCN Red List (Hayes et al., 2020; IUCN, 2021). The best abundance estimate in the Western North Atlantic is 35,493 based on surveys conducted from Newfoundland and Florida (Hayes et al., 2020). A trend analysis was not conducted on this species, because there are insufficient data to generate this information. PBR for this stock is 303, and the annual human-caused mortality and injury for 2013 to 2017 was estimated to be 54.3 (Hayes et al., 2020). This stock is not classified as strategic under the MMPA because mortality does not exceed the calculated PBR. Threats to this stock include fishery interactions, non-fishery related human interaction, contaminants in their habitat, and climate-related shifts in prey distribution (Hayes et al., 2020). There is no designated critical habitat for this stock in the Project Area.

RWF

Risso's dolphins have been observed in OCS waters offshore Rhode Island year-round, with most sightings during the summer. Sighting data primarily shows that this species is found along the shelf break, with only few species seen in waters shallower than 100 m. Only one sighting in the Rhode Island Ocean Special Area Management Plan study area was reported in the spring (Kenney and Vigness-Raposa, 2010). Kraus et al. (2016) only observed two Risso's dolphins in the RI-MA WEA during the spring. Risso's dolphins do occur in the area; however, because of the infrequent sightings in shallower waters and more concentrated distribution along the continental shelf, the likelihood of encountering Risso's dolphins in the RWF area is relatively low.

RWEC

Risso's dolphins are unlikely to occur within the RWEC – OCS or RWEC – RI due to their primary occurrence in deeper waters along the OCS edge (Hayes et al., 2020).

Common Bottlenose Dolphin

In the Western North Atlantic, there are two morphologically and genetically distinct common bottlenose morphotypes, the Western North Atlantic Northern Migratory Coastal stock and the Western North Atlantic Offshore stock. The offshore stock is primarily distributed along the OCS and slope from Georges Bank to Florida (Hayes et al., 2020), whereas the northern migratory coastal stock is distributed along the coast between southern Long Island, New York and Florida (NMFS, 2020a). Given their distribution, only the offshore stock is likely to occur in the Project Area and is the only stock included in this assessment.

Common bottlenose dolphins are large, relatively robust animals. The snout is stocky and set off from the head by a crease. They are typically light to dark grey in color with a white underside (Jefferson et al., 1993). Whistles produced by bottlenose dolphins can vary over geographic regions, and newborns are thought to develop "signature whistles" within the first few months of their lives that are used for intraspecific communication. Whistles generally range in frequency from 300 Hz to 39 kHz with SLs between 114 and 163 dB re 1 µPa m (Erbe et al., 2017). Bottlenose dolphins also make burst-pulse sounds and echolocation clicks, which can range from a few kHz to over 150 kHz. As these sounds are used for locating and capturing prey, they are directional calls; the recorded frequency and sound level can vary depending on whether the sound was received head-on or at an angle relative to the vocalizing dolphin. SLs for burst-pulses and clicks range between 193 and 228 dB re 1 µPa m (Erbe et al., 2017). There are sufficient available data for bottlenose dolphin hearing sensitivity using both behavioral and AEP methods as well as anatomical modeling studies, which show hearing for the species is greatest between approximately 400 Hz and 169 kHz (Southall et al., 2019).

Common bottlenose dolphins are not listed under the ESA and are classified as Least Concern on the IUCN Red List (Hayes et al., 2020; IUCN, 2021). The best abundance estimate for the Western North Atlantic offshore stock is 62,851 based on recent surveys between the lower Bay of Fundy and Florida (Hayes et al., 2020). A population trend analysis for this stock was conducted using abundance estimates from 2004, 2011, and 2016, which show no statistically significant trend (Hayes et al., 2020). The PBR for this stock is 519, and the average annual human-cause mortality and serious injury from 2013 to 2017 was estimated to be 28, attributed to fishery interactions (Hayes et al., 2020). Because annual mortality does not exceed PBR, this stock is not classified as strategic under the MMPA. In addition to fisheries, threats to common bottlenose dolphins include non-fishery related human interaction; anthropogenic noise; offshore development; contaminants in their habitat; and climate-related changes in prey distribution (Hayes et al., 2020). There is no designated critical habitat for either stock in the Project Area.

RWF

Common bottlenose dolphins were reported in the RI-MA WEA in all seasons; highest seasonal abundance estimates were during the fall, summer, and spring (**Figure 3.1-13**). Kraus et al. (2016) reports the offshore stock as only be sighted in the RI-MA WEA during the summer months. The greatest concentrations of common bottlenose dolphins were observed in the southernmost portion of the RI-MA WEA study area in the fall (Kraus et al., 2016). Therefore, common bottlenose dolphins are likely to occur in the RWF.

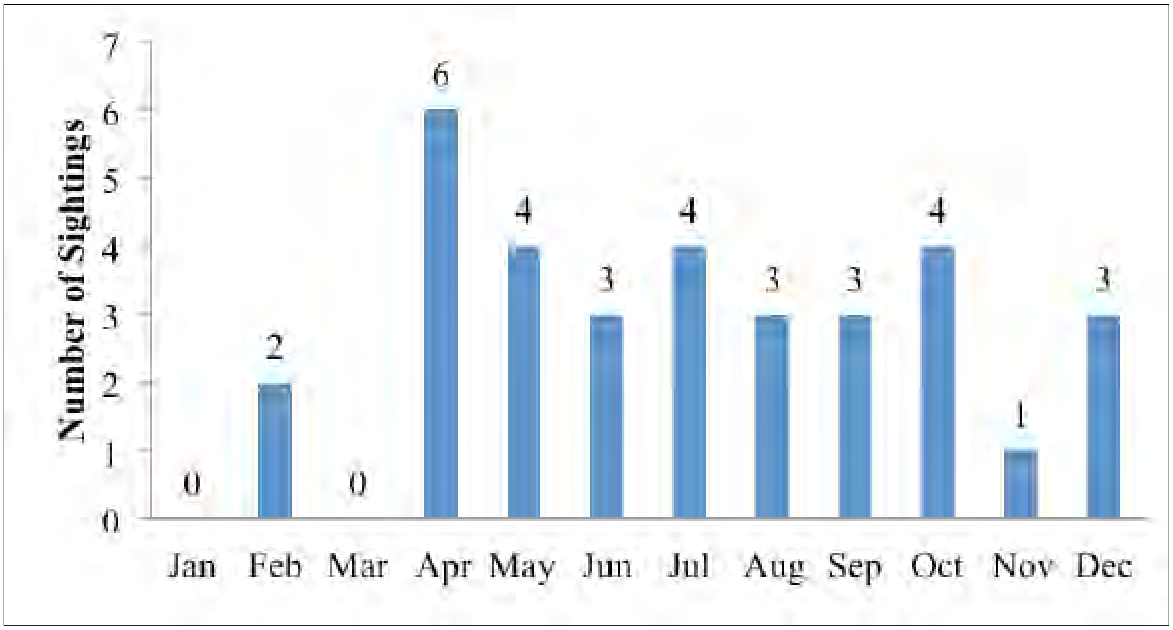

Figure 3.1-13. Visual detections of common bottlenose dolphin by month for all survey years between October 2011 and June 2015. From: Kraus et al. (2016).

RWEC

As previously discussed, common bottlenose dolphins that occur within the nearshore areas of the Project Area are likely to come from the offshore stock, despite its predominantly offshore distribution, as the seasonal stranding records match the temporal patterns of the offshore stock rather than the coastal stock (Kenney and Vigness-Raposa, 2010). Therefore, the offshore stock can be expected to occur in both the RWEC – OCS and RWEC – RI.

Harbor Porpoise

The harbor porpoise is mainly a temperate, inshore species that prefers to inhabit shallow, coastal waters of the North Atlantic, North Pacific, and Black Sea. Harbor porpoises mostly occur in shallow OCS and coastal waters. In the summer, they tend to congregate in the Northern Gulf of Maine, Southern Bay of Fundy, and around the southern tip of Nova Scotia (NMFS, 2020a). In the fall and spring, harbor porpoises are widely distributed from New Jersey to Maine (NMFS, 2020a). In the winter, intermediate densities can be found from New Jersey to North Carolina, with lower densities from New York to New Brunswick, Canada (Kenney and Vigness-Raposa, 2010). In cooler months, harbor porpoises have been observed from the coastline to deeper waters (>1,800 m), although the majority of sightings are over the continental shelf (NMFS, 2020a).

This species is among the smallest of the toothed whales and is the only porpoise species found in Northeastern U.S. waters. A distinguishing physical characteristic is the dark stripe that extends from the flipper to the eye. The rest of its body has common porpoise features; a dark gray back, light gray sides, and small, rounded flippers (Jefferson et al., 1993). Harbor porpoises produce high frequency clicks with a peak frequency between 129 and 145 kHz and an estimated SLs that ranges from 166 to 194 dB re 1 μPa m (Villadsgaard et al., 2007). Available data estimating auditory sensitivity for this species suggest that they are most receptive to noise between 300 Hz and 160 kHz (Southall et al., 2019).

This species not listed under the ESA, is listed as Least Concern by the IUCN Red List, and is considered non-strategic under the MMPA (NMFS, 2020a; IUCN, 2021). They are also not considered Endangered or Threatened by the state of Rhode Island, but they are considered a Species of Greatest Conservation Need (RI DEM, 2020). The best available abundance estimate for the Gulf of Maine/Bay of Fundy stock occurring in the Project Area is 95,543 based on combined survey data from NOAA and the Department of Fisheries and Oceans Canada between the Gulf of St. Lawrence/Bay of Fundy/Scotian Shelf and Central Virginia (NMFS, 2020a). A population trend analysis is not available because data are insufficient for this species (NMFS, 2020a). The PBR for this stock is 851, and the estimated human-caused annual mortality and serious injury from 2014 to 2018 was 150 (NMFS, 2020a). This species faces major anthropogenic effects because of its nearshore habitat. Historically, Greenland populations were hunted in large numbers for food and oil. Currently, they continue to suffer incidental mortality from Western North Atlantic fishing activities such as gillnets and bottom trawls (NMFS, 2020a). Harbor porpoises also face threats from contaminants in their habitat, vessel traffic, habitat alteration due to offshore development, and climate-related shifts in prey distribution (NMFS, 2020a). There is no designated critical habitat for this species near the Project Area.

RWF

Over the course of the study, Kraus et al. (2016) observed 121 individual harbor porpoises within the RI-MA WEA. Fall observations included the most individuals, followed by winter, spring, and summer (**Figure 3.1-14**). Vertical camera detections of all small cetaceans showed that the most commonly detected species over time was the harbor porpoise (Kraus et al., 2016). The preferred habitat of the harbor porpoise further increases the likelihood of encountering them seasonally in fall, winter, and spring within the RWF area (BOEM, 2013; NMFS, 2020a).

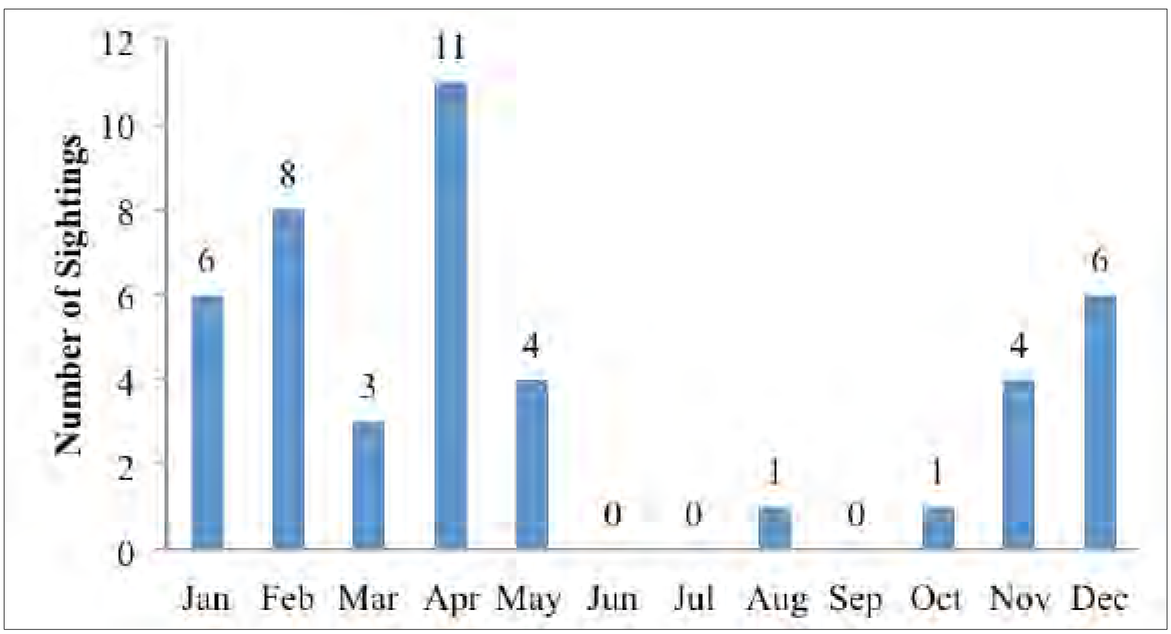

Figure 3.1-14. Visual detections of harbor porpoise by month for all survey years between October 2011 and June 2015. From: Kraus et al. (2016).

RWEC

Harbor porpoise occurrence offshore Rhode Island is highly seasonal with most sightings occurring in winter and spring and relatively few in summer and fall (Kenney and Vigness-Raposa, 2010). Strandings are reported all along the southern shore of Long Island, New York, and along both sides of Long Island Sound. They are most commonly reported in Eastern Long Island Sound, Gardiner's Bay, and Peconic Bay during the winter, west of the RWEC corridor. They have the greatest abundance in Rhode Island waters during the spring when they are known to migrate from their offshore wintering habitat in the mid-Atlantic to their summer feeding grounds in the Gulf of Maine (Kenney and Vigness-Raposa, 2010). Therefore, harbor porpoises are likely to occur within both the RWEC – OCS and RWEC – RI.

Harbor Seal

Harbor seals, also known as common seals, are one of the most widely distributed seal species in the Northern Hemisphere. They can be found inhabiting coastal and inshore waters from temperate to polar latitudes. Genetic variability from different geographic populations has led to five subspecies being recognized. Harbor seals are found in the Western Atlantic from the Mid-Atlantic U.S. to the Canadian Arctic and east to Greenland and Iceland (Rice, 1998). Peak breeding and pupping times range from February to early September, and breeding occurs in open water (Temte, 1994).

The harbor seal is one of the smaller pinnipeds, and adults are often light to dark grey or brown with a paler belly and dark spots covering the head and body (Jefferson et al., 1993; Kenney and Vigness-Raposa, 2010). Male harbor seals have been documented producing an underwater roar call which is used for competition with other males and attracting mates. These are relatively short calls with a duration of about 2 sec and a peak frequency between 1 and 2 kHz (Van Parijs et al., 2003). Behavioral audiometric studies for this species estimate peak hearing sensitivity between 100 Hz and 79 kHz (Southall et al., 2019).

Harbor seals are not listed under the ESA, are listed as Least Concern by the IUCN Red List, and are considered non-strategic because anthropogenic mortality does not exceed PBR (NMFS, 2020a; IUCN, 2021). Like the harbor porpoise they are also not listed as endangered or threatened by the state of Rhode Island but are listed as a Species of Greatest Conservation Need (RI DEM, 2020). The best available abundance estimate for harbor seals in the Western North Atlantic is 75,834, with global population estimates reaching 610,000 to 640,000 (Bjørge et al., 2010; Lowry, 2016; NMFS, 2020a). There is no population trend analysis currently available, however one is underway using 2018 survey data (NMFS, 2020a). The PBR for this population is 2,006, and the annual human-caused mortality and serious injury from 2014 to 2018 was estimated to be 365.2 seals per year. This mortality and serious injury was attributed to fishery interactions, non-fishery related human interactions, and research activities (NMFS, 2020a). Until 1972, harbor seals were commercially and recreationally hunted. Currently, only Alaska natives can hunt harbor seals for sustenance and the creation of authentic handicrafts. Other threats to harbor seals include disease and predation (NMFS, 2020a). There is no designated critical habitat for this species in the Project Area.

RWF

Harbor seals can be found along the coast of Rhode Island and the RI-MA WEA, as well as in surrounding waters. Several haul-out sites are located on Block Island, Rhode Island, which is close to the western end of the RWF area (BOEM, 2013). Survey data collected from NMFS and the Provincetown Center for Coastal Research reported 151 harbor seal sightings, a large concentration of which were observed near the coast from eastern Long Island, New York, to Buzzards Bay and Vineyard Sound. There were occurrences of harbor seal offshore; however, the level of abundance was lower than what was observed near haul-out sites (Kenney and Vigness-Raposa, 2010). Therefore, harbor seals could be potentially encountered in the RWF area.

RWEC

Harbor seals are regularly observed in coastal areas; however, there are few records from shipboard and aerial surveys. Harbor seals are difficult to detect as the only sighting cue available would be seeing the seal's head above the water. CETAP excluded seals from their data collection efforts specifically for this reason (CETAP, 1982). Most available records are of strandings and haul-out counts. Harbor seals are known to inhabit Southern New England waters year-round, although the population steadily increases in April and then abruptly declines in May.

Harbor seals are regularly observed around coastal areas throughout Rhode Island. While there are no known pupping grounds in this area, six haul-out sites have been identified in Narragansett Bay. They are most commonly observed at the Dumplings off Jamestown at Rome Point in North Kingstown, Rhode Island (Kenney and Vigness-Raposa, 2010). Nearly all the haul-outs within Narragansett Bay are rocky ledges or isolated rocks with the exception of Spar Island, which is a man-made dredge spoil (Kenney and Vigness-Raposa, 2010). Harbor seals can likely be found in the nearshore areas around the proposed RWEC corridor. Harbor seals are likely to be one of the most frequent and densely occurring marine mammal that could occur annually within both the RWEC – OCS and RWEC – RI.

Grey Seal

Gray seals inhabit temperate to sub-Arctic waters of the North Atlantic, in both nearshore and deeper OCS waters (Hall, 2002). Three different geographic populations occur; Western North Atlantic, Eastern North Atlantic, and Baltic populations (Kenney and Vigness-Raposa, 2010). Peak breeding and pupping times are January to late March, and breeding occurs in open water (Baker et al., 1995).

Gray seals are among the larger phocids found in the Western North Atlantic (Jefferson et al., 1993). Two types of underwater vocalizations have been recorded for male and female gray seals; clicks and hums. Clicks are produced in a rapid series resulting in a buzzing noise with a frequency range between 500 Hz and 12 kHz. Hums, which is described as being similar to that of a dog crying in its sleep, are lower frequency calls, with most of the energy <1 kHz (Schusterman et al., 1970). AEP studies indicate that hearing sensitivity for this species is greatest between 140 Hz and 100 kHz (Southall et al., 2019).

This species is not listed under the ESA, is listed Least Concern by the IUCN Red List, and is non-strategic because anthropogenic mortality does not exceed PBR (NMFS, 2020a; IUCN, 2021). Estimates of the entire Western North Atlantic gray seal population are not available, only estimated portions of the stock are available, although recent genetic evidence suggests that all Western North Atlantic gray seals may actually comprise a single stock (NMFS, 2020a). The best available current abundance estimate for gray seals of the Canadian gray seal stock is 424,300 and the current U.S. population estimate is 27,131 (NMFS, 2020a). The population of gray seals is likely increasing in the U.S. Atlantic EEZ; recent data show approximately 28,000 to 40,000 gray seals were observed in Southeastern Massachusetts in 2015 (NMFS, 2020a). The population trend for grey seals in the U.S. differs across all the pupping colonies, ranging from -0.2% on Green Island to 26.3% on Monomoy Island from 1988 to 2019 (NMFS, 2020a). In Canada, the total population was estimated to be increasing by 4.4% per year from 1960 to 2016. The PBR for this population is 1,389, and the annual human-caused mortality and serious injury between 2014 and 2018 was estimated to be 4,729 in both the U.S. and Canada (NMFS, 2020a). Like harbor seals, the gray seal was commercially and recreationally hunted until 1972. Mortality was attributed to fishery interactions, non-fishery related human interactions and hunting, research activities, Canadian commercial harvest, and removals of nuisance animals in Canada (NMFS, 2020a). Other threats to this population include predation, natural phenomena like storms, and disease prompting NMFS to declare a UME for pinnipeds due to phocine distemper virus in 2018 (NMFS, 2020a,b). There is no designated critical habitat for this species in the Project Area.

RWF

Overall, individuals within the RWF are relatively low; occasionally young pups have been found stranded off Long Island, New York, and Rhode Island beaches. The AMAPPS surveys identified 11 individuals during their winter aerial surveys (Palka et al., 2017). Two breeding and pupping grounds are located in Nantucket Sound at Monomoy and Muskeget Island. Gray seals live there year-round and exhibit minimal migration patterns; however, recent tagging studies observed increased movement between the U.S. and Canada. The overall time spent in U.S. waters remains uncertain, but the updated U.S. population estimates make it possible that these seals will be seen around the RWF area (NMFS, 2020a).

RWEC

Historically, gray seals were relatively absent from Rhode Island and nearby OCS waters. However, with the recent recovery of the Massachusetts and Canadian populations, their occurrence has increased in Southern New England and the Mid-Atlantic U.S. (Kenney and Vigness-Raposa, 2010). Records of gray seal strandings are primarily observed in the spring and are distributed broadly along ocean-facing beaches in Long Island, New York, and Rhode Island. In New York, gray seals are typically seen alongside harbor seal haul-outs. Two frequent sighting locations include Great Gull Island and Fisher's Island, New York (Kenney and Vigness-Raposa, 2010). Even though sightings are not as frequent as harbor seals, gray seals do occur in Rhode Island waters; therefore, these seals may be present in both the RWEC – OCS and RWEC – RI.

3.2 Sea Turtles

Four sea turtle species could potentially be present in the Project Area: green sea turtles (*Chelonia mydas*), Kemp's Ridley sea turtles (*Lepidochelys kempii*), loggerhead sea turtles, and leatherback sea turtles (*Dermochelys coriacea*). Regional Kemp's ridley and leatherback sea turtle populations are listed as Endangered under the ESA, while the green and loggerhead populations are listed as Threatened (**Table 3.2-1**). Densities for sea turtles are available from the U.S. Navy OPAREA Density Estimate database on the Strategic Environmental Research and Development Program Spatial Decision Support System (Department of the Navy, 2007, 2012) and Northeast Large Pelagic Survey Collaborative Aerial and Acoustic Surveys for Large Whales and Sea Turtles (Kraus et al., 2016) for Kemp's Ridley, loggerhead, and leatherback sea turtles for spring, summer, fall, and winter.

Table 3.2-1. Sea turtles with geographic ranges that include the Northeastern U.S. region, and the relative occurrence in the Project Area.

Common Name	Scientific Name	Stock	Current Population Status	Relative Occurrence in the RWF	Relative Occurrence in the RWEC – OCS	Relative Occurrence in the RWEC – RI
Green sea turtle	*Chelonia mydas*	North Atlantic DPS	ESA Threatened RI State Endangered	Uncommon	Uncommon	Uncommon
Kemp's Ridley sea turtle	*Lepidochelys kempii*	-	ESA Endangered RI State Endangered	Uncommon	Regular	Regular
Loggerhead sea turtle	*Caretta*	Northwest Atlantic Ocean DPS	ESA Threatened RI State Endangered	Common	Common	Common
Leatherback sea turtle	*Dermochelys coriacea*	-	ESA Endangered RI State Endangered	Common	Common	Common

DPS = Distinct Population Segment; ESA = Endangered Species Act; Project Area = includes the Revolution Wind Farm (RWF), Revolution Wind Export Cable (RWEC) – Outer Continental Shelf (OCS) and RWEC – Rhode Island (RI) state waters, and Onshore Facilities.
[1]Information based on available survey data for the region and the Wind Energy Area where Project will be located.

Sea turtle life history stages are similar in all species and include eggs, hatchling, juvenile, and adult stages. In general, sea turtles nest in tropical, subtropical, and warm-temperate beaches (Davenport, 1997). In the U.S., common nesting colonies are located in the Gulf of Mexico and Western South Atlantic Ocean; however, specific nesting distributions are described in the species-specific discussions that follow. Females mate in nearshore waters and then lay their eggs on the beach. Hatchling sea turtles move offshore in a swimming frenzy immediately after hatching (Davenport, 1997). At the surface-pelagic juvenile stage, sea turtles move to convergence zones or to *Sargassum* spp. mats and undergo passive oceanic migrations (Witherington et al., 2012). Juvenile sea turtles actively recruit to nearshore nursery habitats and move into adult foraging habitats when approaching sexual maturity. At maturity, sea turtles return to their natal beaches to lay their eggs (Davenport, 1997).

The following subsections summarize data on the status and trends, distribution and habitat preferences, behavior, and life history of sea turtles that may be found in the Project Area as available in published literature and reports, including USFWS species fact sheets.

3.2.1 Green Sea Turtle

Green sea turtles have a worldwide distribution and can be found in both tropical and subtropical waters (NatureServe, 2019; NMFS and USFWS, 1991). In the Western North Atlantic Ocean, they can be found from Massachusetts to Texas, as well as in waters off Puerto Rico and the U.S. Virgin Islands (NMFS and USFWS, 1991). Depending on the life stage, green sea turtles inhabit high-energy oceanic beaches, convergence zones in pelagic habitats, and benthic feeding grounds in shallow protected waters (NMFS and USFWS, 1991). Green sea turtles are known to make long-distance migrations between their nesting and feeding grounds. Hatchlings occupy pelagic habitats and are omnivorous. Juvenile foraging habitats include coral reefs, emergent rocky bottoms, *Sargassum* spp. mats, lagoons, and bays (USFWS, 2018a). Once mature, green sea turtles leave pelagic habitats and enter benthic foraging grounds, primarily feeding on seagrasses and algae (Bjorndal, 1997).

Major green sea turtle nesting beaches occur on Ascension Island, Aves Island, Costa Rica, and Suriname. In the U.S., green sea turtles nests in North Carolina, South Carolina, Georgia, Florida, the U.S. Virgin Islands, and Puerto Rico (USFWS, 2018a). Nesting seasons vary by region. On average, individual females nest every 2 to 4 years, laying an average of 3.3 nests per season at approximately 13-day intervals. The average clutch size is approximately 136 eggs and incubation ranges from 45 to 75 days (USFWS, 2018a).

Bartol and Ketten (2006) measured the AEPs of two Atlantic green sea turtles and six sub-adult Pacific green sea turtles. Sub-adults were found to respond to stimuli between 100 and 500 Hz, with a maximum sensitivity of 200 and 400 Hz. Juveniles responded to stimuli between 100 and 800 Hz, with a maximum sensitivity between 600 and 700 Hz. Piniak et al. (2016) confirmed similar levels, as juvenile green sea turtles responded to underwater stimuli between 50 and 1,600 Hz with maximum sensitivity between 200 and 400 Hz. Dow Piniak et al. (2012a) found that the AEPs of juvenile green sea turtles were between 50 and 1,600 Hz in water and 50 and 800 Hz in air; with ranges of maximum sensitivity between 50 and 400 Hz in water and 300 and 400 Hz in air.

There are 11 listed DPSs for green sea turtles, all of which are listed as Threatened or Endangered. The North Atlantic DPS, which is likely to occur in the Project Area, was listed as Threatened in 1978 (NMFS, 2020c). The global population is listed as Endangered under the IUCN Red List (IUCN, 2021). They are also listed as endangered by the state of Rhode Island (RI DEM, 2020). Worldwide, green sea turtle populations have declined due to past harvesting for eggs and meat (USFWS, 2018a). Currently, major risks to green sea turtles include loss of nesting and foraging habitat, nest predation, marine pollution, vessel strikes, and anthropogenic activity such as offshore dredging or fishing (USFWS, 2018a). Critical habitat was designated by NMFS for the green sea turtles in 1998 in the coastal waters of Culebra Island, Puerto Rico, and its outlying Keys (USFWS, 2018a). There is no designated critical habitat for green sea turtles in the Project Area.

RWF

There are few records of green sea turtle sightings in the RWF area. Only one confirmed sighting was reported in March 2005 south of Long Island, New York, between the 40- and 50-m isobaths (Kenney and Vigness-Raposa, 2010). NOAA's Northeast Fisheries Science Center conducted a combination of AMAPPS along the Northeast U.S. Coast from 2010 through 2015 (Palka et al., 2017). Survey waters spanned from Cape May, New Jersey, to the mouth of the Gulf of St. Lawrence, Canada. Out of five surveys that were conducted, green sea turtles were spotted only during 2010 and 2011. Six individuals were sighted south of Long Island, New York, and within the Nantucket Shoals during summer aerial surveys (17 August through 26 September 2010). Five green sea turtles were also sighted off the southern coast of Long Island, New York, during the summer aerial surveys (7 August through 26 August 2011) (Palka et al., 2017).

Digital aerial surveys conducted by the New York State Energy Research and Development Authority (NYSERDA) to gather baseline data on birds, marine mammals, turtles, and fish reported only one green sea turtle during summer 2016 surveys, and no confirmed green sea turtle sightings have been reported during 2017 or 2018 surveys (Normandeau and APEM, 2019). Based on the available sighting information of green sea turtles in this region, their occurrence would be infrequent in the RWF.

RWEC

In Southern New England, green sea turtles are known to occur in the waters around Cape Cod Bay and Block Island and Long Island Sounds (CETAP, 1982). In 2005, there was one confirmed green sea turtle sighting southwest of the RWEC corridor offshore Long Island, New York (Kenney and Vigness-Raposa, 2010). Stranding data from NMFS Sea Turtle Stranding and Salvage Network indicate that only two green sea turtles have been found stranded on Rhode Island between 2000 and 2018 (NMFS, 2019a). This species is considered uncommon in both the RWEC – OCS and RWEC – RI, and if they were to occur, it would primarily be during summer months as water temperature is a limiting factor in their distribution (BOEM, 2013).

3.2.2 Kemp's Ridley Sea Turtle

Kemp's ridley sea turtles occur off the coast of the Gulf of Mexico and along the U.S. Atlantic Coast (Turtle Expert Working Group [TEWG], 2000). Juveniles inhabit the U.S. Atlantic Coast from Florida to the Canadian Maritime Provinces. In late fall, Atlantic juveniles/sub adults travel northward to forage in the coastal waters off Georgia through New England, then return southward for the winter (New York State Department of Environmental Conservation [NYSDEC], 2019; Stacy et al., 2013). Preferred habitats include sheltered areas along the coastline, including estuaries, lagoons, and bays (NMFS, 2020d). Sixty percent of Kemp's ridley nesting occurs on beaches near Rancho Nuevo, Tamaulipas, Mexico. The nesting season spans from April through July (NMFS and USFWS, 2007). On average, individual females nest every 1 to 2 years, with an average of 1 to 3 clutches every season and an average clutch size of 110 eggs per nest (NMFS and USFWS, 2007).

Data are limited on Kemp's ridley hearing capability; however, available studies show that all sea turtle species can likely detect lower frequency noises below approximately 1 to 2 kHz. Generally, sea turtle hearing is thought to more closely resemble that of fish rather than marine mammals given their inner ear morphology and the lower frequency ranges over which sea turtle hearing has been reported (Bartol and Ketten, 2006; Dow Piniak et al., 2012a; Martin et al., 2012; Popper et al., 2014).

The Kemp's ridley sea turtle was listed as Endangered under the ESA throughout its range in 1970, and is currently listed as Critically Endangered under the IUCN Red List (IUCN, 2021; NMFS, 2020d). They are also listed as endangered by the state of Rhode Island (RI DEM, 2020). The decline in global kemp's ridley populations is the result of human activity, such as harvesting adults and eggs for food and as fisheries bycatch (USFWS, 2018b). There is no designated critical habitat for this species in the Project Area (NMFS, 2020d).

RWF

Kemp's ridley sea turtles are more common in the New York Bight region and along the Long Island, New York, coastline; there are few visual sighting data for Kemp's ridley sea turtles in the RWF (Normandeau and APEM, 2019). This could be partly be due to Kemp's ridley sea turtles' small size, which makes them difficult to detect during aerial surveys. AMAPPS surveys documented five Kemp's ridley sea turtles during aerial surveys conducted from August through September, 2010, in waters from Cape May, New Jersey, to the Gulf of St. Lawrence, Canada. No confirmed sightings were reported from 2011 through 2014 (Palka et al., 2017). Kraus et al. (2016) detected Kemp's ridley sea turtles in the RI-MA WEA using vertical camera photographs. However, only four photographic detections were confirmed in 2012 (Kraus et al., 2016). Kenney and Vigness-Raposa (2010) reported 14 observations of Kemp's ridley offshore Rhode Island around Block Island in the summer and fall. Given the available data for Kemp's ridley turtle presence in the RI-MA WEA, it is not likely that they would be encountered in the RWF area.

RWEC

Kemp's ridley sea turtles that occur in Southern New England can be seen in Long Island Sound, along the Rhode Island coastline, and in Cape Cod Bay (CETAP, 1982; Waring et al., 2012). Beginning in July, Kemp's ridley turtles begin inhabiting the Long Island Sound area. To date, all Kemp's Ridley turtles encountered in Long Island Sound have been juveniles. Between July and early October, juveniles occupy estuarine waters of the Long Island Sound, Peconic Bay, and other bays along the south shore of Long Island, New York. During this time, growth rates increase by approximately 25% per month, indicating that these waters provide an abundant food source for these turtles. The Long Island Sound has not been formally identified as critical habitat; however, research has inferred that this area could potentially provide a critical coastal developmental habitat for immature Kemp's ridley sea turtles during the early turtle life stages (2 to 5 years) (Morreale et al., 1992; NYSDEC, 2019). The main characteristics of developmental habitats are coastal areas sheltered from high winds and waves such as embayments, estuaries, and nearshore temperate waters shallower than 50 m (NMFS, 2020d).

In October, Kemp's ridley sea turtles begin to migrate out of the estuaries and back into pelagic environments. If they do not migrate out by late November, they are likely to become cold-stunned. There are many records of cold-stunned Kemp's ridley sea turtles washing ashore on Long Island, New York (Burke et al., 1993). Cold-stunned Kemp's ridley sea turtles are often found stranded on beaches of Rhode Island and Massachusetts beginning in autumn when water temperatures drop below 50°F (Stacy et al., 2013). However, strandings are more common in Massachusetts; 929 reported Kemp's ridleys between 2000 and 2018 along Massachusetts coasts versus only 8 reported for Rhode Island (NMFS, 2019a). Therefore, Kemp's ridley sea turtles may be present in low numbers in the RWEC - OCS and RWEC – RI in the spring and summer.

3.2.3 Loggerhead Sea Turtle

Loggerhead sea turtles have a worldwide distribution and inhabit temperate and tropical waters, including estuaries and continental shelves of both hemispheres. Five populations of loggerhead sea turtles exist worldwide in the Atlantic Ocean, Pacific Ocean, Indian Ocean, Caribbean Sea, and Mediterranean Sea. In the Western Atlantic Ocean, the five major nesting aggregations are: (1) a northern nesting aggregation from North Carolina to northeast Florida, approximately 20° N latitude; (2) a south Florida nesting aggregation from 29° N latitude on the east coast to Sarasota on the west coast; (3) a Florida Panhandle nesting aggregation at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting aggregation on the eastern Yucatán Peninsula, Mexico; and (5) a Dry Tortugas nesting aggregation on the islands of the Dry Tortugas, near Key West, Florida (TEWG, 2000).

Female loggerhead sea turtles mate from late April through early September. Individual females might nest several times within one season and usually nest at intervals of every 2 to 3 years. For their first 7 to 12 years, loggerhead sea turtles inhabit pelagic waters near the North Atlantic Gyre and are called pelagic immatures. When loggerhead sea turtles reach 40 to 60 cm straight-line carapace length, they begin recruiting to coastal inshore and nearshore waters of the continental shelf through the U.S. Atlantic and Gulf of Mexico and are referred to as benthic immatures. Benthic immature loggerheads have been found in waters from Cape Cod, Massachusetts, to southern Texas. Loggerhead sea turtles forage off the Northeastern U.S. and migrate south in the fall as temperatures drop. Most recent estimates indicate that the benthic immature stage ranges from ages 14 to 32 years and they mature at around ages 20 to 38 years. Prey species for omnivorous juveniles include crab, mollusks, jellyfish, and vegetation at or near the surface. Coastal subadults and adults feed on benthic invertebrates, including mollusks and decapod crustaceans (TEWG, 2000).

Based on Bartol et al. (1999), juvenile loggerhead sea turtles respond to click stimuli from tone bursts of 250 to 750 Hz. Martin et al. (2012) recorded the AEPs of one adult loggerhead sea turtle, which responded to frequencies between 100 and 1,131 Hz, with greatest sensitivity between 200 and 400 Hz.

There are nine listed DPSs for loggerhead sea turtles; the Northwest Atlantic Ocean DPS, which occurs in the Project Area, was listed as Threatened in 2011 (NMFS, 2020e). The global population is listed as Vulnerable by the IUCN Red List (IUCN, 2021). They are also listed as endangered by the state of Rhode Island (RI DEM, 2020). Major threats to this population include loss of nesting and foraging habitat, nest predation, marine pollution, vessel strikes, disease, and fisheries bycatch (USFWS, 2018c). In 2014, NMFS designated critical habitat for the Northwest Atlantic Ocean DPS in multiple locations along the U.S. East Coast and in the Gulf of Mexico. These areas include *Sargassum* spp. habitat, nearshore reproductive habitat, overwintering areas, breeding habitat, and migratory corridors located between North Carolina and Florida in the Atlantic Ocean (79 *FR* 39855). No designated critical habitat exists in the Project Area.

RWF

Loggerhead sea turtles are frequently seen in waters off the coast of Rhode Island, Massachusetts, and New York. AMAPPS surveys reported loggerhead sea turtles as the most commonly sighted sea turtles on OCS waters from New Jersey to Nova Scotia, Canada. During the December 2014 to March 2015 aerial abundance surveys, 280 individuals were recorded (Palka et al., 2017). Kraus et al. (2016) reported that loggerhead occurrence in the RI-MA WEA was highest during August and September (**Figure 3.2-1**). Across all four survey years, there were 27 sightings in August and 45 sightings in September within the RI-MA WEA. During the NYSERDA Digital Aerial Baseline Surveys, sightings were dispersed across the continental shelf offshore Long Island past Montauk, New York, and there were 649 loggerhead detections during summer 2017 surveys. Fewer individuals were observed during fall surveys, and no turtles were detected during winter surveys (Normandeau and APEM, 2019).

Because of their documented occurrence, it is likely that loggerhead sea turtles could occur within the RWF area during the summer and fall. However, it is unlikely there would be a high concentration of turtles within the RWF, because most of these observations were reported as single sightings widely distributed throughout the RI-MA WEA (Kraus et al., 2016; Palka et al., 2017).

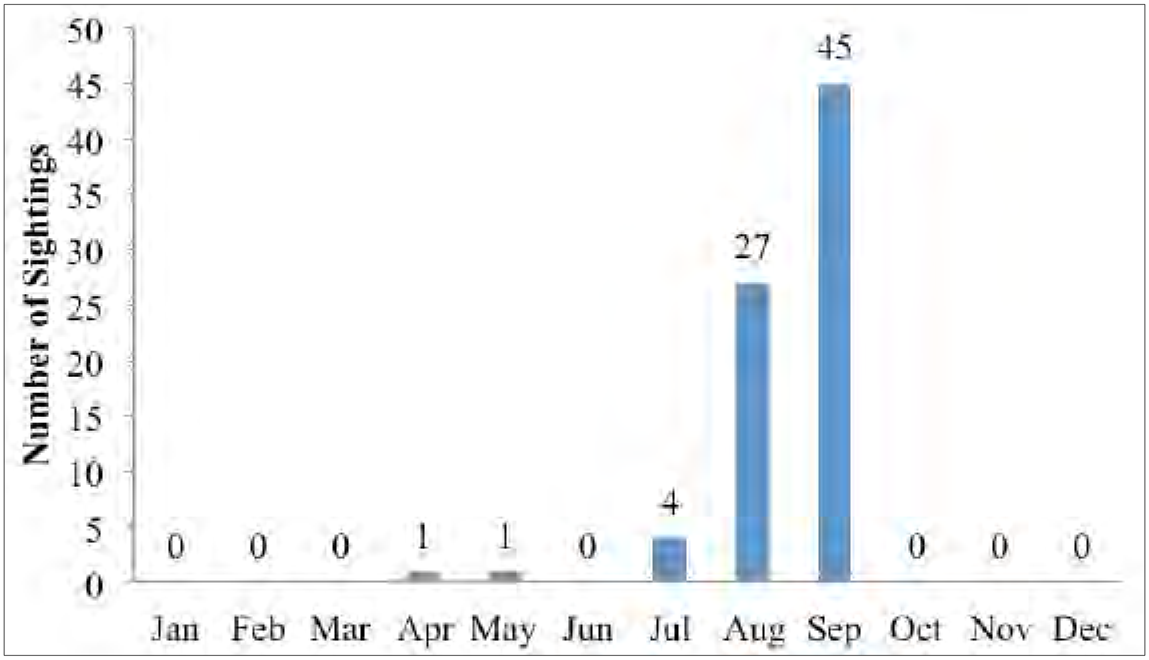

Figure 3.2-1. Visual detections of loggerhead sea turtle by month for all survey years between October 2011 and June 2015. From: Kraus et al. (2016).

<u>RWEC</u>

Loggerhead sea turtles are commonly seen off the coasts of New York and Rhode Island. CETAP conducted extensive aerial surveys from 1978 through 1982 along the coast from Cape Hatteras, North Carolina to Long Island, New York. Many loggerhead sea turtles were sighted along the continental shelf waters between Cape Hatteras, North Carolina, and Long Island, New York. A high density of loggerhead sea turtles was seen near the shore of central Long Island, New York. Loggerhead sea turtles show a northern limit at approximately 41° N latitude (CETAP, 1982), and few sightings were reported past that northern limit (Shoop and Kenney, 1992). Loggerheads are most commonly seen in June, they then begin to decrease until October as they migrate to warmer waters (Shoop and Kenney, 1992). Turtles that fall behind may succumb to cold-stunning, which usually occurs during the fall when water temperatures begin to fall. Between 1986 and 1988, 28 cold-stunned turtles were stranded in eastern Long Island, New York (Kenney and Vigness-Raposa, 2010), and recent stranding data from NMFS reported 68 loggerhead strandings in Rhode Island between 2000 and 2018 (NMFS, 2019a). Loggerhead sea turtle occurrence within both the RWEC – OCS and RWEC – RI is therefore expected to be relatively common.

3.2.4 Leatherback Sea Turtle

The leatherback sea turtle is primarily a pelagic species and is distributed in temperate and tropical waters worldwide. The leatherback is the largest, deepest diving, most migratory, widest ranging, and most pelagic of the sea turtles (NMFS, 2020f). In 2017, NMFS received a petition to identify the Northwest Atlantic subpopulation as a DPS and list it as Threatened under the ESA. In response to this petition, NMFS initiated a status review for the leatherback sea turtle to review the new information available since the original listing (82 FR 57565). This change has not yet been adopted so the global population listing remains as-is for this species. Adult leatherback sea turtles forage in temperate and subpolar regions in all oceans. Jellyfish are the major component of the leatherback diet; they are also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed (USFWS, 2018d; NMFS, 2020f).

Historically, the most important nesting ground for the leatherback was the Pacific coast of Mexico. However, because of exponential declines in leatherback nesting, French Guiana in the Western Atlantic now has the largest nesting population. Other important nesting sites for the leatherback include Papua New Guinea, Papua-Indonesia, and the Solomon Islands in the Western Pacific. In the U.S., nesting sites include the Florida east coast; Sandy Point, U.S. Virgin Islands; and Puerto Rico. U.S. nesting occurs from March through July. On average, individual females nest every 2 to 3 years, laying an average of 5 to 7 nests per season with an average clutch size of 70 to 80 eggs. Critical habitat has been designated for the leatherback sea turtle in the U.S. Virgin Islands at Sandy Point Beach, St. Croix, and the water adjacent to Sandy Point Beach (44 *FR* 17710).

Dow Piniak et al. (2012b) found that hatchling leatherback sea turtles responded to stimuli between 50 and 1,200 Hz in water and 50 and 1600 Hz in air. The maximum sensitivity was between 100 and 400 Hz in water and 50 and 400 Hz in air.

The leatherback sea turtle has been federally listed as Endangered under the ESA since 1970 and is considered Vulnerable by the IUCN Red List (IUCN, 2021; NMFS, 2020f). They are also listed as endangered by the state of Rhode Island (RI DEM, 2020). Threats to this population include fisheries bycatch, habitat loss, nest predation, and marine pollution (USFWS, 2018d). Critical habitat for this species was designated in waters adjacent to Sandy Point Beach, U.S. Virgin Islands in 1979 (44 *FR* 17710) and along the U.S. West Coast between Point Arena and Point Arguello, California, and between Cape Flattery, Washington, and Cape Blanco, Oregon, in 2012 (77 *FR* 4169).

RWF

Leatherback sea turtles were the most frequently sighted turtle species by Kraus et al. (2016) in the RI-MA WEA and were mostly observed from May through November (**Figure 3.2-2**). Leatherback sea turtles are rarely detected in the spring and not detected at all during the winter. A strong peak in leatherback sea turtle sightings is seen during August, with 71 reported sightings from Kraus et al. (2016). In the fall, there is a high concentration of sightings south of Nantucket, Massachusetts (Kraus et al., 2016). NYSERDA reported one leatherback in the RI-MA WEA during fall 2016 aerial surveys. While there were a few detections in the New York Bight region, none were detected offshore Rhode Island near the RWF during summer 2016 surveys (Normandeau and APEM, 2019). The AMAPPS surveys reported four leatherback sea turtle sightings during the summer 2011 shipboard abundance surveys (Palka et al., 2017). Because of the documented occurrence and use of Southern New England waters and within the vicinity of the RI-MA WEA, it is likely that leatherback sea turtles could occur in the RWF area during the summer and fall months. However, it is unlikely that large concentrations of these animals would be found in the RWF because observations show that their distribution is widespread, and the only concentrated occurrence was documented south of Nantucket, Massachusetts, east of the RWF.

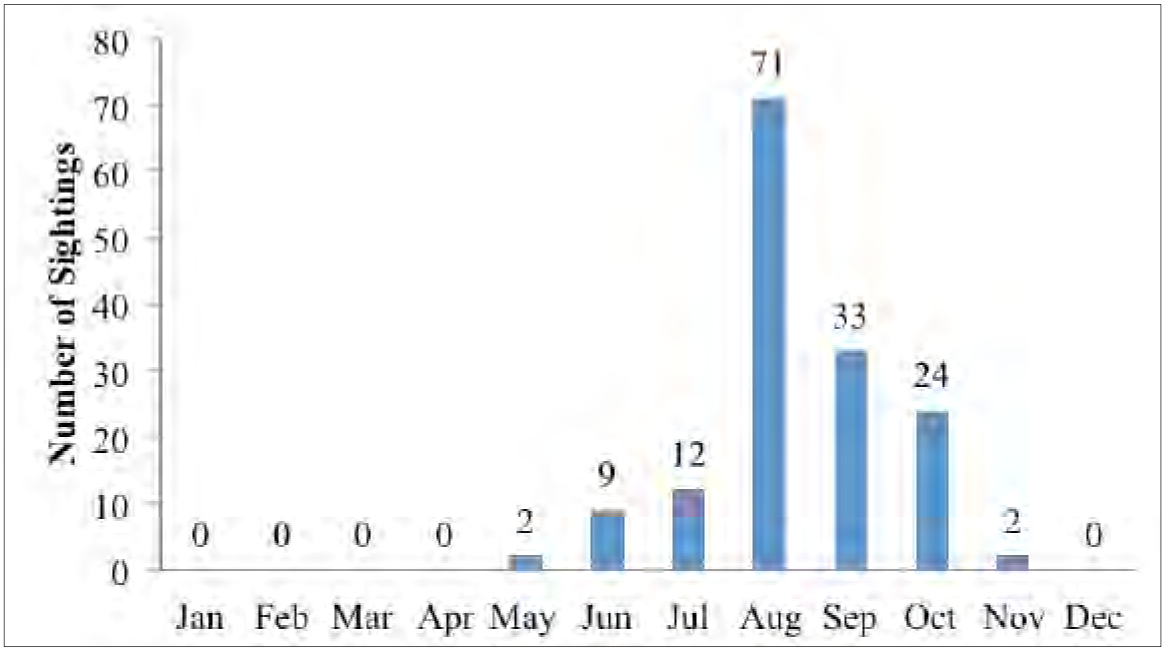

Figure 3.2-2. Visual detections of leatherback sea turtle by month for all survey years between October 2011 and June 2015. From: Kraus et al. (2016).

RWEC

Leatherback sea turtle strandings on U.S. shores are mostly of adult or near-adult size turtles (NMFS and USFWS, 1992). In relation to species occurrence, leatherback sea turtle sightings generally are fewer in number compared to loggerheads and Kemp's ridleys. Leatherback sea turtle distribution is similar to loggerhead sea turtles with occurrences from Cape Hatteras, North Carolina, to Long Island, New York, but leatherbacks are more frequently observed in the Gulf of Maine, southwest of Nova Scotia, Canada. Boaters fishing within 10 miles (16 km) of the south shore of Long Island, New York, frequently report leatherback sightings (NMFS and USFWS, 1992). Aggregations of leatherback sea turtles have been observed around Block Island, Rhode Island, and south of Long Island, New York, and strandings of this species are relatively common in Rhode Island (Kenney and Vigness-Raposa, 2010; NMFS, 2019a). Between 2000 and 2018, NMFS reported 76 leatherback sea turtle strandings in Rhode Island, the highest of the four expected sea turtle species (NMFS, 2019a). Leatherback sea turtle occurrence in both the RWEC – OCS and RWEC – RI is therefore expected to be common.

3.3 ESA-Listed Fish Species

There are three ESA-listed fish species that could potentially occur within the shelf and coastal waters of the Western North Atlantic: Atlantic sturgeon (*Acipenser oxyrhynchus*), shortnose sturgeon (*Acipenser brevirostrum*), and giant manta ray (*Mobula birostris*) (**Table 3.3-1**). These three species are listed as Endangered under the ESA so further detail is provided on their distribution, behavior, and relevant life history traits in this report.

While all three species have ranges that include the Project Area, the Atlantic sturgeon is the only species whose occurrence is common enough that they are at risk of potential impacts from Project Activities. Therefore, only this species is included in the impact assessment (**Section 5.0**). Species information and justification for excluding the shortnose sturgeon and giant manta ray from this assessment are provided in the following sections.

Table 3.3-1. Protected fish species that could potentially occur in the Project Area and their relative occurrence in the Project Area.

Common Name	Scientific Name	Stock	Federal ESA Status	Relative Occurrence in the RWF	Relative Occurrence in the RWEC – OCS	Relative Occurrence in the RWEC – RI
Atlantic sturgeon	*Acipenser oxyrhynchus*	NY Bight DPS	Endangered RI State Historical	Common	Common	Common
Shortnose sturgeon	*Acipenser brevirostrum*	-	Endangered	Rare	Rare	Rare
Giant manta ray	*Mobula birostris*	-	Endangered	Rare	Rare	Rare

DPS = Distinct Population Segment; ESA = Endangered Species Act Project Area = includes the Revolution Wind Farm (RWF), Revolution Wind Export Cable (RWEC) – Outer Continental Shelf (OCS) and RWEC – Rhode Island (RI) state waters.
[1]Information based on finfish assessment conducted in Section 4.3.3 and the Essential Fish Habitat Assessment (Inspire Environmental, 2020) provided with the Revolution Wind Construction and Operations Plan.

3.3.1 Atlantic Sturgeon

Atlantic sturgeon are found from Canada to Florida in estuarine habitats and rivers as well as in coastal and shelf marine environments. Subadults move out to estuarine and coastal waters in the fall; and adults inhabit fully marine environments and migrate through deep water when not spawning (Atlantic Sturgeon Status Review Team [ASSRT], 2007). The most recent status review for the Atlantic sturgeon was conducted in 2007. In this review, commercial bycatch was assessed, which showed that the majority (61%) of tagged sturgeon recaptures came from ocean waters within 4.8 km of shore, with the lowest ocean bycatch occurring in the summer months (July to September) (ASSRT, 2007). Atlantic sturgeon occurring within the Project Area are part of the New York Bight DPS. The Atlantic Sturgeon benchmark (SAR) (Atlantic States Marine Fisheries Commission [ASMFC], 2017) indicates that all DPS stocks are depleted but recovering. It is estimated that biomass and abundance are currently higher than that in 1998 (last year of available survey data) for the New York Bight DPS (75% average probability). The estimated abundance of age-0 to -1 Atlantic sturgeon in the Delaware River in 2014 was 3,656 individuals (Hale et al., 2016), which is similar to the age-1 estimate of 4,314 for the Hudson River in 1995 (Peterson et al., 2000). Similar estimates from the 2007 status review suggest that the Hudson River population consists of approximately 4,600 wild juveniles with a spawning stock of 870 adults.

The Atlantic sturgeon is a large (up to 4 m long), long-lived, anadromous fish that feeds on benthic invertebrates (NMFS, 2020g). Their primary hearing range falls within lower frequencies (under approximately 1 kHz), and while they do have a swim bladder, it is not involved in hearing (Popper et al., 2014).

NMFS listed the New York Bight DPS as Endangered in 2012 (77 *FR* 5879) and the critical habitat designation was finalized in 2017 (82 *FR* 3916). The IUCN lists the Atlantic sturgeon as Near Threatened (IUCN, 2021) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora lists the species under *Appendix II*, which lists species that are not necessarily now threatened with extinction, but that may become so unless trade is closely controlled. Current threats to Atlantic sturgeon within critical habitat include dams and turbines, dredging, water quality, and climate change. There is critical habitat designated for the New York Bight DPS within the Connecticut, Housatonic, Hudson, and Delaware Rivers, but no offshore critical habitat designation.

RWF

Historically, this population of Atlantic sturgeon spawned in several rivers between Massachusetts and the Chesapeake Bay; currently, however, the New York Bight DPS is known to consistently spawn only within the Hudson and Delaware rivers between April and May (ASSRT, 2007). During the spring and early summer, adult Atlantic sturgeon travel upstream in spawning rivers along Southern New England and New York. Throughout the rest of the year, spawning age adults can be found in both coastal and offshore waters in this region (ASMFC, 1990). Using commercial bycatch data, Stein et al. (2004) reported numerous juvenile and adult Atlantic sturgeon caught in waters offshore Massachusetts and Rhode Island near the RWF, and therefore they can be expected to occur in the RWF area, with a peak presence between November and May.

RWEC

Atlantic sturgeon are not likely to use any rivers in Narragansett Bay, Rhode Island for spawning; therefore, while their occurrence within the RWEC – OCS and RWEC – RI could be expected, it would be less than that expected in the RWF area.

3.3.2 Shortnose Sturgeon

Much of the distribution information is the same for the two sturgeon species, which co-occur in habitats along the U.S. Atlantic coast. Shortnose sturgeon occurring in the Project Area are from the Northeast spawning population encompassing the Connecticut, Hudson, and Delaware Rivers.

Morphologically, the shortnose sturgeon is smaller overall with a less pronounced snout than other sturgeon species, but their hearing capabilities would be similar to those described for the Atlantic sturgeon (**Section 3.3.1**). Like the Atlantic sturgeon, the shortnose sturgeon is listed as Endangered under the ESA but is classified as Vulnerable on the IUCN Red List (IUCN, 2021; NMFS, 2020h).

RWF

In a 2010 Biological Assessment (Shortnose Sturgeon Status Review Team, 2010), shortnose sturgeon were described as spending less time in open ocean habitats and spawning farther upriver than Atlantic sturgeon. The Northeast spawning population in particular uses freshwater habitats more than any of the other shortnose sturgeon populations (Kynard et al., 2016). They are considered more of an amphidromous species (defined as a species that spawns and remains in freshwater for most of its lifecycle but spends some time in saline water) rather than fully anadromous. Marine migrations do occur, and individuals have been recorded traveling 140 km in 6 days when moving between rivers (Kynard et al., 2016). However, because of the shortnose sturgeon proclivity to freshwater and estuarine habitats, the potential for shortnose sturgeon to be present in both the RWF area would be considered rare.

RWEC

As described for the RWF, this species' preference for freshwater habitat and the fact that primary spawning rivers are located in New York and Connecticut make it unlikely that this species will occur in either the RWEC – OCS or RWEC – RI.

3.3.3 Giant Manta Ray

The giant manta ray occurs in tropical, sub-tropical, and temperate waters (NMFS, 2020i). Their distribution in the Atlantic ranges from the Carolinas to Brazil and they are very rarely found in colder waters of the Western North Atlantic. Giant manta rays undergo seasonal migrations, which are thought to coincide with the movement of zooplankton, current circulation and tidal patterns, seasonal upwelling, seawater temperature, and possibly mating behavior. The giant manta ray is a seasonal visitor to productive coastlines, oceanic island groups, and offshore pinnacles and seamounts. They are generally found at depths below 10 m and tagging studies indicate dives of up to 200 to 450 m (NMFS, 2020i). They are slow-growing, highly migratory animals with sparsely distributed and fragmented populations throughout the world. Giant manta rays may reach disc widths of over 7 m (NMFS, 2020i). Regional population sizes are small (between 100 to 1,500 individuals) (Marshall et al., 2018; NMFS, 2020i).

The giant manta ray is listed as Threatened under the ESA and Vulnerable on the IUCN Red List (IUCN, 2021; NMFS, 2020i). Commercial fishing is the primary threat to the giant manta ray (NMFS, 2020i) as it is targeted and caught as bycatch in several global fisheries throughout its range.

RWF

Giant manta rays are often observed in estuarine waters and near oceanic inlets, potentially using these habitats as nursery grounds. The giant manta ray is commonly encountered on shallow reefs and is also occasionally observed in sandy bottom areas and seagrass beds (Marshall et al., 2018). Mantas have been reported as far north as Canada in the Western North Atlantic; however, its propensity for warmer waters makes its presence unlikely in the RWF area.

RWEC

Although the giant manta ray is often observed in shallow coastal waters and estuaries, they are unlikely to occur in either the RWEC – OCS or RWEC – RI given their preference for warmer waters.

3.4 Summary

Species distribution and life history information were obtained from surveys conducted in and around the RI-MA WEA and available published literature in order to determine baseline conditions for the Project Area. This information helps determine what species are most likely to occur in the RWF and the RWEC – OCS and RWEC – RI and when they can be expected to occur. Information about their movement, behavior, feeding preferences, and reproductive characteristics help predict how vulnerable species may be to Project-related impacts, which helps determine the impact severity presented in **Sections 4.3.3.2**, **4.3.4.2**, and **4.3.5.2** of the Project's COP. Species that may occur in the Project Area include both ESA-listed Endangered and Threatened species and non-listed species. Listed species may be more vulnerable to potential population-level impacts given their lower overall abundance and thus warrants further consideration in the impact assessment process.

All 36 marine mammal species presented in **Table 3.1-1** are protected under the MMPA and have reported geographic distributions that include the Project Area. Of these species, only 15 are reasonably expected to occur in the Project Area. Four of the 15 expected species are also listed as Endangered under the ESA: the fin whale, North Atlantic right whale, sei whale, and sperm whale. The four species of sea turtle likely to occur in the Project Area are all listed as either Endangered or Threatened under the ESA. Of the three ESA-listed fish species whose ranges include the Project Area, only the Atlantic sturgeon is likely to occur in the RWF, RWEC – OCS, and RWEC – RI. The current status of these resource populations as well as the protection given to ESA- and MMPA-protected species warrants further consideration in this assessment. Using the expected distribution and known vulnerability of these species provided in the previous section, the severity of potential impacts is discussed in **Section 5.0**.

4.0 ACOUSTIC RISK ASSESSMENT

Marine mammals, sea turtles, and fish use sound for social and reproductive communication, foraging, and situational awareness which makes them susceptible to impacts from underwater noise. As discussed in **Section 2.2**, various natural and anthropogenic activities contribute to noise in the ocean creating a complex acoustic habitat. Changes in the acoustic habitat can change an animal's ability to function within its given acoustic habitat.

Marine animals can perceive underwater noise over a broad range of frequencies from about 10 Hz to more than 200 kHz, and the primary acoustic habitat for a species will be focused within their specific vocal and hearing ranges. Given the acoustic specificity of each species, noise sources present different potential impacts. Additionally, impacts will vary due to differences in the acoustic properties of the source and how it propagates through the water.

For the purposes of this acoustic assessment, noise produced by Project Activities are classified as impulsive or non-impulsive. Impulsive noises are characterized as a distinct energy pulse that has a rapid rise time and relatively high PK. Most impulsive noises are broadband and are generated by sources such as airguns, impact pile driving, and some commercial sub-bottom profilers. Non-impulsive noises do not have the characteristic energy pulse or rapid rise times seen in impulsive sources; non-impulsive sources include vessels, drilling, and vibratory pile driving (Southall et al., 2007).

Impact pile driving during Project construction is expected to pose the greatest risk of potential impact relative to other noise-producing activities. Impact pile driving could result in physiological impacts (i.e., injury in sea turtles and fish, PTS in marine mammals) for some species given the acoustic and spectral characteristics of the noise produced by the activity. However, for most noise-producing Project Activities, temporary behavioral responses by marine mammals, sea turtles, and Atlantic sturgeon are the most likely impact during construction and operation of the RWF and RWEC. The magnitude and probability of most effects generally decreases with increasing distance from a source. The potential for physiological impacts (i.e., injury, PTS,) or biologically significant behavioral impacts is further reduced by implementing active operational environmental protection measures such as use of noise mitigation systems (NMS).

The underwater acoustic analysis report (Denes et al., 2020) provides a thorough compilation of the estimated propagation distances to regulatory acoustic criteria for multiple RWF impact pile driving scenarios. Regulatory criteria are based on impact thresholds that are either regulated under the MMPA or have substantial science-based criteria and have been applied in regulatory or impact assessment under the MMPA or ESA (Fisheries Hydroacoustic Working Group [FHWG], 2008; Popper et al., 2014; Blackstock et al., 2018; NMFS, 2018, 2019b). All thresholds are based on the most current accepted threshold levels for both physiological (i.e., PTS or auditory injury) and behavioral impacts (**Section 4.1**).

For this Technical Report, noise related to Project Activities was described in detail based on Denes et al. (2020) and published literature (**Section 2.1**). A compilation of available data regarding potential impacts of underwater noise produced by sources similar to those expected during Project Activities is summarized for marine mammals, sea turtles, and Atlantic sturgeon (**Section 2.3**). Results of the underwater acoustic analysis report (Denes et al., 2020) are also summarized in this Section to further assess potential impacts that may result from Project Activities.

The following subsections provide an overview of the acoustic threshold criteria and modeling parameters used to estimate the distances to physiological and behavioral acoustic thresholds which are also summarized for reference. This information provides the basis for the impact assessment of noise-producing Project Activities (**Section 5.0**).

4.1 Acoustic Threshold Criteria

Acoustic thresholds are received sound levels that meet current scientific criteria as sufficient for eliciting the onset of a physiological effect (e.g., auditory injury, PTS) or behavioral response in a given marine species. Threshold criteria are used to identify the acoustic metrics and sound levels that may constitute an impact to a particular species and thus may require regulatory action. Acoustic threshold criteria are defined for the three faunal groups (i.e., marine mammals, sea turtles, and fish) considered in this assessment. The thresholds for each faunal group are defined with different metrics and therefore may have a different regulatory context and application.

Acoustic threshold criteria were established using two primary evaluators: 1) species' hearing sensitives; and 2) noise source characteristics. Marine mammals are divided into multiple hearing groups based on frequency-dependent hearing sensitivities (**Section 4.1.1**). Acoustic threshold criteria are the same for all sea turtle species, although there may be some distinction between hatchling and adult hearing capabilities (Lavender et al., 2014; Piniak et al., 2016) (**Section 4.1.2**). Accepted criteria for fish are dependent upon hearing mechanisms involving the swim bladder as well as the size of the fish (**Section 4.1.2**).

As discussed previously, Southall et al. (2007) identified two main types of noise sources: impulsive and non-impulsive. Non-impulsive sources can be further classified into operational categories of continuous or intermittent. Impulsive source criteria are typically presented using three metrics; PK and SEL_{24h}, which reflect the different potential exposure characteristics of the source which may cause physiological impacts; and SPL, which is used in behavioral impact assessments. Non-impulsive source criteria typically use SEL_{24h} and SPL as they do not have the characteristic peak in intensity (represented by the PK metric) that impulsive sources do. Throughout this assessment, modeling results used the most applicable physiological and behavioral threshold criterion for each affected resource for both impulsive and non-impulsive noise sources.

The noise sources of potential concern during proposed Project Activities include impact pile driving (impulsive source), geophysical surveys (both impulsive and non-impulsive sources), DP vessel thrusters, aircrafts, vibratory pile driving, and operational WTGs (non-impulsive sources). Acoustic thresholds, as defined in the following subsections, were used to establish the total ensonified area of noise received by the animal at levels that may result in either physiological or behavioral impacts, depending on the animals' hearing capability and source type.

4.1.1 Marine Mammals

Recognizing that marine mammal species do not have equal hearing capabilities, marine mammals are separated into hearing groups (Southall et al., 2007, 2019; NMFS, 2018). To account for these hearing groups, frequency weighting functions were applied when determining physiological (i.e., PTS) thresholds to scale species' sensitivities to a received noise depending on the spectral content of that noise. In effect, the sound energy contained within the frequency hearing range of an animal has the potential to affect hearing while sound energy outside an animal's frequency hearing range is unlikely to affect its hearing. The overall objective in defining hearing groups and deriving frequency weighting functions was to better define the role that frequency content plays in potential PTS.

Regulatory marine mammal hearing groups, originally identified by Southall et al. (2007) then later modified by Finneran (2016) and adopted by NMFS (2018), are categorized as LF cetaceans, mid-frequency (MF) cetaceans, HF cetaceans, phocid pinnipeds in water (PPW), and otariid pinnipeds in water (OW). Each category has a defined auditory weighting function and estimated acoustic threshold for the onset of PTS. No species from the OW hearing group (i.e., eared seals) are expected to occur in the Project Area and are not discussed further.

More recently, Southall et al. (2019) conducted a broad, structured assessment of the audiometric and physiological basis for the categorization of marine mammal hearing groups. Southall et al. (2019) kept the same frequency responses (i.e., hearing sensitivities) but re-categorized the LF, MF, and HF hearing groups to LF, HF (previously MF), and very high-frequency (VHF) (previously HF) hearing groups, and distinguished between phocid carnivores (i.e., pinnipeds) in water (PCW) and in air. Their assessment also indicated a probable distinction among baleen whales to include a very-low frequency (VLF) and a LF group, and an additional distinction among many of the odontocetes to include a distinction between an MF group containing the beaked, killer, and sperm whales and other HF cetaceans. There is insufficient evidence to support these distinctions, so the broader LF and HF hearing group categories are currently used resulting in a total of five possible groups (**Table 4.1-1**).

Southall et al. (2019) further acknowledge that there are presently insufficient direct data within the HF and VHF groups to explicitly derive distinct thresholds and weighting functions. They thus propose retaining the thresholds and functions developed by Finneran (2016) and adopted by NMFS (2018), but with slightly different categorical identifiers. The results of Southall et al. (2019) remain congruent with the current existing regulatory guidance (NMFS, 2018). A comparison of the two categorical terminologies and the general hearing ranges for each hearing group is provided in **Table 4.1-1**.

Table 4.1-1. Marine mammal hearing groups and general hearing frequency ranges as designated by the National Marine Fisheries Service (NMFS) (2018) and new hearing groups developed by Southall et al. (2019) with species that may occur in the Project Area included in each hearing group.

NMFS (2018) Hearing Group Designation and Generalized Hearing Range[1]	Southall et al. (2019) Hearing Group Designation	Species or Taxonomic Groups (species potentially occurring in the Project Area)
LF Cetacean (7 Hz to 35 kHz)	LF Cetaceans	Baleen whales (e.g., fin whale, sei whale, North Atlantic right whale, minke whale, humpback whale)
MF Cetacean (150 Hz to 160 kHz)	HF Cetaceans	Dolphins (e.g., Atlantic spotted dolphin, Atlantic white-sided dolphin, common dolphin, Risso's dolphin, common bottlenose dolphin) and toothed whales (e.g., sperm whale, long-finned pilot whale)
HF Cetacean (275 Hz to 160 kHz)	VHF Cetaceans	True porpoises (e.g., harbor porpoise)
PPW (50 Hz to 86 kHz)	PCW	True seals (e.g., harbor seal, gray seal)

HF = high-frequency; LF = low-frequency; MF = mid-frequency; PCW = phocid carnivores in water; PPW = phocid pinnipeds in water; VHF = very high-frequency.
[1]Represents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on an approximate 65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al., 2007) and PPW (approximation).

In addition to variability in marine mammal hearing sensitivities, science recognizes that different noise source types do not equally affect species in the same manner, particularly when considered in the context of accumulated sound levels. Repeated exposure to noise is potentially more damaging as it increases the accumulation of received sound necessary to elicit TTS or PTS. Within each noise source and hearing group, threshold levels are identified depending on the group-specific hearing capabilities and how they relate to the potential onset of TTS and PTS. Impulsive noise exposures result in TTS and PTS at lower accumulated sound levels than non-impulsive noises given their rapid onset and broadband nature. Consequently, they are also subject to dual thresholds (Southall et al., 2007 [adopted by Finneran (2016) and by NMFS (2018)]).

For marine mammals, acoustic thresholds are used within the context of harassment under the MMPA. The MMPA defines harassment in two levels: Level A (PTS) and Level B (behavioral). The marine mammal threshold criteria used in this assessment comprises NMFS (2018) technical guidance criteria for Level A and Level B exposure thresholds recommended by NMFS (2019b). Marine mammal species will not be equally affected by the Proposed Activities due to individual exposure patterns, the context in which noise is received, and, most prominently, individual hearing sensitivities.

Marine mammal PTS onset thresholds are frequency weighted to account for differences in hearing sensitivities among these hearing groups. Current marine mammal behavioral onset thresholds do not used frequency weighting functions to distinguish between hearing groups. However, it is common practice to apply frequency weighting functions to behavioral thresholds as they can provide valuable information regarding marine mammal behavioral responses. Therefore, to provide a more comprehensive assessment of behavioral impacts, the frequency weighted ranges to behavioral thresholds calculated by JASCO (Denes et al., 2020) were used in this assessment. The ranges in Denes et al. (2020) are provided for both the step function currently recommended by NMFS (2019b) based on work by High Energy Seismic Survey (HESS, 1999) and a range of isopleths following the probabilities of response adapted from Wood et al. (2012); however, this assessment only shows ranges to the single step function threshold of SPL 160 dB re 1 µPa following recommendation from NMFS (2019b).

4.1.2 Sea Turtles and Fish

There are three accepted references for defining acoustics thresholds in sea turtles and Atlantic sturgeon: Popper et al. (2014), criteria developed by the FHWG (2008), and a recent analysis of acoustic impacts to marine mammals and sea turtles published by the U.S. Navy (Blackstock et al., 2018). These sources present criteria for physiological effects that are categorized as injury; however, Popper et al. (2014) concedes that injury includes a very wide spectrum of physiological effects, and even those sources that have the potential for mortal injury will likely vary by context and biological conditions. The physiological thresholds indicate the received sound levels at amplitudes expected to cause physiological changes in the animal.

For sea turtles, Popper et al. (2014) provides thresholds for mortal injury or potential mortal injury only for impulsive noises, which were used in this assessment. They provide subjective criteria for recoverable injury and TTS (e.g., near, intermediate, far) rather than discrete values. The subjective nature of these criteria is not applicable to the acoustic assessment and would be highly dependent on the context of the activity. For non-impulsive noises, the only available physiological threshold criteria are from FHWG (2008). Two options are available for behavior criteria in sea turtles; FHWG (2008) and Blackstock et al. (2018). Both references base the onset of disturbed behavior on caged sea turtle studies conducted by McCauley et al. (2000) during an active seismic survey, with the difference being the assessment of the sea turtles at various received levels. Blackstock et al. (2018) noted that due to the potential caging influence, the SPL threshold of 175 dB re 1 µPa was likely a more appropriate threshold to use for the onset of behavioral disturbance in sea turtles in open water; and this threshold was used for sea turtles in this assessment.

The Popper et al. (2014) PK physiological threshold value (207 dB re 1 µPa) for fish is nearly identical to the PK physiological threshold value (206 dB re 1 µPa) for fish used by FHWG (2008). However, their reported SEL_{24h} physiological thresholds for fish differs by 27 dB, demonstrating the continued uncertainty in the understanding of acoustic criteria in fish. The fish species of primary concern in this assessment is the Atlantic sturgeon, which have a relatively primitive swim bladder with no known connection between the swim bladder and inner ear. Atlantic sturgeon are not expected to be found close enough to be impacted by pile driving activities to sustain mortal injuries; therefore, this acoustic assessment presents the Popper et al. (2014) thresholds for potential recoverable injury in fish. For impulsive sources, the threshold used in this assessment is for fish with swim bladders not involved with hearing, which is applicable to Atlantic sturgeon. For non-impulsive sources, the selected threshold was for fish with swim bladders that are involved with hearing because this is the only threshold available from Popper et al. (2014) for that source type. Popper et al. (2014) also does not provide thresholds for behavior criteria, and instead uses TTS as the onset threshold for a behavioral reaction. In order to better summarize potential injury verses behavioral impacts, the TTS criteria were not considered in this report, but are presented in the underwater acoustic analysis report (Denes et al., 2020). This assessment used the FHWG (2008) behavior criteria for sturgeon/salmon. The FHWG (2008) behavioral threshold of SPL 150 dB re 1 µPa has not been tested for biologically significant behavioral reactions in fish, and behavioral responses in fish may range from a heightened awareness of the noise to changes in movement or feeding activity (Popper and Hastings, 2009); therefore, it should be considered a highly conservative estimate for the onset of behavioral responses in Atlantic sturgeon.

The impulsive and non-impulsive thresholds used in this assessment based on the previously referenced publications are provided in the following sections. As discussed in **Section 2.3**, fish are known to be sensitive to both sound pressure and particle motion. However, there are currently no accepted thresholds for the onset of impact related to particle motion. Therefore, the thresholds and acoustic assessment provided in this Technical Report focus only on the pressure component of underwater noise.

4.1.3 Acoustic Criteria for Impulsive Sources

For impulsive sources, PK or SEL_{24h} criteria are used as the metric necessary for determining if an animal exceeds physiological auditory thresholds. These thresholds apply to impact pile driving and some equipment used during geophysical surveys. Physiological thresholds have frequency weighting functions applied for marine mammals but not for fish or sea turtles.

Impulsive sources have only a single SPL metric for behavioral criteria in each faunal group. The acoustic criteria for physiological impacts and behavioral disturbance for each faunal group are provided in **Table 4.1-2**.

Table 4.1-2. Acoustic criteria for impulsive sources used in the acoustic assessment for the Project construction scenarios.

Faunal Group	Physiological Thresholds[1]		Behavioral Thresholds[2]	
	Acoustic Metric	Threshold Value	Acoustic Metric	Threshold Value
LF Cetaceans	SEL_{24h}	183 dB re 1 µPa² s	SPL	160 dB re 1 µPa
	PK	219 dB re 1 µPa		
MF Cetaceans	SEL_{24h}	185 dB re 1 µPa² s	SPL	160 dB re 1 µPa
	PK	230 dB re 1 µPa		
HF Cetaceans	SEL_{24h}	155 dB re 1 µPa² s	SPL	160 dB re 1 µPa
	PK	202 dB re 1 µPa		
PPW	SEL_{24h}	185 dB re 1 µPa² s	SPL	160 dB re 1 µPa
	PK	218 dB re 1 µPa		
Sea Turtles	SEL_{24h}	210 dB re 1 µPa² s	SPL	175 dB re 1 µPa
	PK	207 dB re 1 µPa		
Fish	SEL_{24h}	210 dB re 1 µPa² s	SPL	150 dB re 1 µPa
	PK	207 dB re 1 µPa		

dB = decibel; HF = high-frequency; LF = low-frequency; µPa = micropascal; MF = mid-frequency; PPW = phocid pinnipeds in water; re = referenced to; SEL_{24h} = cumulative 24-h sound exposure level; PK = zero-to-peak sound pressure level; SPL = root-mean-square sound pressure level;
[1]Physiological thresholds are defined here as onset of permanent threshold shift in marine mammals (National Marine Fisheries Service [NMFS], 2018); onset of potential mortal injury in sea turtles (Popper et al, 2014); and onset of recoverable injury in fish with a swim bladder not involved in hearing (Popper et al., 2014).
[2]Behaviorial thresholds derived from the following sources: marine mammals = NMFS (2019b); sea turtles = Blackstock et al. (2018); fish = Fisheries Hydroacoustic Working Group (2008).

4.1.4 Acoustic Criteria for Non-impulsive Sources

The criteria for non-impulsive sources is somewhat simplified due to it being a singular rather than dual criteria. Non-impulsive sources are applicable for the vessels, aircrafts, some equipment used during geophysical surveys, WTG noise, and potential vibratory pile driving required for cofferdam installation in the near shore components of the RWEC. Activities with non-impulsive sources (and geophysical survey equipment, including impulsive sources) were not modeled in the underwater acoustic analysis report (Denes et al., 2020). Although non-impulsive sources were not modeled for this Project, acoustic criteria for the affected resources are available for non-impulsive sources and therefore are discussed in the context of impact assessment in this Technical Report, allowing a qualitative assessment of potential impacts relative to expected sound levels produced by these activities (**Section 2.1**).

In addition to the difference in source type, the threshold values for non-impulsive sources are different from those for impulsive sources for both physiological and behavioral impacts. Non-impulsive thresholds values are provided in **Table 4.1-3**.

Table 4.1-3. Acoustic threshold criteria for non-impulsive sources used in the acoustic assessment for Project Activities.

Faunal Group	Physiological Thresholds[1]		Behavioral Thresholds[2]	
	Acoustic Metric	Threshold Value	Acoustic Metric	Threshold Value
LF Cetaceans	SEL_{24h}	199 dB re 1 µPa^2 s	SPL	120 dB re 1 µPa
MF Cetaceans	SEL_{24h}	198 dB re 1 µPa^2 s	SPL	120 dB re 1 µPa
HF Cetaceans	SEL_{24h}	173 dB re 1 µPa^2 s	SPL	120 dB re 1 µPa
PPW	SEL_{24h}	201 dB re 1 µPa^2 s	SPL	120 dB re 1 µPa
Sea Turtles	SPL	180 dB re 1 µPa	SPL	175 dB re 1 µPa
Fish	$SPL_{,48h}$[3]	170 dB re 1 µPa	SPL	150 dB re 1 µPa

dB = decibel; HF = high-frequency; LF = low-frequency; µPa = micropascal; MF= mid-frequency; PPW = phocid pinnipeds in water; re = referenced to; SEL_{24h} = cumulative 24-h sound exposure level; SPL = root-mean-square sound pressure level;
[1]Physiological thresholds are defined here as onset of permanent threshold shift in marine mammals (National Marine Fisheries Service [NMFS],2018); onset of potential mortal injury in sea turtles (Fisheries Hydroacoustic Working Group [FHWG], 2008); and onset of recoverable injury in fish (Popper et al., 2014).
[2] Behavioral thresholds derived from the following sources: marine mammals = NMFS (2019b); sea turtles = Blackstock et al. (2018); fish = FHWG (2008).
[3]Recoverable injury threshold reported for fish with swim bladders involved in hearing. Popper et al., (2014) does not provide thresholds for fish with swim bladder not involved with hearing. Threshold assumes that the fish is exposed to the SPL value for 48 continuous hours.

4.2 Underwater Acoustic Modeling

Modeled sound fields were used to determine potential impacts to marine species based on the corresponding threshold criteria (**Section 4.1**); the methodology used for underwater acoustic modeling is fully described in Denes et al. (2020) and summarized here for reference.

Hammer energy and strikes required to reach the target pile depth are not equal throughout the period of installation of a pile. Therefore, the modeling takes into account the sequence of hammer energy and pile strikes during the course of pile installation. Modeling also considers an NMS in the form of a big bubble curtain (BBC) or similar device, which is expected to be employed during all impact pile driving events for this Project to minimize potential impact to marine species. Use of an NMS represents a measure that achieves an overall reduction of in-water sound energy resulting in smaller distances to acoustic thresholds (Denes et al., 2020). For all species, the NMS reduces the risk of impacts in two ways. First, by reducing the radial distance to a predicted threshold, the probability of an animal entering the impact area is reduced. Second, by reducing the distance to a predicted threshold level, the ability to monitor and mitigate an area of impact is improved. Based on recent information regarding the efficacy of NMSs, broadband noise attenuation of up to 10 dB is expected to be achieved during impact pile driving activities in RWF; however, attenuation levels will be dependent upon frequency (Bellman, 2014, 2020). Ranges using 0-, 6-, 10-, and 15-dB broadband attenuation are presented in the summary tables for reference (**Section 4.4**), but for the impact assessment, 10-dB attenuation is assumed. Additionally, mitigation, such as reduction in hammer energy and operational shutdowns, or aversion behavior by animals were not included in the modeling scenarios, although they warrant consideration when conducting the impact assessment.

Factors relating to the acoustic properties of the noise source and operational variables will also influence noise propagation through the water column and are described further in the following section. More importantly, certain combinations of variables will affect the distance calculations more than others. The combination of parameters to assess expected ranges to the specified threshold distances for individual faunal groups to serve as the basis for the acoustic impact assessment.

Several assumptions were applied to the presented data in order to streamline the viewing of the underwater acoustic model results (Denes et al., 2020) for use in an assessment framework. The environmental propagation conditions used in the modeled scenarios consider seasonal and geographic location variability. Generally, modeled threshold distances were larger during the winter versus summer. The actual distances created during construction are likely further influenced by *in situ* environmental conditions at different locations during construction, as seen in the variability in the model results for the two locations for the WTG and OSS foundations (Denes et al., 2020). However, for the purposes of this impact assessment, ranges modeled for each season and location are combined, and are provided as mean threshold ranges for each modeled activity. This Technical Report, where appropriate to understand the impact assessment, provides results and assumptions that are also found in Denes et al. (2020). However, fine-scale environmental as well as operational variability cannot be captured in the summary provided in this Technical Report, and readers should refer to Denes et al. (2020) for detailed modeling results and methods.

4.2.1 Impact Pile Driving Parameters

A maximum of 100 WTG monopile foundations may be installed along with two foundations for the OSSs, which may use either monopile or jacket foundations. For the WTG foundations, 12-m diameter steel monopiles were modeled at two representative locations within the RWF Lease Area (Denes et al., 2020). For the OSSs, 15-m diameter steel monopiles and 4-m diameter jacket pin piles were included in the modeling assessment, modeled at three representative locations within the RWF Lease Area. The impact pile driving parameters used in this model to calculate the ranges to prescribed physiological and behavior thresholds were based on engineering and Project design assumptions. While not expected, some of the assumptions and design criteria may change slightly up to the point of RWF construction. Modeling used the most accurate and current parameters expected for the Project, and where there is uncertainty, a conservative approach was used (Denes et al., 2020).

Operational variables specific to impact pile driving that my influence noise propagation include hammer type, pile type, pile schedule (hammer energy/number of strikes), and geographic location. To account for current uncertainty in the Project design criteria, multiple scenarios were modeled to account for variability in the anticipated pile schedule and hammer energy.

For the monopile foundations, three piling schedules were used to estimate threshold distances for each of the three foundation types proposed for this Project (Denes et al., 2020). For the modeling assessment, it was assumed that WTG monopile foundations will require up to 6,500 strikes to install, the OSS monopile foundations will require 11,500 strikes to install, and the OSS jacket foundation, which consist of four pin piles, will require 11,000 strikes to install (Denes et al., 2020). Modeling accounted for the inclusion of a soft start at the beginning of each pile. The piling scenarios for each pile type are provided in **Tables 4.2-1** through **4.2-3**.

Table 4.2-1. Piling schedule for the 12-m wind turbine generator monopile foundations (Denes et al., 2020).

Energy Level (kJ)	Strike Count	Pile Penetration (m)	Modeled strike rate (min^{-1})
1,000	500	8	30
2,000	1,000	5	
3,000	2,000	12	
4,000	3,000	15	

kJ = kilojoule.

Table 4.2-2. Piling schedule for the 15-m offshore substations monopile foundations (Denes et al., 2020).

Energy Level (kJ)	Strike Count	Pile Penetration (m)	Modeled strike rate (min^{-1})
1,000	500	12	30
2,000	1,000	8	
3,000	2,000	10	
4,000	8,000	20	

kJ = kilojoule.

Table 4.2-3. Piling schedule for the offshore substations jacket foundation consisting of four 4 m pin piles (Denes et al., 2020).

Energy Level (kJ)	Strike Count	Pile Penetration (m)	Modeled strike rate (min^{-1})
500	500	15	30
1,000	1,000	10	
1,500	1,500	13	
2,000	8,000	32	

kJ = kilojoule.

The energy output and number of blows at different pile schedules (e.g., soft-start, full driving, end set) will produce different threshold distances for each energy level. In order to better summarize the details of the model into an assessment of the installation activities, the mean threshold distances produced by all potential pile schedules and across all four hammer energies are provided in this Technical Report, representing the potential impacts produced over the course of a full pile installation (i.e., start to completion of driving a pile foundation). Multiple scenarios were modeled to estimate the linear ranges to regulatory acoustic thresholds (**Section 4.1**) for the complete pile schedule.

4.2.2 Acoustic Ranges and Exposure Ranges

Acoustic propagation through the water was modeled to produce three-dimensional sound fields around each source radiating out to a point at which sound levels reached expected ambient conditions. Noise is generally assumed to propagate out from the source to create an even spherical sound field; however, influence from local physical and oceanographic features results in sound propagating unevenly in all directions. Therefore, the radial distance that encompasses 95% of the modeled sound field is used to define the *acoustic range* from the source within which noise at or above acoustic thresholds for a marine species may be exceeded. An animal located within that range for a defined period of time is said to be exposed to the corresponding threshold. The radial distance, or acoustic range, thus relies solely on noise propagation through the environment and assumes a stationary receiver (i.e., animal) to predict the maximum distance at which that receiver could receive enough acoustic energy over the time period determined by the metric (e.g., 24-h for marine mammal SEL thresholds).

The acoustic ranges are traditionally used in the regulatory context of impact assessment and, in the case of marine mammals, are used to estimate takes as defined by the MMPA. The acoustic range can also help assess whether standard mitigation methods (e.g., visual observation) adequately reduce the risk of potential impacts from noise to a given marine species.

However, it is recognized that modeled acoustic ranges to threshold levels may overestimate the actual distances at which animals receive exposures meeting the threshold criteria and are likely not realistic, particularly for accumulating metrics like SEL. Applying animal movement and exposure models provides a more realistic indication of the distances at which acoustic thresholds are met. For this reason, *exposure ranges* were modeled to provide a realistic estimate of the ranges at which moving animals exceed the given acoustic thresholds. Notably, the exposure ranges are species-specific rather than categorized only by faunal group which affords more biological context to be considered when assessing impacts.

To determine exposure ranges, pile strikes are propagated to create an ensonified environment (**Section 4.2.1**) while simulated animals (i.e., animats) are moved about the ensonified area following known species-specific behaviors. Modeled animats that have received sound energy that exceeds the acoustic threshold criteria are registered, and the closest point of approach (CPA) recorded at any point in that animal's movement is then reported as its exposure range. This process is repeated multiple times for each animat to produce and the exposure-based ranges which comprise 95% of the CPAs for animats that exceeded the threshold (i.e., $ER_{95\%}$). The exposure range approach is used as the basis for the impact assessment in **Section 5.0**, for developing environmental protection measures, and for future MMPA assessments due to the incorporation of animal movement and behavior in the development of these ranges.

An animal being exposed to a specific threshold or occupying the waters within the propagated sound field does not alone constitute an impact for a particular species. Assessing the potential for impact needs to simultaneously consider the source, activity, environmental factors influencing propagation, frequency weighting factors, mitigation factors, and autecological characteristics of an at-risk species. Variability in each of these factors will, in turn, vary the potential risk to each species. Therefore, modeled exposure ranges are one component of the overall impact assessment process in this Technical Report.

Because accurate animal movement information is not currently available for Atlantic sturgeon to use in the model, the traditional acoustic range approach was used for the impact assessment for this species. However, it should be recognized that these are likely overestimates since Atlantic Sturgeon are not expected to remain in one location long enough to elicit potential physiological impacts or biologically significant disturbances.

The results of the modeling are summarized in **Sections 4.3** and **4.4** for acoustic ranges and exposure ranges, respectively. A wider selection of acoustic threshold criteria were modeled in the underwater acoustic analysis report (Denes et al., 2020); however, only the ranges to the threshold criteria presented in **Section 4.1.3** were summarized in the following sections and applied to the impact assessment (**Section 5.0**).

4.3 Summary of Modeled Acoustic Ranges

Summarized modeling results for acoustic ranges to physiological and behavioral thresholds are provided in **Tables 4.3-1** through **4.3-3** for each foundation type. As discussed previously, modeling was conducted for two locations for each pile type and two seasons, winter and summer (Denes et al., 2020). Ranges are provided separately for each location and season in Denes et al. (2020); however for the purposes of this report, the minimum, maximum, and mean values of the modeled ranges with 10 dB applied for both seasons and all locations are provided.

Table 4.3-1. Mean acoustic ranges (m) to physiological thresholds and frequency weighted[1] behavioral thresholds for each faunal group for a 12-m wind turbine generator monopile foundation with 10 dB noise attenuation applied (Denes et al., 2020).

Faunal Group	Physiological Threshold Ranges						Behavioral Threshold Ranges		
	PK			SEL_{24h}			SPL		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
LF Cetaceans	5	5	5	4,476	8,663	6,476	3,825	4,260	4,043
MF Cetaceans	-	-	-	80	102	90	2,235	3,240	2,738
HF Cetaceans	178	200	189	3,420	5,404	4,379	1,771	2,772	2,272
PPW	6	6	6	810	1,165	988	3,282	3,785	3,534
Sea Turtles[2]	95	101	98	330	512	423	481	2,741	1,465
Atlantic Sturgeon	95	101	98	330	512	423	5,805	9,758	7,782

- = threshold not reached; LF= low frequency; MF= mid frequency; HF= high frequency; PPW= phocid pinnipeds in water; SEL_{24h} = cumulative 24-h sound exposure level; PK = peak sound pressure level; SPL = root-mean-square sound pressure level.
[1]Frequency weighting applied to marine mammals only. Sea turtle and fish results are unweighted.
[2]Modeling results for SPL are only available at 170 and 180 decibels (dB) referenced to 1 micropascal; therefore, the range to the SPL 175 dB sea turtle threshold was estimated from those values.

Table 4.3-2. Mean acoustic ranges to physiological thresholds and frequency weighted[1] behavioral thresholds for each faunal group for a 15-m offshore substation monopile foundation with 10 dB noise attenuation applied (Denes et al., 2020).

Faunal Group	Physiological Threshold Ranges						Behavioral Threshold Ranges		
	PK			SEL_{24h}			SPL		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
LF Cetaceans	6	6	6	5,324	11,121	7,976	4,093	4,671	4,382
MF Cetaceans	-	-	-	90	142	110	2,379	3,216	2,798
HF Cetaceans	260	260	260	3,846	6,475	5,078	1,843	2,597	2,220
PPW	7	7	7	1,141	1,583	1,356	3,545	3,838	3,692
Sea Turtles[2]	90	95	93	840	1,054	945	764	3,024	1,777
Atlantic Sturgeon	90	95	93	840	1,054	945	6,921	10,888	8,905

- = threshold not reached; LF= low frequency; MF= mid frequency; HF= high frequency; PPW= phocid pinnipeds in water; SEL_{24h} = cumulative 24-h sound exposure level; PK = peak sound pressure level; SPL = root-mean-square sound pressure level.
[1]Frequency weighting applied to marine mammals only. Sea turtle and fish results are unweighted.
[2]Modeling results for SPL are only available at 170 and 180 decibels (dB) referenced to 1 micropascal; therefore, the range to the SPL 175 dB sea turtle threshold was estimated from those values.

Table 4.3-3. Mean acoustic ranges to physiological thresholds and frequency weighted[1] behavioral thresholds for each faunal group for a 4-m offshore substation jacket foundation with 10 dB noise attenuation applied (Denes et al, 2020).

Faunal Group	Physiological Threshold Ranges						Behavioral Threshold Ranges		
	PK			SEL_{24h}			SPL		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
LF Cetaceans	4	4	4	5,639	15,426	10,215	3,732	4,092	3,912
MF Cetaceans	-	-	-	165	277	223	2,356	3,360	2,858
HF Cetaceans	87	88	88	4,732	9,558	7,132	1,947	3,029	2,488
PPW	5	5	5	1,604	2,470	2,019	3,205	3,774	3,490
Sea Turtles[2]	42	42	42	682	888	781	368	2,253	1,187
Atlantic Sturgeon	42	42	42	682	888	781	5,871	11,345	8,608

- = threshold not reached; LF= low frequency; MF= mid frequency; HF= high frequency; PPW= phocid pinnipeds in water; SEL_{24h} = cumulative 24-h sound exposure level; PK = peak sound pressure level; SPL = root-mean-square sound pressure level.
[1]Frequency weighting applied to marine mammals only. Sea turtle and fish results are unweighted.
[2]Modeling results for SPL are only available at 170 and 180 decibels (dB) referenced to 1 micropascal; therefore, the range to the SPL 175 dB sea turtle threshold was estimated from those values.

4.4 Summary of Modeled Exposure Ranges

Applying animal movement and exposure models (Denes et al., 2020) provides a more realistic indication of the distances at which acoustic thresholds are met. As previously described, modeled exposure ranges are species-specific; however, the exposure ranges are grouped by hearing group in this report to be consistent with the approach taken for the impact assessment (**Section 5.0**).

The exposure ranges to marine mammals and sea turtle physiological and behavioral thresholds are provided in **Tables 4.4-1** through **4.4-3** for the three pile types proposed for the RWF WTG and OSS. As mentioned previously, exposure ranges are not provided for the Atlantic sturgeon because accurate animal movement information is not available to apply to the model.

Similar to the acoustic ranges (**Section 4.3**), results were provided separately for both seasons modeled (Denes et al., 2020); however, for the purposes of this report, the mean of both seasons is provided in the following tables for each level of noise attenuation modeled (0, 6, 10, and 15 dB). All levels of noise attenuation are provided for reference, but the impact assessment in **Section 5.0** only considers the ranges with 10 dB attenuation applied.

Table 4.4-1. Mean exposure ranges ($ER_{95\%}$) (m) to marine mammal and sea turtle physiological and behavioral thresholds resulting from installation of 12-m wind turbine generator monopile foundations with 0, 6, 10, and 15 dB broadband attenuation (Denes et al., 2020).

Faunal Group	Physiological Threshold Ranges								Behavioral Threshold Ranges			
	PK				SEL_{24h}				SPL			
	0 dB	6 dB	10 dB	15 dB	0 dB	6 dB	10 dB	15 dB	0 dB	6 dB	10 dB	15 dB
LF Cetaceans	89	12	5	2	7,465	3,409	1,916	770	7,650	4,928	3,891	3,169
MF Cetaceans	4	2	0	0	45	6	5	0	7,897	5,080	3,972	3,204
HF Cetaceans	850	390	205	118	5,845	3,210	2,035	955	7,830	5,040	3,960	3,225
PPW	99	15	6	3	2,453	768	195	23	7,990	5,120	4,048	3,285
Sea Turtles	460	164	110	55	688	127	17	13	3,178	1,990	1,187	520

dB=decibel; LF= low frequency; MF= mid frequency; HF= high frequency; PPW= phocid pinnipeds in water; SEL_{24h} = cumulative 24-h sound exposure level; PK = zero-to-peak sound pressure level; SPL = root-mean-square sound pressure level.
[1]Frequency weighting applied to marine mammals only. Sea turtle results are unweighted.

Table 4.4-2. Mean exposure ranges ($ER_{95\%}$) (m) to marine mammal and sea turtle physiological and behavioral thresholds resulting from installation of 15-m offshore substation monopile foundations with 0, 6, 10, and 15 dB broadband attenuation (Denes et al., 2020).

Faunal Group	Physiological Threshold Ranges								Behavioral Threshold Ranges			
	PK				SEL_{24h}				SPL			
	0 dB	6 dB	10 dB	15 dB	0 dB	6 dB	10 dB	15 dB	0 dB	6 dB	10 dB	15 dB
LF Cetaceans	77	13	6	3	7,449	3,666	2,149	868	8,530	5,519	4,196	3,436
MF Cetaceans	5	2	0	0	21	2	2	0	8,503	5,507	4,260	3,466
HF Cetaceans	580	320	260	93	5,805	3,010	1,865	885	8,640	5,585	4,260	3,470
PPW	85	88	7	4	2,395	800	305	28	8,728	5,630	4,293	3,605
Sea Turtles	360	149	81	308	1,048	273	13	0	3,417	2,317	1,500	802

dB=decibel; LF= low frequency; MF= mid frequency; HF= high frequency; PPW= phocid pinnipeds in water; SEL_{24h} = cumulative 24-h sound exposure level; PK = zero-to-peak sound pressure level; SPL = root-mean-square sound pressure level.
[1]Frequency weighting applied to marine mammals only. Sea turtle results are unweighted.

Table 4.4-3. Mean exposure ranges ($ER_{95\%}$) (m) to marine mammal and sea turtle physiological and behavioral thresholds resulting from installation of 4-m offshore substation jacket foundations with 0, 6, 10, and 15 dB broadband attenuation (Denes et al., 2020).

Faunal Group	Physiological Threshold Ranges								Behavioral Threshold Ranges			
	PK				SEL_{24h}				SPLSPL			
	0 dB	6 dB	10 dB	15 dB	0 dB	6 dB	10 dB	15 dB	0 dB	6 dB	10 dB	15 dB
LF Cetaceans	16	3	0	0	14,581	7,090	3,794	1,563	8,398	4,979	3,765	3,004
MF Cetaceans	0	0	0	0	235	41	10	2	8,511	5,106	3,824	3,041
HF Cetaceans	240	78	48	24	10,885	5,925	3,690	1,975	8,790	5,130	3,865	3,040
PPW	21	4	0	0	6,280	2,310	1,068	253	8,825	5,115	3,878	3,075
Sea Turtles	87	42	24	33	1,017	232	57	0	2,955	1,710	1,030	480

dB=decibel; LF= low frequency; MF= mid frequency; HF= high frequency; PPW= phocid pinnipeds in water; SEL_{24h} = cumulative 24-h sound exposure level; PK = zero-to-peak sound pressure level; SPLSPL = root-mean-square sound pressure level.
[1]Frequency weighting applied to marine mammals only. Sea turtle results are unweighted.

5.0 IMPACT ASSESSMENT FOR RWF AND RWEC

All potential IPFs resulting from Project Activities were assessed for marine mammals, sea turtles, and ESA-listed fish species (i.e. Atlantic Sturgeon) in **Sections 4.3.3.2**, **4.3.4.2**, and **4.3.5.2** of the Project's COP. IPFs that have the potential to have greater than negligible impacts on marine mammals, sea turtles, and Atlantic sturgeon (as defined in **Section 1.1**) include habitat alteration, underwater noise, and vessel traffic. Using the baseline information provided in **Section 3.0**, the potential for impacts from Project Activities was assessed for all affected resources and characterized as either direct or indirect, and short-term or long-term (**Sections 5.1**, **5.2**, and **5.3**) using the parameters identified in **Section 1.2** (detectability, duration, spatial extent, and severity).

The detectability of an IPF referred to whether it would be perceptible to a marine mammal, sea turtle, or fish based on published literature that documented responses to these or comparable IPFs. The duration of an impact was determined to be either short-term or long-term, and considered both the duration of the impact-producing activities (**Sections 2.0** and **3.0** of the Project's COP) and how quickly an animal would recover once the activity ceased, based on available publications. The spatial extent of the IPF was estimated using Project-specific modeling (as applicable), and information provided in **Sections 2.0** and **3.0** of the Project's COP. The severity of the potential impact was then determined based on the other three parameters, the current status of the populations under consideration, and the likelihood for population-level impacts based on published literature. These four parameters combined were used to determine if a potential impact exceeded a negligible determination. For example, a potential impact would be considered greater than negligible if it was determined an IPF was detectable to a resource, resulted from an activity occurring over a longer period or resulted in an impact that took longer for the resource to recover, and occurred over a broader spatial area which increased the risk of overlap between the IPF and the resources' geographic range.

Additionally, Project-specific modeling was conducted by JASCO to assess the potential for impact for the underwater noise IPF (Denes et al., 2020). Denes et al. (2020) defines and characterizes acoustic propagation resulting from impact pile driving activity associated with the Project for all scenarios included in the Project Envelope (**Section 3.0** of the Project's COP) and results applicable to this assessment are provided for reference. Results of the modeling provided a more quantitative estimate of the spatial extent of this IPF as it pertains to impact pile driving. Noise from DP vessels, aircraft, vibratory pile driving, geophysical survey, and WTG operations were not modeled for this Project, so the potential for impact was based predominantly on published literature and modeling conducted for other similar projects. Detectability of this IPF was based on accepted acoustic thresholds for each faunal group (**Section 4.1**), estimated source levels for each noise-producing activity (**Section 2.1**), and the description of the existing underwater acoustic habitat of the Project Area (**Section 2.0**). As stated above, the duration is based on information provided in **Sections 2.0** and **3.0** of the Project's COP. These criteria, combined with the current status of the affected populations, helped determine the severity of potential impacts. Results of the modeling, including acoustic and exposure ranges for impact pile driving are summarized in **Section 4.0** for reference.

The information provided in the following sections is intended to provide a more detailed explanation of the underwater noise IPF and any IPFs that may result in greater than negligible impacts on marine mammals, sea turtles, and ESA-listed fish, specifically Atlantic sturgeon.

5.1 Summary of Impacts

Based on the list of affected species identified in **Section 2.2**, the potential for impacts resulting from Project activities during construction, O&M, and decommissioning were assessed using the methodology described in **Section 1.2**. All potential IPFs are discussed in **Section 4.1** of the COP; only habitat alteration, underwear noise, and vessel traffic were discussed in this Technical Report as they are the only IPFs with the potential to result in greater than negligible impacts to affected resources (**Section 1.3**). As previously discussed in **Section 3.3**, the only ESA-listed fish species likely to occur in the Project Area is the Atlantic sturgeon, so potential impacts were only assessed for this species. A summary of anticipated impacts to marine mammals, sea turtle, and Atlantic sturgeon discussed in this report is provided in **Table 5.1-1**.

Table 5.1-1. Summary of anticipated impacts on marine mammals, sea turtles, and Atlantic sturgeon from underwater noise, vessel traffic, and habitat alteration resulting from Project Activities during construction, operation and maintenance (O&M), and decommissioning.

IPF	Marine Mammals	Sea Turtles	Atlantic Sturgeon
DP Vessel Noise	Direct, Short-term	Direct, Short-term	Direct, Short-term
Aircraft Noise	Direct, Short-term	Direct, Short-term	Direct, Short-term
Geophysical Surveys	Direct, Short-term	Direct, Short-term	Direct, Short-term
Impact Pile Driving	Direct, Short-term	Direct, Short-term	Direct, Short-term
Vibratory Pile Driving	Direct, Short-term	Direct, Short-term	Direct, Short-term
WTG Noise	Direct, Long-term	Direct, Long-term	Direct, Long-term
Vessel Traffic	Direct, Short-term (construction/decommissioning) and Long-term (O&M)	Direct, Short-term (construction/decommissioning) and Long-term (O&M)	Direct, Short-term (construction/decommissioning) and Long-term (O&M)
Habitat Alteration	Direct, Short-term (construction and decommissioning) and Long-term (O&M)	Direct (construction and decommissioning), Direct and Indirect (O&M), Short-term (construction and decommissioning) and Long-term (O&M)	-

- indicates no impact expected; DP = dynamic positioning; ESA = Endangered Species Act; IPF = impact producing factor; WTG = wind turbine generator.

The primary IPF expected to impact all potentially affected resources is underwater noise. Project Activities that will produce noise include impact pile driving during construction, the use of DP vessels and aircraft, vibratory pile driving used for the installation of a cofferdam, geophysical surveys, and WTG operations. Impact pile driving is likely to have the greatest risk of impact due to the impulsive characteristics and high noise levels produced by this source (**Section 4.2**). No injury is anticipated for any resource with the application of the environmental protection measures outlined in **Section 5.5**, but some level of behavioral response is anticipated for all resources (**Section 5.0**).

Project-related vessel traffic will contribute a nominal amount to the overall volume of existing traffic in this region. Although the risk of a strike is low, in the unlikely event a strike were to occur, the consequences of an individual mortality in a population that is listed as Threatened or Endangered is countered by their overall resilience to population-level impacts. The implementation of vessel strike avoidance measures (**Section 5.5**) will reduce the risk of strikes for potentially affected species.

Marine mammals and sea turtles are the only resources expected to receive greater than negligible impacts as a result of habitat alteration caused by the presence of the RWF foundations and associated scour protection. Studies have shown that marine mammals may forage around the foundations (**Section 5.1.3**) and sea turtles use artificial structures offshore for foraging and shelter from ocean currents and vessel traffic (**Section 5.2.3**). However, the habitat alteration resulting from the installation of the foundations and scour protection may have inadvertent impacts on these resources, such as wakes disrupting zooplankton prey species and increased susceptibility of sea turtles to cold stunning if they remain in the RWF area longer than typically expected (**Sections 5.1.3** and **5.2.3**). Sea turtles may also become habituated to the habitat created by the foundations and scour protection and may be impacted by the removal of foraging and sheltering habitat when the RWF is decommissioned (**Section 5.2.3**).

5.2 Marine Mammals

As shown in **Table 1.2-1**, IPFs that could have greater than negligible impacts on marine mammals include underwater noise, vessel traffic, and habitat alteration. These IPFs are discussed further in the following subsections.

5.2.1 Underwater Noise

As discussed in **Section 2.3**, the range of potential effects from noise includes hearing threshold shift; auditory injury; masking; and stress and disturbance, including behavioral responses (NRC, 2003; 2005; Nowacek et al., 2004; Richardson et al., 1995; Southall et al., 2007). The severity of potential impacts increases when the exposure occurs close to a noise source and with the duration of the exposure. Impact pile driving was identified as the activity that would likely have the greatest potential for auditory impact, including PTS, on marine mammals; however, through the use of NMSs and other mitigation measures, no acoustic injury is expected to any marine mammal species. DP vessel noise, aircraft activities, vibratory pile driving, geophysical surveys, and WTG noise may also affect the acoustic habitat of marine mammals and in some cases result in behavioral disturbance. Impact and vibratory pile driving, geophysical surveys, and aircraft activities would occur during construction of the RWF and RWEC, WTG noise would occur during RWF operations, and DP vessel activity could occur during any Project phase.

5.2.1.1 DP Vessel Noise

Impacts on marine mammals from vessel noise have been documented and include temporary disruptions of communication or echolocation from auditory masking; behavior disruptions of individual or localized groups of marine mammals; and limited, localized, and short-term displacement of individuals of any species, including strategic stocks, from localized areas around the vessels. Aguilar-Soto et al. (2006) reported that the noise from a passing vessel masked ultrasonic vocalizations of a Cuvier's beaked whale (*Ziphius cavirostris*) and reduced the maximum communication range by 82% when exposed to a 15-dB increase in ambient noise levels at the vocalization frequencies, resulting in a 58% reduction in the effective detection distance of the Cuvier's beaked whale's echolocation clicks. Hatch et al. (2012) estimated that calling North Atlantic right whales may have lost 63% to 67% of their communication "space" due to shipping noise. LF (20 to 200 Hz) noise from large ships overlaps the frequency range of some mysticete vocalizations, and increased levels of ambient noise have been documented in areas with high shipping traffic, causing responses in some mysticetes that have included habitat displacement; changes in behavior; and alterations in the intensity, frequency, and intervals of their calls (Rolland et al., 2012).

Marine mammals are able to compensate, to a limited extent, for auditory masking through a variety of mechanisms, including increasing SLs (i.e., the Lombard effect) or durations of their vocalizations or by changing spectral and temporal properties of their vocalizations (Hotchkin and Parks, 2013; Parks et al., 2010). North Atlantic right whales in high-noise conditions have been documented to lower their call rate and produce calls with a higher average fundamental frequency (Parks et al., 2007). In the presence of ship noise, beluga whales produced whistles at higher frequencies and longer durations (Lesage et al., 1999). Di Iorio and Clark (2009) found that blue whales increased their rate of social calling in the presence of sub-bottom exploration equipment, which was presumed to represent a compensatory behavior to elevated ambient noise levels during the surveys. Several marine mammal species are also known to increase the SLs of their calls in the presence of elevated noise levels (Dahlheim, 1987; Lesage et al., 1999; Terhune, 1999). Holt et al. (2008) studied the effects of anthropogenic noise exposure on Endangered southern resident killer whales in Puget Sound, reporting that they increased their call amplitude by 1 dB for every 1 dB increase in ambient noise in the 1 to 40 kHz frequency band. Castellote et al. (2012) reported that male fin whales from two different subpopulations not only modified their song characteristics during increased ambient noise conditions, but also left the area and did not return for 14 days. Castellote et al. (2012) hypothesized that the fin whales modified their acoustic communications to compensate for the increased ambient noise levels and that the animals had a lower tolerance for seismic airgun noise than for shipping noise.

Modeling was not conducted for DP vessel noise for this Project, but a qualitative discussion of noise produced by DP vessels can be found in Denes et al. (2020). No acoustic injury impacts are expected to occur to marine mammals as a result of vessel noise due to the non-impulsive nature of the sources and relatively low SLs produced (BOEM, 2013; McPherson et al., 2016). Because vessel noise is perceptible and can temporarily alter a mammal's acoustic habitat, it has the potential for disrupting or interfering with normal biological activities that could constitute behavioral disturbance. Behavioral impacts resulting from vessel noise would be expected only from vessels that use DP thrusters. DP vessels will predominately be used during the approximate 18-month construction period and during the decommissioning phase. During the 20 to 35 year O&M period, DP vessels operating in a station-keeping mode, which produce the greatest sound levels, will be used intermittently; however, DP thrusters may also be used for propulsion on some vessels during transits between ports and the RWF and RWEC. For those few individuals that are present in the region during DP vessel operations, behavioral disturbances may be consequential if the response results in the interruption of critical behavior. However, the anticipated noise associated with DP vessel operations throughout the Project would be temporary and is not expected to be a significant contribution to cumulative vessel noise already present in the region. With the added presumption that individual or groups of marine mammals in the Project Area are familiar with vessel-related noises, particularly within trafficked areas around the RWF and nearby shipping lanes, behavioral impacts on marine mammals from Project-related DP vessel noise are expected but would not be extensive or biologically significant. Impacts are expected to be temporary, and marine mammal behavior would return to baseline conditions when DP vessel activity ceases. Therefore, the effects of Project-related DP vessel noise on marine mammals are considered ***direct*** and ***short-term***.

5.2.1.2 Aircraft Noise

Noise produced from aircrafts used during Project construction have the potential to propagate underwater at levels that could be detectable to marine mammals. Received SPL measured from a helicopter at 18 m depth were approximately 106 dB re 1 µPa and were shown to generally increase with decreasing water depth, decreasing altitude of the aircraft, and increasing flight speed (Patenaude et al., 2002). Additionally, behavioral responses to aircraft noise have been observed in bowhead whales (*Balaena mysticetus*) in response to both helicopters and planes (Patenaude et al., 2002). However, helicopters would only be used intermittently to support crew transfers during construction and O&M (**Section 4.1.4.1** of the Project's COP), and given the relatively short duration of construction activities (approximately 18 months), only temporary changes in behavior are expected to occur. Impacts from aircraft noise are considered ***direct*** and ***short-term***.

5.2.1.3 Geophysical Surveys

As discussed in **Section 2.1.5**, geophysical surveys will be conducted prior to construction of the RWF and RWEC to identify any seabed obstructions or potential MEC/UXOs. The likelihood of encountering MEC/UXOs within the Project Area is low, and should one be identified it will be disposed of using methods designed to avoid potential detonation of the device. The preferred approach for MEC/UXO is avoidance, but in a situation where avoidance is not possible, low-noise methods of removal or relocation will be employed (**Section 3.3.3.2** of the Project's COP). Therefore, explosive decommissioning of MEC/UXOs is not considered in this assessment, and only noise from the geophysical survey equipment used to locate potential obstructions was analyzed.

Equipment used during these surveys has the potential to produce noise that would exceed physiological and behavioral thresholds for marine mammals (**Section 4.1**). However, previous assessments estimated ranges to physiological thresholds of <50 m, and ranges to behavioral thresholds were all <200 m (CSA Ocean Sciences Inc., 2018, 2020). With the implementation of the environmental protection measures outlined in **Section 5.5**, the risk of impact is low and would be limited to temporary disturbances. Furthermore, due to the relatively short duration of these activities which would only occur during a portion of the full 18-month construction period, impacts are considered ***direct*** and ***short-term***.

5.2.1.4 Impact Pile Driving

Potential acoustic impacts from impact pile driving include noise levels that can elicit direct injury to or behavioral responses in marine mammals and have the potential to cause displacement from critical habitat (Brandt et al., 2011; Bailey et al., 2010), alteration of acoustic habitat availability, and masking (Madsen et al., 2006). Within 10 m of the source, impact pile driving can generate SLs expressed as PK ranging from 233 to 245 dB re 1 µPa m and SLs expressed as SEL_{24h} ranging from 218 to 249 dB re 1 µPa^2 m^2 s with a predominant frequency content below 1,000 Hz (Amaral et al., 2018). During the 2015 Block Island impact pile driving activities, distances to measured behavior SPL threshold isopleths (160 dB re 1 µPa, unweighted) ranged from 2.7 to 4.6 km from the pile source (Amaral et al., 2018). However, physiological threshold distance calculations during the 2015 Block Island impact pile driving measurements used pre-2016 NOAA acoustic guidance criteria (SPL of 180 dB re 1 µPa, unweighted). Recently, BOEM (2018) detailed best management practices designed to minimize pile driving impacts on marine mammals, which will be applied during RWF WTG and OSS installation activities. The application of these practices will minimize the potential for impact ranges by reducing the distances to physiological and behavioral thresholds, and by allowing for the effective application of environmental protection measures (**Section 5.4**).

Results of acoustic modeling conducted for this Project are fully described in Denes et al. (2020) and summarized in **Sections 4.3** and **4.4** for reference. Modeled impact pile driving was conducted for three pile types; 12-m monopile foundations used for the RWF WTGs, 15-m monopile foundations being considered for the RWF OSS, and 4-m jacket pin pile foundations also being considered for the RWF OSS (**Section 3.0** of the Project's COP). Results of the exposure range modeling (**Section 4.4**) indicate that sound levels generated during impact pile driving for all pile types and scenarios with 10 dB attenuation applied will exceed the biological thresholds associated with behavioral disturbance in marine mammals; and could exceed thresholds for the potential onset of physiological effects in some species beyond 3 km if the duration of exposure approached 24 h (**Section 4.4**). The $ER_{95\%}$ for PK physiological thresholds for all pile types and scenarios were generally small (<10 m) with 10 dB attenuation applied for all marine mammal hearing groups except HF cetaceans whose $ER_{95\%}$ for PK reached up to 260 m (**Section 4.4**). $ER_{95\%}$ for SEL_{24h} with 10 dB attenuation for all pile types and scenarios ranged from 1,916 to 3,794 m for LF cetaceans; 0 to 10 m for MF cetaceans; 1,865 to 3,690 for HF cetaceans; and 195 to 1,068 for PPW for all pile types and scenarios (**Section 4.4**). Estimated $ER_{95\%}$ to behavioral thresholds ranged from approximately 3 to 4 km for all hearing groups (**Section 4.4**).

Physiological exposures based on the PK metric are not expected for any marine mammal hearing group due to the small propagation distances and use of an NMS that not only reduces propagation ranges but acts as a physical barrier excluding many species from PK threshold exposures. Based on the modeled $ER_{95\%}$ for SEL_{24h}, only LF and HF cetaceans have large enough ranges to result in a reasonable potential to receive sound levels that exceed physiological thresholds; and this potential primarily exists during periods when species presence is greatest (**Section 3.1**). Additionally, receiving sound levels that exceed thresholds does not equate to PTS, and auditory injury is not expected to occur from impact pile driving activities. Implementation of environmental protection measures in the form of an NMS and monitoring programs (**Section 5.5**) applied during impact pile driving will further reduce the risk of physiological exposures. However, because the potential for PTS exists it is necessary to assess the effect of such an impact should it occur. PTS occurring to species with very low populations such as the North Atlantic right whale has the potential to cause population-level effects should an individual be functionally removed from that population (e.g., loss of communication with conspecifics). Therefore, ESA-listed species with already low population estimates would face a higher risk of population-level effects compared to non-ESA-listed species that have a greater capacity to absorb and recover from potential impact without incurring population-level effects.

There is a greater likelihood of behavioral disturbances to all marine mammal species because the metric for such exposures is based on an instantaneous received SPL, rather than an accumulated metric (e.g., SEL_{24h}). The $ER_{95\%}$ to behavioral thresholds range from approximately 3 to 4 km for all hearing groups. At these ranges, the ability to monitor and mitigate becomes challenging in an operational setting. As discussed in **Section 2.3**, behavioral disturbances are contextual, and disturbance from the relatively short pile installation period is not expected to have any population-level effects and would likely result in only brief disruptions in species' activities. Because impacts would only occur during the 18-month duration of construction activities, impacts from impact pile driving are considered ***direct*** and ***short-term*** for all marine mammal species.

5.2.1.5 Vibratory Pile Driving

Based on previous assessments of vibratory pile driving, sound levels may reach physiological threshold criteria for marine mammals at relatively small distances. *In situ* measurements conducted by the California Department of Transportation during bridge construction vibratory pile driving of sheet piles along the U.S. West Coast and Alaska reported a 162 dB re 1 μPa^2 s SEL over 1 s of vibratory pile driving measured 10 m from the source (Buehler et al., 2015). However, given the relatively short duration of vibratory pile driving activities (up to 3 days) and the location of the proposed cofferdam installation in Narragansett Bay, Rhode Island (**Section 3.0** of the Project's COP), it is unlikely species will be present within proximity of this noise source for durations sufficient to result in the onset of PTS in marine mammals.

While physiological thresholds consider exposure time, current behavioral metrics do not consider the duration of the animal's exposure to noise above the threshold. Therefore, the traditional assessment for behavioral exposures is dependent solely on the presence or absence of a species within the ensonified area. Animals are less likely to respond to sound levels when distant from a source, even when those levels elicit responses at closer ranges; both proximity and received levels are important factors in aversion responses (Dunlop et al., 2017). While vibratory pile driving activities may produce noise which exceeds the behavioral thresholds for marine mammals (**Section 2.1.4**), exposure to an SPL at a specified threshold level does not equate to a behavioral response or a biological consequence. Furthermore, the low abundance of marine mammal species in the nearshore location of the proposed cofferdam and the short period of vibratory pile driving activities significantly reduces the risk of behavioral exposures. There is a low potential for some dolphin, porpoise, and seal species to be present in the region around the cofferdam in Narragansett Bay (**Section 3.1**), and for those species vibratory pile driving presents a behavioral disturbance risk but not a physiological risk. Because impacts would only occur during the approximate 3-day installation period over which vibratory pile driving will occur, impacts to all marine mammals are considered ***direct*** and ***short-term***.

5.2.1.6 WTG Operations

WTGs primarily produce two types of noise: aerodynamic WTG blade noise and mechanical noise. The mechanical noise type can be transmitted underwater via the WTG towers and foundations. As described in **Section 2.1.4**, underwater noise generated by WTGs is concentrated below 500 Hz (Tougaard et al., 2009); and therefore, poses the greatest risk to the LF cetacean hearing group. However, Tougaard et al. (2009) stated that it was unlikely that auditory masking would occur due to the low noise levels produced by operational WTGs. They showed that WTG produced SPL ranging from 100 to 120 dB re 1 μPa at roughly 100 m from the foundation, although the MW size was not identified. Noise measurements taken at 50 m away from a 3.6 MW WTG reported peak power spectral density levels of 126 dB re 1 μPa^2 Hz^{-1} with frequencies centered at 162 Hz and noise levels that varied by wind speed. Acoustic monitoring at the Block Island Wind Farm showed that WTG blades turning at maximum speed (12 rpm) increased noise in lower frequency bands by 3 to 10 dB (HDR, 2019). However, the WTG proposed for the RWF range in size from 8 to 12 MW, and measurements of operational noise for WTGs above 6 MW are not available in the published literature. Madsen et al. (2006) noted that there seemed to be only a weak relationship between the size of the WTG and the emitted noise levels, but cautions that this may not be valid for large WTGs of several megawatts.

Even with the larger WTGs proposed for this Project, noise levels are unlikely to exceed physiological onset thresholds, and impacts would be limited to audibility and perhaps some degree of responsiveness, such as avoidance (MMS, 2007). There is no published information about long term sound exposures to marine mammals from offshore wind farms. Animals such as seals and dolphins display some attraction to prey increases at wind farms, which may suggest that noise levels produced are insufficient to elicit behavioral disturbances in those groups (Teilmann and Carstensen, 2012). There is no published literature assessing long-term movement or acoustic exposure of LF cetaceans in or around offshore wind farms. Additionally, WTG noise will persist for longer periods of time and could impact more species compared to noise produced by construction and installation activities (MMS, 2007).

LF cetaceans are the most likely to perceive and potentially react to the LF noise produced by the WTGs; however, such responses have not been documented. However, due to the large uncertainty regarding the noise propagated by large-scale wind farms with >6 MW WTGs, additional considerations were made for LF cetaceans. Should avoidance behaviors due to noise produced by the wind farm result in reduced access to feeding areas that intersect or are adjacent to the RWF, impact severity could be greater for these species. While this impact is not anticipated, the lack of documented activity of LF cetaceans around operational wind farms requires that such impacts be considered a possibility.

Given the relatively low sound levels that would be produced during WTG operations, only temporary changes in marine mammal behavior would be expected to occur, and no measurable impacts are expected to MF and HF cetaceans or PPW. Due to the anticipated operation of the RWF of 20 to 35 years, impacts to marine mammals are considered ***direct*** and ***long-term***.

5.2.2 Vessel Traffic

Marine mammals may be vulnerable to collisions with moving vessels (Douglas et al., 2008; Laist et al., 2001; Pace, 2011). Vessel strikes happen when either marine mammals or vessels fail to detect one another in time to avoid the collision. Variables that contribute to the likelihood of a vessel strike include vessel speed, vessel size and type, and visibility. Marine mammal strikes have been reported at vessel speeds of 2 to 51 kn, and lethal or severe injuries are most likely to occur at speeds of 14 kn or more (MMS, 2007). Most reports of collisions involve large whales, but collisions with smaller species have also been reported (Van Waerebeek et al., 2007). Laist et al. (2001) provided records of the vessel types associated with collisions with marine mammals; most severe and lethal marine mammal injuries involved large ships (80 m or more in length). Vessel speed was found to be a significant factor as well, with 89% of the records involving vessels moving at 14 kn or more (MMS, 2007).

All large marine mammals are potentially at risk of a vessel strike. Whale species that are most frequently involved in vessel collisions include the fin whale, North Atlantic right whale, humpback whale, minke whale, sperm whale, sei whale, gray whale (*Eschrichtius robustus*), and blue whale (Dolman et al., 2006). Smaller cetaceans and pinnipeds are also at risk of vessel strikes; however, these species tend to be more agile, power swimmers and are more capable of avoiding collisions with oncoming vessels (MMS, 2007).

For some species, like the North Atlantic right whale, vessel strikes pose a significant risk mainly due to behavioral characteristics and habitat preferences. Vessel strikes are consistently one of the most common causes of North Atlantic right whale mortality annually (Hayes et al., 2020). Slow-moving and deep diving species that rest while on the surface or species that traverse or occupy shipping lanes are at highest risk.

Annual large whale mortality records include a vessel strike assessment. A high number of mortalities prompted NMFS to declare a UME from January 2016 through September 2020 for Atlantic coast humpbacks (NMFS, 2020d); from January 2017 through September 2020 for minke whales (NMFS, 2020c); and from January 2017 through October 2020 for North Atlantic right whales (NMFS, 2020a). A total of 133 humpback whales and 97 minke whales were found dead between Maine and North Carolina since 2016, and 42 North Atlantic right whales were found dead or seriously injury between Newfoundland and North Carolina (NMFS, 2020a,c,d). Necropsy examinations were conducted on approximately half the humpback whales observed, of which 50% showed evidence of human interaction such as a vessel strike (NMFS, 2020d). More than 60% of the mink whales were able to be examined, of which several showed signs of human interaction, but findings were not consistent and further research is needed (NMFS, 2020c). Necropsies were able to be conducted on 20 of the 31 dead North Atlantic right whales, and although results are still pending approximately 50% of the whales examined showed evidence of vessel strikes (NMFS, 2020a). Between 2013 through 2017, there was 0.8 records of annual vessel strikes of fin whales and 0.8 records annual vessel strikes of sei whales which resulted in serious injury or mortality (Hayes et al., 2020).

Most fast-moving cetacean species, including several delphinids such as the bottlenose and common dolphin, actively approach vessels to swim within the pressure wave produced by the vessel's bow and are at lower risk of vessel strike (Glass et al., 2009; Jensen and Silber, 2003; Laist et al., 2001; van der Hoop et al., 2015).

Project vessel traffic will result in a relatively short-term increase in the volume and movement of vessels in the Project Area during construction and decommissioning. Larger work vessels will generally transit to the work location and remain in the area until installation is complete. These large vessels will move slowly over a short distance between work locations. Transport vessels will travel between ports in Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Virginia, and Maryland and the offshore construction area (**Section 3.0** of the COP). During O&M, Project vessel traffic will be present over a longer duration, but the general size and number of vessels used for routine maintenance will be smaller than that of construction and decommissioning, except in the event major maintenance is required in which case traffic will be similar to construction and decommissioning. Depending on the time of year, the Project-related increase in vessel traffic would be nominal compared to other vessel operations within the area. For this analysis, it is expected that the proposed additional volume of vessel traffic associated with Project Activities would not constitute a significant increase to existing vessel traffic within the relatively heavy trafficked RI-MA WEA due to the close proximity of shipping lanes. To mitigate marine mammal vessel strikes, BOEM and NOAA require vessel strike avoidance measures that are based on NMFS's Vessel Strike Avoidance Measures and Reporting for Mariners (NMFS, 2008). Adherence to these provisions would further reduce the risk of associated vessel strikes or disturbance to marine mammals that might result from the proposed RWF construction activities or subsequent decommissioning activities.

The temporary increase in traffic during the construction and decommissioning phases pose the highest risk of vessel strikes to marine mammals. As previously discussed, not all marine mammal species are uniformly affected by vessel strikes. Some species have a higher risk of collision with vessels given their size, mobility, and surface behavior. Due to the low populations estimates for Endangered whale species, vessel strikes that may result in injury or mortality would result in the removal of that animal from the population; however, the severity of a mortality in a population that is listed as Endangered is countered by their overall resilience to population-level impacts. Vessel traffic during the activity is not expected to result in vessel strikes. Adherence to all NOAA and lease-stipulated speed restrictions and watch requirements by Project-related vessels reduces the risk of vessel strikes. Due to the relatively short duration of construction and decommissioning activities (approximately 18 months each), only ***direct***, ***short-term*** impacts are anticipated for all marine mammals. Vessel traffic during O&M will use vessels which will be generally smaller in size but will make more transits between the port and the RWF on a regular basis for maintenance and repairs throughout the operational life of the Project; therefore, impacts on all marine mammal species during this phase are therefore considered ***direct*** and ***long-term***.

5.2.3 Habitat Alteration

As introduced in **Section 4.3.4.2** of the Project's COP, impacts of habitat alteration on marine mammals during construction of the RWF are expected to be ***direct*** and ***short-term***. Seafloor preparation, installation of the foundations, vessel anchoring, and installation of the IAC and OSS-Link Cable will temporarily displace existing communities both on and in the sediment in the RWF, which is expected to alter the existing benthic habitat. Marine mammals foraging in the RWF area may experience a temporary loss in prey availability, and those species that forage on benthic species will encounter reduced foraging opportunities where soft-bottom communities are displaced by the placement of the foundations and scour protection. This is not anticipated to produce measurable impacts on marine mammals because the area altered by the RWF foundations represent a portion of available habitat for benthic communities in the region, and pelagic species are expected to return to the area following construction.

Impacts on marine mammals due to habitat alteration are expected to occur primarily during the O&M phase. During O&M the presence of the WTG and OSS foundations and scour protection, and the IAC and OSS-Link Cable protection in the RWF will alter the existing sandy-bottom habitat and provide structural relief that may act as an artificial reef, a phenomenon termed the "reef effect." The reef effect caused by the introduction of a new hard bottom habitat in this area is expected to attract numerous species of algae, shellfish, and finfish to this site (Langhamer, 2012; Reubens et al., 2013; Wilhelmsson et al., 2006). Colonization of these structures often follows a characteristic sequence, starting with settlement of smaller planktonic organisms such as algae and zooplankton followed by barnacles and other organisms that live on the seafloor or on structures in the water column (Langhamer, 2012). Fish and invertebrate species are also likely to aggregate around the foundations and scour protection, which could provide increased prey availability and structural habitat (Boehlert and Gill, 2010; Bonar et al., 2015). This can have a positive side effect, by creating a sanctuary area for trawled organisms where higher survival of larger fish species is an expected outcome that can extend to outer areas (Langhamer, 2012).

Long-term studies of artificial reefs in European seas indicate that it takes approximately 5 years before stable communities are established (Jensen et al., 2000; Petersen and Malm, 2006). The Project is anticipated to operate over a 20- to 35-year period, making it likely that colonization of the foundations and scour protection will occur. This will result in an increase in the availability of marine mammal prey species, thus providing beneficial foraging opportunities for some marine mammals in this region. Projects to restore artificial reefs noted an increase in the presence of harbor porpoises at the new artificial reef site compared to surrounding habitats, and it was hypothesized they were following prey species (Mikkelsen et al., 2013). Other studies have observed seals concentrating their foraging efforts around wind farms and oil and gas platforms, often returning to these areas, which suggests successful foraging behavior around the foundations (Arnould et al., 2015; Russell et al., 2014). Another benefit for some species is that windfarms are not just a single structure, but a series of many located relatively closely to each other. This presents many feeding opportunities for smaller species of dolphins with low body fat percentages (that require multiple feedings) or mother/calf pairs (that have been observed repeatedly at structures in the literature) (Lindeboom et al., 2011; Hammar et al., 2010).

However, this effect will not be universal across marine mammal species. Currently, there are no quantitative data on the responses of large whale species (i.e., mysticete species) to the presence of offshore wind farms. It is uncertain whether large whale species will avoid or be attracted to the RWF structures, and Kraus et al. (2019) indicated that this potential shift in large whale distribution is a critical issue to consider as offshore wind farms are developed. It is possible that they may face similar beneficial foraging opportunities as smaller odontocetes and seals; however, differences in prey preference will result in differences in impacts on marine mammal species. The presence of the foundations in the water column could create wakes that may disrupt aggregations of zooplankton prey species within the RWF. This could impact species such as the North Atlantic right whale who primarily feed on zooplankton, but benthic and pelagic fish and shellfish would not be affected by the wakes, so whales foraging on these prey species would not be impacted (Kraus et al., 2019).

Large whale species could also be impeded by the presence of the foundations in the water column. As discussed in **Section 3.0** of the Project's COP, up to 100 foundations spaced approximately 1.85 km may be installed. Larger marine mammal species and those that engage in foraging behaviors, such as bubble-net feeding performed by humpback whales or surface active groups observed for North Atlantic right whales, may be affected by the foundations in the water column compared to smaller species or species that forage independently.

While limited data are available on the long-term effects of habitat alteration due to the installation of an offshore wind farm, the primary impact on marine mammals would be from altered prey distribution. For some species, this impact could be beneficial due to increase foraging opportunities, while other species may experience difficulties foraging within the RWF area due to the presence of the foundations. Because the three-dimensional habitat introduced by the RWF foundation will be present throughout the 20-35 year life of the Project, impacts from habitat alteration due to the installation of the RWF are considered ***direct*** and ***long-term*** for marine mammals during O&M.

5.3 Sea Turtles

Sea turtles are primarily present in the Project Area during summer and fall months and can occur in the RWF and RWEC corridor depending on the species and age class. As shown in **Table 1.2-1**, IPFs for sea turtles include underwater noise, vessel traffic (i.e., physical disturbance, risk of strikes), and habitat alteration due to the presence of RWF foundations and scour protection.

5.3.1 Underwater Noise

Few studies have examined the role of acoustic cues in relation to sea turtle ecology (Cook and Forrest, 2005; Mrosovsky, 1972; Samuel et al., 2005). Sea turtles may use noise for navigation, locating prey, avoiding predators, and environmental awareness (Dow Piniak et al., 2012a). The few vocalizations described for sea turtles are restricted to the grunts and gular (throat) pumps of nesting females, which are LF sounds and are relatively loud when compared to ambient noise, leading to speculation that nesting females may use these sounds to communicate within species (Cook and Forrest, 2005; Mrosovsky, 1972). Very little is known about the extent to which sea turtles use their auditory environment ("soundscape") for navigation, assessment of their environment, or identification of predators and prey, and the acoustic habitat for sea turtles change with each life stage as the preferred habitat shifts (**Section 3.2**). For example, the inshore acoustic habitat where juvenile and adult sea turtles generally reside is dominated by LF noise and generally has higher ambient noise levels than the open ocean environment where hatchlings reside (Hawkins and Myrberg, 1983). Moreover, in highly trafficked inshore areas, nearly constant LF noises from shipping, recreational boating, and seismic surveys increase the potential for acoustic impact (Hildebrand, 2005, 2009) and masking of biologically important sounds (Fay, 2009).

Popper et al. (2014) made a distinction between "mortal injury" and "recoverable injury," with the latter defined as an injury that is not likely to result in mortality such as sensory hair cell damage, minor internal or external hematoma. The definition of "recoverable injury" in this context implicitly includes PTS due to permanent inner-ear hair cell damage because the term "recoverable injury" is defined as any injury that is not a mortal injury. Therefore, PTS could be considered a threshold for injury, as it has been used for marine mammals (NMFS, 2018).

Due to the lack of data on sea turtle hearing and auditory impacts, no quantitative TTS criteria for sea turtles have been developed. Some previous environmental analyses have applied cetacean TTS criteria to sea turtles (BOEM, 2013; U.S. Department of the Navy, 2001). Finneran and Jenkins (2012) developed TTS criteria for sea turtles based on criteria for LF cetaceans, with the inclusion of an auditory weighting function for sea turtles. However, Popper et al. (2014) concluded that sea turtle hearing is better represented by data from fishes than from marine mammals because the functioning of the inner ear of sea turtles is dissimilar to that of mammals. Popper et al. (2014) used data from fishes exposed to impact pile driving to develop criteria for death or mortal injury of sea turtles exposed to impulsive noises.

The potential for masking impacts on sea turtles is difficult to evaluate because the role of noise in their ecology is not known. Sea turtles can hear LF noises. It has been hypothesized that the natural noise of the surf zone may help nesting sea turtles find their nesting site (Nunny et al., 2011) and that grunts made by nesting sea turtles may be for terrestrial communication (Cook and Forrest, 2005). Ferrara et al. (2014) identified four types of sounds in leatherback sea turtle nests during incubation and hypothesized that sounds are used to coordinate group behavior in hatchlings. Recent studies of a freshwater turtle species identified 11 types of sounds that are used to synchronize behavior among hatchlings and coordinate the movements of hatchlings and adult females (Ferrara et al., 2013).

Sources of noise resulting from Project Activities that have the potential to impact sea turtles include both impact and vibratory pile driving during the construction phase, DP vessel thrusters throughout all Project phases, and WTG noise during the O&M phase. Construction activities, specifically impact pile driving, are likely to generate the greatest noise levels, which can result in physiological injury or behavioral disturbances to sea turtles. Severity of impacts depends on the level and frequency characteristics of the noise as well as anticipated presence of sea turtle species.

5.3.1.1 DP Vessel Noise

Underwater noise generated by Project-related vessels, including those using DP thrusters, and equipment noise could disturb sea turtles or contribute to auditory masking throughout all phases of the Project. The intensity of this noise is largely related to vessel size and speed as well as thruster operations on DP vessels. Quantitative modeling was not conducted for this Project, a qualitative discussion of DP vessel noise is provided in Denes et al. (2020).

The most likely effects of vessel noise on sea turtles would include behavioral changes and auditory masking. Vessel noise is transitory, and the SLs are too low to cause death or injuries such as auditory threshold shifts. Based on existing studies on the role of hearing in sea turtle ecology, it is unclear whether masking resulting from vessel noise would have biologically significant impacts on sea turtles. Behavioral responses to vessels have been observed but are difficult to attribute exclusively to noise rather than to visual or other vessel cues. Studies of sea turtles are also inconclusive as to whether they may habituate to a continuous noise source. Nevertheless, it is conservative to assume that noise associated with Project DP vessels may elicit behavioral changes in individual sea turtles near the vessels. It is assumed that these behavioral changes would be limited to evasive maneuvers such as diving, changes in swimming direction, or changes in swimming speed to distance themselves from vessels. Also, as indicated in **Section 5.1.2**, the low volume of Project-related vessel traffic relative to existing traffic would contribute a nominal amount to the overall noise levels in an already heavily trafficked area. Given that impacts would only occur while the limited number of DP vessels are operating during construction and decommissioning, and DP vessels operating in a station-keeping mode, which produces the greatest sound levels, are expected to occur infrequently during O&M, it is expected that impacts to sea turtles from vessel noise are considered ***direct*** and ***short-term***.

5.3.1.2 Aircraft Noise

Noise produced from aircrafts used during Project construction have the potential to propagate underwater at levels that could be detectable to sea turtles. Received SPL measured from a helicopter at 18 m depth were approximately 106 dB re 1 µPa and were shown to generally increase with decreasing water depth, decreasing altitude of the aircraft, and increasing flight speed (Patenaude et al., 2002). Additionally, sea turtles are known to be able to detect lower frequency noises and recordings of helicopter noise show primary frequencies below approximately 400 Hz (Patenaude et al., 2002; Dow Piniak et al., 2012a; Dow Piniak et al., 2012b; Martin et al., 2012; Popper et al., 2014). However, helicopters would only be used intermittently to support crew transfers during construction and O&M (**Section 4.1.4.1** of the Project's COP), and given the relatively short duration of construction activities (approximately 18 months), only temporary changes in behavior are expected to occur. Impacts from aircraft noise are considered ***direct*** and ***short-term***.

5.3.1.3 Geophysical Surveys

As discussed in **Section 2.1.5**, geophysical surveys will be conducted prior to construction of the RWF and RWEC to identify any seabed obstructions or potential MEC/UXOs. The likelihood of encountering MEC/UXOs within the Project Area is low, and should one be identified it will be disposed of using methods designed to avoid potential detonation of the device. The preferred approach for MEC/UXO is avoidance, but in a situation where avoidance is not possible, low-noise methods of removal or relocation will be employed (**Section 3.3.3.2** of the Project's COP). Therefore, explosive decommissioning of MEC/UXOs is not considered in this assessment, and only noise from the geophysical survey equipment used to locate potential obstructions was analyzed.

Equipment used during these surveys has the potential to produce noise that would exceed physiological and behavioral thresholds for sea turtles (**Section 4.1**). However, based on previous assessments conducted for marine mammals (CSA Ocean Sciences Inc., 2018, 2020) estimated ranges to physiological thresholds are not expected to exceed more than a few meters, and behavioral thresholds would be <200 m. With the implementation of the environmental protection measures outlined in **Section 5.5**, the risk of impact is low and would be limited to temporary disturbances. Furthermore, due to the relatively short duration of these activities which would only occur during a portion of the full 18-month construction period, impacts are considered ***direct*** and ***short-term***.

5.3.1.4 Impact Pile Driving

Available data indicate that adult sea turtles in water can hear frequencies ranging from 50 Hz to 1,200 Hz and juveniles can hear frequencies up to 1,600 Hz, a range that overlaps with the main energy output from impact pile driving (Bartol and Ketten, 2006; Bartol et al., 1999; Dow Piniak et al., 2012a; Lavender et al., 2014; Martin et al., 2012; Ridgway et al., 1969). Reported hearing ranges and thresholds differ somewhat among species and life stages, but the data are too limited to be definitive because of the small numbers of individuals tested. Death or injury can occur from exposure to high intensity impulsive noises (Popper et al., 2014). Sea turtle deaths and injuries have been documented in proximity to underwater explosions (Gitschlag and Herczeg, 1994; Klima et al., 1988; Viada et al., 2008), but those impacts were attributed primarily to barotrauma resulting from exposure to the high energy of the shock wave generated by the explosions. Based on an extensive review of current scientific literature and studies, no sea turtle deaths or injuries are documented to have been caused by impact pile driving. Because of their rigid external anatomy, it is possible that sea turtles may be protected to some degree from the impacts of lower energy impulsive noises (Ketten and Bartol, 2005; Popper et al., 2014).

Avoidance of impulsive noise sources by sea turtles has also been inferred from field observations of sea turtle behavior during seismic surveys (DeRuiter and Doukara, 2012; Holst et al., 2006; Weir, 2007). Based on the best available data, it is assumed that sea turtle behavioral responses to impulsive noise may begin to occur at a received SPL between 166 and 175 dB re 1 μPa (Blackstock et al., 2018; FHWG, 2008; Popper et al., 2014).

Modeled impact pile driving at RWF WTG for the 12-m WTG monopiles with 10 dB attenuation resulted in a $ER_{95\%}$ distance of 110 m to the sea turtle PK physiological threshold and 20 m to the SEL_{24h} threshold (**Table 4.4-1**). For the 15-m monopiles used in the RWF OSS, mean $ER_{95\%}$ were 81 m to the PK physiological thresholds and 13 m to the SEL_{24h} thresholds, and for the 4-m jacket foundations, mean modeled distances were 24 and 57 m for the PK and SEL_{24h} thresholds, respectively (**Tables 4.4-2** and **4.4-3**). Sea turtles are not expected to linger within this distance for durations that would elicit a physiological impact. The maximum distance to PK thresholds represents the greatest potential for instantaneous injury to sea turtles and would be reached only at the highest hammer energy near the end of pile installation (Denes et al., 2020). Due to the placement of noise attenuation devices and general construction activities combined with smaller impact isopleths for the majority of hammer strikes, sea turtles are not expected to encroach any of the PK isopleths and, therefore, no physiological exposures are expected for sea turtles from impact pile driving.

Modeled $ER_{95\%}$ for sea turtle behavioral thresholds ranged from 1,030 to 1,500 m for all pile types and scenarios (**Section 4.4**). There is a likelihood of behavioral threshold exposure and general activity in the area that could result in sea turtles temporarily vacating the RWF construction area. Exposures to behavioral thresholds are expected to be temporary and not biologically significant. Because impacts are only expected during the 18-month duration of construction activities, it is expected that impact pile driving will result in ***direct***, ***short-term*** impacts on sea turtles.

5.3.1.5 Vibratory Pile Driving

Vibratory pile driving associated with RWEC construction, while within the estimated hearing range of sea turtles, is expected to produce lower noise levels relative to impact pile driving. Modeling was not conducted for cofferdam installation for RWEC; however, no injury or mortality is expected, and behavioral exposures are unlikely due to the relatively low SLs produced by this activity (**Section 2.1.4**) and the nearshore location of the proposed cofferdam installation (**Section 3.0** of the Project's COP). If behavioral exposures were to occur, behavioral responses are expected to be temporary, short-term, and would not affect the reproduction, survival, or recovery of Threatened or Endangered species. Additionally, vibratory pile driving would only occur during a 3-day period between October and January, and winter and spring have very low densities of sea turtles in the area (**Section 3.2**) and would have a lower potential for any exposure risk. Vibratory pile driving is therefore anticipated to have ***direct***, ***short-term*** impacts on sea turtles.

5.3.1.6 WTG Operations

Sea turtle hearing is within the frequency range (<1,200 Hz) for operational WTG (Popper et al., 2014; Thomsen et al., 2006). Thus, it is possible that WTG noise may influence sea turtle behavior. Potential responses to WTG noise generated during normal operations may be expected to be behavioral and include avoidance of the noise source, disorientation, and disturbance of normal behaviors such as feeding (MMS, 2007). Noise generated during normal operations might affect many individuals and for a much longer time period (MMS, 2007). As discussed in **Section 5.1.1.4**, operational WTGs can produce SPL ranging from 100 to 120 dB re 1 μPa at roughly 100 m from the foundation, which is higher than the ambient levels measured within the RI-MA WEA (Kraus et al., 2016; Tougaard et al., 2009).

Although operational WTGs could potentially increase ambient noise levels around the RWF, the sound levels produced are not high enough to result in potential injury to sea turtles. Only behavioral disturbances such as long-term avoidance of the RWF and surrounding vicinity are likely to occur. Sea turtles are known to occur in areas of higher ambient noise given their preference for coastal habitats, and therefore are more likely to habituate to increases in ambient noise. Additionally, as discussed in **Section 5.2.3**, sea turtles will likely be attracted to the RWF foundations due to beneficial foraging and sheltering opportunities, which further indicate the potential effects of operation WTG noise will not be biologically significant. Based on this, the anticipated behavioral impacts on to sea turtles from WTG noise is not expected to be biologically significant, but will be present throughout the 20 to 35-year life of the Project and are therefore considered ***direct*** and ***long-term***.

5.3.2 Vessel Traffic

Sea turtles may be able to actively maneuver within the water column to avoid collisions with approaching slow-moving (<5 kn) construction vessels; however, construction support vessels may travel at faster speeds and sea turtles may not be able to avoid them. Based on knowledge of their sensory biology (Bartol and Ketten, 2006; Bartol and Musick, 2003; Levenson et al., 2004), sea turtles may detect objects such as vessels, prey, and predators in the water column by means of auditory and visual cues. However, research examining the ability of sea turtles to avoid collisions with vessels shows that they may rely more on visual than auditory cues (Hazel et al., 2007). Sea turtle collisions with commercial vessels are not well-documented, but many rescued or stranded sea turtles show evidence of vessel strikes (Singel et al., 2007). From 1997 to 2005, 14.9% of all stranded loggerhead turtles in the U.S. Atlantic and Gulf of Mexico were documented as having sustained some type of propeller or collision injury. This study did not indicate what proportion of these injuries was post- or ante-mortem (NMFS and USFWS, 2008). It is likely that collisions with small or submerged sea turtles, or collisions during nighttime or periods of poor visibility, may go undetected and undocumented. Sea turtles are negatively buoyant and remains will sink in deep water, making them very unlikely to drift to shore or be recovered.

The potential for collisions between vessels and sea turtles increases at night and during inclement weather. Sea turtles spend at least 20% to 30% of their time at the surface for respiration, basking, feeding, orientation, and mating, during which time they are more susceptible to vessel strikes (Lutcavage et al., 1997). Temporary vessel traffic during all Project phases would slightly increase vessel traffic within the area; however, it represents a very small contribution in overall vessel traffic in the already heavily trafficked region. Large construction and decommissioning vessels will generally transit to the work location and remain in the area until installation is complete. These large vessels will move slowly and over short distance between work locations. Transport vessels will travel between ports in Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Virginia, and Maryland and the RWF throughout all Project phases (**Section 3.0** of the COP). These vessels will range in size from smaller crew transport boats to tug and barge vessels.

While mortality from vessel collision is frequently documented in sea turtle stranding data, the issue is most prevalent in shallow inshore and near-coastal waters where there are high densities of high-speed vessel traffic (Singel et al., 2007). In the unlikely event of a sea turtle vessel strike that results in injury or mortality, the risk of population-level consequences would be greater due to the removal of an individual(s) from a population or DPS that is considered already at risk. However, considering that Project-related vessel traffic will comprise slower moving work vessels and a relatively low volume of support vessels, and that vessel strike avoidance measures including speed restrictions and minimum separation distances following guidance from NMFS (2008) will be implemented for all Project vessels, the risk of a strike is expected to be low. Therefore, potential impacts on sea turtles from vessel traffic during construction and decommissioning are considered ***direct*** and ***short-term*** due to the relatively short duration of these activities (approximately 18 months each). As discussed briefly in **Section 5.2.2**, vessel traffic during the O&M phase is expected to comprise smaller vessels but a higher number of transits compared to the construction and decommissioning phases throughout the 20-35 year life of the Project, and impacts are therefore considered ***direct*** and ***long-term***.

5.3.3 Habitat Alteration

The presence of the RWF foundations and scour protection and IAC and OSS-Link Cable protection throughout the 20 to 35 year life of the Project will alter the existing sandy-bottom habitat and structural relief that may act as an artificial reef, a phenomenon termed the "reef effect". The reef effect caused by the introduction of a new hard bottom habitat in this area is expected to attract numerous species of algae, shellfish, finfish, and sea turtles to this site (Langhamer, 2012; Reubens et al., 2013; Wilhelmsson et al., 2006). For sea turtles, artificial reefs have been shown to provide a number of ecological functions such as foraging and sheltering habitat and structures are used to remove biological build-up from their carapace (Barnette, 2017; NRC, 1996). In the Gulf of Mexico, both loggerhead and leatherback turtles were often observed resting at oil and gas platforms, making it likely that these species will behave similarly at the proposed windfarm structures (Gitschlag and Herczeg, 1994; NRC, 1996). The increased abundance of benthic species such as mussels and crabs, as well as the pelagic fish species attracted to this site would provide foraging opportunities for sea turtles transiting this site. Colonization of offshore structures often follows a characteristic succession starting with lower trophic level species such as diatoms and algae followed by upper trophic level species (Langhamer, 2012). Long-term studies indicate that it takes approximately 5 years for a stable community to be established, but biomass coverage of mussel species at these artificial structures has been shown to dramatically increase within the first 2 years (Joschko et al., 2008; Petersen and Malm, 2006). Particularly in areas with minimal hard bottom habitat or structural relief, these artificial reefs may supply important inter-nesting habitats for sea turtles (Barnette, 2017). Multiple species like green, hawksbill (*Eretmochelys imbricata*), and loggerhead sea turtles have also been observed using anthropogenic structures and submerged rocks to clean their flippers and carapace (Barnette, 2017). With the proposed foundations and scour protection, it is likely this will be result in a beneficial impact to sea turtles due to increased structural habitat and foraging opportunities.

The habitat conversion is also expected to attract commercial and recreational fishing to the area, which could pose a threat to sea turtles through entanglement or ingestion of fishing gear. Greater fishing effort around RWF area would increase the amount of equipment in the water, particularly monofilament line, which has been identified as a major hazard for all sea turtle species. Additionally, the beneficial foraging and sheltering opportunities for sea turtles could cause them to remain in the area longer than they typically would, making them more susceptible to cold stunning. Wakes created by the presence of the foundations may also influence distributions of drifting jellyfish aggregations; however, since other prey species available to sea turtles will not be affected by these wakes, impacts on sea turtle foraging are not expected to be substantial (Kraus et al., 2019). Given the available data that suggests an attraction of sea turtles to offshore structures and because the newly created habitat by the RWF foundations will be present throughout the 20-35 year life of the Project, impacts on sea turtles are considered ***direct*** and ***indirect***, and ***long-term*** during O&M.

Limited information is available related to the effect of decommissioning these structures after artificial reef habitat has been formed. The majority of research examining the impacts of decommissioning offshore structures focuses on methods involving explosives, which will not be used for this Project. Revolution Wind plans to fully dismantle the RWF components and either remove them from the seabed completely or cut the foundations at an appropriate depth below the mudline, enabling the environment to return to near baseline conditions. Sea turtles using these structures for foraging and shelter will be negatively impacted; however, the level of impact from removal of this habitat is uncertain. Studies of manatees at power plants in Florida indicate that they become dependent on these structures as habitat and struggle to adapt when they are decommissioned (Laist, 2005; Sattelberger, 2017). Given the propensity for sea turtles to utilize artificial reef habitats created by offshore structures, the current listing status of local sea turtles, and the expected loss of beneficial habitat used for foraging and shelter, potential negative impacts from decommissioning of the RWF are expected. However, because of the relatively short duration of decommissioning activities, and the anticipated return to baseline once the Project components are removed, impacts would be considered ***direct*** and ***short-term***.

5.4 Atlantic Sturgeon

Potential impacts on the Atlantic sturgeon would not be substantially different from impacts on other fish species and species with designated Essential Fish Habitat. No spawning habitat will be affected as Atlantic surgeon spawn in hard-bottom, freshwater habitats. Seasonal migratory patterns present the potential for Atlantic sturgeon to be present in the RWF area; however, it is not expected to be a regular visitor or occupant in large numbers. As shown in **Table 1.2-1**, IPFs for Atlantic sturgeon that could reach greater than negligible determinations include underwater noise and vessel traffic (i.e., physical disturbance, risk of strikes).

5.4.1 Underwater Noise

Atlantic sturgeon have a primitive swim bladder that is not connected to the inner ear. Anatomical and physiological variations make it difficult to generalize about the impacts of noise on individual species (Thomsen et al., 2006). There are few studies specific to sturgeon hearing; however, Popper (2005) estimated that noise detection in sturgeon ranged from <100 Hz up to 1,000 Hz and indicated that sturgeon may be able to localize noise sources (i.e., determine the direction from which it comes). Sturgeon produce vocalizations during spawning, indicating some level of acoustic dependence for critical biological functions.

A workshop report is available, which contains a summary of research on fish hearing and physiology and presents audiograms for fish that have been measured under appropriate acoustic conditions (Normandeau, 2011). However, as discussed in **Section 2.3.2**, there is a gap in the understanding of particle motion sensitivity in fish, as few studies examined both the effects of pressure and particle motion simultaneously. It is expected that particle motion associated with impulsive noise sources such as impact pile driving will have similar effects as pressure waves with fish exhibiting behavioral responses such as temporarily vacating the impact area. Excess particle motion may also mask communication and could cause permanent or temporary damage to sensory structures.

There are only limited data on mortality in response to anthropogenic noise, and it is not clear whether death or injury only occurs in close proximity to a noise source (Hawkins et al., 2014). Overall, it is more likely that fish will experience sub lethal impacts that increase the possibility for delayed mortality when exposure occurs near a source (Hawkins et al., 2014). Because the majority of Project activities produce non-impulsive LF noise that is within the sensitive hearing range of most fish, the potential for fish to experience TTS, masking, and behavioral impacts are a higher likelihood than auditory injury or mortality.

Behavioral responses (e.g., fleeing, avoidance) to active acoustic noise sources are the most likely direct effect for Atlantic sturgeon exposed to noise during Project activities. Fewtrell and McCauley (2012) found that fish exhibited alarm responses to airgun noises exceeding SEL_{24h} between 147 and 151 dB re 1 μPa^2 s. The potential for masking or behavioral response may exist at a distance of many kilometers from a noise source, depending on the ambient noise levels in the region and the frequency and amplitude characteristics of the noise source.

5.4.1.1 DP Vessel Noise

Research indicates that the direct effects of DP vessel noise will not cause mortality or barotraumatic injuries in adult fish (Hawkins et al., 2014). DP vessel SLs have been shown to cause several different behavioral responses, TTS, auditory masking, and changes in blood chemistry. The most common behavioral responses are avoidance, alteration of swimming speed and direction, and alteration of schooling behavior (Becker et al., 2013; Handegard and Tjøstheim, 2005; Sarà et al., 2007; Vabø et al., 2002).

Laboratory and field studies have demonstrated several other behaviors that are influenced by DP vessel noise. For example, several studies noted changes in the time spent burrowing or using a refuge, time spent defending or tending to nests and eggs (Bruintjes and Radford, 2013; Picciulin et al., 2010), intraspecific aggression and territoriality interactions (Bruintjes and Radford, 2013; Sebastianutto et al., 2011), foraging behavior (Bracciali et al., 2012; Purser and Radford, 2011; Voellmy et al., 2014a,b), vocalization patterns (Picciulin et al., 2008, 2012), and overall frequency of movement (Buscaino et al., 2010). These studies also demonstrated that behavioral changes were generally temporary or that fish habituated to the noises. Some studies noted changes in the blood chemistry of several fish species (e.g., European sea bass [*Dicentrarchus labrax*], gilthead seabream [*Sparus aurata*], red drum [*Sciaenops ocellatus*], spotted sea trout [*Cynoscion nebulosus*]) in response to vessel noise (Buscaino et al., 2010; Spiga et al., 2012).

Auditory masking and TTS in fish exposed to vessel noise has been demonstrated in a few studies. Auditory thresholds have been shown to increase by as much as 40 dB when fish are exposed to vessel noise playbacks (Codarin et al., 2009; Wysocki and Ladich, 2005; Vasconcelos et al., 2007). The degree of auditory masking or TTS generally depends on the hearing sensitivity of the fish, the frequency, and the noise levels tested (Wysocki and Ladich, 2005). The impact of auditory masking and TTS indicate that vessel noise can lower the ability of fish to detect biologically relevant sounds, but the effects were found to be temporary and hearing abilities returned to normal after cessation of the vessel noise.

Modeling was not conducted for DP vessel noise for this Project, but a qualitative discussion of noise produced by DP vessels can be found in Denes et al., 2020. It is unlikely that Atlantic sturgeon would be exposed to DP vessel noise associated with the Project because of their sparse spatial distribution in the Project Area and habitat preference of estuaries and rivers adjacent to, and occasionally in, coastal and shelf waters. Given these factors, and because impacts would only occur while the limited number of DP vessels are operating during construction and decommissioning, and DP vessels operating in a station-keeping mode, which produces the greatest sound levels, are expected to occur infrequently during O&M, impacts of DP vessel noise on Atlantic sturgeon are considered ***direct*** and ***short-term***.

5.4.1.2 Aircraft Noise

Noise produced from aircrafts used during Project construction have the potential to propagate underwater at levels that could be detectable to Atlantic sturgeon. Received SPL measured from a helicopter at 18 m depth were approximately 106 dB re 1 µPa and were shown to generally increase with decreasing water depth, decreasing altitude of the aircraft, and increasing flight speed (Patenaude et al., 2002). Additionally, most fish species are known to be able to detect lower frequency noises and recordings of helicopter noise show primary frequencies below approximately 400 Hz (Patenaude et al., 2002; Dow Piniak et al., 2012a,b; Martin et al., 2012; Popper et al., 2014). However, helicopters would only be used intermittently to support crew transfers during construction and O&M (**Section 4.1.4.1** of the Project's COP), and given the relatively short duration of construction activities (approximately 18 months), only temporary changes in behavior are expected to occur. Impacts from aircraft noise are considered ***direct*** and ***short-term***.

5.4.1.3 Geophysical Surveys

As discussed in **Section 2.1.5**, geophysical surveys will be conducted prior to construction of the RWF and RWEC to identify any seabed obstructions or potential MEC/UXOs. The likelihood of encountering MEC/UXOs within the Project Area is low, and should one be identified it will be disposed of using methods designed to avoid potential detonation of the device. The preferred approach for MEC/UXO is avoidance, but in a situation where avoidance is not possible, low-noise methods of removal or relocation will be employed (**Section 3.3.3.2** of the Project's COP). Therefore, explosive decommissioning of MEC/UXOs is not considered in this assessment, and only noise from the geophysical survey equipment used to locate potential obstructions was analyzed.

Equipment used during these surveys has the potential to produce noise that would exceed physiological and behavioral thresholds for fish (**Section 4.1**). However, based on previous assessments conducted for marine mammals (CSA Ocean Sciences Inc., 2018, 2020) estimated ranges to physiological thresholds are not expected to exceed more than a few meters, and behavioral thresholds would be <200 m. With the implementation of the environmental protection measures outlined in **Section 5.5**, the risk of impact is low and would be limited to temporary disturbances. Furthermore, due to the relatively short duration of these activities which would only occur during a portion of the full 18-month construction period, impacts are considered ***direct*** and ***short-term***.

5.4.1.4 Impact Pile Driving

Impact pile driving is an impulsive noise source that has the potential to cause barotrauma at close ranges (Halvorsen et al., 2012a,b). Because the effect of changing pressure on the swim bladder is the underlying cause of barotrauma, fish without swim bladders like elasmobranchs (i.e., sharks, skates, rays) and flatfish are not as vulnerable to underwater noise impacts as those with swim bladders. Atlantic sturgeon have a relatively small swim bladder which is not directly connected to the inner ear, and they are able to voluntarily release gas from their swim bladder. Therefore, the risk of barotrauma due to exposure to impulsive signals from impact pile driving is lower relative to fish species that cannot release swim bladder gas.

Anticipated noise levels during RWF construction may exceed behavioral thresholds for fish, including Atlantic sturgeon, and may elicit a behavioral avoidance response as observed for some fish species (Becker et al., 2013). A physiological stress response or TTS may also occur due to exposure to impact pile driving noise. The stress response may involve elevated levels of stress hormones (i.e., corticosteroids) as documented for fish exposed to continuous SPL of 153 to 170 dB re 1 µPa (Smith et al., 2004; Wysocki et al., 2006) or increased heart rate following exposure to elevated SPL (Graham and Cooke, 2008).

Elevated noise levels are expected to cause Atlantic sturgeon to temporarily vacate the area (Krebs et al., 2016), resulting in a temporary disruption of feeding, mating, and other essential activities. Atlantic sturgeon have been shown to avoid impact pile driving activities in the Hudson River, and based on this, they were not expected to be exposed to the SEL_{24h} produced by this activity (Krebs et al., 2016). The same avoidance response is expected should Atlantic sturgeon be present during impact pile driving activities at the RWF given the highly mobile nature of this species.

Mean modeled acoustic ranges to Atlantic sturgeon SEL_{24h} thresholds with 10 dB attenuation were approximately 423 m for the 12-m WTG monopile foundations, 945 m for the 15-m OSS monopile foundations, and 781 m for the 4-m OSS jacket foundations (**Section 4.3**). PK ranges were generally smaller, ranging from 42 to 98 m for all pile types and scenarios with 10 dB attenuation applied (**Section 4.3**). Average acoustic ranges for behavioral thresholds were 7 to 8 km for all pile types and scenarios (**Section 4.3**). As discussed in earlier sections, exposure to behavioral thresholds does not constitute behavioral responses, nor are they expected to create any biologically significant consequences.

Atlantic sturgeon are an anadromous species that primarily utilize rivers, bays, estuaries, coastal, and shallow continental shelf waters. However, since Atlantic sturgeon are a demersal species that could potentially be present in the RWF area during impact pile driving activities, behavioral impacts could occur. Because impacts to Atlantic sturgeon from impact pile driving would only occur during the approximate 18-month construction period, impacts are considered ***direct*** and ***short-term***.

5.4.1.5 Vibratory Pile Driving

Vibratory pile driving generally poses less risk of an acoustic impact to fish than impact pile driving because of the non-impulsive nature of the noise produced by vibratory hammers. Unlike impact hammers, which are classified as an impulsive noise source, the sound energy produced by vibratory hammers rises more gradually and SLs are typically 10 to 20 dB lower than those for impact hammers (Buehler et al., 2015).

Vibratory pile driving is not known to produce noise levels that cause mortality in fish due to the non-impulsive nature of this noise source. As such, there are no biological thresholds for mortality associated with non-impulsive noise sources. Modeling was not conducted for cofferdam installation for RWEC; however, information regarding the acoustic properties of DP vessels is provided in Denes et al. (2020). Atlantic sturgeon that are present within the area ensonified at levels exceeding the behavioral threshold are expected to move away from the noise source and avoid the area where the physiological threshold would be exceeded during vibratory pile driving.

Underwater noise produced during vibratory pile driving for the installation and removal of temporary cofferdams would be intermittent and short term, after which, the potential acoustic impacts to Atlantic sturgeon posed by cofferdam installation would no longer be present. Based on these factors and the results of previous acoustic modeling for the South Fork Wind Farm, which demonstrate the relatively small spatial extent of acoustic impacts as well as the likely avoidance of this activity by Atlantic sturgeon, there is a low risk of acoustic impacts to this species. Because impacts are only expected during the approximate 3-day period anticipated for vibratory pile driving for installation of temporary cofferdams at RWEC, impacts are considered ***direct*** and ***short-term***.

5.4.1.6 WTG Operations

Noise produced by WTGs is within the hearing range of Atlantic sturgeon. Depending on the noise intensity, such noises could disturb or displace fish within the surrounding area or cause auditory masking (MMS, 2007). However, with generally low noise levels, fish would be impacted only at close ranges (within 100 m) (Thomsen et al., 2006). Thomsen et al. (2006) reviewed the observations of fish behaviors in proximity to an operational WTG and found varying results, from no perceived changes in swimming behavior of European eels (*Anguilla anguilla*) and both increased and decreased catch rates of cod within 100 m of the operational WTGs. Additionally, Atlantic sturgeon are an anadromous species that primarily utilize rivers, bays, estuaries, coastal, and shallow continental shelf waters, and their occurrence in the RWF is expected to be seasonal in very low numbers (**Section 3.3.1**). While there may be some behavioral modifications, these would be localized and would not represent any population-level changes. Therefore, impacts from WTG noise on Atlantic sturgeon are considered ***direct*** and ***long-term***, given the anticipated 20 to 35-year life of the Project.

5.4.2 Vessel Traffic

The potential for Atlantic sturgeon to be struck by a vessel is high and vessel strikes are a fairly common occurrence. Between 2005 and 2008, surveys in the Delaware estuary reported a total of 28 Atlantic sturgeon mortalities, of which 50% were the result of an apparent vessel strike (Brown and Murphy, 2010). Similarly, five Atlantic sturgeon were reported to have been struck by commercial vessels within the James River, Virginia, in 2005, and one strike per 5 years is reported for the Cape Fear River, North Carolina. The majority of strikes occurred near busy ports where entrance channels narrow, or a significant portion of estuary and river habitat is transited by commercial vessels entering a port (Brown and Murphy, 2010).

As previously mentioned, vessel traffic during construction and decommissioning of the RWF would result in a temporary increase vessel traffic within the area; however, it represents a very small contribution in overall vessel traffic in the already heavily trafficked region. Larger construction vessels will generally transit to the work location and remain in the area until installation is complete. These large vessels will move slowly and over short distances between work locations.

Transport vessels will travel between several ports and the RWF over the course of Project construction and decommissioning. These vessels will range in size from smaller crew transport boats to tug and barge vessels. Smaller vessels will also be used for routine maintenance trips during the O&M phase.

The Project-related increase in vessel traffic during all phases is not expected to be significant when compared to other vessel traffic within the region, and most vessels will be slow moving. Additionally, the implementation of vessel strike avoidance measures such as speed restrictions will further reduce the risk of collisions with Atlantic sturgeon. In the unlikely event that an Atlantic sturgeon is struck and injury or mortality occurs, the risk of population-level impacts would be greater given the Endangered status of this population. However, as previously stated, Atlantic sturgeon occurrence in the RWF is expected to be seasonal, and occurrence in the RWEC would be less common than the RWF (**Section 3.3.1**), making it unlikely they would incur population-level impacts due to vessel strikes. Impacts from vessel strikes are considered ***direct*** and ***short-term*** for Atlantic sturgeon during the construction and decommissioning phases, given the relatively short, 18-month duration anticipated for each. As discussed in **Sections 5.2.2** and **5.3.2**, vessels used during the O&M phase will be generally smaller, but will require more trips between the port and the RWF throughout the 20-35 year operational life of the Project, so impacts during this phase are considered ***direct*** and ***long-term***.

5.5 Avoidance, Minimization and Mitigation

Revolution Wind will implement the avoidance, minimization, and environmental protection measures considered to reduce potential impacts resulting from exposure to underwater noise and vessel traffic during construction and operation of the RWF and RWEC. Revolution Wind, through Orsted NA, is developing a comprehensive Protected Species Mitigation and Monitoring Plan (PSMMP) across all Orsted NA wind leases. The RWF PSMMP will align with all regulatory requirements from BOEM and NMFS by the time necessary for approval of the mitigation and monitoring plans. Details and implementation parameters of each mitigation measure will be provided in the final PSMMP. Additional environmental protection measures beyond those summarized here may be implemented during construction and operations of the RWF and RWEC; and those will be fully detailed in the PSMMP. The mitigation categories that will be used for RWF and REC construction include:

- Noise attenuation through use of a noise mitigation system;
- Establishment of exclusion zones;
- Visual and passive acoustic monitoring;
- Area clearance prior to start of hammer;
- Operational shutdowns and delays;
- Soft start procedures; and
- Vessel strike avoidance and other precautionary procedures.

Project-specific training will be conducted for all Project crews prior to the start of construction activities. Confirmation of the training and understanding of the requirements will be documented on a training course log sheet. Signing the log sheet will certify that the crew members understand and will comply with the necessary requirements throughout the construction activities.

5.5.1 Noise Attenuation

A noise mitigation system is any device or suite of devices that reduces pile driving sound levels that are transmitted through the water. Primary systems reduce the source levels produced by the pile and secondary systems reduce the propagated sound levels of the piling. A noise mitigation system, such as a bubble curtain, hydro damper, or similar, will be used during impact pile driving to decrease the sound levels in the water near the source and thus reduce the impact on marine mammals. Attenuation levels vary by type of system, frequency band, and location. Small bubble curtains have been measured to reduce sound levels from approximately 10 dB to more than 20 dB, but they are highly dependent on water depth, current, and configuration and operation of the curtain (Austin et al., 2016; Bellmann, 2014; Koschinksi and Lüdemann, 2013; Bellmann et al., 2020).

No noise attenuation will be used at the cofferdam due to its location, the activities occurring at the cofferdam, the short time period involved with installation and removal, and very low risk of physiological exposures when other mitigations, as descried in the following sections, are employed.

5.5.2 Establishment of Exclusion Zones

Exclusion zones (EZs) and monitoring zones (MZs) will be established within which Protected Species Observers (PSOs) will monitor for the presence of marine protected species in the vicinity of activities. The size of the EZs and MZs will be based on the type of activity being conducted and the various protected species or species groups expected within the region.

5.5.3 Visual and Acoustic Monitoring

Visual and acoustic monitoring of the established MZs will be performed by qualified and NMFS-approved PSOs. PSOs will be responsible for detecting and identifying marine mammals and sea turtles approaching the established EZs; notifying Project personnel to the presence of species as well as communicating and enforcing the action(s) that are necessary to ensure mitigation and monitoring requirements are implemented as appropriate.

5.5.4 Area Clearance

At the start of each impact pile driving activity, PSOs (and/or PAM operators) will clear the EZ before initiation of soft start procedures. A soft start may not be initiated if any marine mammal or sea turtle is observed within the EZ. If a marine mammal or sea turtle is observed within the EZ during the pre-clearance period, a soft start may not begin until the animal(s) has been observed exiting its respective zone or until a designated time period has elapsed with no further sightings.

5.5.5 Soft Start Procedures

Soft start procedures are applicable to impact pile driving only. Every pile installation will begin with a soft start procedure. The soft start procedure is detailed in **Section 3.2.4.2**. A soft start procedure is used to allow animals potentially in the Project Area to detect the presence of the noise-producing activities and depart the area before full power impact pile driving activity begins. A soft start of impact pile driving will not begin until the EZ has been cleared by the PSOs (and PAM operators when applicable), as described above.

5.5.6 Vessel Strike Avoidance and Other Protective Measures

Vessel operators and crew will maintain a vigilant watch for marine mammals and sea turtles, and slow down or stop their vessels if either are sighted to minimize the potential for a vessel strike. Survey vessel crew members responsible for navigation duties will receive site-specific training on marine mammal sighting/reporting and vessel strike avoidance measures. All vessel crew members will undergo Project-specific marine mammal and compliance training and all vessels will adhere to NOAA vessel guidelines, Lease stipulations, and additional restrictions in management areas as necessary. Vessels will maintain Lease-stipulated separation distances and safe maneuvering when in the proximity of marine mammals. Vessels will monitor NMFS North Atlantic right whale reporting systems daily. Additional measures will also be implemented to minimize non-acoustic impacts including:

- Vessels will follow NOAA guidelines for marine mammal strike avoidance measures, including vessel speed restrictions;
- All personnel working offshore will receive training on marine mammal awareness and marine debris awareness;
- All construction and operations vessels will comply with regulatory requirements related to the prevention and control of spills and discharges;
- Accidental spill or release of oils or other hazardous materials will be managed through and Oil Spill Response Plan (OSRP); and
- The IAC, OSS-Link Cable, and RWEC will be buried to a target depth of 1.2 to 1.8 m to the extent feasible. Actual burial depths and the potential need for cable protection measures will be based on a Cable Burial Risk Assessment, which will evaluate seabed conditions, seabed mobility, and risk of interaction with external hazards such as fishing gear and vessel anchors.

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Appendix S: Commercial and Recreational Fisheries Technical Report Revolution Wind Offshore Wind Farm

Technical Report

Commercial and Recreational Fisheries Technical Report

Revolution Wind Offshore Wind Farm

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March 2021

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List of Acronyms

ACCSP	Atlantic Coastal Cooperative Statistics Program
BMP	Best Management Practice
COP	Construction and Operations Plan
CT DEEP	Connecticut Department of Energy and Environmental Protection
EEZ	exclusive economic zone
EFH	essential fish habitat
GARFO	Greater Atlantic Regional Fisheries Office
GIS	geographic information system
IPF	impact-producing factor
Lease	Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf OCS-A 0486
Lease Area	BOEM-designated Renewable Energy Lease Area OCS-A 0486
MADMF	Massachusetts Division of Marine Fisheries
MRIP	Marine Recreational Information Program
NOAA Fisheries	National Marine Fisheries Service
NROC	Northeast Regional Ocean Council
NYSDEC	New York State Department of Environmental Conservation
O&M	operations and maintenance
OCS	Outer Continental Shelf
OnSS	onshore substation
OSS	offshore substation
Project	Revolution Wind Offshore Wind Farm Project
Project Area	Proposed Wind Farm Area, Export Cable Corridor, and all onshore Project facility locations including the Onshore Transmission Cable Corridor, and Onshore Substation
RIDEM	Rhode Island Department of Environmental Management
RI-MA WEA	Rhode Island-Massachusetts Wind Energy Area
RWEC	Revolution Wind Farm Export Cable
RWEC-RI	Revolution Wind Farm Export Cable-Rhode Island State Waters
RWEC-OCS	Revolution Wind Farm Export Cable-Outer Continental Shelf
RWF	Revolution Wind Farm

SPCC	Spill Prevention, Control, and Countermeasure
TJB	transition joint bay
TSS	total suspended solids
VTR	Vessel Trip Report
VMS	Federal Vessel Monitoring System
WTG	wind turbine generator

1.0 INTRODUCTION

1.1 Description of the Proposed Action

Revolution Wind, LLC (Revolution Wind), a 50/50 joint venture between Orsted North America Inc. (Orsted NA) and Eversource Investment LLC (Eversource), proposes to construct and operate the Revolution Wind Farm Project (hereinafter referred to as the Project). The wind farm portion of the Project will be located in federal waters on the Outer Continental Shelf (OCS) in the designated Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0486 (Lease Area). The Lease Area is approximately 20 statute miles (mi) (17.4 nautical miles [nm], 30 kilometers [km]) south of the coast of Rhode Island (Figure 1.1-1). The Project consists of the Revolution Wind Farm (RWF), located within the Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf -A 0486 Lease Area (Lease Area) and the Revolution Wind Farm Export Cable (RWEC), traversing federal (RWEC-OCS) and Rhode Island state waters (RWEC-RI) to potential landfall options at Quonset Point in North Kingstown, Rhode Island.

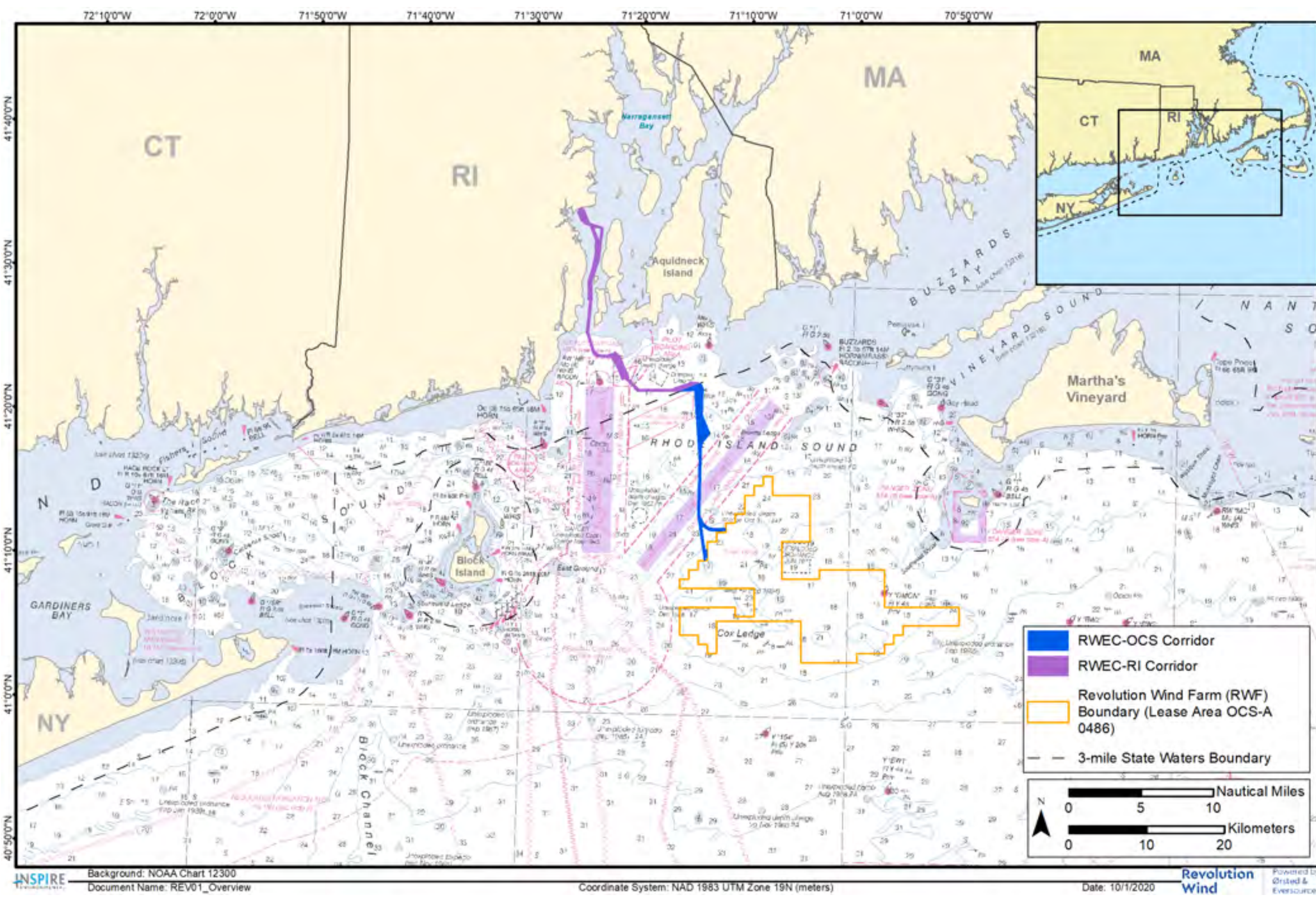

Figure 1.1-1 Map of the Project Area, including the Potential Export Cable Route and Revolution Wind Farm.

The Project will be comprised of both offshore and onshore components, which are described in detail in Section 3 of the Construction and Operations Plan (COP). This Technical Report focuses on evaluation of the Project's offshore components, which include the following:

- up to 100 Wind Turbine Generators (WTGs) connected by a network of Inter-Array Cables (IAC);
- up to two Offshore Substations (OSSs) connected by an OSS-Link Cable; and
- up to two submarine export cables (referred to as the RWEC), generally co-located within a single corridor.

1.2 Regulatory Context and Resource Definition

The National Oceanic Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) requires all federally permitted commercial fishing vessels (with the exception of those vessels that only have a lobster permit) to submit vessel trip reports (VTRs) for every fishing trip (50 Code of Federal Regulations [CFR] 648.7). The VTR data provide a broad census of fishing activity that encompasses the majority of commercial fisheries active near the RWF and RWEC fisheries study corridor (see Section 2.1.1.1). VTRs include a single fishing location (reported in latitude and longitude coordinates) for where "the majority of fishing effort occurred" on each trip, gear type, and species targeted (NOAA Fisheries, 2018).

NOAA Fisheries also monitors the location and movement of commercial fishing vessels for certain fisheries via a vessel monitoring system (VMS). VMS data are maintained by the Northeast Regional Ocean Council (NROC) and the Mid-Atlantic Regional Council on the Ocean for fishing vessel activity of select fisheries (see Section 2.1.1.2) in the northeast and mid-Atlantic regions of the US, which encompasses the RWF and RWEC locations,

The lobster and Jonah crab fisheries do not have VTR or VMS requirements. VMS data for lobster and Jonah crab likely come from fishermen with lobster permits that also participate in other fisheries that require VTRs or VMS (RIDEM, 2017). The American lobster fishery is active in the marine portions of the Project Area and is managed cooperatively by the states and NOAA Fisheries under the framework of the Atlantic States Marine Fisheries Commission. Jonah crab was once considered bycatch of the lobster fishery, but since 2011 (Truesdale et al., 2019) has increasingly been targeted as a commercial fishery. Landings in the fishery come predominantly from Massachusetts (70%) and Rhode Island (24%) and the fishery has only recently (2015) been managed through an interstate Fishery Management Plan (FMP; ASMFC, 2015).

1.3 Contents of This Technical Report

This technical report provides a detailed explanation of the data and analyses used to assess commercial and recreational fisheries resources in the RWF and RWEC fisheries study corridor. The information presented herein supports the summary-level data and analysis presented in Section 4.6.5 of the COP. Section 2 of this technical report describes the data sources and analysis used to characterize commercial and recreational fishing activity in the RWF and RWEC areas. Data analyzed in this technical report were requested from NOAA Fisheries and obtained from publicly available data sources. All data requested were subject to strict confidentiality requirements set forth by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006. These requirements prevent the government from making any data public that can be linked to individual people or businesses. This is achieved by applying the "Rule of Three," where any data presented to the public must have been reported by at least three fishermen, vessels, dealers, etc. Any data that can only be attributed to two or fewer entities must be aggregated to a higher level. Section 2.2 of this report provides detailed summaries of the data requested from state and federal agencies, as well as supplementary maps for data sets referenced in Section 4.6.5 of the COP. Potential impacts and mitigation are discussed in Section 3.0.

2.0 AFFECTED ENVIRONMENT

2.1 Methodology

2.1.1 Federal Data

2.1.1.1 Federal Vessel Trip Report (VTR) Data

The RWF and RWEC fisheries study corridor occur within the larger Rhode Island-Massachusetts Wind Energy Area (RI-MA WEA). The VTR data used for characterizing commercial fisheries in the RWF and RWEC fisheries study corridor as summarized in this report were requested from and processed by NOAA Fisheries following the methods described by Kirkpatrick et al. (2017). Also, included was the application of the statistical model as described by DePiper (2014) that assesses the VTR self-reported fishing locations compared to observed haul locations. NOAA Fisheries also provided nonconfidential data on commercial fishing activity (2008 to 2017) in terms of revenue and landings, for fishing activity reported to occur within the RWF, as well as within a 46-mi (74-km)-long, 6.2-mi (10-km)-wide RWEC fisheries study corridor (Figure 2.1-1) that was established as an approximate buffer around a preliminary RWEC corridor. The RWEC fisheries study corridor was not established for the cable corridor that occurs within the RWF, therefore VTR data collected near the RWEC within the RWF are attributed to the RWF in tables below. The RWEC fisheries study corridor was defined to provide a reasonable geographic extent for fisheries activity that may occur near the RWEC fisheries study corridor, and may, therefore, be affected in some way by the installation and operations of the RWEC. The RWEC fisheries study corridor was created based on a preliminary RWEC corridor and was defined to be wide enough to accommodate changes over time to the RWEC centerline. To add context, the data were provided alongside the overall VTR data available for commercial fishing activity in the Greater Atlantic Region, which extends from Maine to North Carolina.

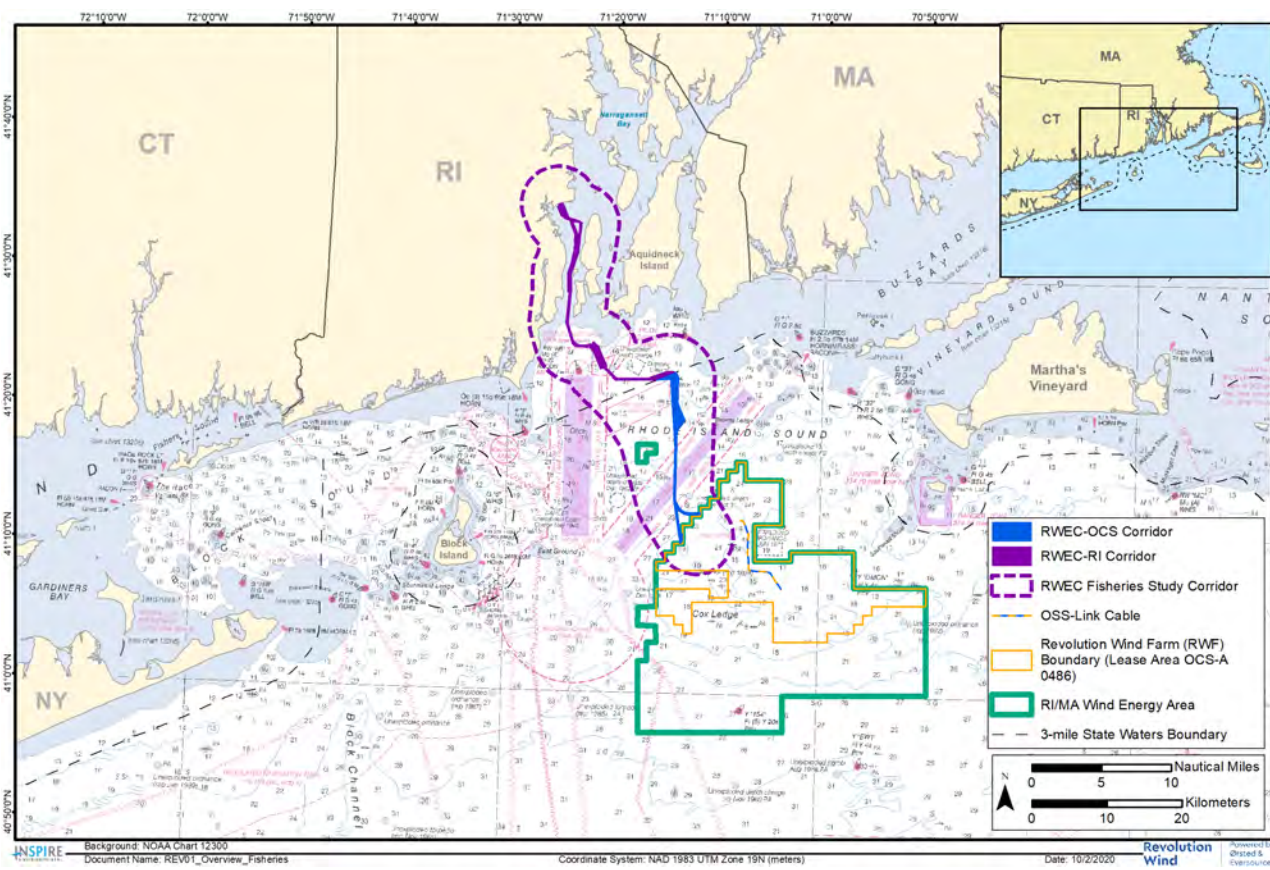

Figure 2.1-1 Map of the Revolution Wind Farm, the RI-MA WEA, and the RWEC Fisheries Study Corridor

The data provided by NOAA Fisheries represent fishing activity for federally permitted vessels that fish in either federal (defined as: 3 nm to 200 nm [3.5 to 345 mi; 5.6 to 556 km]) or state (within 3 nm) waters. Fishermen with federal and state permits (including those who also hold state permits) are required to submit VTRs to NOAA Fisheries. VTR data for fishermen who fish only in state waters were requested and obtained from the Atlantic Coastal Cooperative Statistics Program (ACCSP, 2020). To avoid duplicate records of fishing activity in state waters, fishermen who hold federal permits, but fished in state waters, were excluded from the ACCSP Fisheries VTR data set.

The VTR data provided by NOAA Fisheries provide a context for characterizing both revenue and biomass (pounds landed) from high-volume and high-value fisheries. A limitation of the data set is that it is most accurate when used to describe the general geographical characteristics of the commercial fishing industry in aggregate and does not provide information on precise fishing locations.

2.1.1.2 Federal Vessel Monitoring System (VMS)

VMS data are collected through a satellite surveillance system that primarily is the primary means used by NOAA Fisheries for monitoring the location of certain commercial fishing vessels working in federal waters. Vessels holding the following permits are required to have an operational VMS unit installed:

- Full-time or part-time limited access Atlantic sea scallop (*Placopecten magellanicus*), or limited access general category scallop permit;
- Occasional limited access scallop permit when fishing under the Scallop Area Access Program;
- Limited access monkfish (*Lophius americanus*), occasional scallop, or combination permit electing to provide VMS notifications;
- Limited access multispecies permit when fishing on a category A or B day at sea (DAS);
- Atlantic surfclam (*Spisula solidissima*) or ocean quahog (*Arctica islandica*) open access permit;
- Limited access monkfish vessel electing to fish in the Offshore Fishery Program;
- Limited access Atlantic herring (*Clupea harengus*) permit;
- Open access Atlantic herring Areas 2 and 3 permit;
- Limited access Atlantic mackerel (*Scomber scombrus*) permit; and
- Longfin squid (*Doryteuthis pealeii*) / butterfish (*Peprilus triacanthus*) moratorium permit.

The VMS location data are sent at least once an hour to NOAA Fisheries Office of Law Enforcement via transceiver units on the fishing vessels. The data include vessel identification, time, date, and the location at sea (NOAA Fisheries, 2019a). This information makes it possible for NOAA Fisheries to calculate the approximate speed that the vessel is travelling between vessel transmissions. The data are then filtered by estimated vessel-speed, depending on the gear and fishery, to indicate areas where it is likely that fishing is occurring (and not vessel transit locations). The benefit of VMS data is the geographical specificity of the fishing locations; one limitation of the data is that the "speed rule" used to filter the fishing locations from the vessel's path of transit does not perfectly isolate fishing locations. In addition, VMS data do not provide complete coverage for all FMPs, i.e., there is not 100% reporting for some FMPs for some years. For instance, from 2017 to 2019, the percentage of FMPs using VMS ranged from 24 percent (American lobster) to 95 percent (Mackerel/Squid/Butterfish) (Douglas Christel, NOAA Fisheries, pers. comm. 5/18/2020).

To characterize fisheries active in the RWF and RWEC fisheries study corridor, spatial VMS data from the years 2011 through 2016 (where available) were overlaid with the RWF and RWEC fisheries study corridor to assess the relative intensity of fishing activity for multiple fisheries within and surrounding the Project Area. General fisheries categories with available data included in this analysis were:

- Large-mesh multispecies (groundfish);
- Monkfish;
- Pelagics (herring, mackerel, and squid);
- Atlantic herring;

- Atlantic surfclam/ocean quahog;
- Atlantic sea scallop; and
- Squid

Squid are listed twice above because this fishery was designated a specific fisheries code by NOAA Fisheries in 2014. Metadata about the VMS data are available at the Mid-Atlantic Ocean Data Portal (http://portal.midatlanticocean.org/), the Northeast Ocean Data portal (www.northeastoceandata.org), and in a report by Fontenault (2018) detailing how VMS data were prepared for the NROC. The VMS maps were qualitatively assessed for intensity of fishing activity in the RWF and RWEC fisheries study corridor. As there is no catch or revenue information attached to VMS locations, the intensity of fishing location should be considered in conjunction with other available data and stakeholder input. The VMS data overlaid with the RWF and RWEC fisheries study corridor are illustrated in Section 2.2.2.

This Technical Report also includes a review of the results of the 2017 report published by Rhode Island Department of Environmental Management (RIDEM) that linked together fishing location from VMS data, trip identification information from VTR data, and additional information from dealer landings data (RIDEM, 2017). This analysis worked with multiple sources of data on federal fishing activity to attach revenue and landings data to VMS point locations from within each of the WEAs, and created fishing-intensity maps based on those data sets for the southern New England region. The results of this analysis describe the fisheries active in the RI-MA WEA and take advantage of the VMS data spatial resolution for describing fishing locations. RIDEM also produced smoothed (i.e., outliers were removed) relative vessel density maps for the fisheries reporting with VMS between 2011 and 2016; which are similar to the maps produced from the data obtained from the data from the Northeast Ocean Data Portal, and therefore, are not included here to avoid repetition.

2.1.2 VTR Data as Rasters

Observed fishing locations may occur far from the VTR reported coordinates, with departures that vary based on gear type and other trip characteristics (DePiper, 2014). NOAA Fisheries, therefore, developed a fishing-intensity raster dataset to improve the spatial representation of self-reported VTR fishing locations (Benjamin et al., 2018). This raster dataset includes the VTR data, the statistical model estimated by DePiper 2014, and spatial data describing closures gathered from GARFO's GIS portal, the Federal Register, and the Code of Federal Regulations (Benjamin et al., 2018). As described in Benjamin et al. (2018), the model developed by DePiper (2014) constructs the great circle distance between the VTR coordinate and all observed hauls on that trip. A duration model is then estimated to explain distance from the self-reported VTR to observed fishing locations as a function of VTR characteristics, finding that gear, trip length, and broad ocean area are the variables that best explain this distance. Confidence intervals are then generated that estimate the smallest distances in which to expect a percent of observed hauls around a VTR point.

This modeling approach can be applied to historical fishery data and aggregated as a metric of fishing effort by target fishery (e.g., herring) and time period (e.g., fishing year 2010). After constructing these raster datasets, maps of fishing effort for various variables (e.g., revenue) can be produced using a heat map visualization of fishing intensity (Benjamin et al., 2018).

2.1.3 State Vessel Trip Reports

The ACCSP holds records for fishing activity reported to occur in state waters by those fishermen who hold state permits, federal permits, or both state and federal permits. The fishing activity in state waters by those fishermen with both federal and state permits is reported to NOAA Fisheries, and was included in the activity summary of commercial fisheries (Section 2.1). The federal VTR data were used to summarize fishing within the RWF and RWEC fisheries study corridor and include fishing by vessels with federal permits in those areas. Thus, to avoid reporting fishing activity in state waters twice, data on fishing in state waters were filtered to include records for vessels that only fish in each states' waters. Many fishermen fish in both state and federal waters; however, those fishermen were not included in the state-waters-only data. For this reason, the data seem to indicate that certain species were not caught and landed from the statistical areas every year, or at all. Landings of those species were reflected in the federal VTR data summary. These caveats apply to all state VTR data described in this report. The state data should be considered in the broader context of fishing activity reported to the federal VTR database, and in conjunction with stakeholder input provided through the communication and engagement program that Revolution Wind has developed for this purpose (Section 2.1.5).

State VTR data are assessed for Connecticut, Massachusetts, New York, and Rhode Island. Connecticut, Massachusetts, and New York were included in the state VTR request because Revolution Wind may use New London and multiple RI ports for construction staging and operations and maintenance (O&M) activities. Vessels leaving and returning to these ports to support Project activities will potentially be transiting through state waters of all these states and, therefore, their impacts are considered and included. An expanded port plan (see Section 3) includes New Jersey, Virginia, and Maryland. The state VTR data were obtained for fishing activity within and around the immediate vicinity of the RWF and RWEC fisheries study corridor, where infrastructure will be located and long-term vessel activity will occur. Transit to and from remote ports will be limited to short-term use of these ports during the construction phase only, therefore Project-generated transit will not add significantly more traffic beyond existing levels. State VTR regions are depicted relative to the RWF and RWEC fisheries study corridor in Figure 2.1-2 and relevant federal statistical areas are depicted in Figure 2.1-3.

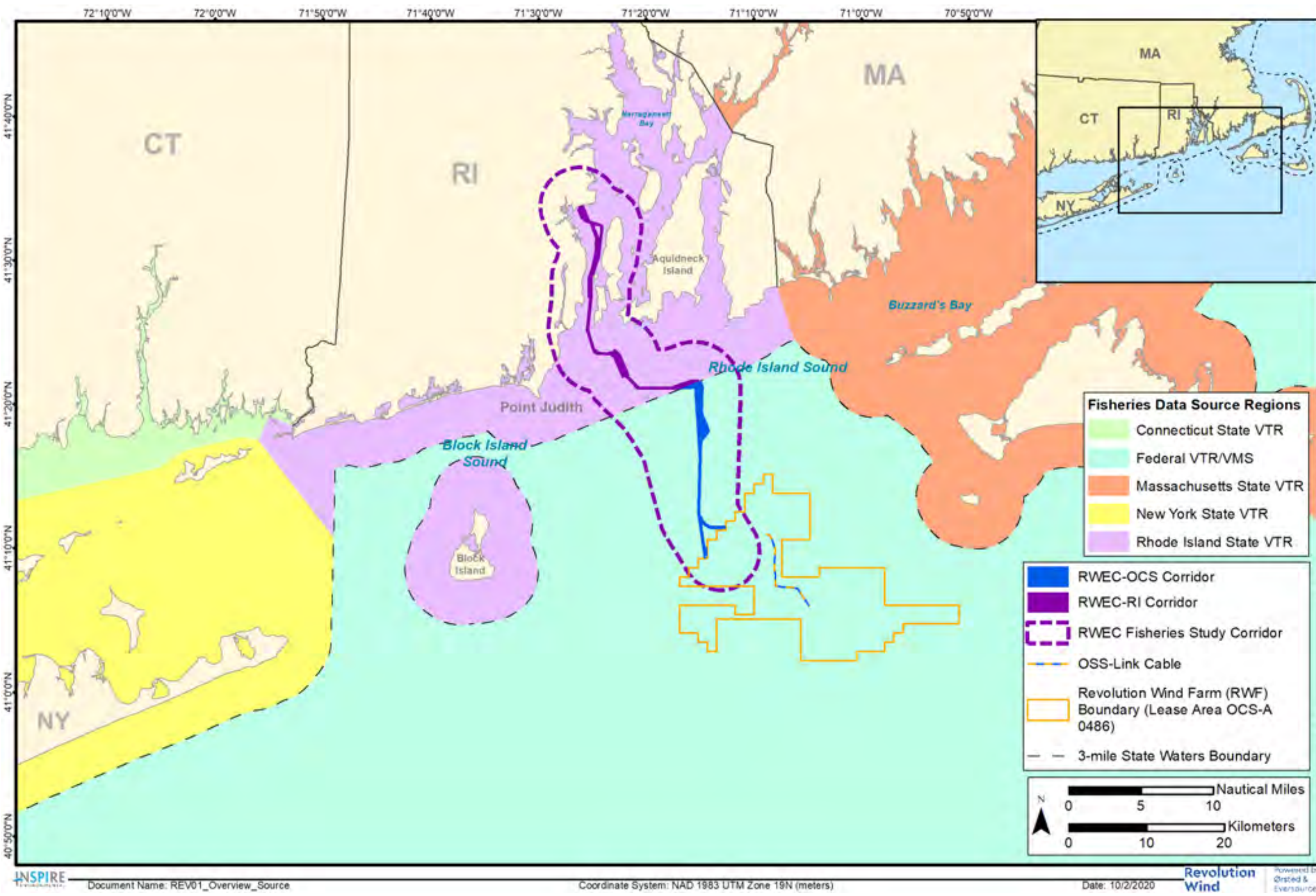

Figure 2.1-2 Map of the Revolution Wind Farm and State VTR Regions

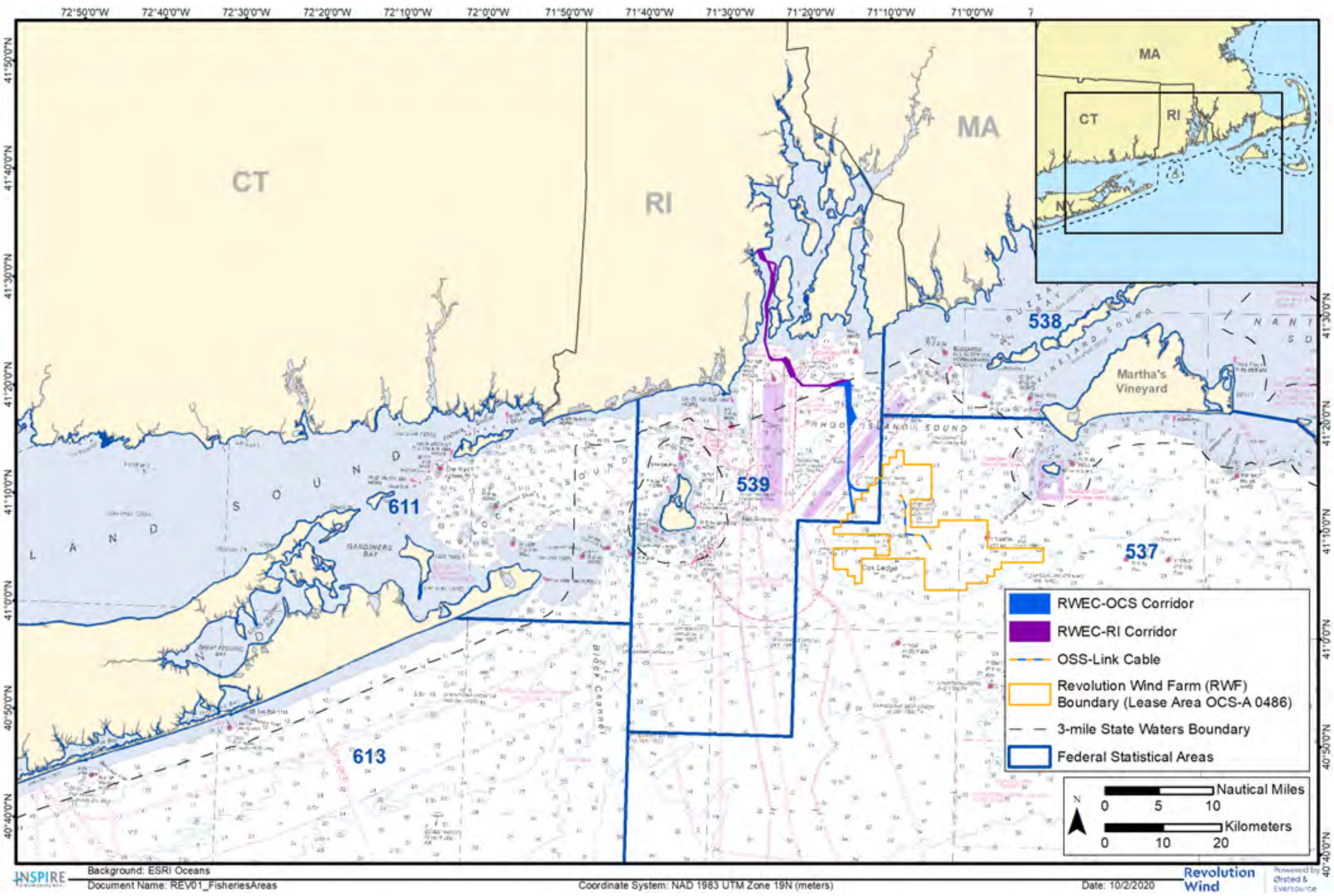

Figure 2.1-3 Map of the Revolution Wind Farm and Federal Statistical Fishing Areas

2.1.3.1 Connecticut State Vessel Trip Reports

Federal VTR data describe most commercial fishing activity in both state and federal waters by vessels that have a federal permit or, both a state and federal fishing permit. However, those vessels that only have state commercial fishing permits are not included in the federal VTR data set. Landing permits allow a vessel to land catch in its home state even though fishing may have occurred outside of the home state's jurisdictional waters. State-permitted vessels must report their catch, including the statistical area within which fishing occurred (Figure 2.1-3), to the Connecticut Department of Energy and Environmental Protection (CT DEEP). Data on fishing in state waters by state-permitted vessels can be accessed by the public through data requests to the ACCSP.

State commercial fishing data for Connecticut were requested from statistical areas 539 and 611 to characterize those fisheries that could be affected by the RWF and RWEC (Figure 2.1-3). Fishing activity was characterized in terms of landed pounds of target species, the landing port, and the gear category. The data were presented in the units of landed pounds of catch because the landing price was not readily available. The "average" of pounds landed reflects the sum of pounds landed during the 2009 to 2018 period, divided by the number of years with data available (in this way, 0-value years were excluded).

2.1.3.2 Massachusetts State Vessel Trip Reports

State-permitted vessels must report their catch, including the statistical area within which fishing occurred (Figure 2.1-3), to the Massachusetts Division of Marine Fisheries (MADMF). Massachusetts State commercial fishing data for this report include statistical areas 537, 538, 539, and 613 to characterize those fisheries that could be affected by the RWF and RWEC (Figure 2.1-3).

2.1.3.3 New York State Vessel Trip Reports

State-permitted vessels must report their catch, including the statistical area within which fishing occurred (Figure 2.1-3), to the New York State Department of Environmental Conservation (NYSDEC). New York State commercial fishing data for this report include statistical areas 537, 539, 611, and 613 to characterize those fisheries that could be affected by the RWF and RWEC (Figure 2.1-3).

2.1.3.4 Rhode Island State Vessel Trip Reports

State-permitted vessels must report their catch, including the statistical area within which fishing occurred (Figure 2.1-3), to the Rhode Island Department of Environmental Management (RIDEM). Rhode Island State commercial fishing data for this report include statistical areas 537, 538, 539, and 611 to characterize those fisheries that could be affected by the RWF and RWEC (Figure 2.1-3).

2.1.4 Marine Recreational Information Program

The NOAA Fisheries Marine Recreational Information Program (MRIP) is a collection of regional surveys organized to produce recreational fisheries statistics. The data are collected through angler-intercept surveys after a fishing trip by boat returns to shore. This integrated series of surveys provides estimates of marine recreational catch, effort, and participation across states, fishing locations, and fishing modes. To describe the affected environment of recreational fisheries in the RWF and RWEC fisheries study corridor, this Technical Report used the NOAA Fisheries MRIP estimates for shoreside and private fishing modes occurring in inland, state territorial sea, and federal exclusive economic zone (EEZ) fishing locations. MRIP data used for this report were provided by NOAA Fisheries, and are available through queries at the Fisheries Statistics Division website (NOAA Fisheries, 2019b).

One of the limitations of the MRIP data set is that it does not include a spatial component; the only location information available is the categorization of fishing location into state or federal waters. An additional limitation of this data set is that the survey program was designed to estimate fishing effort by recreational anglers at the state level. When the data are disaggregated to the county level or lower, the percent standard error increases and the information is less reliable (NOAA Fisheries, 2019b). Given that we cannot assign estimated angler effort to any location in the ocean, it is impossible to estimate recreational effort near the RWF using the MRIP data alone. For this reason, the MRIP data must be considered in conjunction with stakeholder input provided by recreational for-hire boat captains in the Ocean SAMP data set (RICRMC, 2010).

2.1.5 Revolution Wind Stakeholder Communication and Engagement

Revolution Wind has committed to engaging with stakeholders in the commercial and recreational fishing communities that are active in the RWF and RWEC fisheries study corridor. This stakeholder outreach program was formulated by Revolution Wind to gather local knowledge from the region's fishermen and to establish open and reliable communication with the fishing industry. Revolution Wind has established an experienced team of Fisheries Liaisons and Fisheries Representatives to facilitate a two-way process of communication through individual outreach via email, text message, or in person, and that also includes, but is not limited to, public presentations, listening sessions, Notices to Mariners, and updates to websites and social media. Revolution Wind has also extended these outreach efforts to include state and federal fisheries agencies, working groups, and regulatory bodies by soliciting input through joint meetings and webinars. The outreach program will be conducted throughout all phases of the Project and is designed to evolve as needs change and the Project progresses. Detailed information about the communication and outreach plan implemented by Revolution Wind is provided in the Fisheries Communication and Outreach Plan (Orsted, 2020).

2.1.6 Aquaculture

Aquaculture in Rhode Island waters includes the cultivation of oysters, kelp, hard-shell clams, and mussels. Oysters are the main crop, with nearly 296 acres under cultivation worth more than 5.7 million dollars in 2017 (Liberman, 2018).

Locations of Rhode Island aquaculture sites were mapped based on data accessed from the NROC (NROC, 2019) and from the RIDEM Division of Fish and Wildlife, Marine Fisheries Section (RIDEM, 2019). Maps were created based on shapefiles provided by RIDEM with information on site ID, location, and status last updated July 20, 2018.

2.2 Baseline Conditions

Species that are targeted for commercial and recreational fishing in Southern New England are managed through Fishery Management Plans (FMPs) by the New England Fishery Management Council, the Mid-Atlantic Fishery Management Council (50 CFR 600.105), the Atlantic States Marine Fisheries Commission, or some combination of these (NOAA Fisheries, 2017). Some FMPs include multiple species because they share habitat and are often fished or collected as marketable bycatch using the same gear type. Commercial fisheries that target certain species can be grouped into broad categories by the gear used. Mobile-gear is used while the vessel is in motion, and includes gear such as trawls and dredges. Fixed-gear is set and retrieved later, such as lobster pots and gill nets. Recreational fishing activity can be categorized by fishing mode (charter boat, party boat, private boat, or shore) and by fishing location (inland, state territorial sea, and federal EEZ) (NOAA Fisheries, 2019b).

The RWEC-OCS will traverse federal waters located within a study area previously examined for potential wind farm development effects on fish and fisheries by the New York State Energy and Development Authority (NYSERDA, 2017; Scotti et al., 2017). These studies examined fishery dependent data sources, such as federal VTR and VMS data for the most recent years available at the time the studies were conducted. For this technical report, more recent data were obtained from these sources. Other data sources that were reviewed include fishery independent trawl data from the Northeast Fisheries Science Center (NEFSC) and the Northeast Areas Monitoring and Assessment Program (NEAMAP). These sources provide information on a diverse assemblage of fish and invertebrates in the area that can be used for stock assessments for those species targeted in commercial and recreational fisheries. The study area examined by NYSERDA (2017) and Scotti et al. (2017) contains fishing grounds for boats that land their catch in New Jersey, New York, Rhode Island, and Massachusetts.

Vessels originating from New England and Mid-Atlantic states catch a diverse range of pelagic, demersal, and benthic species using various types of gear. Commercially and recreationally valuable saltwater species populations are highly dynamic, both spatially and temporally. Many species undertake seasonal migrations, which are often correlated with seasonal variation in water temperature and prey availability. Interannual fluctuations in population sizes can occur in response to climate change, fishing, and other ecological pressures (Friedland et al., 2018, McManus et al., 2018). Fish and macroinvertebrate populations supporting commercial and recreational fisheries along the Northeast Continental Shelf are diverse (Malek et al., 2014). Some fisheries are experiencing a regional decline and others an increase (Collie et al., 2008), whereas the location of some fisheries has shifted to the northeast in association with climate-related changes (Friedland et al., 2018).

Benthic communities have experienced increased water temperatures in the region in the past several decades, and average pH is expected to continue to decline as seawater becomes more saturated with carbon dioxide (Saba et al., 2016). Acidification of seawater is associated with decreased survival and health of organisms with calcareous shells (such as the Atlantic scallop, blue clam, and hard clam), but less is known about direct effects of acidification on cartilaginous and bony fishes. The ranges of dozens of groundfish species in New England waters have shifted northward and into deeper waters in response to increasing water temperatures (Pinsky et al., 2013; Nye et al., 2009) and more species are predicted to follow (Selden et al., 2018; Kleisner et al., 2017). Predicted range shifts include a northward extension for sea scallops and offshore movement for American lobster (Tanaka et al., 2020). The black sea bass, identified as particularly sensitive to habitat alteration (Guida et al., 2017), has been increasing in abundance over the past several years, and is expected to continue its expansion in southern New England as water temperatures increase (McBride et al., 2018). Several pelagic forage species have been increasing in the region, including butterfish, scup, squid (Collie et al., 2008) and Atlantic mackerel (McManus et al., 2018). Distributions of other species are reported to be shifting southward, including spiny dogfish, little skate, and silver hake (Walsh et al., 2015), or alternatively, shifting offshore (e.g., surfclams; Timbs et al., 2019). It has been suggested that the spiny dogfish may replace the Atlantic cod as a major predator in southern New England as the cod is driven north by warm waters that the spiny dogfish tolerates more readily (Selden et al., 2018). Further temperature increases in southern New England are expected to exceed the global ocean average by at least a factor of two and ocean circulation patterns are projected to change (Saba et al., 2016). Distributional shifts are occurring in both demersal and pelagic species, perhaps mediated by changes in spawning locations and dates (Walsh et al., 2015). Southern species, including some highly migratory species such as mahi that prefer warmer waters, are expected to follow the warming trend and become more abundant in the area (Walsh et al., 2015; South Atlantic Fishery Management Council, 2003). Climate change may also be affecting the migrations of anadromous fish in the region. The herrings, shad, and sturgeon were identified as having high biological sensitivity to adverse effects of climate change (Hare et al., 2016). In addition to physiological effects of temperature and pH, anadromous fishes face a physical risk caused by flooding in their spawning rivers.

The following sections present an assessment of the relative intensity of several fisheries active in the RWF and RWEC, organized based on the data source.

2.2.1 Federal Vessel Trip Report (VTR) Data

VTR data were provided by NOAA Fisheries and the ACCSP for the RWF and for the RWEC fisheries study corridor, and are summarized in the following section. The data are presented based on the subset (defined by the gear used), the targeted species, and the state in which the fisheries' landings occurred. Data for the species and state fishery subsets include estimates for the decade 2009-2018, whereas the gear type fishery subset is based on a nine-year period (2009 to 2017) due to confidentiality rules. Each fishery subset includes estimates for the respective time periods for the:

- Annual average values of revenue and landings sourced from within the RWF or the RWEC fisheries study corridor.
- Annual average revenue and landings for all fishing activity from Maine to North Carolina sourced from NOAA Fisheries' Greater Atlantic Region Fisheries Office (GARFO).
- Percent of revenue and landings sourced from within the RWF or the RWEC fisheries study corridor out of total regional landings reported to GARFO.

Revenue units are United States dollars (USD) deflated to January 2010 for consistency; landings are reported in landed pounds.

2.2.1.1 Revolution Wind Farm

In the RWF, the top fisheries reported on VTRs by federally permitted vessels in terms of average annual revenue were caught using bottom trawl, pot, sink gillnet, and dredge. In terms of average pounds landed from within the RWF, the top gears were the bottom trawl, sink gillnet, and mid-water trawl (Table 2.2-1). The greatest percentage of Greater Atlantic revenue sourced from within the RWF was caught using sink gill net (5.75 percent), followed by bottom trawl (3.20 percent), and midwater trawl (1.08 percent).

Table 2.2-1 Summary of Federal VTR Fishing Data in RWF, by Gear, for 2009 to 2017

	Annual Average Revenue and Landings from within RWF		Annual Average of Total Revenue and Landings		Percent of Total Gear Values from RWF	
Gear	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Bottom Trawl	330,811	805,298	10,345,534	17,650,034	3.20	4.56
Pot	309,044	97,245	45,170,421	23,622,011	0.68	0.41
Sink Gillnet	263,817	383,264	4,587,604	6,446,946	5.75	5.95
Dredge	174,324	20,636	35,344,833	15,083,131	0.49	0.14
All Others	45,641	380,191	1,630,016,690	1,281,322,761	<0.01	0.03
Midwater Trawl	25,900	259,659	2,388,786	19,750,762	1.08	1.32

	Annual Average Revenue and Landings from within RWF		Annual Average of Total Revenue and Landings		Percent of Total Gear Values from RWF	
Gear	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
By Hand	5,776	1,652	566,211	236,037	1.02	0.70

Source: NOAA Fisheries, 2019c.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
"Total" revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.
% = percent

Federally permitted vessels target many species in the RWF. The top species-groups reported on VTRs in terms of average annual revenue were lobster, flounders, hakes, Atlantic herring, scup, squid, black sea bass, and channeled whelk. In terms of pounds landed, the top species-groups in the RWF were Atlantic herring, Atlantic mackerel, and hakes. Scallops, surf clams, and quahogs are included in the All Others category due to the way data were provided. Table 2.2-2 provides the full species summary. For all of the species-groups listed, the average annual landings and revenue from within the RWF make up a very small percentage of the average annual landings and revenue from the Greater Atlantic region. For instance, the species with the greatest proportion of Greater Atlantic total revenue that was sourced from within the RWF were cunner (0.68 percent), Atlantic mackerel (0.51 percent) and channeled whelk (0.44 percent).

Table 2.2-2 Summary of Federal VTR Fishing Data in RWF, by Species, for 2009 to 2018

	Annual Average Revenue and Landings from within RWF		Annual Average of Total Revenue and Landings		Percent of Total Species Values in RWF	
Species	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Lobster, America	214,904	50,374	507,710,672	138,232,706	0.04	0.04
Flounders	88,240	33,976	53,080,045	23,015,911	0.17	0.15
Hakes	60,136	141,855	15,760,216	20,652,426	0.38	0.69
Herring, Atlantic	42,852	455,959	26,499,546	166,320,214	0.16	0.27
Scup	36,987	63,108	9,280,444	14,364,599	0.40	0.44
Squids	34,084	30,416	38,571,711	48,152,606	0.09	0.06
Sea Bass, Black	32,211	7,547	8,045,522	2,477,656	0.40	0.31
Whelk, Channeled	31,673	4,512	7,175,012	1,232,408	0.44	0.37
Mackerel, Atlantic	20,008	198,560	3,889,243	16,596,797	0.51	1.20
Dogfish, Spiny	14,296	81,592	3,619,191	18,787,974	0.40	0.43
Crab, Jonah	14,121	23,578	10,983,269	14,424,939	0.13	0.16
All Others	11,886	21,067	946,435,275	407,953,101	0.00	0.01
Butterfish	9,141	16,100	2,180,724	3,340,689	0.42	0.48
Bass, Striped	4,425	1,131	18,797,974	5,984,307	0.02	0.02
Bluefish	2,811	5,382	2,796,095	4,627,112	0.10	0.12
Tautog	381	128	926,176	273,651	0.04	0.05
Weakfish	263	142	319,712	207,805	0.08	0.07
Dogfish, Smooth	231	464	976,231	2,039,068	0.02	0.02
Bonito	191	86	112,986	53,480	0.17	0.16
Cunner	138	97	20,410	6,394	0.68	1.52
Spot	88	175	3,139,254	2,828,116	<0.01	0.01
Eel, Conger	40	61	49,241	68,105	0.08	0.09
Sea Robins	13	33	20,812	124,470	0.06	0.03
Whiting, King	1	1	902,941	810,033	<0.01	<0.01

Source: NOAA Fisheries, 2019c. ACCSP, 2019.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
"Total" revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.
% = percent

Vessels hailing from Rhode Island, Massachusetts, New York, and Connecticut conducted the most federally permitted fishing activities within the RWF (Table 2.2-3). The greatest average annual revenue generated by federally permitted vessels in the RWF were from landings in Rhode Island ($613,467), followed by Massachusetts ($398,575), and New York ($41,704). These values were put in context by including the total revenue landed in that state from all fishing activity during 2009 to 2018. The greatest percentage of revenue sourced from within the RWF is by Rhode Island (0.73 percent), followed by New York (0.08 percent) and Massachusetts (0.07 percent; Table 2.2-3). Data cannot be reported by port due to confidentiality rules. Further analysis of detailed landings data as reported by individual port is unavailable for all listed states due to confidentiality rules.

Table 2.2-3 Summary of Federal VTR Fishing Data in RWF, by State, for 2009 to 2018

	Annual Average Revenue and Landings from within RWF		Annual Average of Total Revenue and Landings		Percent of Total State Values in RWF	
State	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Rhode Island	613,467	949,843	83,808,376	83,061,985	0.73	1.14
Massachusetts	398,575	811,785	547,819,893	272,427,302	0.07	0.30
New York	41,704	24,420	53,395,207	30,909,690	0.08	0.08
All Others	16,773	9,274	558,828,937	725,429,171	<0.01	<0.01
Connecticut	9,138	7,218	16,183,340	8,793,496	0.06	0.08

Source: NOAA Fisheries, 2019c. ACCSP, 2019.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
"Total" revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.
% = percent

2.2.1.2 Revolution Wind Export Cable Fisheries Study Corridor

Among the fisheries that are active within the 46-mile (74-km) RWEC fisheries study corridor, the top fisheries reported on VTRs by federally permitted vessels by revenue were caught using bottom trawl, mid-water trawl, pot, sink gillnet, dredge, and by hand (Table 2.2-4). In terms of pounds landed, the top gears in the RWEC fisheries study corridor were the mid-water trawl, bottom trawl, sink gillnet, and pot. The gear categories with the greatest proportion of total revenue that was sourced from within the RWEC fisheries study corridor were mid-water trawl (16.3 percent), bottom trawl (7.6 percent), and sink gillnet (2.2 percent). Table 2.2-4 summarizes the gears used to fish in the RWEC fisheries study corridor, which traverses Federal Statistical Fishing Area 539.

Table 2.2-4 Summary of Federal VTR Fishing Data in RWEC Fisheries Study Corridor, by Gear, for 2009 to 2017

	Annual Average Revenue and Landings from within RWEC Fisheries Study Corridor		Annual Average of Total Revenue and Landings		Percent of Total Gear Values in RWEC Fisheries Study Corridor	
Gear	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Bottom Trawl	781,301	2,186,189	10,345,534	17,650,034	7.55	12.39
Midwater Trawl	389,676	3,969,291	2,388,786	19,750,762	16.31	20.10
Pot	314,797	136,028	45,170,421	23,622,011	0.70	0.58
All Others	110,642	464,104	1,630,016,690	1,281,322,761	0.01	0.04
Sink Gillnet	99,834	213,070	4,587,604	6,446,946	2.18	3.31
Dredge	27,746	9,072	35,344,833	15,083,131	0.08	0.06
By Hand	3,293	1,356	566,211	236,037	0.58	0.57

Source: NOAA Fisheries, 2019c.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
"Total" revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.

% = percent

In the RWEC fisheries study corridor, the top individual species reported on VTRs by federally permitted vessels in terms of revenue were Atlantic herring, lobster, squid, flounders, scup, butterfish, hakes, black sea bass, and spiny dogfish (Table 2.2-5). In terms of pounds landed, the top species in the RWEC fisheries study corridor included Atlantic herring, scup, squid, spiny dogfish, hakes and Atlantic mackerel. The species with the greatest proportion of Greater Atlantic total revenue that was sourced from within the RWEC fisheries study corridor were eel (40.00 percent), bonito (4.30 percent), sea robins (2.39 percent), Atlantic herring (1.95 percent), and butterfish (1.93 percent). Table 2.2-5 provides a full summary of the species caught in the RWEC fisheries study corridor.

Table 2.2-5 Summary of Federal VTR Fishing Data in RWEC Fisheries Study Corridor, by Species, for 2009 to 2018

	Annual Average Revenue and Landings from within RWEC Fisheries Study Corridor		Annual Average of Total Revenue and Landings		Percent of Total Species Values in RWEC Fisheries Study Corridor	
Species	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Herring, Atlantic	516,170	4,870,454	26,499,546	166,320,214	1.95	2.93
Lobster, America	253,817	63,112	507,710,672	138,232,706	0.05	0.05
Squids	168,823	157,838	38,571,711	48,152,606	0.44	0.33
Flounders	157,876	49,611	53,080,045	23,015,911	0.30	0.22
Scup	144,737	280,427	9,280,444	14,364,599	1.56	1.95
All Others	46,271	30,389	946,435,275	407,953,101	0.01	0.01
Butterfish	42,181	62,394	2,180,724	3,340,689	1.93	1.87
Hakes	37,112	86,198	15,760,216	20,652,426	0.24	0.42
Sea Bass, Black	27,692	7,820	8,045,522	2,477,656	0.34	0.32
Dogfish, Spiny	24,007	116,148	3,619,191	18,787,974	0.66	0.62
Bluefish	19,697	41,793	2,796,095	4,627,112	0.70	0.90
Mackerel, Atlantic	18,040	70,893	3,889,243	16,596,797	0.46	0.43
Whelk, Channeled	15,139	2,050	7,175,012	1,232,408	0.21	0.17
Crab, Jonah	14,732	28,633	10,983,269	14,424,939	0.13	0.20
Bass, Striped	12,950	3,528	18,797,974	5,984,307	0.07	0.06
Bonito	4,859	2,128	112,986	53,480	4.30	3.98
Tautog	3,728	1,495	926,176	273,651	0.40	0.55
Dogfish, Smooth	1,947	4,051	976,231	2,039,068	0.20	0.20
Weakfish	1,291	735	319,712	207,805	0.40	0.35
Whiting, King	986	1,132	902,941	810,033	0.11	0.14
Sea Robins	498	1,724	20,812	124,470	2.39	1.39
Tuna, Little	425	944	131,168	233,801	0.32	0.40
Eel, Conger	220	421	49,241	68,105	0.45	0.62
Cunner	106	49	20,410	6,394	0.52	0.77
Mackerel, Spanish	103	200	1,192,684	816,845	0.01	0.02
Whelk, Knobbed	101	64	1,041,479	647,789	0.01	0.01
Menhaden	51	309	35,974,035	410,014,306	<0.01	<.01
Sea Raven	45	37	2,734	2,213	1.65	1.67
Triggerfish	41	41	376,831	184,225	0.01	0.02
Eel, Species Not Specified	10	12	25	32	40.00	37.50
Sea Trout, Species Not Specified	0	141	592,033	273,277	0.00	0.05

Source: NOAA Fisheries, 2019c. ACCSP, 2019.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
“Total” revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.
% = percent

The data indicate that the top states reported by federally permitted vessels for revenue sourced from within the RWEC fisheries study corridor were Rhode Island ($1.22 million), Massachusetts ($329,573), and Maine ($22,593). Top states for pounds landed from within the RWEC fisheries study corridor were Massachusetts ($3.20 million) and Rhode Island ($2.93 million). The greatest percentage of Greater Atlantic revenue sourced from within the

RWEC fisheries study corridor is by Rhode Island (1.45 percent), followed by Massachusetts (0.06 percent). Table 2.2-6 provides a full summary of states used by federally permitted vessels in the RWEC fisheries study corridor.

Table 2.2-6 Summary of Federal VTR Fishing Data in RWEC Fisheries Study Corridor, by State, for 2009 to 2018

	Annual Average Revenue and Landings from within RWEC Fisheries Study Corridor		Annual Average of Total Revenue and Landings		Percent of Total State Values in RWEC Fisheries Study Corridor	
State	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Rhode Island	1,216,027	2,928,234	83,808,376	83,061,985	1.45	3.53
Massachusetts	329,573	3,203,699	547,819,893	272,427,302	0.06	1.18
All Others	55,981	74,826	558,828,937	725,429,171	0.01	0.01
Maine	22,593	141,941	540,523,922	252,863,406	<0.01	0.06
New York	357	137	53,395,207	30,909,690	<0.01	<0.01

Source: NOAA Fisheries, 2019c. ACCSP, 2019.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
“Total” revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.
% = percent

2.2.2 Federal Vessel Monitoring System (VMS)

Federal VMS data can be used to provide additional qualitative information on fishing location for a particular gear type or target species, by filtering data by estimated vessel speed to eliminate those vessels in transit and not fishing. The methods used by NOAA Fisheries to rank vessel density into relatively “low” to “very high” fishing intensity categories are described in detail in the spatial metadata (NOAA Fisheries, 2019a). In addition to discussing VMS intensity as presented on Figures 2.2-1 through 2.2-14, this section also incorporates information about some fisheries as described in RIDEM (2017), which were highlighted as the fisheries that had the most activity in the RI-MA WEA (i.e., fisheries in the Atlantic herring, sea scallop, squid/mackerel/butterfish, monkfish, and northeast multispecies Fishery Management Plans [FMPs]).

The VMS data map of vessel intensity for the groundfish (large-mesh multispecies or northeast multispecies) fleet for the years 2011 to 2014 indicates there was high density of fishing vessels along portions of the RWEC fisheries study corridor, and medium-high, medium-low, and low density in the RWF, as indicated in Figure 2.2-1. In 2015-2016, the vessel activity for the groundfish fishery was high along portions of the RWEC fisheries study corridor (Figure 2.2-2). On the northeastern portion of the RWF, high, medium-high and medium-low fishing vessel intensity was reported. In addition, RIDEM (2017) indicated that there was medium-low and low relative density of fishing activity near the RWEC fisheries study corridor (Figure 88 in RIDEM, 2017). Over the years 2011 to 2016, the total non-confidential landings revenue for groundfish activity in the RI-MA WEA (depicted in Figure 2.1-1) overall was over $1 million (Section 10.1.4, Table 23 in RIDEM, 2017).

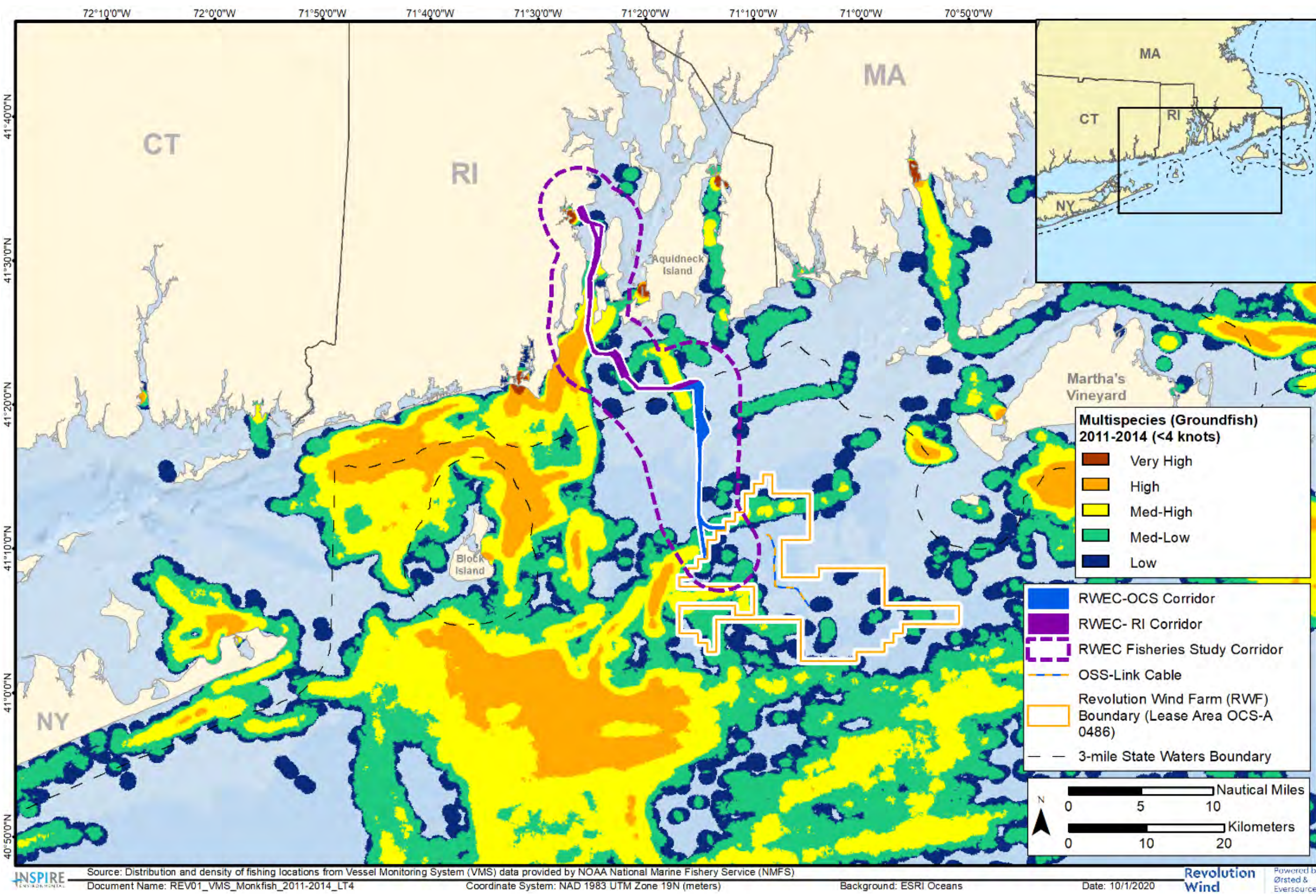

Figure 2.2-1 VMS Map of Vessel Intensity for Large-mesh Multispecies Fishing, 2011 to 2014

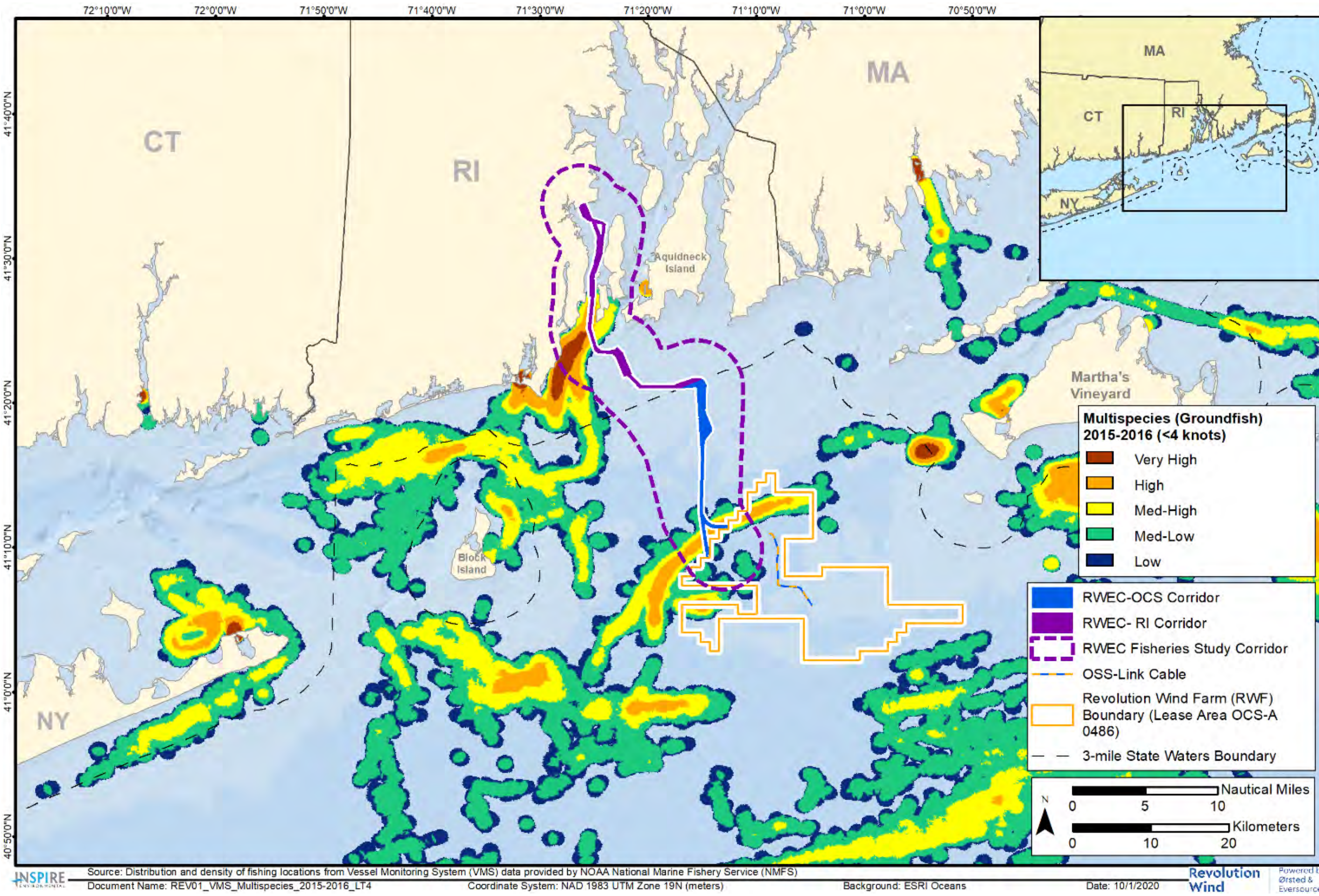

Figure 2.2-2 VMS Map of Vessel Intensity for Large-mesh Multispecies Fishing, 2015 to 2016

The map of vessel intensity for the Atlantic herring fleet for the years 2011-2014 indicates very high, high, medium-high, medium-low and low intensity in areas along the RWEC fisheries study corridor. Vessel activity within the RWF was restricted to the northern portion of the area at medium-high and medium-low intensities (Figure 2.2-3). For the years 2015-2016, the map of vessel intensity indicates medium-high, medium-low, and low intensity on the northern to northwestern portion of the RWF. The RWEC fisheries study corridor borders an area of very-high intensity and traverses high, medium-high, and medium low intensity areas (Figure 2.2-4). There is no map available of smoothed federal fishing activity for Atlantic herring from RIDEM (2017).

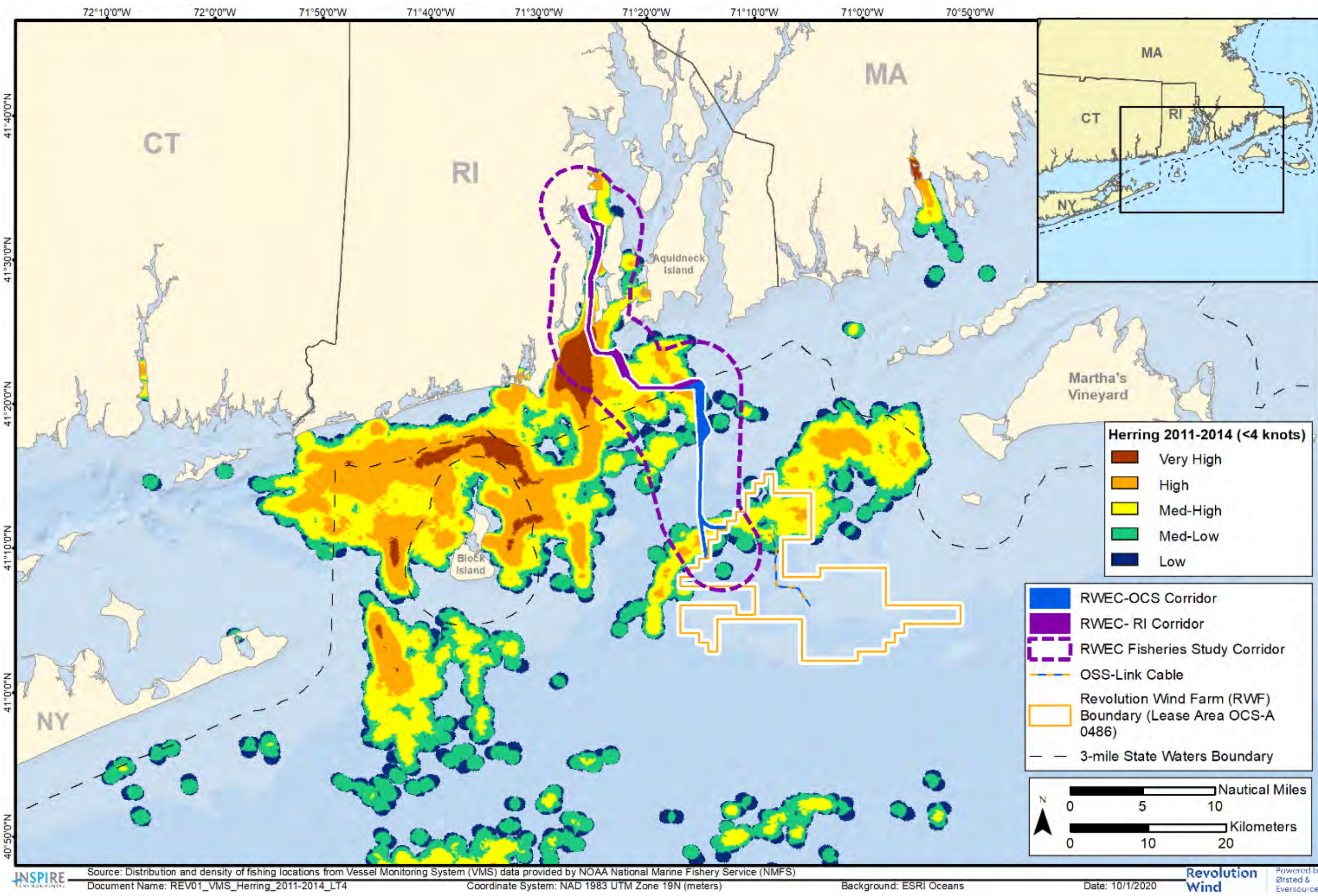

Figure 2.2-3 VMS Map of Vessel Intensity for Atlantic Herring Fishing, 2011 to 2014

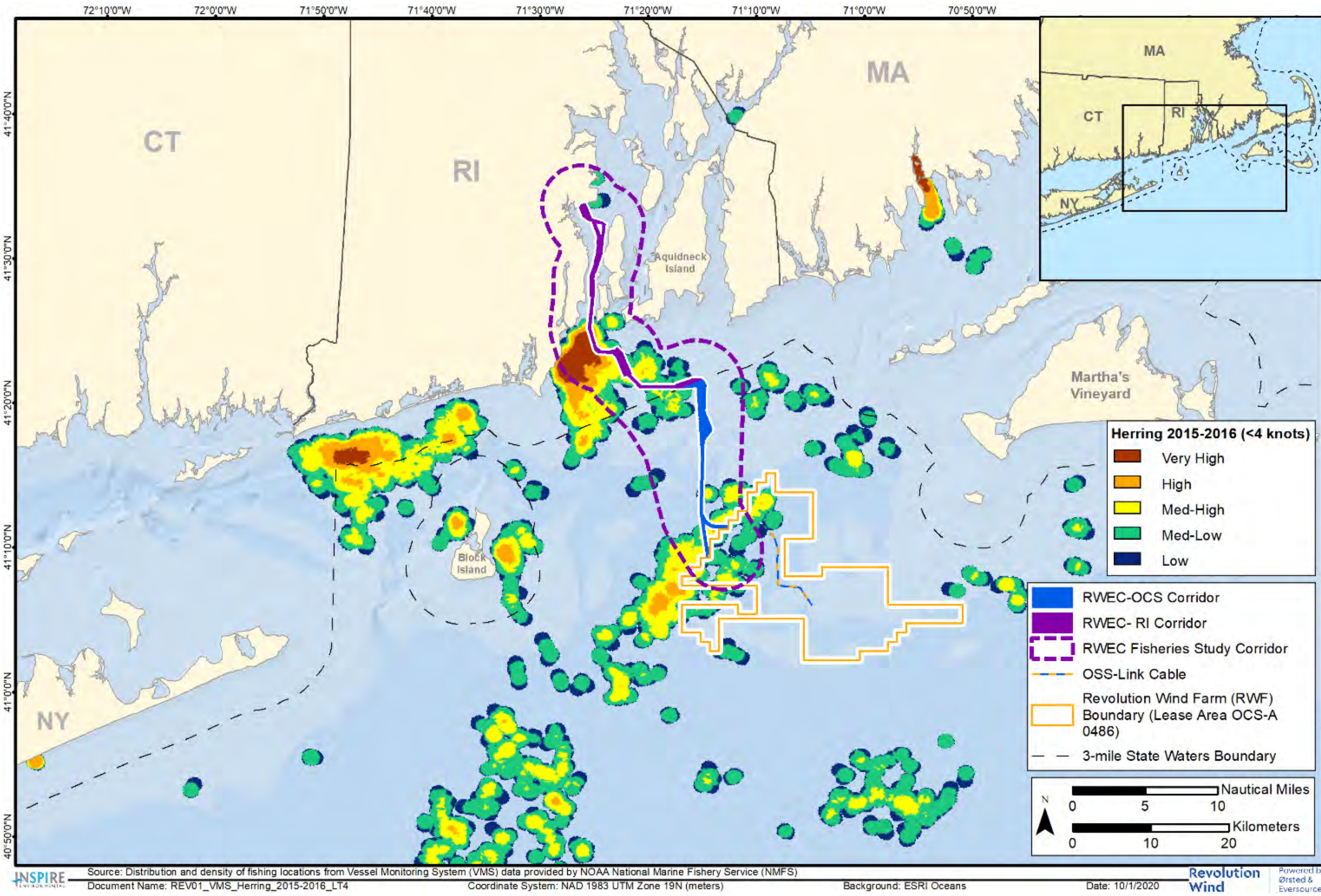

Figure 2.2-4 VMS Map of Vessel Intensity for Atlantic Herring Fishing, 2015 to 2016

The VMS data for vessels targeting pelagic species (herring/mackerel/squid) for 2014 include areas of very-high, high, medium-high, medium-low, and low intensity in the northern portion of the RWF. Along the RWEC fisheries study corridor, all levels of intensity also were encountered (Figure 2.2-5). During 2015 to 2016, vessel intensity targeting these species was concentrated in the northwestern portion of the RWF, ranging from high to low intensity levels (Figure 2.2-6). The RWEC fisheries study corridor traverses the edge of an area of very-high vessel intensity and crosses areas of high, medium-high, medium-low, and low intensity. These data are for several target species combined for a 2-year period, so it is not possible to separate which species is targeted in a specific location from this map. In addition, RIDEM (2017) indicated that there was low relative density of fishing activity for the RWF and the RWEC fisheries study corridor for the squid/mackerel/butterfish FMP (Figure 142 in RIDEM, 2017) over the years 2011-2016. The total non-confidential landings revenue for fishing under the squid/mackerel/butterfish FMP in the RI-MA WEA (depicted in Figure 2.1-1) overall was over $397,000 (Section 10.1.4; Table 23 in RIDEM, 2017).

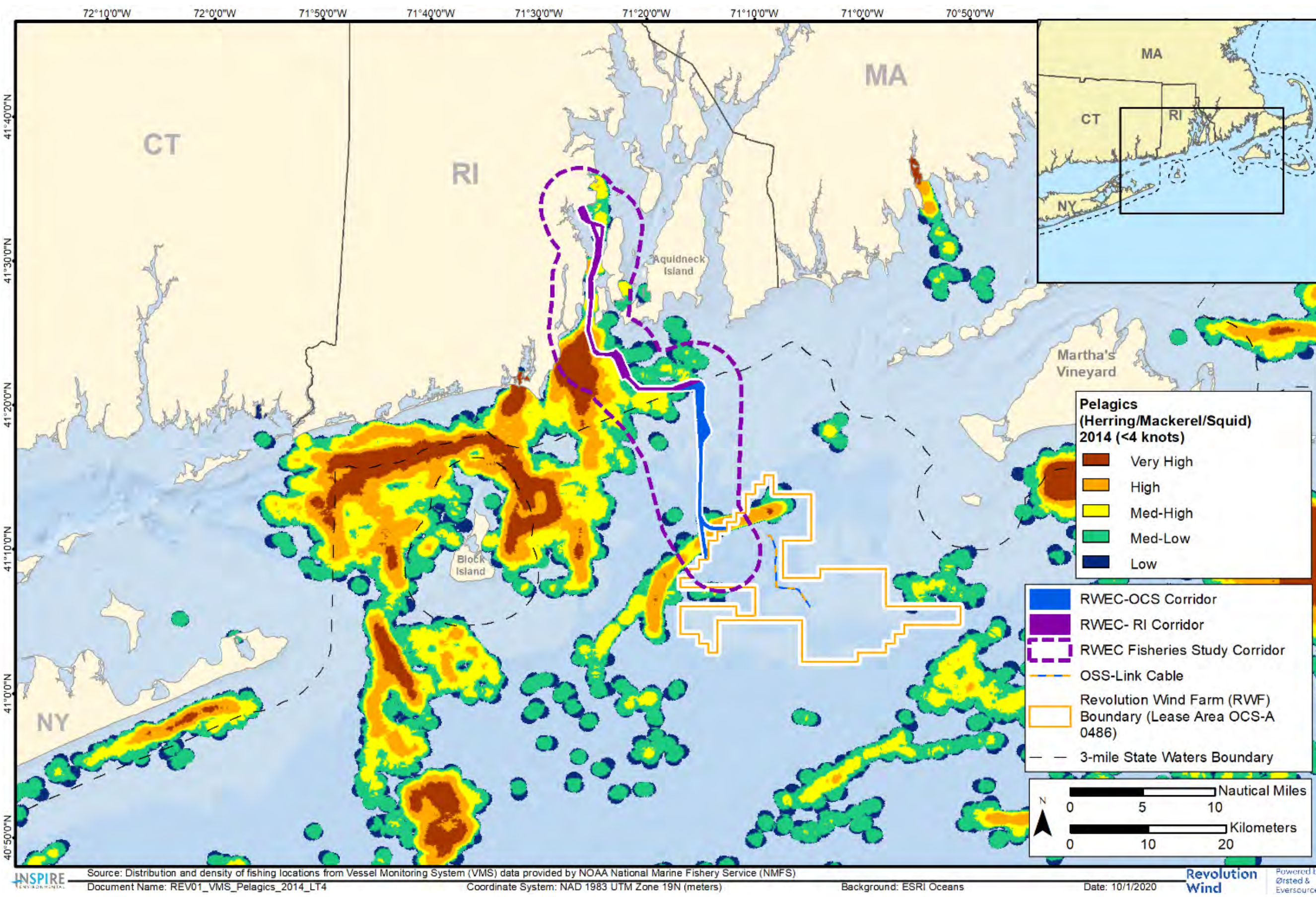

Figure 2.2-5 VMS Map of Vessel Intensity for Pelagic Species (Herring/Mackerel/Squid) Fishing, 2014

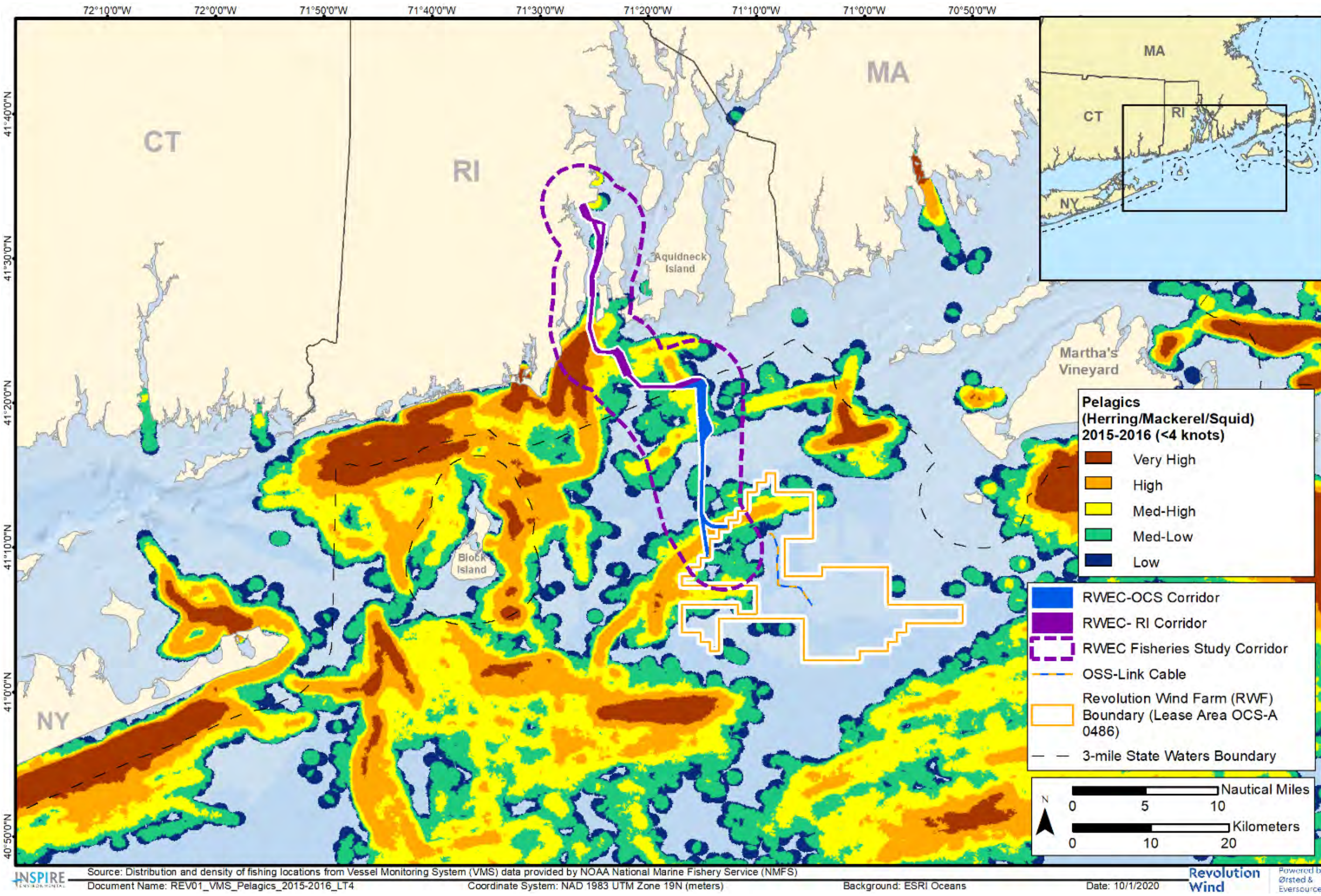

Figure 2.2-6 VMS Map of Vessel Intensity for Pelagic Species (Herring/Mackerel/Squid) Fishing, 2015 to 2016

The map of vessel intensity for the monkfish fleet for the years 2011 to 2014 indicates medium-high, and medium-low intensity activity in areas along the RWEC fisheries study corridor (Figure 2.2-7). It also indicates high, medium-high, and medium-low activity within the RWF. The vessel intensity map for monkfish for 2015 to 2016 indicates high, medium-high, and medium-low activity along the RWEC fisheries study corridor and within the RWF (Figure 2.2-8). Additionally, RIDEM (2017) indicated there was low relative density of fishing activity in the RWF, with medium to very high densities to the southwest of the RWF. Low density fishing activity was indicated for the RWEC fisheries study corridor (Figure 87 in RIDEM, 2017). Over the years 2011 to 2016, the total non-confidential landings revenue for monkfish activity in the RI-MA WEA (depicted in Figure 2.1-1) overall was more than $1.27 million (Section 10.1.4; Table 23 in RIDEM, 2017).

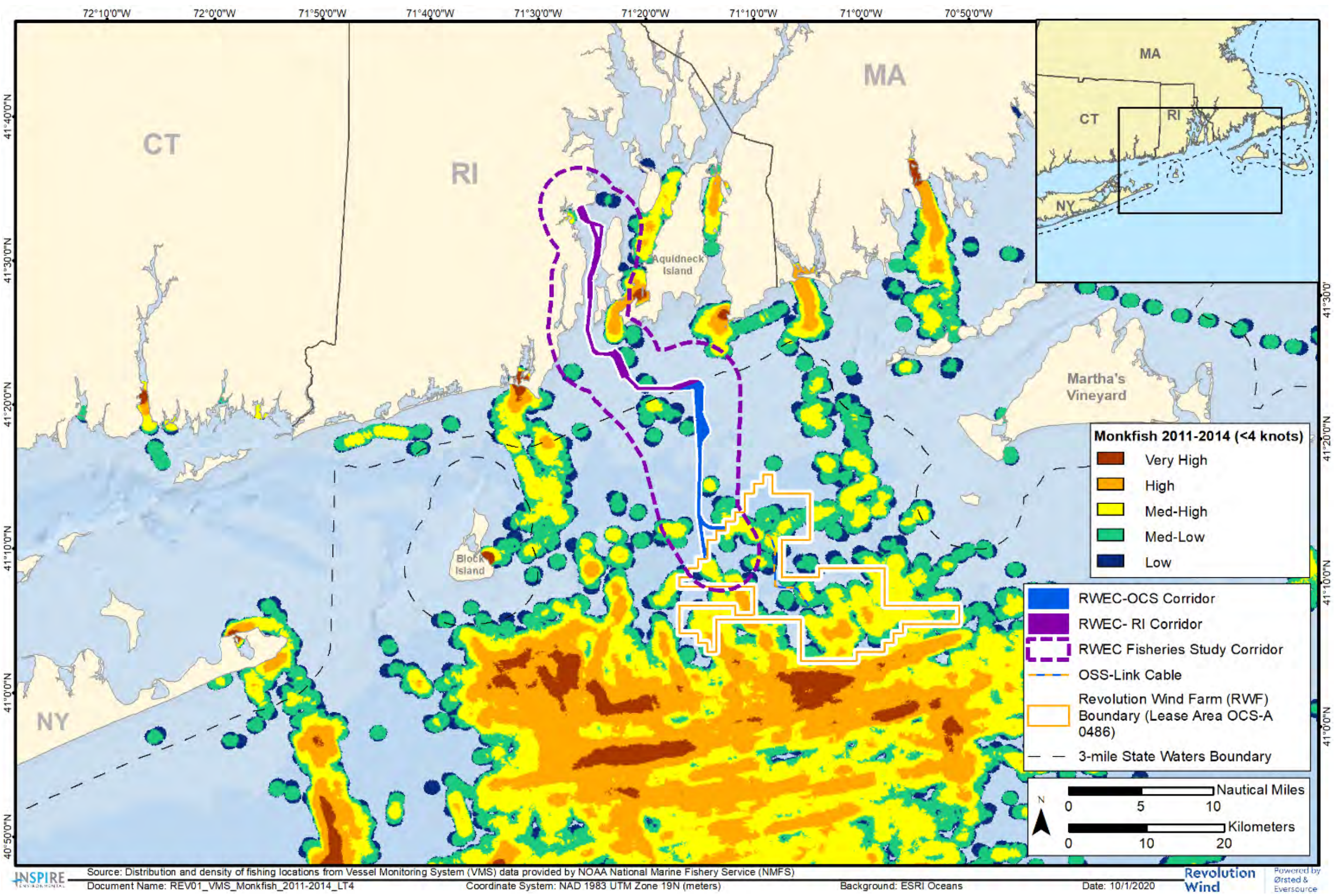

Figure 2.2-7 VMS Map of Vessel Intensity for Monkfish Fishing, 2011 to 2014

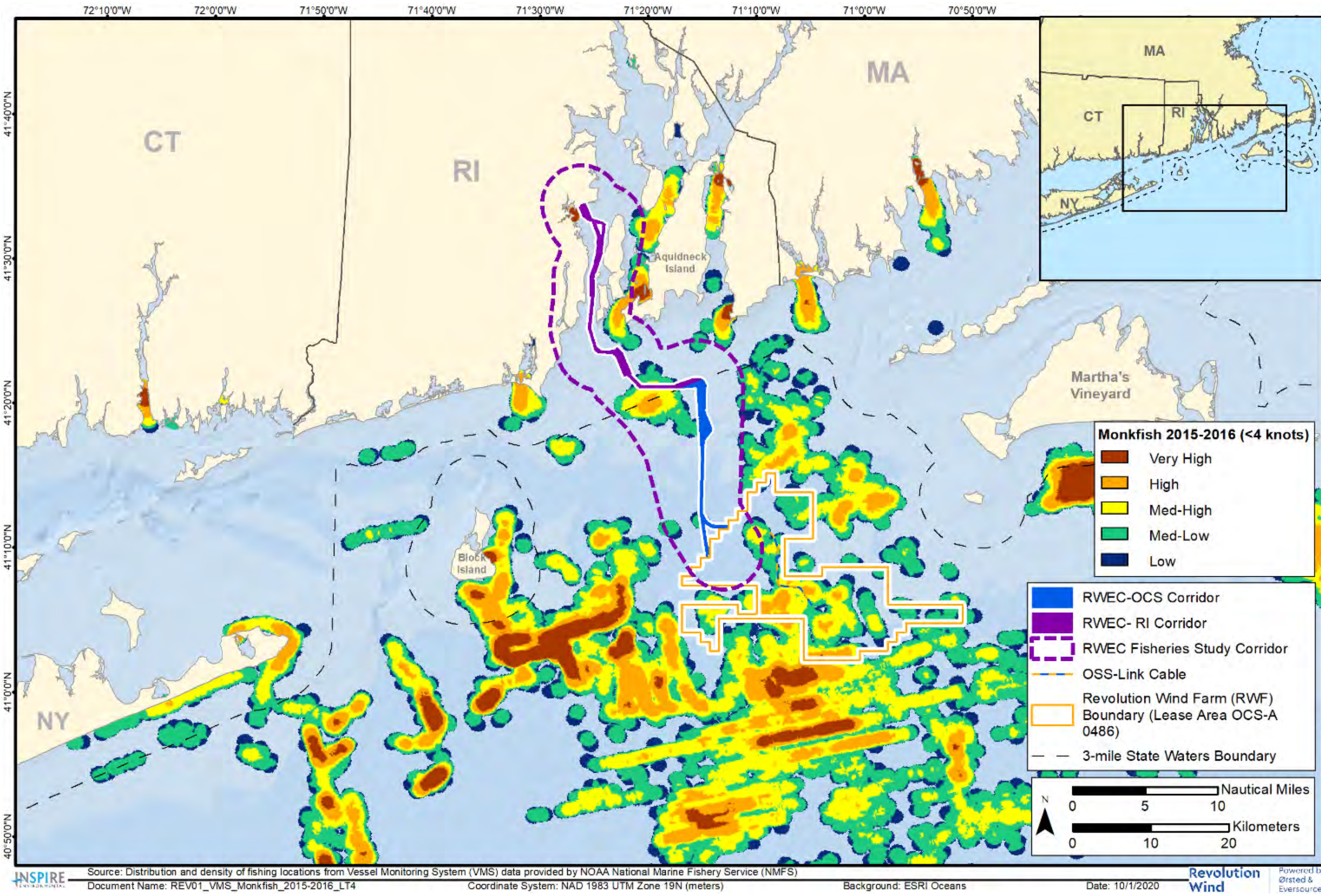

Figure 2.2-8 VMS Map of Vessel Intensity for Monkfish Fishing, 2015 to 2016

The map of vessel intensity for vessels fishing under a surfclam/ocean quahog permit, for the years 2012 to 2014, shows low intensity vessel activity at one location along the RWEC fisheries study corridor and within the northern portion of the RWF, high, medium-high, medium-low, and low fishing vessel intensity is depicted (Figure 2.2-9). The vessel intensity map for surfclam/ocean quahog for 2015 to 2016 indicates very high, high, medium-high, medium-low, and low vessel activity on the northwestern portion of the RWF. The RWEC fisheries study corridor does not overlap surfclam/ocean quahog vessel activity upon exiting the RWF (Figure 2.2-10). RIDEM (2017) indicated that for surfclam/ocean quahog fishing with dredge gear (Figure 59 in RIDEM, 2017), there was some scattered medium and medium-low smoothed relative density of fishing activity in the RWF and RWEC fisheries study corridor over the years 2011 to 2016. Landings revenue for surfclam/ocean quahog dredge activity in the RI-MA WEA (depicted in Figure 2.1-1) overall was confidential for the years 2011-2016 (Section 10.1.3; Table 16 in RIDEM, 2017).

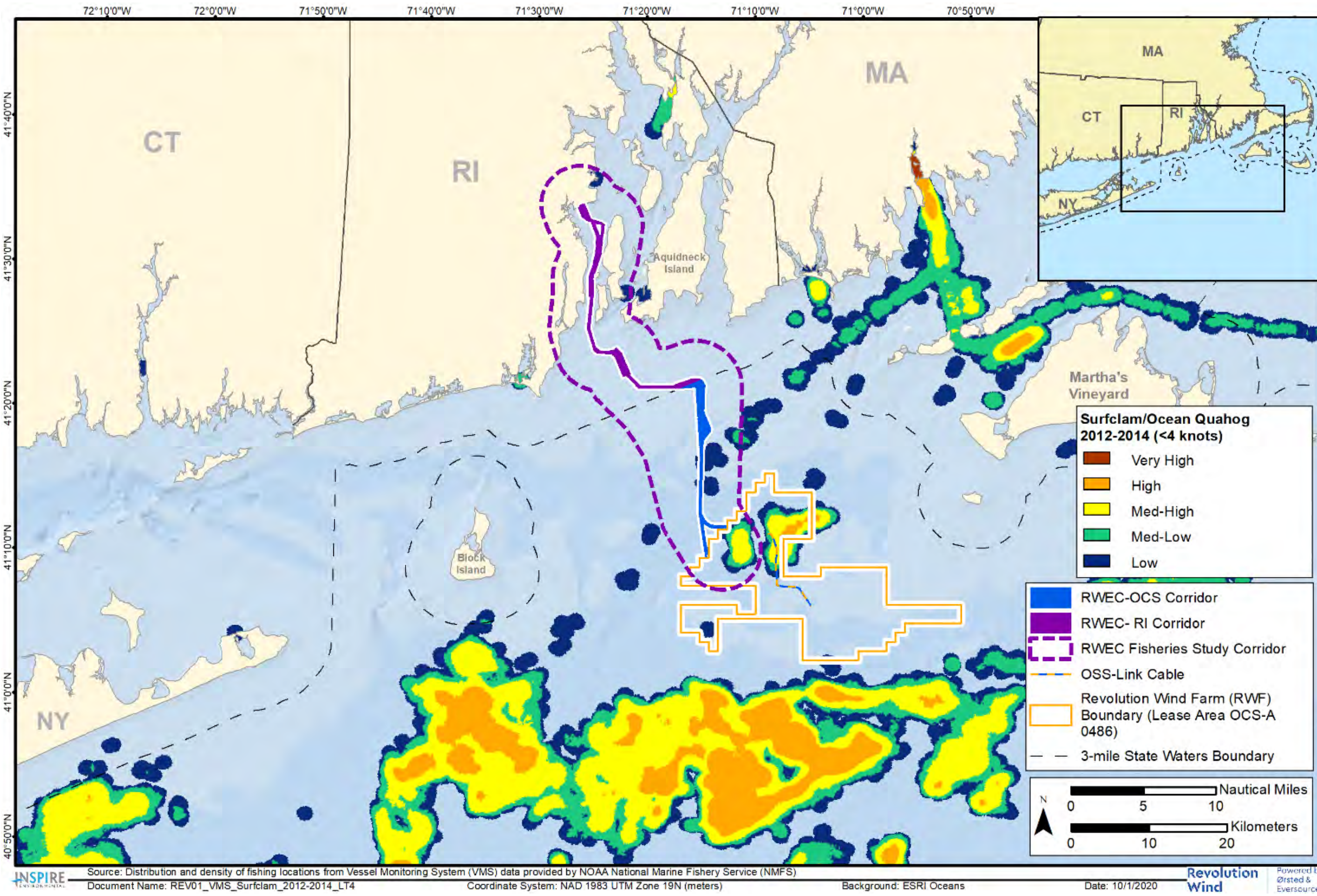

Figure 2.2-9 VMS Map of Vessel Intensity for Surfclam/Ocean Quahog Fishing, 2012 to 2014

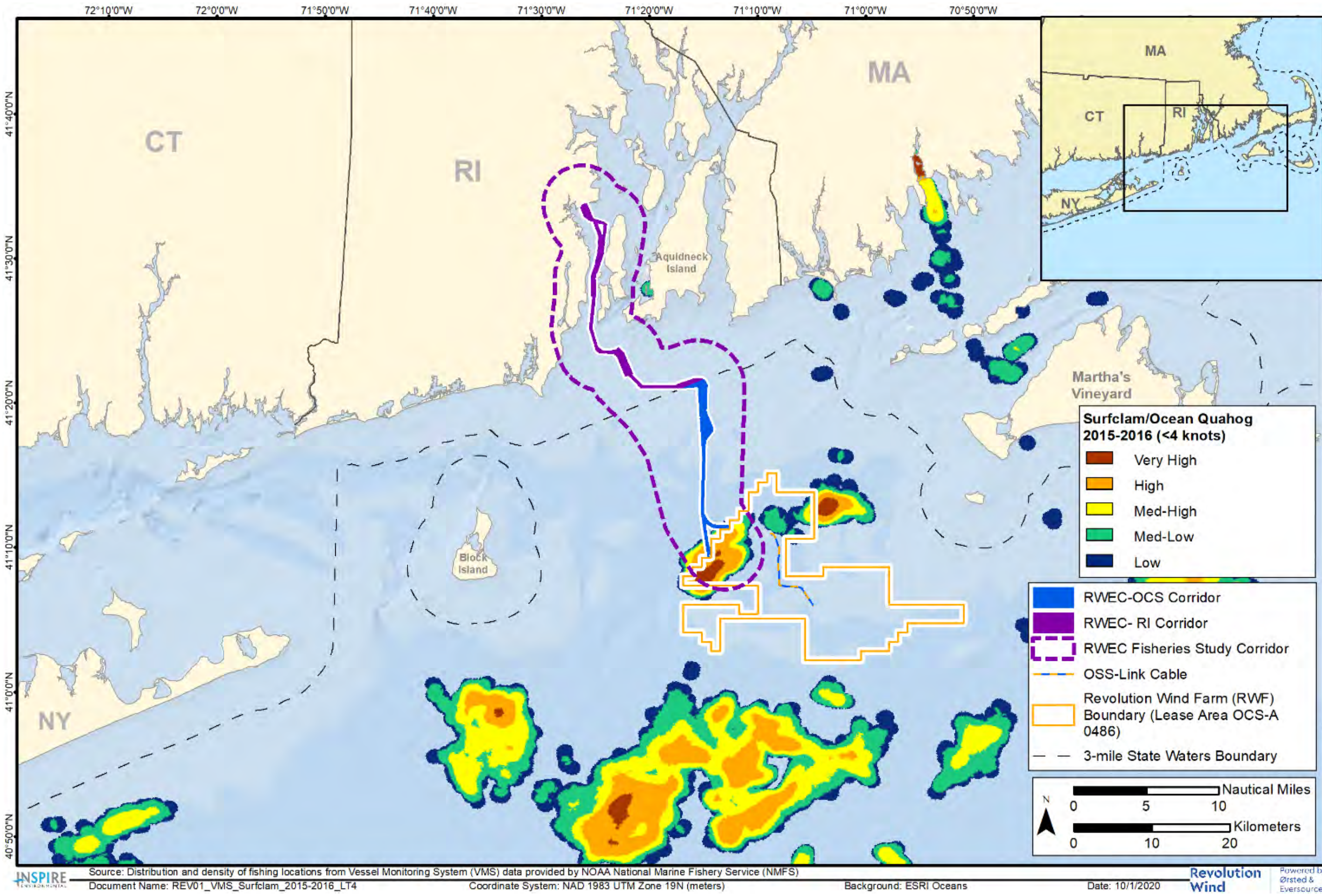

Figure 2.2-10 VMS Map of Vessel Intensity for Surfclam/Ocean Quahog Fishing, 2015 to 2016

The intensity map for vessels fishing for sea scallops for the years 2011 to 2014 indicates a medium-low and low intensity for vessels targeting scallops within the RWF, with the exception of high vessel activity in a small portion of the western RWF (Figure 2.2-11). The RWEC fisheries study corridor traverses areas of medium-low and low vessel activity. The 2015-2016 intensity map for scallop fishery vessels indicates high, medium-high, and low vessel activity in southern portions of the RWF and medium-low to low vessel intensity along the RWEC fisheries study corridor (Figure 2.2-12). In addition, RIDEM (2017) indicated low relative density of fishing activity near the RWF and the RWEC fisheries study corridor (Figure 95 in RIDEM, 2017). Over the years 2011 to 2016, the total nonconfidential landings revenue for sea scallop FMP activity in the RI-MA WEA (depicted in Figure 2.1-1) overall was more than $2.9 million (Section 10.4.1; Table 23 in RIDEM, 2017).

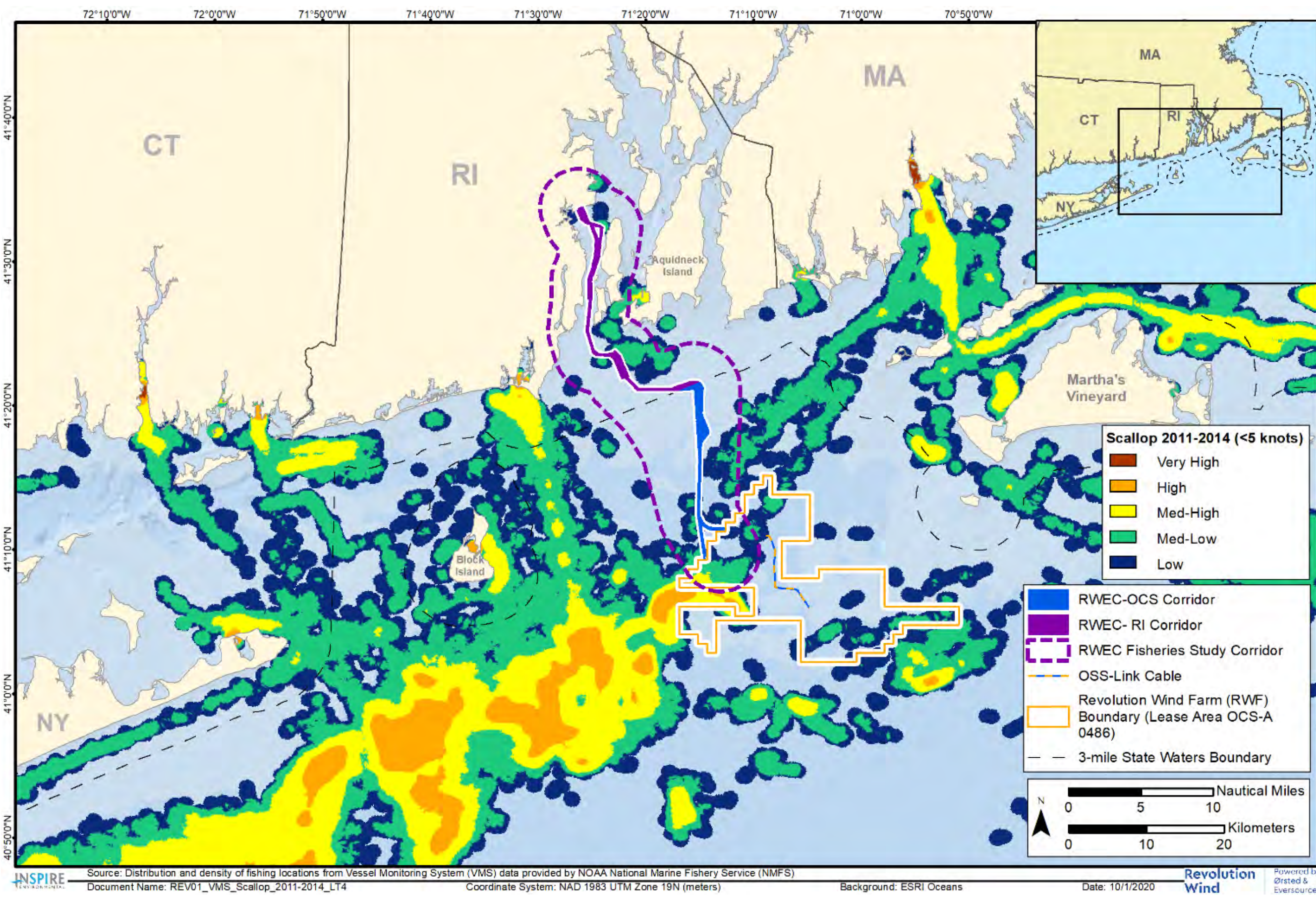

Figure 2.2-11 VMS Map of Vessel Intensity for Sea Scallop Fishing, 2011 to 2014

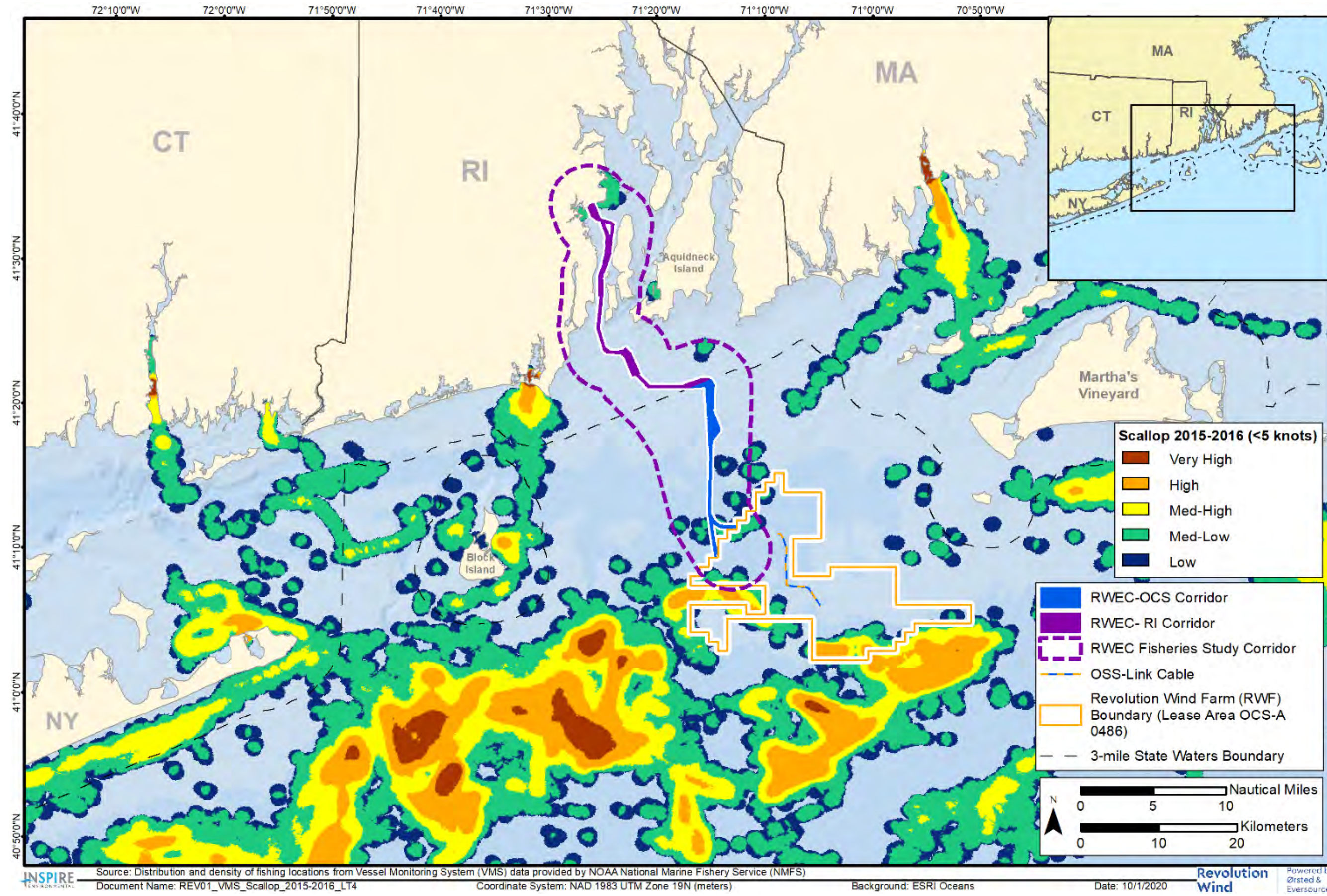

Figure 2.2-12 VMS Map of Vessel Intensity for Sea Scallop Fishing, 2015 to 2016

The intensity map for vessels fishing for squid in the year 2014 indicates medium-low and low vessel intensity occurred on the western edge of the RWF and the RWEC fisheries study corridor traverses areas of high, medium-high, and medium-low intensity (Figure 2.2-13). The 2015-2016 intensity map indicates high, medium-high, and low intensity vessel activity within the RWF, with most activity located in the northern portion of the RWF (Figure 2.2-14). The RWEC fisheries study corridor traverses areas of high, medium-high, medium-low, and low intensity vessel activity along the RWEC fisheries study corridor for 2015-2016. As noted previously, RIDEM (2017) indicated that there was low relative density of fishing activity for the RWF and RWEC fisheries study corridor for the squid/mackerel/butterfish FMP (Figure 142 in RIDEM, 2017) over the years 2011-2016. The total non-confidential landings revenue for fishing under the squid/mackerel/butterfish FMP in the RI-MA WEA (depicted in Figure 2.1-1) overall was over $397,000 (Table 23 in RIDEM, 2017).

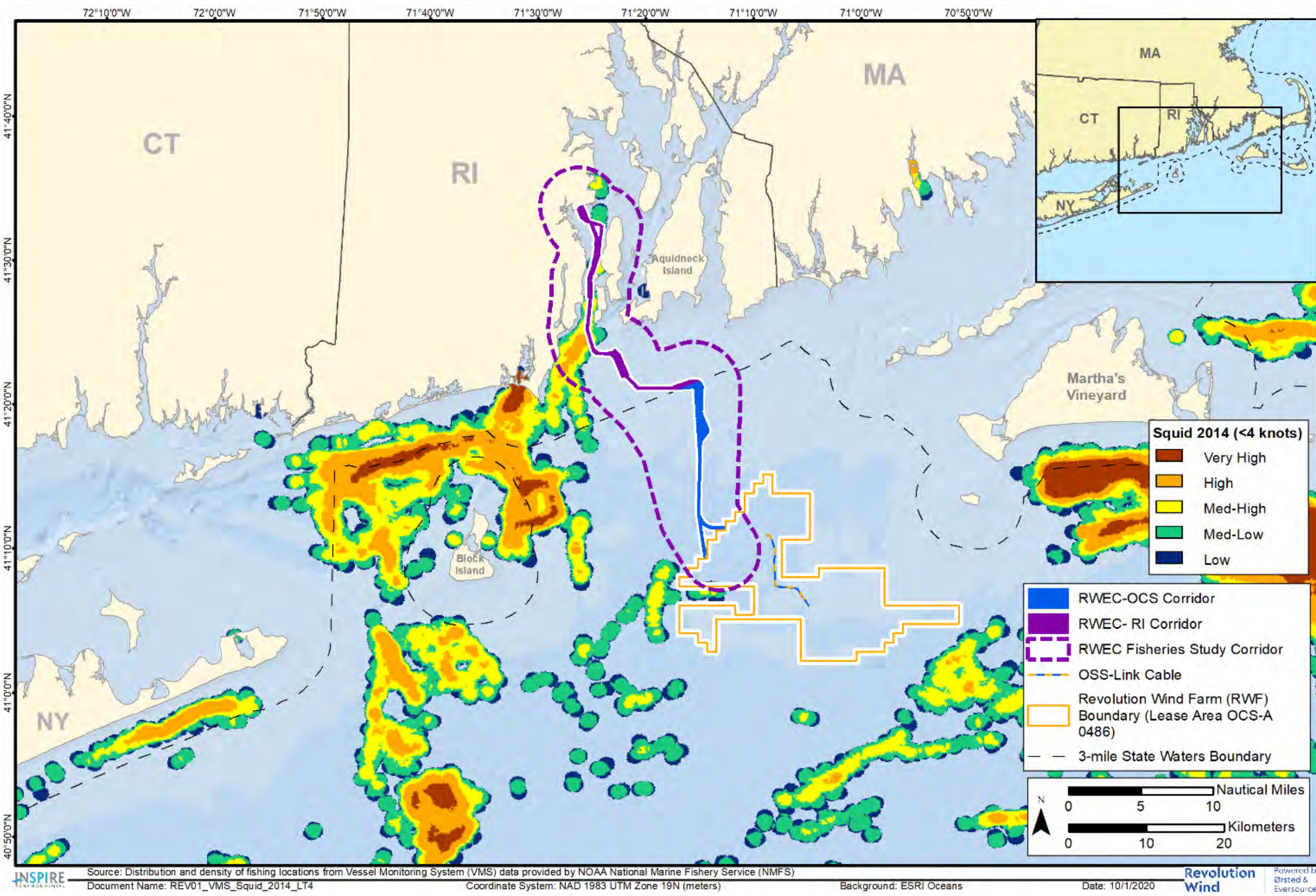

Figure 2.2-13 VMS Map of Vessel Intensity for Squid Fishing, 2014

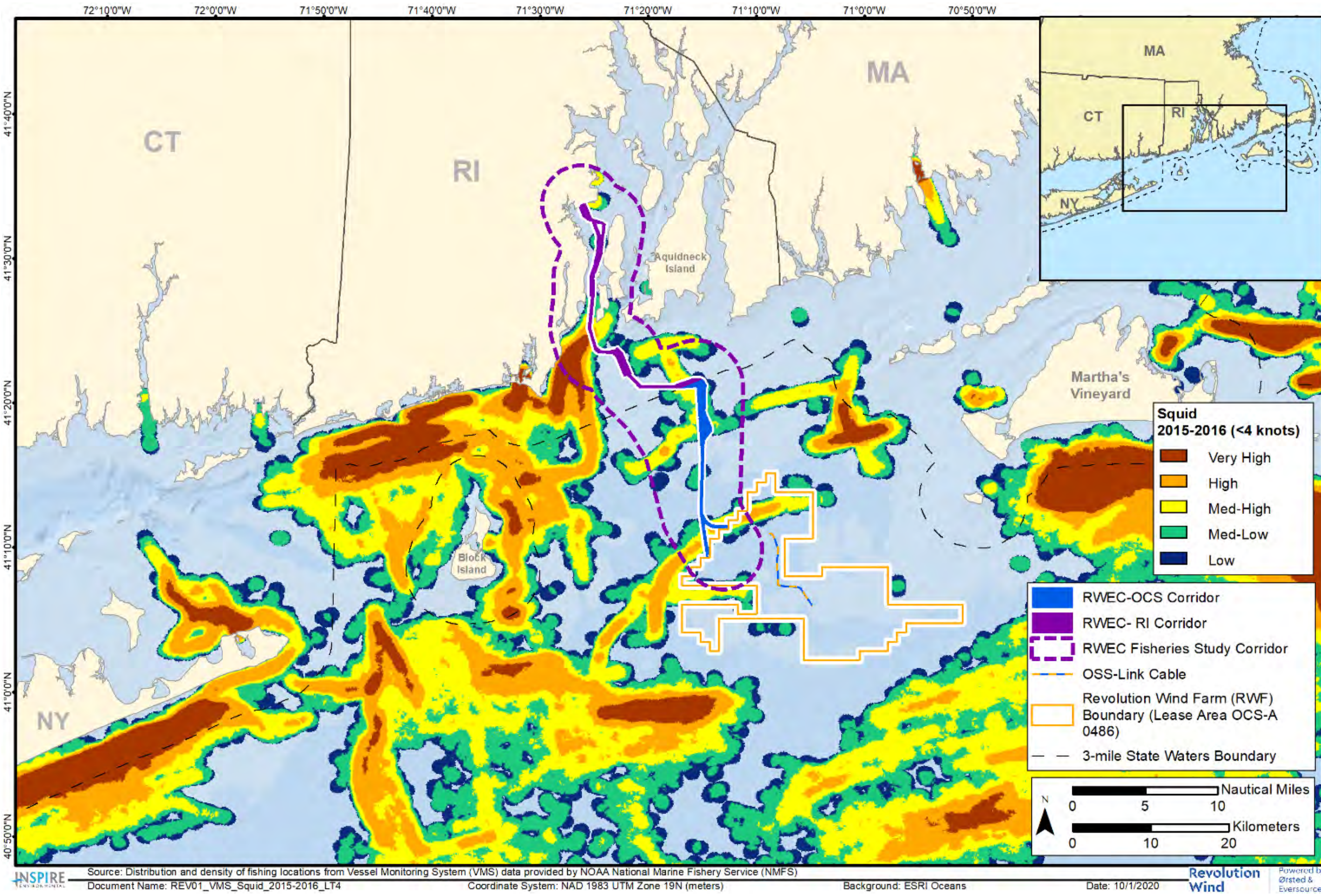

Figure 2.2-14 VMS Map of Vessel Intensity for Squid Fishing, 2015 to 2016

2.2.3 VTR Data as Rasters

Fishing-intensity rasters aggregated by port group were summed to indicate the revenue-intensity of fishing activity in offshore areas being considered as locations for wind turbine facilities (Benjamin et al., 2018). Revenue intensity of fishing activity for 2013 to 2017 is presented on Figures 2.2-15 through 2.2-21 for the fisheries with revenue recorded in the RI-MA WEA (i.e., large-mesh multispecies or northeast multispecies, Atlantic herring, pelagic species by midwater trawl, monkfish, surfclam/ocean quahog, sea scallops, and lobsters).

The revenue-intensity raster map for groundfish (large-mesh multispecies or northeast multispecies) indicates an area of relatively high-revenue fishing activity south of the RWF and an area of moderate-revenue fishing activity southwest of the RWF. Low-revenue fishing activity is depicted in the western portion of the RWF, with no revenue generated by groundfish fishing depicted for the rest of the RWF or adjacent to the RWEC fisheries study corridor (Figure 2.2-15). Maximum groundfish (large-mesh multispecies or northeast multispecies) mean annual revenue per 0.25 km^2 was $4,609 (Figure 2.2-15).

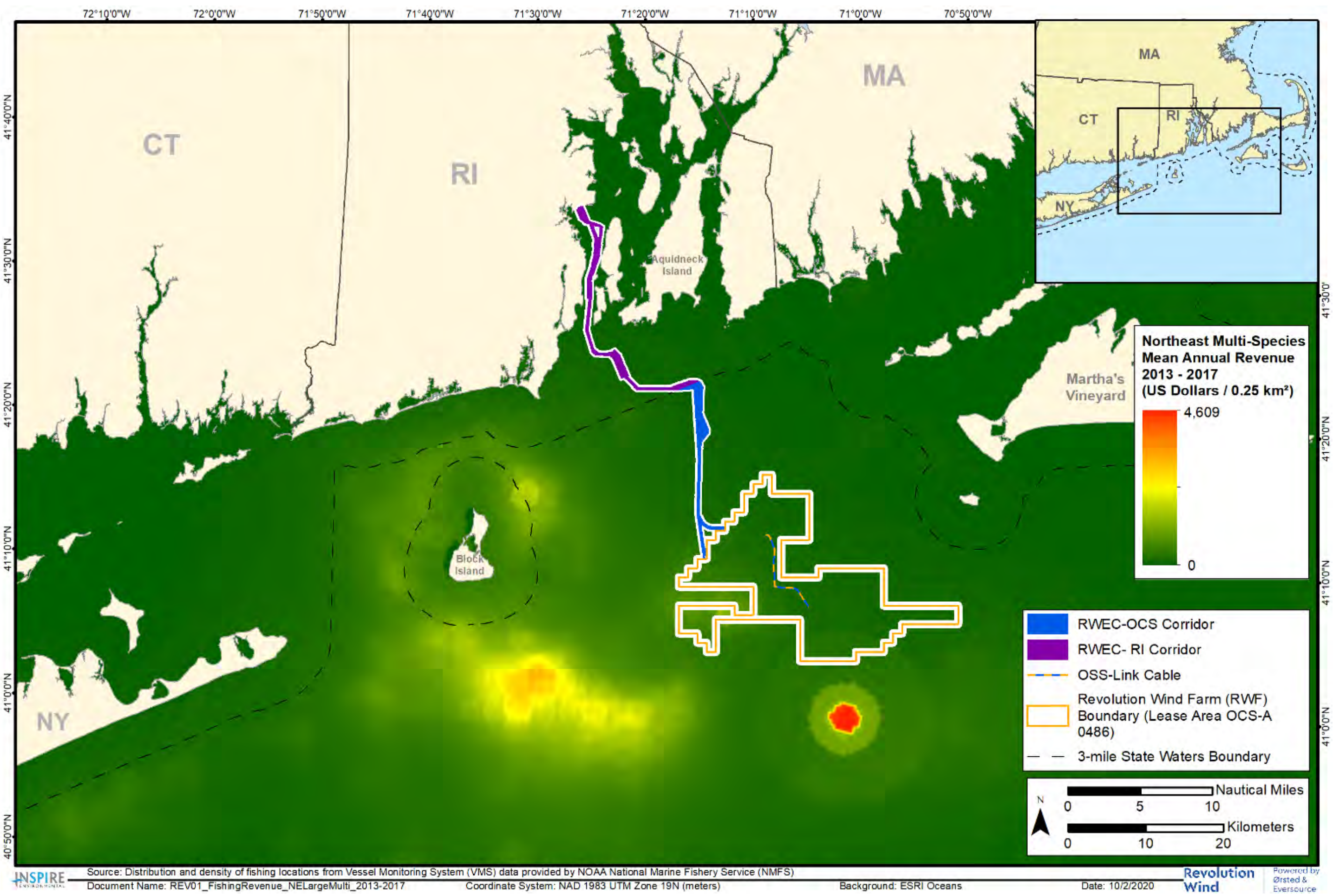

Figure 2.2-15 Revenue-intensity raster map for Large-mesh Multispecies Fishing, 2013-2017

The revenue-intensity raster map for Atlantic herring indicates an area of relatively high-revenue fishing activity southwest of the RWEC fisheries study corridor within RI state waters (Figure 2.2-16). Low-revenue fishing activity is depicted in the northern portion of the RWF, with most of the RWF showing no revenue generated by Atlantic herring fishing activity (Figure 2.2-16). Maximum Atlantic herring mean annual revenue per 0.25 km^2 was $11,482 (Figure 2.2-16).

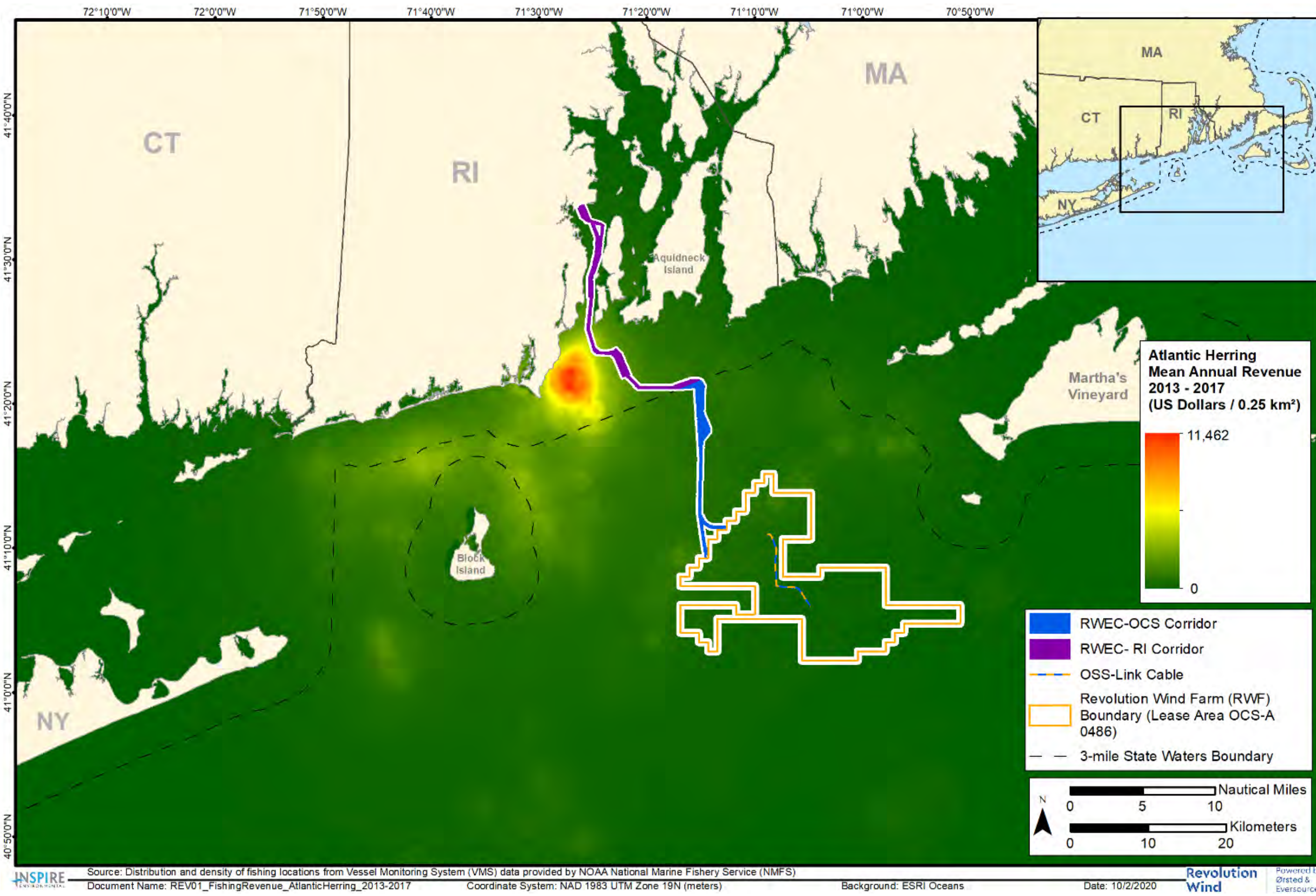

Figure 2.2-16 Revenue-intensity raster map for Atlantic Herring Fishing, 2013-2017

The revenue-intensity raster map for pelagic species (midwater trawl) indicates an area of relatively high-revenue fishing activity southwest of the RWEC fisheries study corridor within RI state waters (Figure 2.2-17). Low-revenue fishing activity is depicted in the northern portion of the RWF, with most of the RWF showing no revenue generated by midwater trawl fishing activity (Figure 2.2-17). Maximum pelagic species mean annual revenue per 0.25 km^2 was $1,634 (Figure 2.2-17).

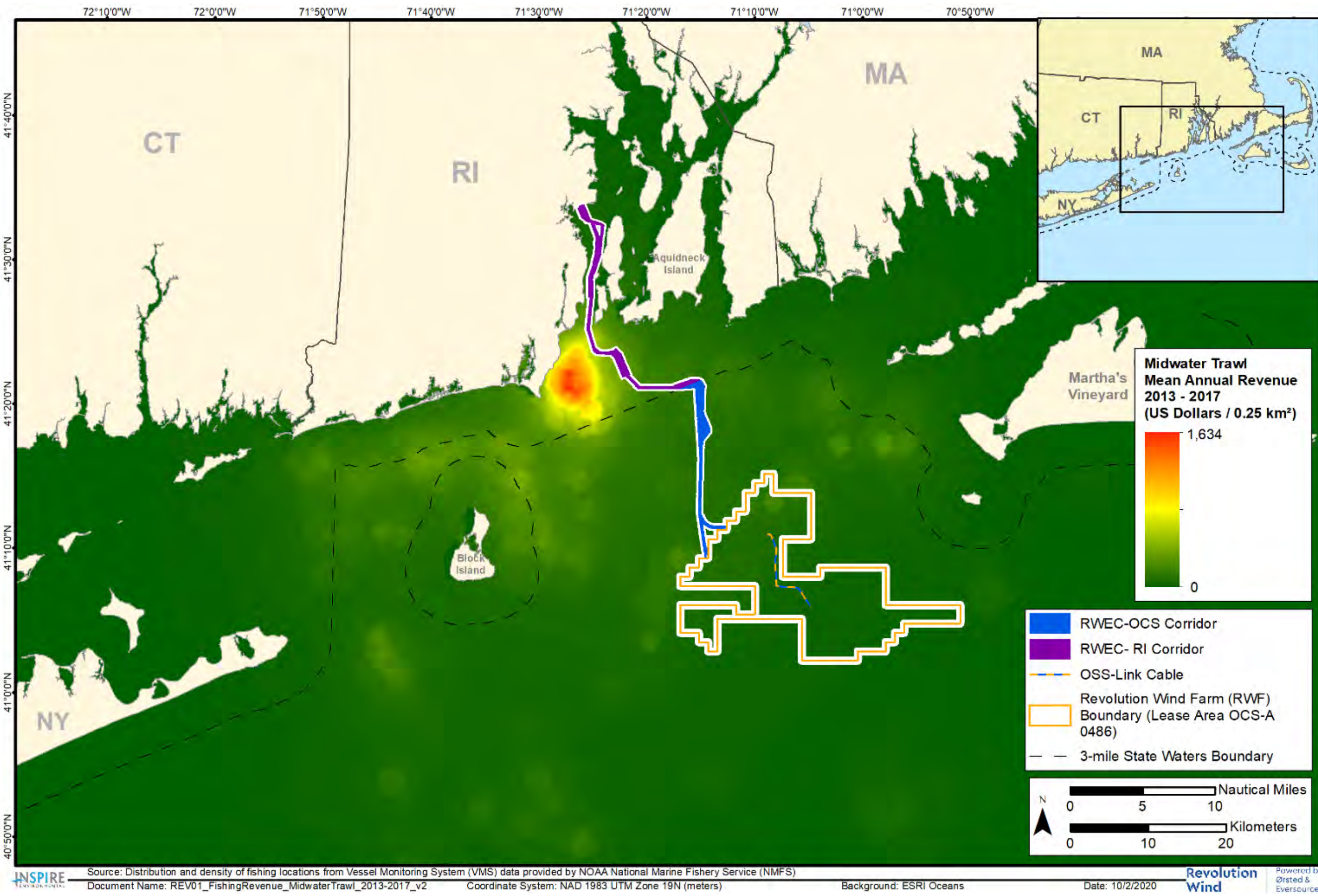

Figure 2.2-17 Revenue-intensity raster map for Pelagic Species (midwater trawl) Fishing, 2013-2017

The revenue-intensity raster map for monkfish indicates an area of relatively high-revenue fishing activity south of the RWF and an area of moderate-revenue fishing activity within the RWF (Figure 2.2-18). There is no indication of revenue-producing fishing activity adjacent to the RWEC fisheries study corridor (Figure 2.2-18). Maximum monkfish mean annual revenue per 0.25 km^2 was $10,729 (Figure 2.2-18).

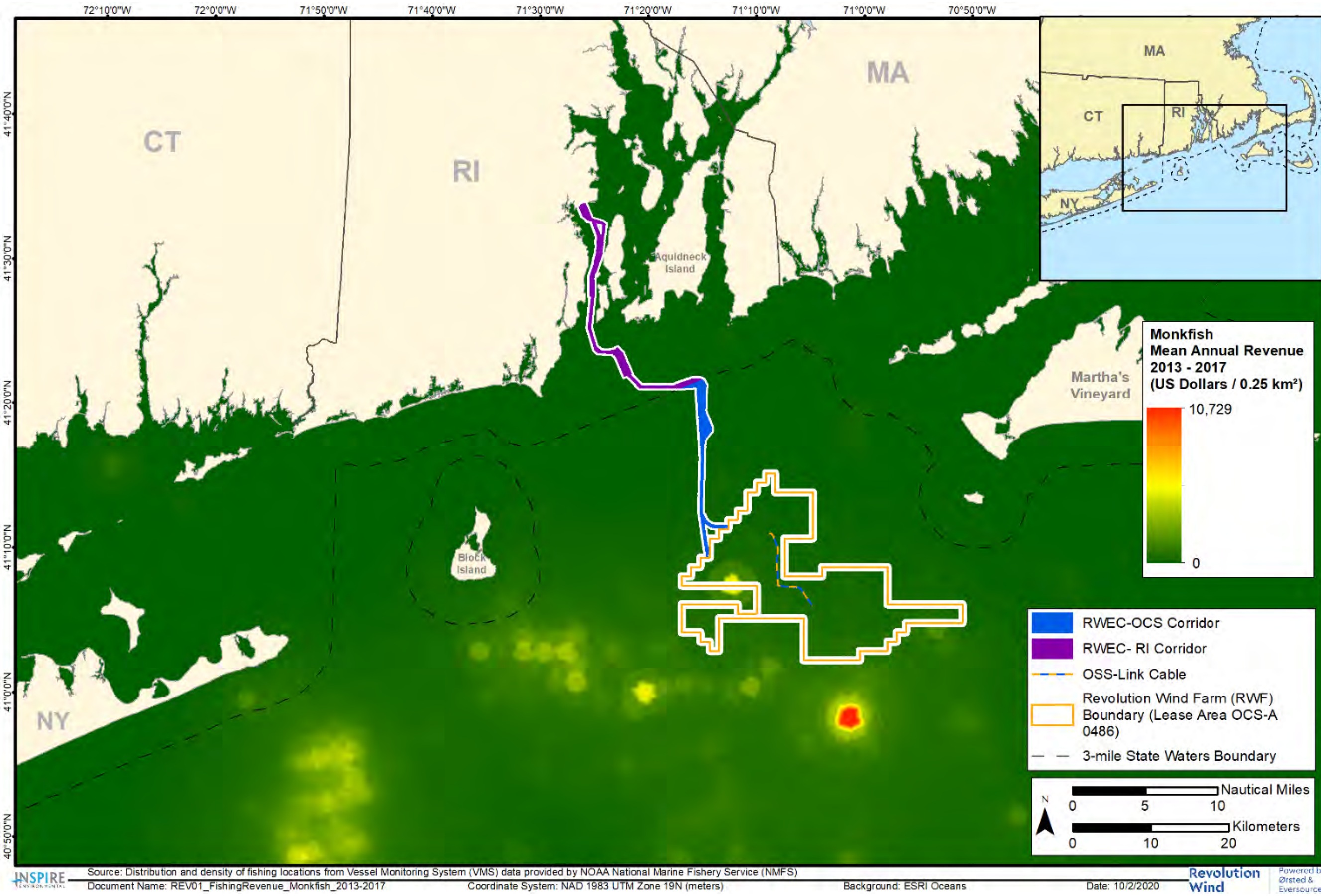

Figure 2.2-18 Revenue-intensity raster map for Monkfish Fishing, 2013-2017

The revenue-intensity raster map for surfclam/ocean quahog indicates areas of relatively moderate to low-revenue fishing activity within the RWF and no revenue-producing fishing activity adjacent to the RWEC fisheries study corridor (Figure 2.2-19). Maximum surfclam/ocean quahog mean annual revenue per 0.25 km^2 was $12,358 (Figure 2.2-19).

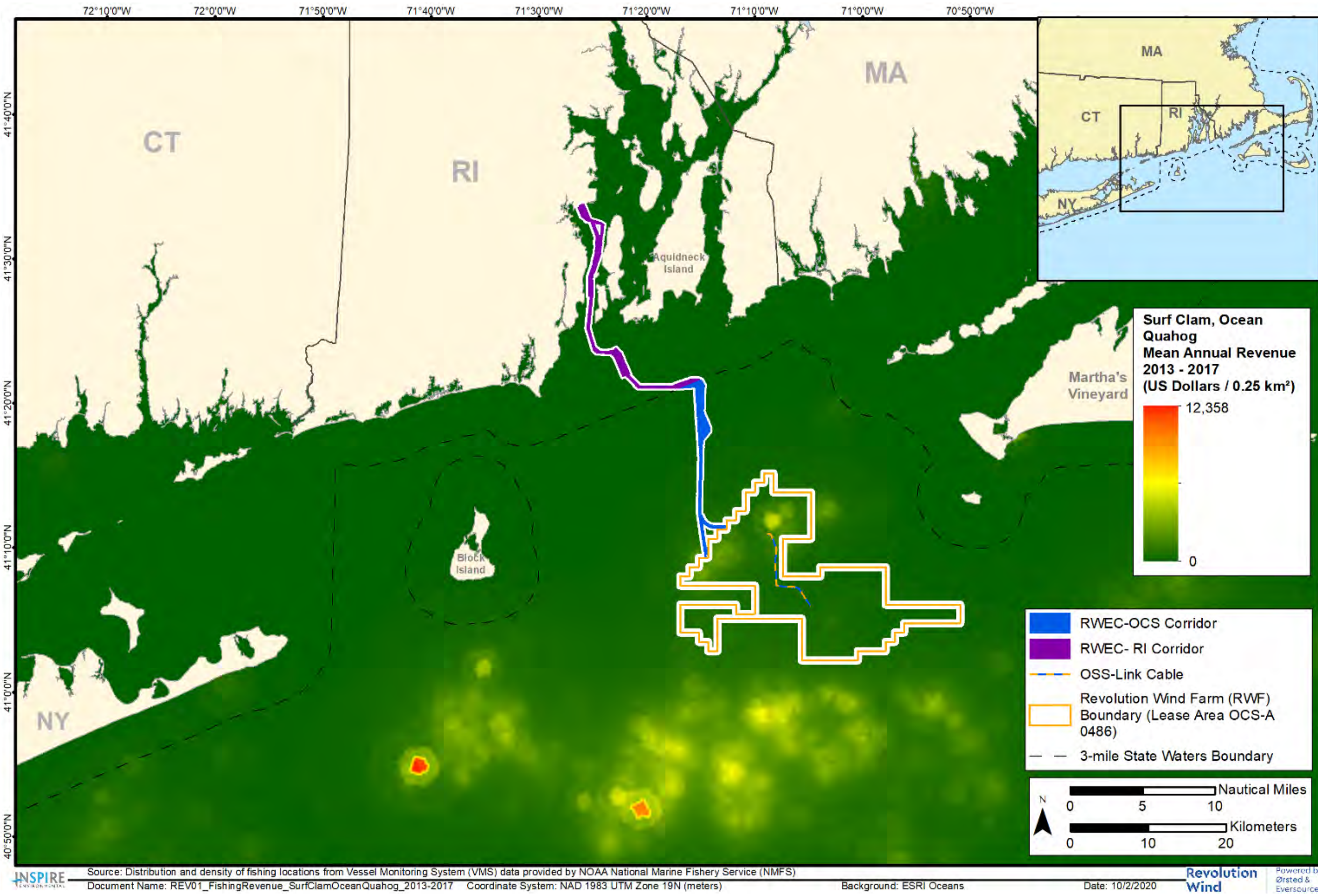

Figure 2.2-19 Revenue-intensity raster map for Surfclam/Ocean Quahog Fishing, 2013-2017

The revenue-intensity raster map for sea scallops indicates an area in the southern RWF of relatively low-revenue fishing activity and no revenue-producing fishing activity adjacent to the RWEC fisheries study corridor (Figure 2.2-20). Maximum sea scallops mean annual revenue per 0.25 km^2 was $19,780 (Figure 2.2-20).

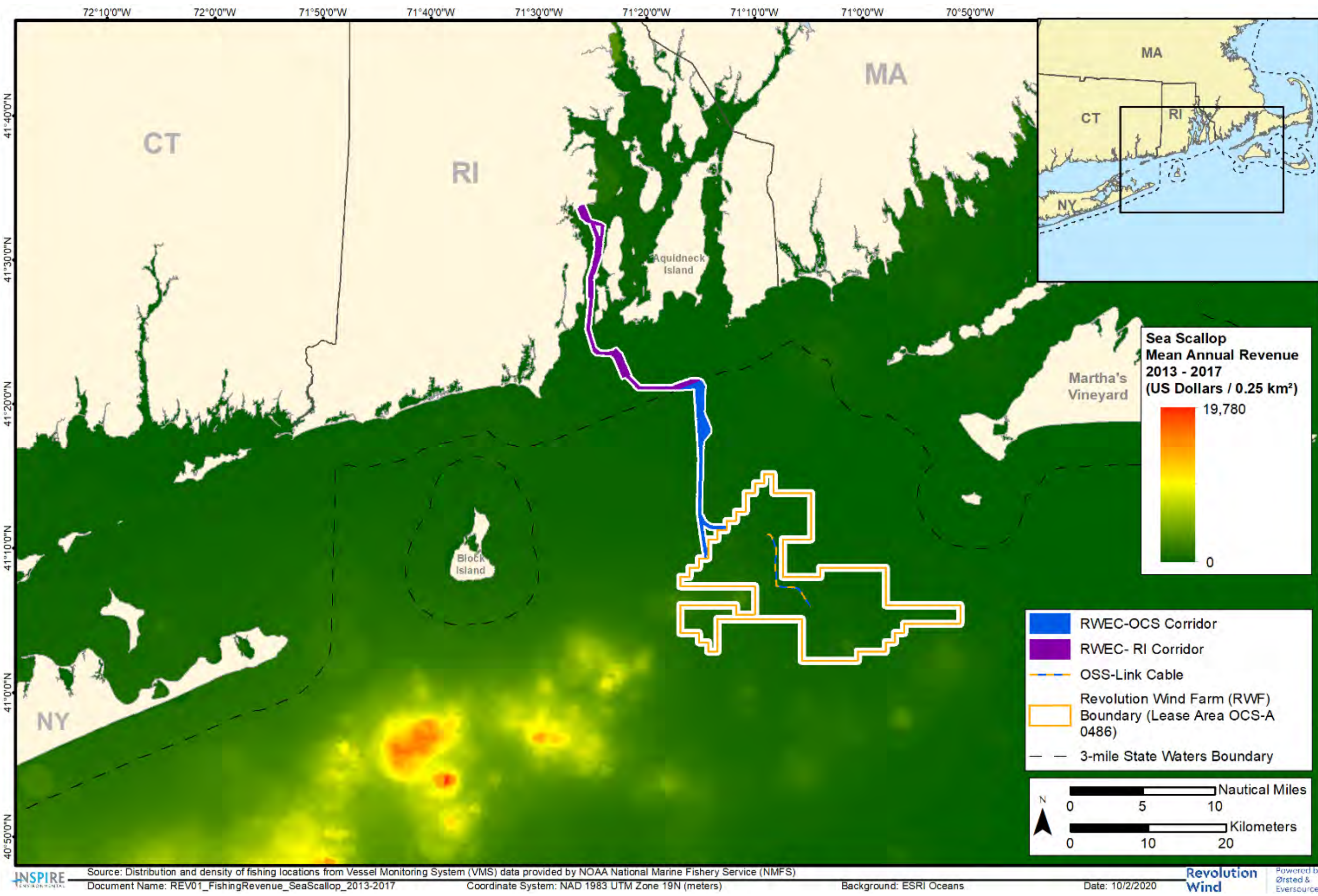

Figure 2.2-20 Revenue-intensity raster map for Sea Scallops, 2013-2017

The revenue-intensity raster map for lobsters indicates relatively low-revenue fishing activity in RWF and adjacent to the RWEC fisheries study corridor (Figure 2.2-21). An area of moderate-revenue fishing activity occurs west of RWF (Figure 2.2-21). Maximum lobster mean annual revenue per 0.25 km^2 was $1,044 (Figure 2.2-21).

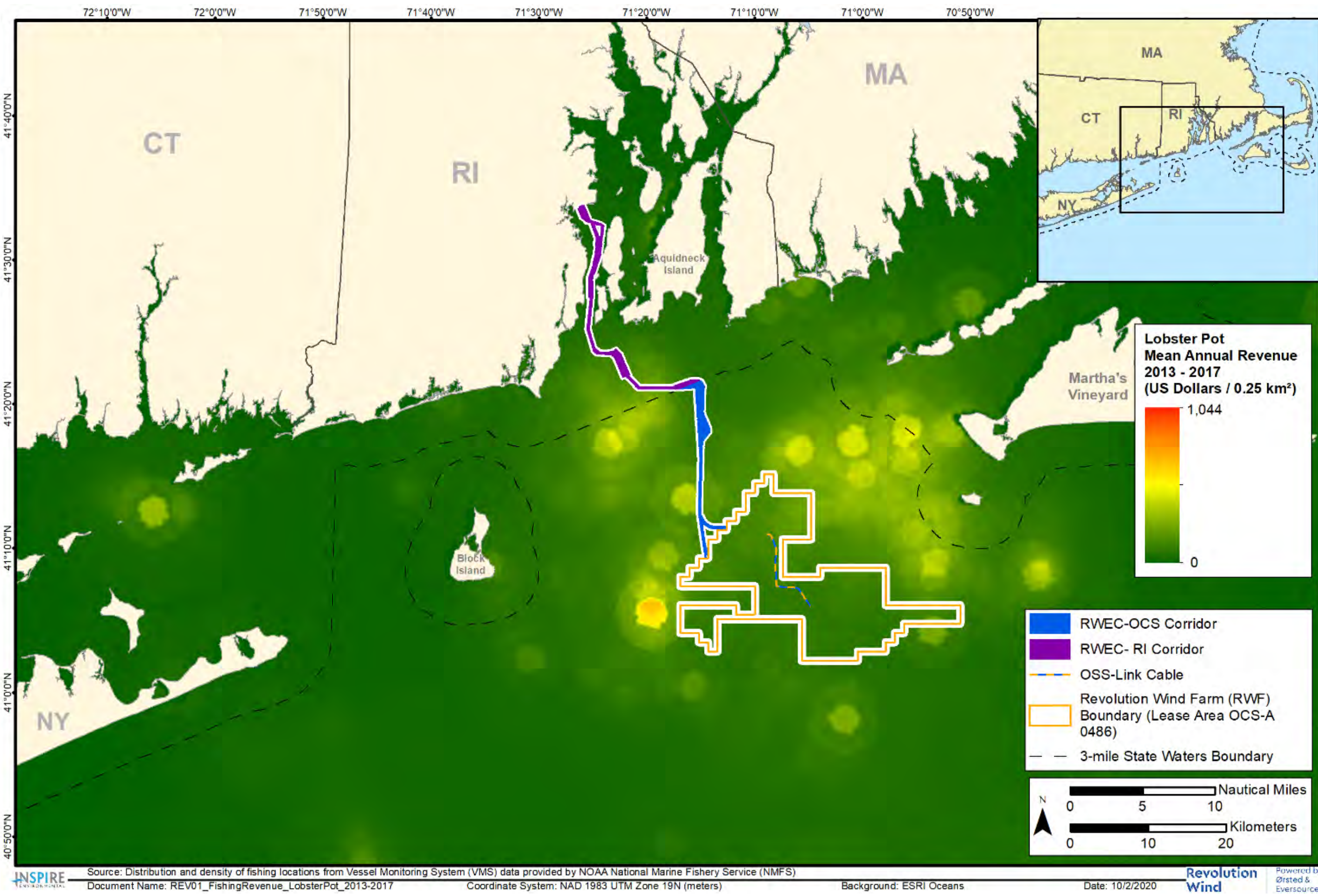

Figure 2.2-21 Revenue-intensity raster map for Lobsters, 2013-2017

2.2.4 Connecticut State Vessel Trip Reports

Commercial fisheries in Connecticut state waters may be categorized similarly to those in federal waters. The largest fishery by gear category in statistical area 611 for the years 2009 to 2018 used pots and traps, where an average of 144,296 pounds were landed per year, representing 100 percent of all landings caught by pots and traps in all Connecticut state waters. The next largest fishery in statistical area 611 used otter trawls, which averaged 106,572 pounds each year, representing all of the state catch. The third largest fishery by gear type was lobster pots and traps, averaging 89,877 pounds per year and also representing all of the lobster pot activity in Connecticut state waters. Table 2.2-7 provides an overview of the gears used in Connecticut state waters (ACCSP, 2019).

From 2009 to 2018, commercial fishermen permitted to fish in Connecticut state waters landed a diverse array of species, including conch, menhaden, lobster, scup, horseshoe crabs, summer flounder, American shad, bluefish, green crabs, and white perch. A complete summary of all species landed in these statistical areas is provided in Table 2.2-8. Statistical area 611 was an important fishing area for conch and menhaden. The greatest average pounds landed for the years 2009 to 2018 include conch (120,204 pounds), menhaden (100,026 pounds), lobster (84,601 pounds), scup (78,320 pounds), horseshoe crabs (58,108 pounds), and summer flounder (47,779 pounds).

The top ports where fishermen landed their catch from fishing in Connecticut state waters were Stonington, Old Saybrook, New London, Guilford, and Clinton. Stonington was the port with the highest average annual landings (82,034 pounds) and the largest number of active fishing permits (58 permits; Table 2.2-9).

Table 2.2-7 Categories of Gear Used by Connecticut State-only Permitted Vessels during 2009-2018 in Statistical Area 611

	Average Pounds Landed per Year (2009-2018)	Total Pounds Landed (2009-2018)	Total Pounds Landed in Connecticut State Waters (2009-2018)	% Pounds Landed out of Total Connecticut State Waters, by Gear
	Statistical Areas	Statistical Areas		Statistical Areas
Gear Category	611	611		611
By Hand, No Diving Gear	57,939	579,389	579,389	100.0
Dip Nets	2,924	29,241	29,241	100.0
Gill Nets	85,978	859,780	859,920	100.0
Hand Line	52	209	209	100.0
Haul Seines	2,227	22,272	22,272	100.0
Hook and Line	56,702	567,023	577,950	98.1
Otter Trawls	106,572	1,065,717	1,065,632	100.0
Pots and Traps, Lobster	89,877	898,767	898,767	100.0
Pots and Traps, Other	12,427	124,269	124,269	100.0
Pots and Traps	144,296	1,442,964	1,443,053	100.0

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and the RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-8 Species Landed by Connecticut State-only Permitted Vessels during 2009-2018 in Statistical Area 611

	Average Pounds Landed per Year (2009-2018)	Total Pounds Landed (2009-2018)	Total Pounds Landed in Connecticut State Waters (2009-2018)	% Pounds Landed out of Total Connecticut State Waters, by Species
	Statistical Areas	Statistical Areas		Statistical Areas
Species	611	611		611
Conch - Family	120,204	1,202,040	1,202,040	100.0
Menhadens	100,026	1,000,262	1,000,322	100.0
Lobster, American	84,601	846,013	846,008	100.0
Scup	78,320	783,205	785,525	99.7
Crab, Horseshoe	58,108	581,081	581,081	100.0
Flounder, Summer	47,779	477,792	482,543	99.0
Shad, American	43,513	435,132	435,132	100.0
Bluefish	20,461	204,605	204,784	99.9
Crab, Green	12,559	125,586	125,586	100.0
Perch, White	10,308	103,084	103,084	100.0
Bass, Black Sea	8,210	82,100	83,013	98.9
Tautog	7,838	78,382	78,467	99.9
Whelk, Channeled	7,182	28,728	28,728	100.0
Bass, Striped	2,918	29,179	29,179	100.0
Eel, American	2,251	22,510	22,510	100.0
Skates, Rajidae (Family)	2,012	20,124	20,059	100.3
Dogfish, Smooth	1,942	19,418	19,418	100.0
Flounder, Winter	1,719	17,190	17,190	100.0
Windowpane	1,662	16,622	16,622	100.0
Sea robins	1,436	14,359	14,359	100.0
Crab, Blue	882	8,815	8,815	100.0
Squid, Longfin Loligo	827	8,269	8,268	100.0
Butterfish	821	8,211	8,211	100.0
Silverside, Atlantic	458	4,580	4,580	100.0
Crabs, Hermit, Pagurus (Genus)	444	2,219	2,219	100.0
Hake, Red	412	2,470	2,475	99.8
Mummichog	370	3,330	3,330	100.0
Mullets	353	1,764	1,764	100.0
Shad, Gizzard	295	1,178	1,178	100.0
Shad, Hickory	293	2,346	2,346	100.0
Crab, Atlantic Rock	206	1,238	1,238	100.0
Weakfish	206	2,055	2,055	100.0
Shiner, Golden	138	415	415	100.0
Triggerfishes	50	502	502	100.0
Cod, Atlantic	26	181	225	80.4
Dogfish, Spiny	22	217	356	61.0
Sculpins	15	61	61	100.0
Tuna, Little Tunny	13	39	39	100.0
Hake, Silver	12	99	98	101.0
Bonito, Atlantic	12	60	60	100.0
Puffers, Tetraodontidae (Family)	8	24	24	100.0

Species	Average Pounds Landed per Year (2009-2018)	Total Pounds Landed (2009-2018)	Total Pounds Landed in Connecticut State Waters (2009-2018)	% Pounds Landed out of Total Connecticut State Waters, by Species
	Statistical Areas	Statistical Areas		Statistical Areas
	611	611		611
Cunner	3	16	16	100.0
Mackerel, Atlantic	2	5	4	125.0

Source: ACCSP, 2019.
Notes:
Values reflect average pounds landed by species and by statistical subarea.
Confidential information was redacted from the requested data set.
Species are sorted by average pounds caught each year in statistical subarea 611.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.

Table 2.2-9 Landing Ports Used by Connecticut State-only Permitted Vessels during 2009-2018 in Statistical Area 611

	Average Pounds Landed per Year by Subarea (2009-2018)	Total number of Active Fishing Permits	Total Pounds Landed by Subarea (2009-2018)	Total Pounds Landed in Connecticut State Waters (2009-2018)	% of Total Catch from Connecticut State Waters, by Port
	Statistical Areas	Statistical Areas	Statistical Areas		Statistical Areas
Landing Port	611	611	611		611
Branford	12,771	18	127,709	127,849	99.9
Bridgeport	13,775	17	137,755	137,755	100.0
Chester (Town of)	3,642	4	25,493	25,493	100.0
Clinton	56,789	22	567,888	567,888	100.0
Darien	10,158	3	71,106	71,106	100.0
East Lyme (Flanders)	1,665	3	6,660	6,660	100.0
Greenwich	1,617	8	16,175	16,175	100.0
Groton	52,746	24	527,465	527,465	100.0
Guilford	67,723	21	677,231	677,231	100.0
Haddam	660	6	4,623	4,623	100.0
Middletown	3,757	3	11,272	11,272	100.0
Milford	31,474	12	314,740	314,740	100.0
Mystic	1,267	9	12,671	12,671	100.0
New Haven	36,729	10	367,288	367,288	100.0
New London	70,880	22	708,800	708,733	100.0
Niantic (East Lyme (sta.))	21,415	31	214,149	215,879	99.2
Noank	8,389	9	83,893	83,893	100.0
Norwalk	10,832	8	108,318	108,318	100.0
Old Lyme	6,340	10	57,057	57,057	100.0
Old Saybrook (Town of)	80,805	52	808,047	808,047	100.0
Pawcatuck	243	4	973	1,057	92.1
Stamford	2,778	8	22,221	22,221	100.0
Stonington	82,034	58	820,341	828,711	99.0
Stratford	2,250	8	20,251	20,251	100.0
Waterford	14,223	14	142,234	142,370	99.9
West Haven	3,685	4	11,055	11,055	100.0
Westbrook (Town of)	14,007	15	140,071	140,071	100.0

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

2.2.5 Massachusetts State Vessel Trip Reports

The largest fishery by gear category in Massachusetts state waters in statistical areas 537 and 538 for the years 2009 to 2018 used pots and traps, yielding average annual landings of 740,978 pounds, accounting for 49 percent of the statewide landings for this gear type. Total annual landings from hook and line averaged 608,431 pounds, accounting for approximately 45 percent of landings from hook and line within state waters. Landings using lobster pots and traps averaged 522,764 pounds landed per year in both statistical areas combined, representing 12 percent of all lobster trap landings in all Massachusetts state waters. Table 2.2-10 provides an overview of the gears used in Massachusetts state waters (ACCSP, 2019).

From 2009 to 2018, commercial fishermen permitted to fish in Massachusetts state waters landed a diverse array of species, including brachyuran crabs, menhaden, ocean quahog, channeled whelk, northern quahog clam, scup, striped bass, bay scallop, black sea bass, horseshoe crabs, eastern oysters, and soft clams. A complete summary of all species landed in these statistical areas is provided in Table 2.2-11. The majority of species came from area 538, with the exception of brachyuran crabs, which had high landings in area 537. Brachyuran crab landings averaged over 3.0 million pounds per year for all statistical areas combined and accounted for 62 percent of statewide crab landings. Channeled whelk landings averaged 563,513 pounds annually in statistical areas 537 and 538 combined and accounted for 95 percent of channeled whelk landings statewide. Species with high landings in area 538 for the years 2009 to 2018 include channeled whelk (551,351 pounds), northern quahog (415,349 pounds), and scup (290,480 pounds).

The top ports where fishermen landed their catch from fishing in all Massachusetts state waters were New Bedford, Chatham, Edgartown, Falmouth, and Westport. New Bedford was the port with the highest average annual landings in statistical areas 537 and 538 combined (701,301 pounds) and the largest number of active fishing permits (626 permits; Table 2.2-12).

Table 2.2-10 Categories of Gear Used by Massachusetts State-only Permitted Vessels during 2009-2018 in Statistical Areas 537 and 538

Gear Category	Average Pounds Landed per Year (2009-2018) Statistical Areas		Total Pounds Landed (2009-2018) Statistical Areas		Total Pounds Landed in Massachusetts State Waters (2009-2018)	% Pounds Landed out of Total Massachusetts State Waters, by Gear Statistical Areas	
	537	538	537	538		537	538
By Hand, Diving Gear	210	25,662	839	230,956	527,341	0.2	43.8
By Hand, No Diving Gear	736	74,480	2,207	670,319	1,991,792	0.1	33.7
Dip Nets		16,679		150,107	215,101		69.8
Dredge	60,667	178,442	606,669	1,784,420	22,268,013	2.7	8.0
Gill Nets		7,411		51,879	5,524,403		0.9
Hand Line	68,050	69,044	612,454	690,442	1,740,763	35.2	39.7
Harpoons		780		6,241	71,863		8.7
Hook and Line	111,829	496,602	1,006,460	4,966,017	13,228,436	7.6	37.5
Long Lines		1,352		6,761	3,908,859		0.2
Not Coded	11,511	10,003	11,511	80,023	2,871,527	0.4	2.8
Other Fixed Nets		35,700		285,603	574,627		49.7
Other Gears	112	143,874	335	1,294,864	5,786,102	<0.1	22.4
Otter Trawls	9,807	124,842	49,034	1,123,580	1,716,517	2.9	65.5
Pots and Traps, Lobster	482,902	39,862	3,863,217	358,762	33,966,462	11.4	1.1
Pots and Traps, Other	83,124	62,518	166,247	375,109	1,339,713	12.4	28.0
Pots and Traps	21,237	719,741	148,658	7,197,414	15,063,126	1.0	47.8
Purse Seine					13,880,167		
Rakes	695	488,807	4,170	4,888,075	31,134,543	<0.1	15.7
Suction Pumps		748		4,490	4,494		99.9

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-11 Species Landed by Massachusetts State-only Permitted Vessels during 2009-2018 in Statistical Areas 537 and 538

Species	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in Massachusetts State Waters (2009-2018)	% Pounds Landed out of Total Massachusetts State Waters, by Species	
	Statistical Areas		Statistical Areas			Statistical Areas	
	537	538	537	538		537	538
Whelk, Channeled	12,162	551,351	72,973	5,513,507	5,846,715	1.2	94.3
Clam, Northern Quahog		415,349		4,153,491	6,682,378		62.2
Scup	117,953	290,480	1,061,578	2,904,798	4,106,087	25.9	70.7
Bass, Striped	19,160	151,721	172,440	1,517,212	6,271,230	2.7	24.2
Scallop, Bay	2,644	122,538	23,794	1,225,379	1,275,687	1.9	96.1
Bass, Black Sea	24,744	122,256	222,698	1,222,563	1,543,660	14.4	79.2
Crab, Horseshoe	397	120,109	1,191	1,080,983	2,655,523	<0.1	40.7
Oyster, Eastern	115	118,652	345	1,186,521	4,457,611	<0.1	26.6
Clam, Soft	454	111,632	2,272	1,004,692	22,334,558	<0.1	4.5
Menhadens		104,916		944,245	14,455,094		6.5
Flounder, Summer	15,615	96,401	140,535	964,005	1,138,208	12.3	84.7
Bluefish	4,663	68,860	41,966	688,603	1,412,892	3.0	48.7
Lobster, American	80,755	45,910	807,547	459,102	39,211,503	2.1	1.2
Whelk, Knobbed	675	42,517	2,025	382,649	440,597	0.5	86.8
Crab, Green		41,999		419,994	1,238,936		33.9
Squid, Longfin Loligo	241	36,232	964	326,087	374,995	0.3	87.0
Tautog	2,008	35,090	18,068	350,897	389,325	4.6	90.1
Mussel, Sea		26,987		134,936	11,656,534		1.2
Surfclam, Atlantic		11,013		99,115	6,604,278		1.5
Crabs, Brachyura	3,073,922	5,398	3,073,922	5,398	4,936,562	62.3	0.1
Snail, Moon		5,287		15,860	17,238		92.0
Mackerel, Atlantic	3,560	4,650	17,801	41,853	496,128	3.6	8.4
Quahog, Ocean	281,280	4,462	562,560	40,162	1,833,700	30.7	2.2
Clam Atlantic Razor		4,050		32,403	3,345,259		1.0
Butterfish		3,427		30,846	32,312		95.5
Tuna, Bluefin	1,240	1,839	9,918	14,713	766,324	1.3	1.9
Skates, Rajidae (Family)		1,524		6,095	1,552,660		0.4
Triggerfishes	417	1,458	2,500	13,125	15,634	16.0	84.0
Ark, Blood		1,402		9,816	187,497		5.2
Crab, Jonah		1,217		7,300	448,928		1.6
Eel, American		1,163		10,468	12,061		86.8
Quahog, False		1,124		4,497	4,957		90.7
Flounder, Winter	435	1,076	2,610	9,680	234,000	1.1	4.1
Tuna, Yellowfin	2,188	855	17,501	4,276	51,015	34.3	8.4
Cusk		768		1,535	2,823		54.4
Clam, Stout Tagelus (Stubby Razor/Bamboo)		705		2,818	2,818		100.0
Scallop, Sea		635		3,807	575,015		0.7
Dogfish, Spiny		347		1,735	7,306,603		<0.1

	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in Massachusetts State Waters (2009-2018)	% Pounds Landed out of Total Massachusetts State Waters, by Species	
	Statistical Areas		Statistical Areas			Statistical Areas	
Species	537	538	537	538		537	538
Bonito, Atlantic	130	344	1,042	3,097	4,201	24.8	73.7
Goosefish	2,299	257	13,796	2,054	165,789	8.3	1.2
Flounder, American Plaice		218		655	61,911		1.1
Cod, Atlantic	419	194	1,258	968	585,844	0.2	0.2
Snail, Slipper Limpet		187		373	373		100.0
Basses, Mixed Sea		140		279	565		49.4
Squid, Shortfin Illex		126		753	1,028		73.3
Hake, Silver		89		356	188,840		0.2
Tuna, Albacore	314	32	1,257	97	4,691	26.8	2.1
Searobins		29		116	154		75.3
Sharks, Chondrichthyes (Class)		10		10			
Dolphinfish	352		2,465		5,797	42.5	
Sharks, Mako	421		2,528		4,029	62.7	
Tuna, Bigeye	864		6,050		20,315	29.8	
Wahoo	55		166		312	53.2	

Source: ACCSP, 2019.
Notes:
Values reflect average pounds landed by species and by statistical subarea.
Confidential information was redacted from the requested data set.
Species are sorted by average pounds caught each year in statistical subarea 538.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-12 Landing Ports Used by Massachusetts State-only Permitted Vessels during 2009-2018 in Statistical Areas 537 and 538

Landing Port	Average Pounds Landed per Year by Subarea (2009-2018)		Total number of Active Fishing Permits		Total Pounds Landed by Subarea (2009-2018)		Total Pounds Landed in Massachusetts State Waters (2009-2018)	% of Total Catch from Massachusetts State Waters, by Port	
	Statistical Areas		Statistical Areas		Statistical Areas			Statistical Areas	
	537	538	537	538	537	538		537	538
Barnstable	1,940	137,841	3	127	3,879	1,378,409	4,893,066	0.1	28.2
Barnstable (County)		2,290		26		18,319	1,555,775		1.2
Bass River		53,229		80		479,064	579,929		82.6
Boston		200		5		601	2,404,824		<0.1
Bourne	572	48,501	10	304	5,150	485,006	620,206	0.8	78.2
Chatham (census name for Chatham Center)	1,192	256,396	9	387	9,536	2,563,959	14,079,050	0.1	18.2
Chilmark	17,687	3,982	26	48	123,807	39,823	163,782	75.6	24.3
Cotuit		16,157		31		145,414	1,425,767		10.2
Cuttyhunk		841		7		7,565	7,565		100.0
Dartmouth	15,141	85,977	47	180	136,270	859,767	1,033,194	13.2	83.2
Dennis	388	51,917	4	103	1,163	519,169	6,696,570	<0.1	7.8
Dukes (County)		51		3		102	100		102.0
Eastham		679		8		4,074	625,189		0.7
Edgartown	4,334	215,384	23	113	39,006	2,153,842	2,257,956	1.7	95.4
Fairhaven	50,689	100,555	41	196	506,893	1,005,551	3,725,925	13.6	27.0
Fall River	1,262	61,590	6	46	6,309	554,306	12,279,208	0.1	4.5
Falmouth (census name for Falmouth Center)	6,422	192,888	47	282	64,221	1,928,881	2,118,923	3.0	91.0
Gay Head	432	3,161	6	17	2,162	22,130	25,049	8.6	88.3
Gloucester	432		4		2,592		9,822,240	<0.1	
Harwich Port	351	20,465	8	115	2,108	204,649	591,445	0.4	34.6
Hyannis	1,201	120,164	9	93	7,204	1,081,480	1,257,080	0.6	86.0
Hyannis Port (Hyannisport)		850		8		5,948	7,350		80.9
Lynn		472		4		1,886	109,551		1.7
Marion	588	54,691	3	49	2,351	546,907	558,563	0.4	97.9
Marshfield (census name for Marshfield Compact)		2,489		17		22,402	3,247,865		0.7
Mashpee	688	24,094	6	57	4,131	216,842	256,370	1.6	84.6
Mattapoisett	8,707	60,733	12	102	87,073	607,328	697,571	12.5	87.1
Menemsha	17,450	50,493	50	96	157,051	454,433	620,787	25.3	73.2
Nantucket (census name for Nantucket Center)	8,863	125,468	34	157	79,766	1,254,679	1,495,430	5.3	83.9
New Bedford	481,370	219,931	170	456	4,813,697	2,199,312	11,992,064	40.1	18.3
Oak Bluffs	705	61,221	10	43	5,637	550,990	569,643	1.0	96.7

Landing Port	Average Pounds Landed per Year by Subarea (2009-2018)		Total number of Active Fishing Permits		Total Pounds Landed by Subarea (2009-2018)		Total Pounds Landed in Massachusetts State Waters (2009-2018)	% of Total Catch from Massachusetts State Waters, by Port	
	Statistical Areas		Statistical Areas		Statistical Areas			Statistical Areas	
	537	538	537	538	537	538		537	538
Onset		16,699		28		166,986	173,572		96.2
Orleans		6,263		19		56,367	4,085,400		1.4
Osterville		888		9		5,330	18,818		28.3
Plymouth (census name for Plymouth Center)		5,926		25		53,332	8,237,380		0.6
Provincetown Wharf		510		7		3,572	6,146,964		0.1
Sandwich (census name for Sandwich Center)	36,918	19,569	14	235	369,183	195,689	5,163,988	7.1	3.8
Somerset		1,913		3		9,565	11,173		85.6
Swansea (Swansea Village)		1,313		10		9,190	564,218		1.6
Tisbury (Town of)	1,914	36,173	9	56	17,223	361,731	379,742	4.5	95.3
Truro		400		4		1,200	364,797		0.3
Unknown		39,970		21		113,956	2,131,392		5.3
Vineyard Haven (Town name Tisbury)	665	57,868	12	64	5,989	578,676	587,324	1.0	98.5
Wareham	907	134,526	7	140	4,535	1,345,262	1,361,384	0.3	98.8
Wellfleet		63		6		444	2,121,695		<0.1
West Tisbury		6,142		22		49,133	49,239		99.8
Westport	26,159	163,416	39	314	261,593	1,634,162	1,929,828	13.6	84.7
Woods Hole	1,727	25,804	9	27	13,815	232,237	262,334	5.3	88.5
Yarmouth	339	70,366	4	112	1,697	703,657	917,816	0.2	76.7

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

2.2.6 New York State Vessel Trip Reports

The largest fishery by gear category in New York state waters for the years 2009 to 2018 in statistical areas 611 and 613 used otter trawls, yielding average annual landings of 576,114 pounds and accounting for 98 percent of the statewide landings for this gear type. The second largest fishery by gear type used other fixed nets, followed by gill nets, and pots and traps. Table 2.2-13 provides an overview of the gears used in New York state waters (ACCSP, 2019).

Commercial fishermen permitted to fish in New York state waters landed many species from 2009 to 2018. Species with the highest average annual landings by weight in statistical areas 611 and 613 combined included striped bass (540,306 pounds), menhaden (439,932 pounds), and scup (429,999 pounds). A complete summary of all species landed in each statistical area is provided in Table 2.2-14. For several species, landings from the two statistical areas account for over 90 percent of statewide landings; these species include scup, bluefish, whelk, conch, butterfish, black sea bass, bay scallop, smooth dogfish, squid, Atlantic herring, northern sea robins, weakfish, and windowpane.

For the state of New York, the category "unknown" for a port designation claimed the highest landings and total number of active fishing permits, accounting for 45 percent of total statewide landings from statistical areas 611 and 613. Among known ports, Oceanside (620,485 pounds) had the highest average annual landings followed by Shinnecock Indian Reservation (474,331 pounds), Mattituck (290,548 pounds), East Hampton (251,866 pounds) and Greenport (192,106 pounds). The top ports based on the number of active fishing permits were Montauk (145 permits), Shinnecock Indian Reservation (135 permits), Moriches (93 permits), and Hampton Bays (82 permits; Table 2.2-15).

Table 2.2-13 Categories of Gear Used by New York State-only Permitted Vessels during 2009-2018 in Statistical 611 and 613

Gear Category	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% Pounds Landed out of Total New York State Waters, by Gear	
	Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613		611	613
Beam Trawls	6,787		13,574		13,574	100.0	
By Hand, Diving Gear	876	1,618	5,257	14,565	25,316	20.8	57.5
By Hand, No Diving Gear	91,314	70,700	913,140	707,002	3,479,728	26.2	20.3
Dip Nets	82,635	886	743,711	7,971	2,023,753	36.7	0.4
Dredge	10,053	357,574	100,533	3,218,166	5,469,876	1.8	58.8
Fyke Nets	879	6,281	3,515	56,532	74,223	4.7	76.2
Gill Nets	117,432	408,656	1,174,322	4,086,556	6,637,888	17.7	61.6
Hand Line	325	701	2,276	2,802	7,229	31.5	38.8
Hook and Line	237,069	69,499	2,370,687	694,994	3,881,334	61.1	17.9
Not Coded		321,497		2,250,477	35,378,232		6.4
Other Fixed Nets	482,500	51,744	4,342,501	413,955	4,778,619	90.9	8.7
Other Gears	27,100	8,632	81,300	17,264	150,444	54.0	11.5
Other Seines	148,133	28,469	1,333,197	256,217	1,767,286	75.4	14.5
Other Trawls	12,873	27,159	90,109	81,478	179,240	50.3	45.5
Otter Trawls	407,198	168,916	4,071,983	1,689,163	5,858,347	69.5	28.8
Pots and Traps, Lobster	62,870		628,697		641,516	98.0	
Pots and Traps	344,556	92,863	3,445,564	928,627	9,832,402	35.0	9.4
Pound Nets	145,258	17,837	1,452,583	142,693	1,595,876	91.0	8.9
Rakes		7,817		31,267	75,343		41.5

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-14 Species Landed by New York State-only Permitted Vessels during 2009-2018 in Statistical Areas 611 and 613

Species	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% Pounds Landed out of Total New York State Waters, by Species	
	Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613		611	613
Scup	403,200	26,799	4,032,000	267,988	4,343,179	92.8	6.2
Menhadens	390,071	49,861	3,510,635	498,614	5,727,713	61.3	8.7
Bluefish	276,531	89,047	2,765,306	890,466	3,847,249	71.9	23.1
Bass, Striped	216,413	323,893	2,164,129	3,238,933	5,959,928	36.3	54.3
Lobster, American	202,433	34,636	2,024,332	242,449	2,589,209	78.2	9.4
Flounder, Summer	127,173	24,549	1,271,728	245,492	1,703,933	74.6	14.4
Whelk - Family	123,769	3,562	1,237,685	28,493	1,344,794	92.0	2.1
Crab, Horseshoe	114,738	97,782	1,147,379	977,816	4,063,670	28.2	24.1
Clam, Soft	101,912	15,194	713,387	106,355			
Conch - Family	79,180	320	79,180	320	79,500	99.6	0.4
Whelk, Channeled	66,219	13,546	662,186	108,367	1,021,185	64.8	10.6
Butterfish	56,686	4,402	566,862	44,022	621,550	91.2	7.1
Bass, Black Sea	51,225	11,779	512,250	117,788	671,627	76.3	17.5
Tautog	46,869	1,761	468,685	17,607	680,481	68.9	2.6
Scallop, Bay	30,858	4,927	308,578	44,344	352,981	87.4	12.6
Dogfish, Smooth	22,680	5,648	226,803	56,484	293,642	77.2	19.2
Squid, Longfin Loligo	20,892	105,061	208,918	945,545	1,156,323	18.1	81.8
Herring, Atlantic	11,874	7,152	118,736	35,761	158,697	74.8	22.5
Searobins, North American	10,538	2,832	73,769	19,824	94,961	77.7	20.9
Crabs, Hermit, Pagurus (Genus)	8,995	1,980	35,981	5,941	59,821	60.1	9.9
Crabs, Spider	8,224	3,471	57,567	20,824	176,411	32.6	11.8
Weakfish	7,991	6,678	79,906	66,778	157,927	50.6	42.3
Windowpane	6,895	2,475	68,950	24,747	94,562	72.9	26.2
Crab, Atlantic Rock	6,329	1,601	56,960	8,006	291,367	19.5	2.7
Surfclam, Atlantic	6,282	768,913	12,563	4,613,477	22,139,355	0.1	20.8
Searobins	6,089	187	54,803	1,123	56,563	96.9	2.0
Silversides, Atherinidae (Family)	5,995	4,638	35,968	41,741	185,827	19.4	22.5
Crab, Blue	5,931	17,595	59,306	175,953	4,065,251	1.5	4.3
Skates, Raja (Genus)	5,516	23,667	55,156	213,006	268,170	20.6	79.4
Crab, Green	5,319	6,368	31,913	50,942	510,966	6.2	10.0
Whelk, Knobbed	4,864	1,498	48,640	7,491	59,150	82.2	12.7
Perch, White	4,003	432	36,024	4,324	40,377	89.2	10.7
Skates, Rajidae (Family)	3,848	33,125	38,475	298,127	336,795	11.4	88.5
Spot	3,816	931	34,345	8,375	43,716	78.6	19.2
Eel, American	3,549	4,208	35,490	42,078	212,649	16.7	19.8
Crab, Jonah	2,775	24,882	16,647	223,937	1,086,936	1.5	20.6
Mussel, Sea	2,038	3,051	14,267	21,356	38,373	37.2	55.7
Flounder, Winter	1,821	2,374	18,212	23,740	44,782	40.7	53.0
Flounder, American Plaice	1,079	405	10,790	2,832	13,622	79.2	20.8
Puffer, Northern	995	266	7,962	2,663	15,780	50.5	16.9
Clam Atlantic Razor	989	17,646	4,946	123,523	3,525,195	0.1	3.5

Species	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% Pounds Landed out of Total New York State Waters, by Species	
	Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613		611	613
Mackerel, Atlantic	871	768	6,965	5,373	13,707	50.8	39.2
Goosefish	864	8,257	7,780	82,568	90,452	8.6	91.3
Silverside, Atlantic	698	1,448	4,883	8,690	20,963	23.3	41.5
Jack, Crevalle	619	91	5,570	548	6,118	91.0	9.0
Crab, Lady	607		1,821		10,073	18.1	
Tuna, Little Tunny	570	971	4,560	8,739	13,847	32.9	63.1
Tuna, Albacore	557	1,173	3,897	5,867	10,496	37.1	55.9
Bonito, Atlantic	402	1,155	4,021	9,243	13,365	30.1	69.2
Shad, Hickory	400	642	3,196	6,421	9,618	33.2	66.8
Kingfish, Northern	387	400	3,485	3,196	7,301	47.7	43.8
Whelk, Waved	357		2,497		46,447	5.4	
Mackerel, Spanish	354	251	3,536	2,515	7,065	50.0	35.6
Hake, Red	292	833	2,920	8,326	17,764	16.4	46.9
Tuna, Skipjack	240		2,163		2,175	99.4	
Dogfish, Spiny	218	1,877	1,306	16,892	30,474	4.3	55.4
Toadfish, Oyster	206		1,850		1,968	94.0	
Herring, Blueback	195		780		5,460	14.3	
Squid, Shortfin Illex	190		1,141		1,205	94.7	
Triggerfishes	190	172	1,901	1,550	4,155	45.7	37.3
Shad, Gizzard	139		1,253		1,545	81.1	
Amberjacks	122		854		855	99.9	
Shrimps, Mantis	121		1,088		1,088	100.0	
Shad, American	120	474	838	3,791	10,355	8.1	36.6
Four spot Flounder, American	118		705		1,663	42.4	
Cod, Atlantic	114	558	916	5,581	8,172	11.2	68.3
Cunner	97	20	778	121	913	85.2	13.3
Mackerel, Atlantic Chub	96	4	288	11	299	96.3	3.7
Drum, Black	96	42	862	250	1,112	77.5	22.5
Cobia	94	28	658	85	767	85.8	11.1
Mackerel, King	70	8	417	34	456	91.5	7.4
Searobin, Northern	63	473	125	473	598	20.9	79.1
Herrings	53	111	106	221	327	32.4	67.6
Garfishes	53	5	423	18	441	95.9	4.1
Snappers, Lutjanidae (Family)	51		204		205	99.5	
Sculpins	44		131		131	100.0	
Hake, White	42		250		388	64.4	
Hake, Silver	35	613	242	5,516	8,135	3.0	67.8
Runner, Blue	25		101		101	100.0	
Croaker, Atlantic	23	27	181	165	655	27.7	25.1
Raven, Sea	22		110		110	100.0	
Pompano, Florida	18		53		56	94.6	
Eel, Conger	13		94		276	34.0	
Pollock	12		24		323	7.4	

Species	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% Pounds Landed out of Total New York State Waters, by Species	
	Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613		611	613
Ladyfish	10		41		46	89.1	
Mullets	6		31		55	56.4	
Toadfishes, Batrachoididae (Family)	6		18		18	100.0	
Spadefish, Atlantic	5		21		23	91.3	
Kingfishes	2		6		159	3.8	
Ark, Blood		870		2,610	6,395		40.8
Clam, Northern Quahog		53,201		425,608	10,696,504		4.0
Flounder, Yellowtail		208		831	831		100.0
Oyster, Eastern		7,446		52,125			
Pitar		2,791		13,953	13,953		100.0
Puffers, Tetraodontidae (Family)		30		61	401		15.1
Shark, Thresher		203		1,014	5,693		17.8

Source: ACCSP, 2019.
Notes:
Values reflect average pounds landed by species and by statistical subarea.
Confidential information was redacted from the requested data set.
Species are sorted by average pounds caught each year in statistical subarea 611.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-15 Landing Ports Used by New York State-only Permitted Vessels during 2009-2018 in Statistical Areas 611 and 613

Landing Port	Average Pounds Landed per Year by Subarea (2009-2018)		Total number of Active Fishing Permits		Total Pounds Landed by Subarea (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% of Total Catch from New York State Waters, by Port	
	Statistical Areas		Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613	611	613		611	613
Amagansett	98,953	12,561	35	24	989,528	125,612	1,115,432	88.7	11.3
Babylon		4,090		5		20,450	678,556		3.0
Bronx (Borough of New York)	17,748		2		53,244		53,813	98.9	
Bronx (County)	10,338		6		72,363		72,363	100.0	
Brooklyn (Borough of New York)	210		4		631		693,732	0.1	
Center Moriches		9,209		18		82,883	154,246		53.7
City Island	7,273		7		72,729		74,549	97.6	
East Hampton	242,505	9,361	49	27	2,425,047	93,607	2,518,784	96.3	3.7
East Moriches	390	26,458	3	28	1,171	264,577	334,774	0.3	79.0
Freeport	635	60,272	3	6	3,173	482,173	2,477,408	0.1	19.5
Glen Cove	3,477		9		34,770		37,440	92.9	
Greenport	192,106		47		1,921,063		1,923,573	99.9	
Hampton Bays	16,239	100,958	18	64	162,391	1,009,584	1,196,841	13.6	84.4
Huntington	10,456		13		94,101		94,186	99.9	
Islip		2,959		5		8,876	547,025		1.6
Mastic		523		4		1,047	1,068		98.0
Mattituck	271,813	18,735	53	10	2,718,130	187,349	2,942,341	92.4	6.4
Montauk	172,390	57,132	145	128	1,723,900	571,320	2,311,777	74.6	24.7
Moriches	3,060	82,883	16	77	21,422	828,826	1,066,133	2.0	77.7
Mount Sinai	131,071	1,341	45	6	1,310,709	10,724	1,328,395	98.7	0.8
Nassau (County)		12,604		2		63,021	687,651		9.2
New Suffolk	3,856	614	11	5	34,705	3,070	37,775	91.9	8.1
Northport	48,621		18		486,211		486,969	99.8	
Oceanside		620,485		8		2,481,939	2,992,157		82.9
Orient	22,633	473	41	3	226,328	1,419	228,303	99.1	0.6
Oyster Bay	4,523		7		45,232		45,232	100.0	
Patchogue	4,216	8,159	5	9	16,865	65,274	780,273	2.2	8.4
Port Jefferson	6,377		17		63,768		63,841	99.9	
Port Washington	23,214		8		185,714		186,224	99.7	
Queens (County)	22,231		11		222,311		1,049,840	21.2	
Riverhead	100,390	3,533	20	7	1,003,903	31,797	1,036,000	96.9	3.1
Sag Harbor	34,298		10		342,976		344,185	99.6	
Setauket	1,359		3		6,796		6,796	100.0	
Shelter Island	101,235	849	12	3	708,647	1,698	710,445	99.7	0.2
Shinnecock Indian Reservation	101,556	372,775	29	106	1,015,557	3,727,751	4,816,517	21.1	77.4
Smithtown	959		4		6,713		7,484	89.7	
South Jamesport	4,200		7		25,200		25,200	100.0	
Southampton	18,168	31,667	9	6	54,503	63,335	120,094	45.4	52.7
Southold	22,343	5,251	28	4	223,426	21,006	276,423	80.8	7.6
Springs	25,956		3		51,912		54,055	96.0	
Stony Brook	9,143		19		91,425		92,458	98.9	

Landing Port	Average Pounds Landed per Year by Subarea (2009-2018)		Total number of Active Fishing Permits		Total Pounds Landed by Subarea (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% of Total Catch from New York State Waters, by Port	
	Statistical Areas		Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613	611	613		611	613
Suffolk (County)	38,018	4,757	7	11	380,181	23,784	496,486	76.6	4.8
Unknown	1,579,150	631,070	477	413	15,791,503	4,417,490	45,281,089	34.9	9.8
Wainscott	57,218		5		572,182		576,454	99.3	

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

2.2.7 Rhode Island State Vessel Trip Reports

The largest fishery by landings in Rhode Island state waters in statistical areas 538, 539, and 611 combined for the years 2009 to 2018 used pots and traps (792,343 pounds) and was concentrated in statistical area 539. Other top gear type categories by landings included other fixed nets (540,644 pounds), hook and line (401,508 pounds) and otter trawls (324,192 pounds). Landings for each gear type fished within statistical areas 538, 539, and 611 accounted for over 90% of the statewide landings for that gear type. Table 2.2-16 provides an overview of the gears used in Rhode Island state waters (ACCSP, 2019).

From 2009 to 2018, commercial fishermen permitted to fish in Rhode Island state waters landed many different species, including in order of highest landings from statistical areas 538, 539, and 611 combined by weight, scup (816,584 pounds), channeled whelk, (358,510), summer flounder (255,120 pounds), menhaden (250,306 pounds), and striped bass (135,556 pounds). A complete summary of all species landed in these statistical areas is provided in Table 2.2-17. The majority of species came from area 539, and the landings from the three statistical areas accounted for over 90 percent of the statewide landings for most species.

The top ports where fishermen landed their catch from fishing in all Rhode Island state waters were Point Judith, Little Compton, Newport, Bristol, and North Kingstown. Point Judith was the port with the highest average annual landings (680,126 pounds) and the largest number of active fishing permits (469 permits; Table 2.2-18).

Table 2.2-16 Categories of Gear Used by Rhode Island State-only Permitted Vessels during 2009-2018 in Statistical Areas 538, 539, and 611

Gear Category	Average Pounds Landed per Year (2009-2018) Statistical Areas			Total Pounds Landed (2009-2018) Statistical Areas			Total Pounds Landed in Rhode Island State Waters (2009-2018)	% Pounds Landed out of Total Rhode Island State Waters, by Gear Statistical Areas		
	538	539	611	538	539	611		538	539	611
By Hand, Diving Gear		5,345			42,759		44,209		96.7	
By Hand, No Diving Gear		45,760			366,078		366,559		99.9	
Dip Nets		7,866			62,925		64,272		97.9	
Dredge		130			520		520		100.0	
Gill Nets		202,887			1,623,097		1,635,066		99.3	
Hand Line		2,242			17,939		18,297		98.0	
Hook and Line	359	388,116	13,033	1,795	3,881,157	117,301	4,013,013	<0.1	96.7	2.9
Long Lines		1,880			13,158		13,177		99.9	
Other Fixed Nets		540,644			4,325,156		4,325,177		100.0	
Other Trawls		32,655			195,930		195,930		100.0	
Otter Trawls		324,192			2,593,534		2,600,214		99.7	
Pots and Traps, Lobster		58,494	2,413		526,445	19,302	546,357		96.4	3.5
Pots and Traps, Other		14,249			128,238		128,274		100.0	
Pots and Traps		757,048	35,295		6,813,434	317,659	7,138,933		95.4	4.4
Rakes		4,629			32,405		32,428		99.9	
Spears		3,217			25,735		26,095		98.6	

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-17 Species Landed by Rhode Island State-only Permitted Vessels during 2009-2018 in Statistical Areas 538, 539, and 611

	Average Pounds Landed per Year (2009-2018)			Total Pounds Landed (2009-2018)			Total Pounds Landed in Rhode Island State Waters (2009-2018)	% Pounds Landed out of Total Rhode Island State Waters, by Species		
	Statistical Areas			Statistical Areas				Statistical Areas		
Species	538	539	611	538	539	611		538	539	611
Scup		781,887	34,697		7,818,873	312,277	8,135,213		96.1	3.8
Whelk, Channeled		354,286	4,224		3,188,578	16,895	3,209,786		99.3	0.5
Menhadens		250,306			2,002,448		2,219,066		90.2	
Flounder, Summer		248,476	6,644		2,236,288	59,793	2,298,164		97.3	2.6
Skates, Rajidae (Family)		134,682			1,077,456		1,077,613		100.0	
Bass, Striped	448	132,481	2,627	1,790	1,192,327	21,018	1,218,776	0.1	97.8	1.7
Bass, Black Sea		97,625	2,360		781,003	21,242	803,422		97.2	2.6
Searobins		57,726	6		461,807	23	461,843		100.0	<0.1
Bluefish	38	47,408	218	115	379,263	1,523	388,506	<0.1	97.6	0.4
Conch - Family		45,035			225,176		225,199		100.0	
Crab, Horseshoe		40,325			322,601		815,188		39.6	
Lobster, American		37,259	2,238		335,327	17,904	353,841		94.8	5.1
Butterfish		34,970			279,760		279,966		99.9	
Squid, Longfin Loligo		33,490			267,923		268,256		99.9	
Tautog		32,624	569		260,990	4,552	266,886		97.8	1.7
Crab, Atlantic Rock		23,549			211,937		211,973		100.0	
Whelk, Knobbed		20,613			144,292		144,702		99.7	
Skate, Little		16,229			113,600		113,600		100.0	
Tuna, Little Tunny		13,353			93,473		94,710		98.7	
Crab, Green		12,834			102,668		102,668		100.0	
Herring, Atlantic		12,628			88,394		88,394		100.0	
Eel, Conger		7,823			62,583		62,710		99.8	
Crab, Jonah		7,590			60,716		60,716		100.0	
Shrimps, Mantis		6,798			27,190		30,827		88.2	
Flounder, Winter		6,692			53,535		53,556		100.0	
Bonito, Atlantic		6,303			50,422		50,634		99.6	
Quahog, Ocean		5,708			17,124		17,124		100.0	
Dogfish, Spiny		5,179			41,435		41,435		100.0	
Cod, Atlantic		4,864			38,916		38,977		99.8	
Dogfish, Smooth		4,529			36,232		37,040		97.8	
Shad, Hickory		4,298			12,893		12,893		100.0	
Eel, American		3,708			29,666		30,000		98.9	
Hake, Silver		2,973			23,784		23,784		100.0	
Triggerfish, Gray		2,613			20,904		20,910		100.0	
Crustaceans		2,163			4,325		4,325		100.0	
Clam, Northern Quahog		2,140			10,698		10,698		100.0	
Goosefish		2,090			16,722		16,722		100.0	
Hake, Red		1,701			13,610		13,610		100.0	
Skate, Winter		1,691			13,526		13,526		100.0	
Triggerfishes		1,663			13,301		13,307		100.0	
Mackerel, Atlantic		1,568			12,545		12,545		100.0	

Species	Average Pounds Landed per Year (2009-2018)			Total Pounds Landed (2009-2018)			Total Pounds Landed in Rhode Island State Waters (2009-2018)	% Pounds Landed out of Total Rhode Island State Waters, by Species		
	Statistical Areas			Statistical Areas				Statistical Areas		
	538	539	611	538	539	611		538	539	611
Searobin, Striped		1,415			7,077		7,077		100.0	
Crabs, Spider		1,393			5,573		5,573		100.0	
Mollusks		1,378			2,756		2,755		100.0	
Tuna, Yellowfin		1,318			10,543		14,358		73.4	
Spot		904			2,711		2,711		100.0	
Weakfish		757			6,055		6,135		98.7	
Crabs, Brachyura		710			2,841		2,841		100.0	
Searobin, Northern		578			2,888		2,888		100.0	
Hake, White		514			3,084		3,084		100.0	
Cunner		449	6		3,590	18	3,710		96.8	0.5
Tuna, Bigeye		441			2,646		4,480		59.1	
Squid, Shortfin Illex		338			2,367		2,367		100.0	
Clam, Soft		326			1,631		1,631		100.0	
Oyster, Eastern		274			547		547		100.0	
Cobia		206			1,651		1,651		100.0	
Windowpane		205			1,638		1,638		100.0	
Kingfish, Northern		198			1,587		1,587		100.0	
Skate, Big		187			1,124		1,124		100.0	
Shark, Sandbar		180			541		541		100.0	
Dolphinfish		178			1,066		1,377		77.4	
Raven, Sea		166			1,330		1,401		94.9	
Crab, Blue		148			738		738		100.0	
Tuna, Bluefin		144			866		2,066		41.9	
Tuna, Albacore		139			836		943		88.7	
Mullet, Striped		119			119		119		100.0	
Grouper, Yellowedge		83			83		83		100.0	
Snapper, Gray		77			153		153		100.0	
Amberjacks		73			219		219		100.0	
Flounder, Southern		55			111		111		100.0	
Flounder, American Plaice		43			85		85		100.0	
Shad, American		37			223		223		100.0	
Kingfishes		33			132		132		100.0	
Hakes, Red and White		25			126		126		100.0	
Flounder, Yellowtail		23			163		163		100.0	
Pollock		13			26		26		100.0	
Runner, Blue		5			16		16		100.0	

Source: ACCSP, 2019.
Notes:
Values reflect average pounds landed by species and by statistical subarea.
Confidential information was redacted from the requested data set.
Species are sorted by average pounds caught each year in statistical subarea 539.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-18 Landing Ports Used by Rhode Island State-only Permitted Vessels during 2009-2018 in Statistical Areas 538, 539, and 611

	Average Pounds Landed per Year by Subarea (2009-2018)			Total number of Active Fishing Permits			Total Pounds Landed by Subarea (2009-2018)			Total Pounds Landed in Rhode Island State Waters (2009-2018)	% of Total Catch from Rhode Island State Waters, by Port		
	Statistical Areas			Statistical Areas			Statistical Areas				Statistical Areas		
Landing Port	538	539	611	538	539	611	538	539	611		538	539	611
Barrington		5,251			12			42,005		42,005		100.0	
Bristol		196,716			61			1,573,730		1,576,268		99.8	
Bristol (County)		329			5			987		987		100.0	
Charlestown		26,190	806		38	3		209,519	6,450	216,077		97.0	3.0
Davisville		248			6			1,240		1,240		100.0	
East Greenwich		7,056			35			56,447		56,470		100.0	
Jamestown		24,367			32			194,932		194,932		100.0	
Little Compton		605,416			51			4,843,330		4,854,883		99.8	
Middletown		2,183			3			10,914		10,914		100.0	
Narragansett (census name Narragansett Pier)		381			6			1,144		1,392		82.2	
New Shoreham		2,170			9			17,362		17,362		100.0	
Newport		426,256			80			3,836,305		4,017,574		95.5	
Newport (County) (in PMSA 2480,6480)		11,869			4			59,347		59,445		99.8	
North Kingstown (local name Wickford)		145,080			97			1,160,644		1,167,684		99.4	
Point Judith	128	672,982	7,016	3	459	7	128	6,056,834	42,098	6,103,311	<0.1	99.2	0.7
Portsmouth		82,392			37			659,140		668,046		98.7	
Providence		27,182			13			244,640		244,818		99.9	
Providence (County) (in PMSA 6060,6480)		2,289			10			13,735		13,735		100.0	
South Kingstown (Town of)		19,535			69			156,279		156,422		99.9	
Tiverton		106,842			49			854,738		854,770		100.0	
Unknown		35,798	1,884		64	4		322,183	5,652	327,847		98.3	1.7
Wakefield		3,306			21			26,446		26,446		100.0	
Warren		26,374			38			210,993		211,061		100.0	
Warwick (RR name Apponaug)		144,786			97			1,158,290		1,158,563		100.0	
Westerly (census name Westerly Center)		57,985	55,330		78	29		463,884	442,639	906,523		51.2	48.8

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

2.2.8 Marine Recreational Information Program (MRIP)

The MRIP integrates a coast-wide intercept survey throughout the year to estimate recreational fishing effort. The following section presents data provided by NOAA Fisheries through a custom data request and data accessed from the MRIP online data portal (NOAA Fisheries, 2019b). The effort and catch data from Connecticut, Massachusetts, New York, and Rhode Island comprise all of the states of origin identified for recreational anglers, accessed from a custom request and the online MRIP data portal. MRIP data indicated that recreational fishing effort seasonally increased in frequency from March through August, reaching its peak intensity by shore (e.g., surfcasting) and in both federal and state waters by private or for-hire/charter vessel in July and August (Figure 2.2-22).

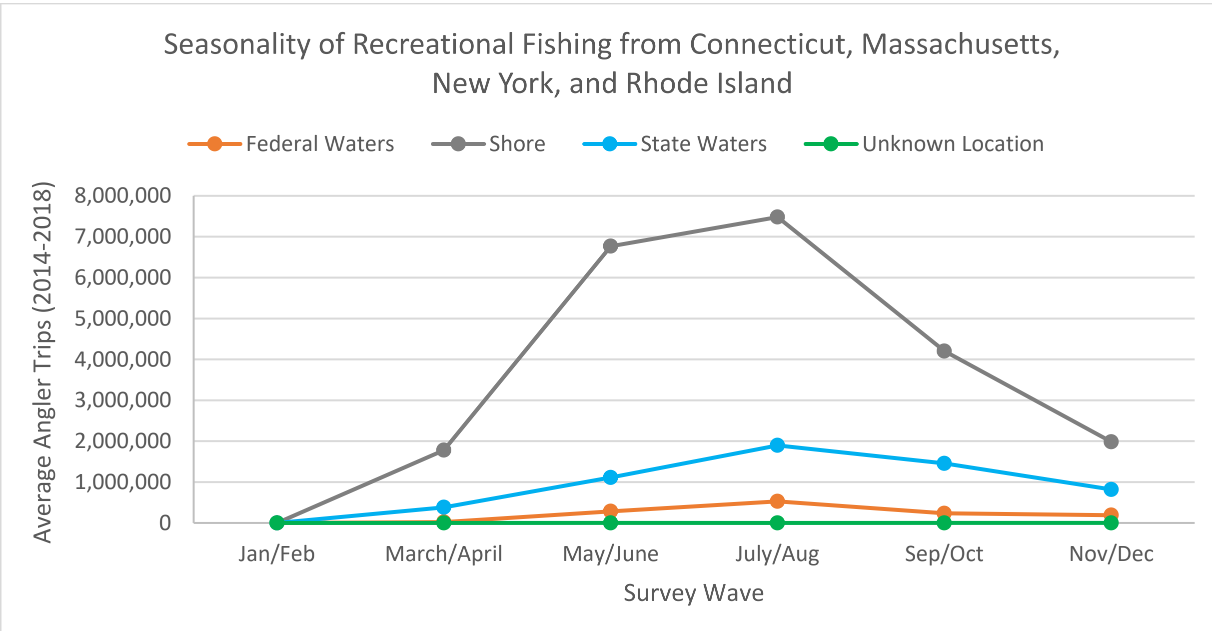

Figure 2.2-22 Average of Estimated Fishing Effort by Recreational Anglers for the Years 2014 to 2018 in Connecticut, Massachusetts, New York, and Rhode Island

Notes: Angler-trip survey data includes trips where fishing location is not recorded, noted as "unknown location" in the figure.
State waters includes water from shore to 3 miles (4.8 kilometers, 2.6 nautical miles); federal waters include waters greater than 3 miles (4.8 kilometers, 2.6 nautical miles) from shore.
Source: NOAA Fisheries, 2019b.

MRIP data were used to estimate relative angler effort for those states with coastlines relatively close to the RWF. Angler effort was categorized by mode (for-hire or charter, private, shore) and by location (federal waters, state waters, and shoreside). There was no spatial information associated with MRIP data; thus, there was no way to determine where fishing trips took place in state or federal waters. These values, therefore, were meant to provide a qualitative overview of angler effort and seasonal changes in activity.

The MRIP survey methods were designed to estimate recreational fishing effort aggregated at the state and regional level. For this reason, the standard error for estimates disaggregated to smaller units than the state level (i.e., county) was very high and indicates weak estimates for fishing activity.

Based on estimates of recreational angler effort disaggregated to the state level, New York state had the greatest average estimated number of angler trips each year (about 14.9 million) for the years 2014 to 2018, most of which visited New York state waters (Table 2.2-19). Of the recreational trips out of New York state that visited New York state waters, 41 percent used private fishing vessels, and 57 percent were shoreside fishing trips (Table 2.2-20).

Of the approximately 7.6 million recreational fishing trips leaving from Massachusetts for the years 2014-2018 (Table 2.2-19), most trips were to fish in Massachusetts state waters. Of the trips to Massachusetts state waters leaving from Massachusetts, 39 percent were on a private fishing vessel, and 59 percent were shoreside fishing trips (Table 2.2-20). Out of approximately 3.8 million recreational fishing trips leaving from Connecticut during this period, the vast majority of trips were to fish in Connecticut state waters (Table 2.2-19). Of the trips to Connecticut state waters leaving from Connecticut, 39 percent were on a private fishing vessel, and 59 percent were shoreside fishing trips (Table 2.2-20). Connecticut recreational fishermen mostly remained in Connecticut state waters for recreational fishing trips.

Out of the nearly 2.9 million recreational fishing trips leaving from Rhode Island, most of the trips were to fish in Rhode Island state waters (Table 2.2-19), with 32 percent of these trips on a private fishing vessel and 67 percent as shoreside fishing trips. For Massachusetts, New York, Connecticut, and Rhode Island, the majority of trips to federal waters were on private vessels, as opposed to charter vessels.

Table 2.2-19 Average Annual Fishing Effort for Recreational Fishing by Mode (Charter Vessel, Private, and Shore Fishing) and by Fishing Area based on MRIP Data (2014-2018)

State	Fishing Area	Average Fishing Effort (Value/5 years)			
		Charter	Private	Shore	Total
Connecticut					
	Federal	4,670	28,693	-	33,364
	State	45,389	1,502,689	2,257,479	3,805,557
	Unknown	-	-	-	-
Connecticut Totals		50,059	1,531,382	2,257,479	3,838,920
Massachusetts					
	Federal	48,612	387,804	-	436,416
	State	111,956	2,790,270	4,224,112	7,126,337
	Unknown	125	-	-	125
Massachusetts Totals		160,693	3,178,074	4,224,112	7,562,879
New York					
	Federal	71,834	609,818	-	681,652
	State	295,414	5,749,305	8,136,501	14,181,220
	Unknown	26	-	-	26
New York Totals		367,274	6,359,123	8,136,501	14,862,898
Rhode Island					
	Federal	12,561	96,011	-	108,572
	State	32,786	892,361	1,836,805	2,761,952
	Unknown	327	-	-	327
Rhode Island Totals		45,674	988,372	1,836,805	2,870,851

Source: NOAA Fisheries, 2019b
Notes:

Unknown location indicates missing data in trip report.

Trips to federal waters cannot take place onshore; therefore, the table cells are marked with “-" because there is no number of trips available.

Trips to state waters include trips that take place onshore, and in charter or private fishing vessels.

Charter boats include party boat and charter boat trips.

Federal waters include waters greater than 3 miles [4.8 kilometers, 2.6 nautical miles]) from shore, state waters include trips that take place inland (onshore and inshore bodies of saltwater or brackish water) and in water less than 3 miles [4.8 kilometers, 2.6 nautical miles] from shore.

Table 2.2-20 Percent of Average Annual Fishing Effort by Mode and Fishing Area, Out of State Totals based on MRIP Data (2014-2018)

State	Fishing Area	% of Total State Angler Trips (based on average values)		
		Charter	Private	Shore
Connecticut				
	Federal	14	86	0
	State	1	39	59
	Unknown	0	0	0
Connecticut Totals		1	40	59
Massachusetts				
	Federal	11	89	0
	State	2	39	59
	Unknown	100	0	0
Massachusetts Totals		2	42	56
New York				
	Federal	11	89	0
	State	2	41	57
	Unknown	100	0	0
New York Totals		2	43	55
Rhode Island				
	Federal	12	88	0
	State	1	32	67
	Unknown	100	0	0
Rhode Island Totals		2	34	64

Source: NOAA Fisheries, 2019b
Notes:
Unknown location indicates missing data in trip report.
Trips to federal waters cannot take place onshore; therefore, shore trips comprise 0% of all trips to federal waters.
Trips to state waters include trips that take place onshore, and in charter or private fishing vessels.
Charter boats include party boat and charter boat trips.
Federal waters include waters greater than 3 miles [4.8 kilometers, 2.6 nautical miles]) from shore, state waters include trips that take place inland (onshore and inshore bodies of saltwater or brackish water) and in water less than 3 miles [4.8 kilometers, 2.6 nautical miles] from shore.

2.2.9 Aquaculture

Aquaculture sites in the area of interest occur along the Rhode Island shoreline, Block Island, and throughout Narragansett Bay (Figure 2.2-23). The proposed RWEC cable corridor is within the geographic range of aquaculture sites depicted in Figure 2.2-24. The RWEC fisheries study corridor to Quonset Point in North Kingstown, Rhode Island overlaps several aquaculture sites in Narragansett Bay; however, the RWEC centerline does not intersect any of these sites (Figure 2.2-24). The closest aquaculture site to the RWEC centerline is located on Conanicut Island, approximately 425 m from the centerline (Figure 2.2-24).

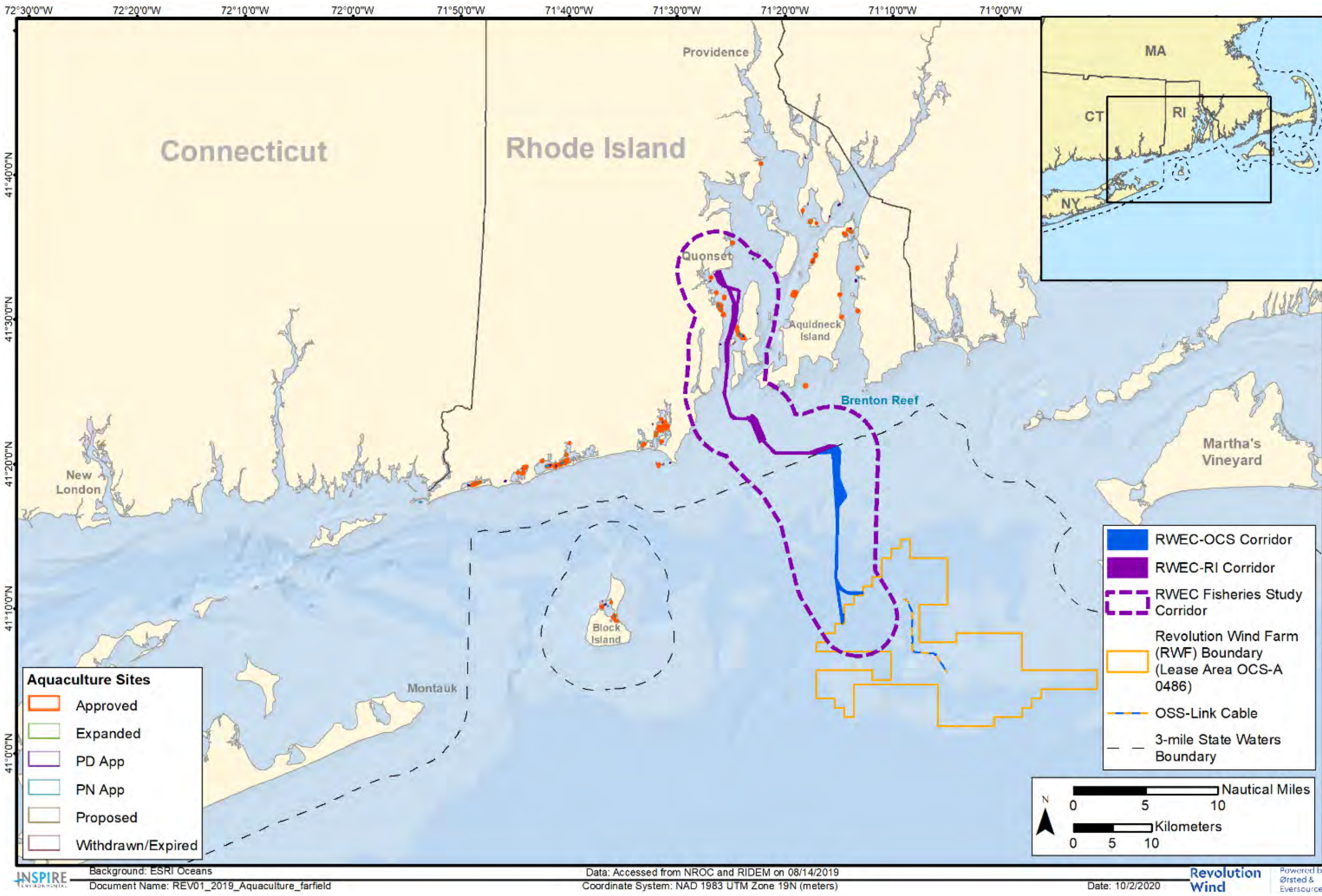

Figure 2.2-23 Map of the OCS-A-0486 Lease Area, Proposed RWEC Corridor, Fisheries Study Corridor, and Aquaculture Sites

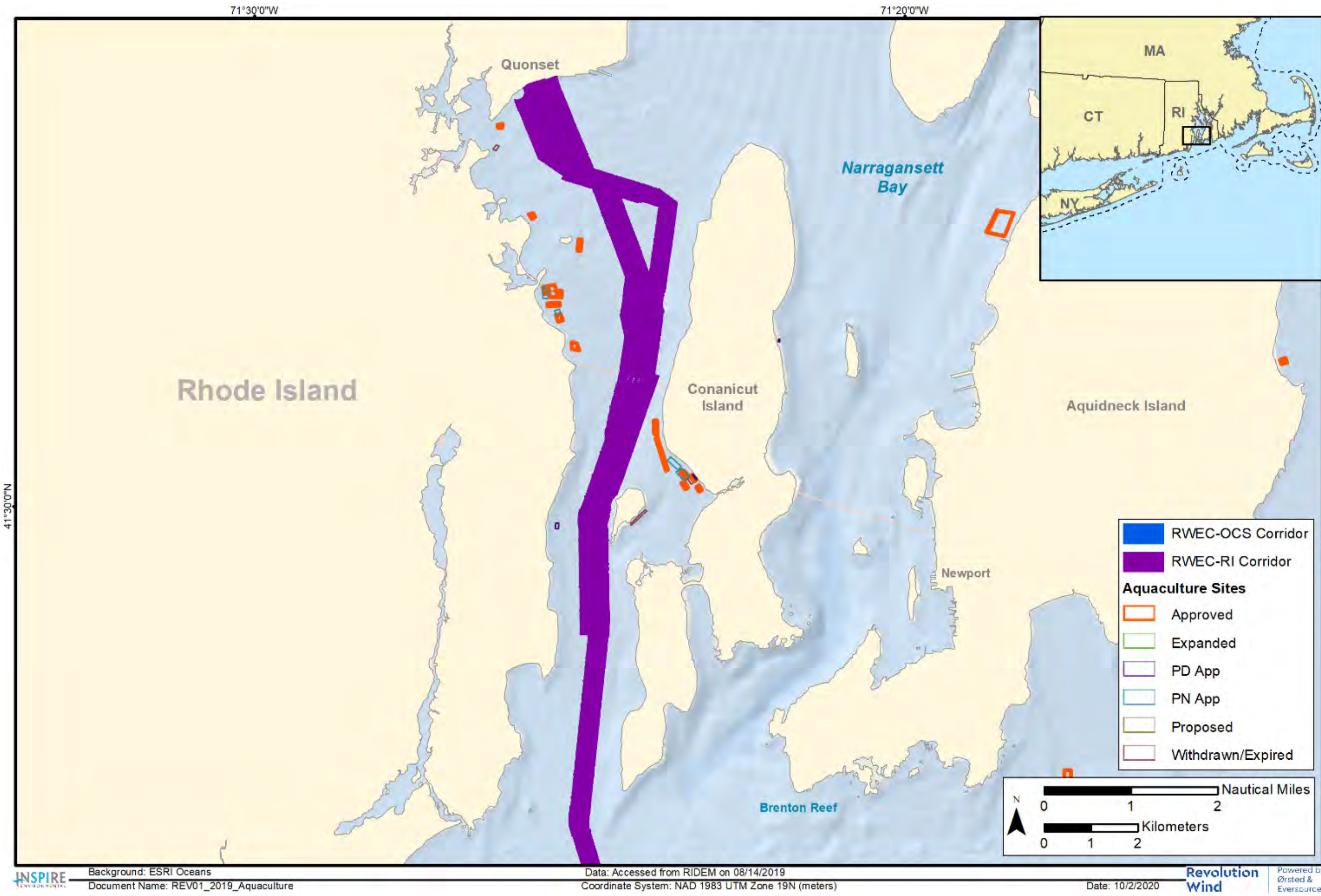

Figure 2.2-24 Map of Proposed RWEC Corridor and the Location of Aquaculture Sites in Narragansett Bay

2.3 Summary

Multiple data sources were used to assess commercial and recreational fisheries activity in the RWF and RWEC fisheries study corridor. Federal (VTR and VMS), state VTR, MRIP, and aquaculture data sources allowed an evaluation of the relative intensity of these fisheries, along with their economic value in the area. Fisheries activities are summarized separately below for the RWF and RWEC fisheries study corridor and by data source. For the VMS data, the highest fishing density category reported for any year analyzed is used in this summary and it should be noted that only the intensity level is summarized, not spatial coverage.

Federal VTR - RWF

- The top fisheries in terms of revenue used bottom trawl, pot, sink gillnet, and dredge.
- In terms of pounds landed, the top gears by revenue were the bottom trawl, sink gillnet, and mid-water trawl.
- The top species in terms of revenue were lobster, flounders, hakes, Atlantic herring, scup, squid, black sea bass, and channeled whelk.
- The top species in terms of pounds landed were Atlantic herring, Atlantic mackerel, and hakes.
- In order of descending percent of total state landings from the RWF, Rhode Island (1.14%), Massachusetts (0.30%), New York (0.08%), and Connecticut (0.08%) had vessels with fishing activity in the RWF.

Federal VTR - RWEC Fisheries Study Corridor

- The top fisheries in terms of revenue used bottom trawl, mid-water trawl, pot, and sink gillnet.
- In terms of pounds landed, the top gears by revenue were the mid-water trawl, bottom trawl, sink gillnet, and pot.
- The top species in terms of revenue were Atlantic herring, lobster, squid, flounders, scup, butterfish, hakes, black sea bass, and spiny dogfish.
- The top species in terms of pounds landed were Atlantic herring, scup, squid, spiny dogfish, hakes, and Atlantic mackerel.
- In order of descending percent of total state landings from the RWEC, Rhode Island (3.53%), Massachusetts (1.18%), and Maine (0.06%) had vessels with fishing activity in the RWF fisheries study corridor.

Federal VMS - RWF

- Fisheries that had the most activity in the RWF were Atlantic herring, surfclam/ocean quahog, sea scallop, squid/mackerel/butterfish, monkfish, and groundfish (large-mesh multispecies or northeast multispecies FMPs).
- Very-high or high-density fishing activity was reported for groundfish, pelagic species (herring/mackerel/squid), monkfish, surfclam/ocean quahog, sea scallops, and squid.
- Medium-high density fishing activity was reported for Atlantic herring.

Federal VMS - RWEC Fisheries Study Corridor

- Fisheries that had the most activity in the RWEC fisheries study corridor were Atlantic herring, surfclam/ocean quahog, sea scallop, squid/mackerel/butterfish, monkfish, and groundfish (large-mesh multispecies or northeast multispecies FMPs).
- Very-high or high-density fishing activity occurred within the RWEC fisheries study corridor for groundfish, Atlantic herring, pelagic species (herring/mackerel/squid), monkfish, squid.
- Medium-low to low density fishing activity was reported for surfclam/ocean quahog, sea scallops.

VTR Data as Rasters - RWF

- Relatively moderate-revenue fish activity occurred in the RWF for monkfish and surfclam/quahog.
- Relatively low-revenue fishing activity occurred in the RWF for groundfish, Atlantic herring, pelagics (midwater trawl), sea scallops, and lobsters.

VTR Data as Rasters - RWEC Fisheries Study Corridor

- Relatively high-revenue fishing activity within the RWEC fisheries study corridor occurred for Atlantic herring and pelagic species (midwater trawl),
- Relatively moderate- to low-revenue fishing activity occurred for lobsters along the RWEC fisheries study corridor.
- No revenue generating fishing activity within the RWEC fisheries study corridor was recorded for groundfish, monkfish, surfclam/quahog, or sea scallops.

State VTRs

Connecticut

- The top gear types by pounds landed were pots and traps, otter trawls, and lobster pots and traps.

- The top species by average annual pounds landed were conch, menhaden, lobster, scup, horseshoe crabs, summer flounder, and American shad.
- The top ports by pounds landed were Stonington, Old Saybrook, New London, Guilford, and Clinton.

Massachusetts

- The top gear types by pounds landed were pots and traps, hook and line, and lobster pots and traps.
- The top gear species by average annual pounds landed were brachyuran crabs, channeled whelk, northern quahog clam, scup, striped bass, bay scallop, black sea bass, whelk, horseshoe crab, eastern oysters, and soft clams.
- The top ports by landed by state-only, permitted vessels were New Bedford, Chatham, Edgartown, Falmouth, and Westport.

New York

- The top gear types by pounds landed were otter trawls, other fixed nets, gill nets, and pots and traps.
- The top species by average annual pounds landed were striped bass, menhaden, scup, bluefish, lobster, horseshoe crab, and summer flounder.
- The top ports by pounds landed were Oceanside, Shinnecock Indian Reservation, Mattituck, East Hampton, and Greenport.

Rhode Island

- The top gear types by pounds landed were pots and traps, fixed nets, hook and line, and otter trawls.
- The top gear species by average annual pounds landed were scup, channeled whelk, summer flounder, menhaden, and striped bass.
- The top ports by pounds landed were Point Judith, Little Compton, Newport, Bristol, and North Kingstown.

MRIP

- Recreational fishing effort seasonally increased in frequency from March through August, reaching its peak intensity by shore (i.e., fishing from shore such as surfcasting) and in both federal and state waters by private and for-hire/charter vessels in July and August.
- For all states surveyed (Connecticut, Massachusetts, New York, Rhode Island), most recreational fishing occurred within the respective state waters.

Aquaculture

- Aquaculture sites occur along the Rhode Island shoreline, Block Island, and throughout Narragansett Bay. No known aquaculture sites are intersected by the proposed RWEC corridor. The closest aquaculture site to the RWEC centerline is located on Conanicut Island, approximately 425 m from the centerline.
- Oysters are the main species cultivated by the aquaculture industry.

3.0 ENVIRONMENTAL CONSEQUENCES AND PROTECTION MEASURES

Potential impacts are characterized as direct or indirect and whether they result from construction, operations and maintenance (O&M), and/or decommissioning of the Project. Anticipated impacts also are characterized as direct or indirect; or as short-term or long-term. Consistent with NEPA (40 C.F.R. § 1508.8.), evaluations in this COP consider both detrimental (or negative) and beneficial impacts of the Project.

- *Direct or Indirect*: Direct effects are those occurring at the same place and time as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity.

- *Short-term or Long-term Impacts:* Short- or long-term impacts do not refer to any defined period. In general, short-term impacts are those that occur only for a limited period or only during the time required for construction activities. Impacts that are short-lived, such as noise from routine maintenance work during operations, may also be short-term if the activity is short in duration and the impact is restricted to a short, defined period. Long-term impacts are those that are likely to occur on a recurring or permanent basis or impacts from which a resource does not recover quickly. In general, direct impacts associated with construction and decommissioning are considered short-term because they will occur within the approximate 1-year construction phase. Indirect impacts are determined to be either short-term or long-term depending on if resource recovery may take several years. Impacts associated with O&M are considered long-term because they occur over the life of the Project (i.e., 25 years per the Lease but could be extended up to 35 years [see Section 3.5 of the COP]).

- *Proposed Environmental Protection Measures*: If measures are proposed to avoid or minimize potential impacts, the impact evaluation included consideration of these environmental protection measures.

Different impact-producing factors (IPFs) may result in varying levels of impact on commercial and recreational fisheries. IPFs that could commercial and recreational fisheries include seafloor disturbance, sediment suspension and deposition, habitat alteration, noise, traffic, visible structures, EMF, discharges and releases, and trash and debris.

3.1 Impact Assessment

Potential impacts are characterized as direct or indirect and as short-term or long-term. Different impact-producing factors (IPFs) may result in varying levels of impact on commercial and recreational fisheries. IPFs that could impact commercial and recreational fisheries include seafloor disturbance, habitat alteration, sediment suspension and deposition, noise, traffic, EMF, visible structures, discharges and releases, and trash and debris. Impacts that affect fishing activity are considered to be direct impacts and impacts on commercial and recreational fisheries that are mediated by impacts on fishery resources (i.e., targeted finfish and invertebrate species) are considered indirect.

The analysis of impacts on commercial and recreational fisheries are discussed separately for the RWF and RWEC in the following sections. The IPFs are further subdivided into IPFs during the construction and decommissioning phases of the Project and the O&M phase of the Project. Potential impacts on fishery resources are discussed in more detail in the Finfish and Essential Fish Habitat (EFH) Assessment (INSPIRE Environmental, 2020). Potential impacts to navigation are discussed in the Navigation Safety Risk Assessment (NRSA) (DNV GL, 2020).

3.1.1 Revolution Wind Farm

IPFs resulting in potential impacts on commercial and recreational fisheries in the RWF area are described in Table 3.1-1 for the construction and decommissioning phases and in Table 3.1-2 for the O&M phase.

Table 3.1-1 IPFs and Characterizations of Potential Impacts on Commercial and Recreational Fisheries within the RWF during Construction and Decommissioning

Table 3.1-1			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
Seafloor Disturbance	Seafloor preparation	Direct, short-term Indirect, short-term	Direct Impacts: Seafloor preparation during construction is expected to result in short-term disruption of access to fishing areas for commercial and recreational fisheries. Fishing activity will be temporarily restricted in the immediate area of seafloor preparation operations due to a short-term 500-yard-radius safety zone established around construction operations, based on engagement with the USCG, USCG regulations (33 CFR § 147), as well as recent precedent set by an offshore renewable energy project constructed in the United States. It is expected that the USCG will also provide moving safety zones centered on cable laying vessels. Indirect Impacts: Indirect impacts on fisheries may occur as a result of the impacts of seafloor preparation on fishery resources. Impacts on fishery resources associated with seafloor preparation will primarily be associated with species that have benthic/demersal life stages and prefer the types of habitats that will be disturbed by seafloor preparation. These activities could cause injury or mortality to benthic/demersal species. Negative effects are expected to be short-term as the effects will cease after seafloor preparation are completed in a given area. Impacts on fishery resources that have pelagic early and/or later life stages are not expected, as pelagic habitats will not be directly affected by seafloor preparation. However, these species may temporarily vacate the area of disturbance. Decommissioning activities are expected to cause similar impacts as construction, but these impacts would be shorter in duration.
	Impact pile driving and/or vibratory pile driving/foundation installation	Direct, short-term Indirect, short-term	Direct Impacts: Impact pile driving and/or vibratory pile driving/foundation installation and/or associated scour protections (if necessary) will temporarily disrupt access to some fishing areas. Fishing activity will be temporarily restricted in the immediate area of seafloor preparation operations due to a short-term 500-yard safety zone established around construction operations. Indirect Impacts: Indirect impacts on commercial and recreational fisheries from impact pile driving and/or vibratory pile driving and foundation installation are similar to those discussed for seafloor preparation.
	RWF IAC and OSS-Link Cable installation	Direct, short-term Indirect, short-term	Direct Impacts: Direct impacts on commercial and recreational fisheries associated with the IAC and OSS-Link Cable installation are expected to result in similar negative impacts as those discussed for seafloor preparation, as the IAC will be installed in the same area that was disturbed during seafloor preparation. Decommissioning activities are expected to cause similar impacts as construction, but these impacts would be shorter in duration. Indirect Impacts: Indirect impacts on commercial and recreational fisheries associated with the IAC and OSS-Link Cable installation are expected to result in similar impacts as those discussed for seafloor preparation.
	Vessel anchoring (including spuds)	Direct, short-term Indirect, short-term	Direct Impacts: Direct impacts on commercial and recreational fisheries associated with vessel anchoring (including spuds) are similar to those discussed in seafloor preparation. Indirect Impacts: Indirect impacts on commercial and recreational fisheries associated with vessel anchoring (including spuds) are similar to those discussed in seafloor preparation, though lesser in spatial extent.

Habitat Alteration	Seafloor preparation Impact pile driving and/or vibratory pile driving/foundation installation RWF IAC and OSS-Link Cable installation Vessel anchoring (including spuds)	**Indirect, long-term**	Indirect Impacts: In areas of sediment disturbance and/or increased sedimentation, benthic habitat recovery and benthic infaunal and epifaunal species abundances may take up to 1 to 3 years to recover to pre-impact levels, based on the results of a number of studies on benthic recovery (e.g., AKRF, Inc. et al., 2012; Germano et al., 1994; Hirsch et al., 1978; Kenny and Rees, 1994). Recolonization rates of benthic habitats are driven by the benthic communities inhabiting the area surrounding the impacted region. Communities well adapted to disturbance within their habitats (e.g., sand sheets) are expected to quickly recolonize a disturbed area, while communities not well adapted to frequent disturbance (e.g., cobble and boulder habitats) may take upwards of a year to begin recolonization and several years to become substantially re-established to pre-disturbance levels. This recovery time would result in a long-term loss of productivity in the disturbed area and a subsequent indirect, long-term impact on commercial and recreational fisheries. During decommissioning, foundations and other facilities will be removed to a depth of 15 ft (4.6 m) below the mudline, unless otherwise authorized by BOEM (30 CFR § 585.910(a). Recovery from decommissioning activities is expected to be similar that experienced during seafloor preparation, resulting in an indirect, long-term impact on commercial and recreational fisheries.
Sediment Suspension and Deposition	Seafloor preparation Impact pile driving and/or vibratory pile driving/foundation installation RWF IAC and OSS-Link Cable installation Vessel anchoring (including spuds)	**Indirect, short-term**	Indirect Impacts: Seafloor-disturbing activities will result in temporary increases in sediment suspension and deposition and may result in indirect, short-term, limited impacts on fisheries due to impacts on fishery species that have preferred habitat in the RWF. As discussed in Section 4.3.3.2 of the COP, sediment transport modeling was conducted to evaluate the concentrations of suspended sediments, spatial extent and duration of sediment plumes, and the seafloor deposition resulting from cable burial activities. For the RWF IAC, a representative segment of 7,392 ft (2,253 m) of installation was simulated and the modeling results indicate that sediment plumes with total suspended solids (TSS) concentrations exceeding the ambient conditions by 100 mg/L could extend up to 853 feet (260 m) from the cable centerline. The plume is expected to be mostly contained within the bottom of the water column. The model estimated that the elevated TSS concentrations would be of short duration and expected to return to ambient conditions in less than 4.8 hours following the cessation of cable burial activities. The modeling results indicate that sedimentation from IAC burial may exceed 0.4 inch (10 mm) of deposition up to 197 feet (60 m) from the cable centerline and could cover up to 47 acres (190,202 m^2). Sediment suspension and deposition associated with decommissioning activities are expected to be similar, but slightly lower in magnitude. Increases in sediment suspension and deposition associated with construction/decommissioning may cause short-term, limited impacts on benthic species and species with limited mobility, and short-term impacts on pelagic species. Commercial fisheries that target species affected by sediment suspension and deposition may experience indirect, short-term impacts due to losses in productivity.
Noise	Impact pile driving and/or vibratory pile driving	**Indirect, short-term**	Indirect Impacts: Potential impacts on benthic and demersal species that are targeted by commercial and recreational fisheries may cause indirect, short-term impacts on the fisheries. Underwater noise can elicit avoidance behavior; therefore, fisheries targeting more mobile species may be affected. See Section 4.3.3.2 of the COP for a detailed discussion of potential noise impacts on fishery resources.
	Vessel noise, construction equipment noise, aircraft noise	**Indirect, short-term**	Indirect Impacts: Indirect, short-term impacts on commercial and recreational fisheries could occur due to avoidance behavior of fishery resources caused by vessel noise, construction and decommissioning equipment noise, and/or aircraft noise. Sounds created by mechanical/hydro-jet plows, vessels, or aircraft during construction and decommissioning are continuous or non-impulsive sounds, which have different characteristics underwater and impacts on marine life. The noise from mechanical/hydro-jet plows is expected to be masked by louder sounds from vessels. The duration of construction equipment and vessel noise at a given location will be short, as the installation vessel will only be present for a short period at any given location along the cable corridor. Underwater noise associated with helicopters is generally brief as compared with the duration of

			audibility in the air (Richardson et al., 1995). Because of this, impacts on fishery resources from aircraft noise are expected to be short-term. Impacts on fishery resources may result from a temporary degradation of habitat quality due to elevated noise levels. However, the noise generated by vessel and aircrafts will be similar to the range of noise from existing vessel and aircraft traffic in the region, and are not expected to substantially affect the existing underwater noise environment.
Discharges and Releases	Hazardous materials spills Wastewater discharge	**Direct, short-term** **Indirect, short-term**	Direct and Indirect Impacts: Routine discharges of wastewater (e.g., gray water or black water) or liquids (e.g., ballast, bilge, deck drainage, stormwater) may occur from vessels, WTGs, or the OSS during construction and decommissioning; however, those discharges and releases are not anticipated to have impacts because all vessel waste will be offloaded, stored, and disposed of in accordance with all applicable local, state and federal regulations. In addition, compliance with applicable Project-specific management practices and requirements will minimize the potential for negatively impacting water quality and marine life. The construction/decommissioning of the RWF is not anticipated to lead to any spills of hazardous materials into the marine environment. All vessels participating in the construction and decommissioning of the RWF will comply with USCG requirements for management of onboard fluids and fuels, including maintaining and implementing spill prevention, control, and countermeasure (SPCC) plans. Vessels will be navigated by trained, licensed vessel operators who will adhere to navigational rules and regulations and vessels will be equipped with spill handling materials adequate to control or clean up an accidental spill. Best management practices (BMPs) for fueling and power equipment servicing will be incorporated into the Project's Emergency Response Plan and Oil Spill Response Plan (ERP/OSRP). Accidental releases are minimized by containment and clean-up measures detailed in the OSRP. Given these measures and the very low likelihood of an inadvertent release, potential impacts of a hazardous material spill on commercial and recreational fisheries and fishery resources are not anticipated.
Marine Trash and Debris		**Direct, short-term**	Direct Impacts: Vessels will adhere to USCG and EPA regulations that require operators to develop waste management plans, to post informational placards, to manifest trash sent to shore, and to use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Also, BOEM lease stipulations require adherence to Notice to Lessee (NTL) 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, which requires the posting of placards at prominent locations on offshore vessels and structures, and which mandates a yearly marine trash and debris awareness training and certification process. As such, measures will be implemented prior to and during construction and decommissioning to avoid, minimize, and mitigate impacts related to trash and debris disposal. Given these measures, impacts from trash and debris on commercial and recreational fisheries and fishery resources are not expected.
Traffic		**Direct, short-term**	Direct Impacts: Commercial and recreational fisheries may experience short-term impacts due to increased vessel traffic during the construction and decommissioning phases of the RWF, as fisherman may avoid areas of increased vessel activity. Potential impacts on navigation are discussed in the Navigational Safety Risk Assessment (NRSA) (DNV GL, 2020). Primary conclusions of the NSRA included that vessel traffic near the project area is light, recreational/pleasure vessels represent the greatest proportion of vessel tracks in the study area, and deep draft vessel traffic in the wind farm area is expected to be limited to emergency circumstances.
Visible Structures		**Direct, short-term**	Direct Impacts: The physical presence of installation and decommissioning vessels and RWF components may affect fishing activity because there will be a minimum safety perimeter around installation and decommissioning vessels and locations where the RWF components will be installed and removed. This temporarily restricted area will consist of a 500-yard radius safety zone.

Table 3.1-2 IPFs and Characterizations of Potential Impacts on Commercial and Recreational Fisheries within the RWF during Operations and Maintenance

Table 3.1-2			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
Seafloor Disturbance	Foundations (WTG and OSS) RWF IAC and OSS-Link Cable non-routine O&M	**Direct, short-term** **Indirect, short-term**	Direct Impacts: Seafloor disturbance during O&M of the RWF will be limited to non-routine maintenance of bottom-founded infrastructure (e.g., foundations, scour protection, cable protection). These maintenance activities may result in direct, short-term impacts on fishing activity, as fishing access would be temporarily disrupted. However, the extent of the disturbance would be limited to specific areas. Indirect Impacts: Seafloor-disturbing maintenance activities are expected to result in similar indirect impacts on fisheries as those discussed for construction/decommissioning (Table 3.1-1), as fishery resources would be temporarily affected. However, the extent of disturbance would be limited to specific areas.
	Vessel anchoring (including spuds)	**Direct, short-term** **Indirect, short-term**	Direct Impacts: During O&M, anchoring will be limited to vessels required to be onsite for an extended duration. Impacts on commercial and recreational fisheries resulting from potential vessel anchoring during O&M activities are expected to be similar to those discussed in Table 3.1-1. Indirect Impacts: Indirect impacts on commercial and recreational fisheries due to impacts on fishery resources associated with vessel anchoring (including spuds) are expected to be short-term impacts.
Habitat Alteration	Foundations (WTG and OSS) RWF IAC and OSS-Link Cable	**Direct, long-term** **Indirect, long-term**	Direct Impacts: Minimal impacts on commercial and recreational fisheries are expected from operation of the IAC and OSS-Link Cable themselves, as they will be buried beneath the seabed. The USCG's stated policy is that "in the United States vessels will have the freedom to navigate through [wind farms], including export cable routes." (See Coast Guard Navigation and Vessel Inspection Circular 01-19 dated 1 August 2019.) Therefore, commercial fishermen will have the freedom to continue to fish within the Lease Area and near cable corridors. Further, the NSRA prepared for the Project, which is based on a very conservative potential layout (i.e., up to 144 WTGs), did not identify major areas of concern regarding safe marine navigation through the RWF. The Project's 1.15 mi (1 nm) by 1.15 mi (1 nm) layout allows for safe navigation by fishing vessels, and, therefore potential impacts on fishing grounds are considered direct and long-term. Indirect Impacts: Presence of the foundations, associated scour protection, and cable protection may result in both negative and beneficial indirect impacts on commercial and recreational fisheries due to conversion of primarily soft-bottom habitat to hard-bottom habitat and the subsequent effects on fishery resources. Fishery resources associated with soft-bottom habitats may experience long-term impacts, as available habitat will be slightly reduced. Fishery resources that inhabit hard bottom habitats may experience a beneficial effect, depending on the quality and type of habitat created by the foundations, scour protection, and cable protection, and the quality and type of the benthic community that colonizes that habitat. Commercial fisheries that target species with limited mobility may have indirect, long-term impacts from the presence of the WTG foundations (due to the impact on benthic and demersal species such as ocean quahog clam, Atlantic surfclam, and Atlantic sea scallop). An indirect, long-term benefit of the WTGs' physical presence is that the new structures may attract recreationally important species. The physical presence of these structures may result in direct benefits to recreational fisheries due to the WTG marking the location with a hardened structure and attracting fishermen. While this is a potentially beneficial impact of the physical presence of the WTGs, it also may be considered a negative impact for recreational fishermen who previously utilized the location as a secluded fishing location because, during operation, the RWF WTGs could potentially become a recreational fishing destination. In addition, increased fishing pressure on fish aggregations at the WTGs may result

Table 3.1-2			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
			in increased recreational fishing mortality rates. If these circumstances arise, then indirect, long-term impacts are expected.
Sediment Suspension and Deposition	RWF IAC and OSS-Link Cable non-routine O&M Vessel anchoring (including spuds)	Indirect, short-term	Indirect Impacts: Increases in sediment suspension and deposition during the O&M phase will result from vessel anchoring and non-routine maintenance activities that require exposing the IAC and/or OSS-Link Cable. Negative indirect impacts on commercial and recreational fisheries resulting from sediment suspension and deposition during the O&M phase are expected to be similar to those discussed for the construction and decommissioning phase (Table 3.1-1), but on a more limited spatial scale.
Noise	Vessel and aircraft noise	Indirect, short-term	Indirect Impacts: Negative impacts on commercial and recreational fisheries due to the impacts of ship and aircraft noise on fishery resources are expected to be similar to those discussed for the construction/decommissioning phase (Table 3.1-1), though lesser in extent. The noise generated by vessel and aircrafts will be similar to the range of noise from existing vessel and aircraft traffic in the region, and is not expected to substantially affect the existing underwater noise environment.
	WTG operational noise	Indirect, long-term	Indirect Impacts: The underwater noise levels produced by WTGs are expected to be within the hearing ranges of fish. Depending on the noise intensity, these noises could cause avoidance of the RWF area for some fishery species or their prey, resulting in indirect impacts on commercial and recreational fisheries. However, noise levels from operation of the RWF WTGs are not expected to result in injury or mortality, and finfish may become habituated to the operational noise (Thomsen et al., 2006; Bergström et al., 2014). Lindeboom et al. (2011) found no difference in the residency times of juvenile cod around monopiles between periods of WTG operation or when WTGs were out-of-order. This study also found that sand eels did not avoid the wind farm. In a similar study, the abundance of cod, eel, shorthorn sculpin, and goldsinny wrasse, were found to be higher near WTGs, suggesting that potential noise impacts from operation did not override the attraction of these species to the artificial reef habitat (Bergström et al., 2013). Based on the available literature, operational noise from the WTGs is expected to have an indirect, long-term impact on commercial and recreational fisheries.
Electric and Magnetic Fields	RWF IAC and OSS-Link Cable	Indirect, long-term	Indirect Impacts: A modeling analysis of the magnetic fields and induced electric fields anticipated to be produced during operation of the RWF IAC, OSS-Link Cable, and RWEC was performed and results are included in the Offshore Electric- and Magnetic-Field Assessment (Exponent, 2020). These modeling results were compared to existing scientific literature on the sensitivity of marine species to EMF. Based on the modeling results and existing evidence, behavioral effects and/or changes in species abundance and distributions are not expected (see section 4.3.3.2 of the COP for additional discussion). These conclusions are consistent with the findings of a previous comprehensive review of the ecological impacts of marine renewable energy projects, where it was determined that there has been no evidence demonstrating that EMF at the levels expected from marine renewable energy projects will cause an effect (negative or positive) on any species (Copping et al., 2016). Moreover, a 2019 BOEM report that assessed the potential for AC EMF from offshore wind facilities to affect marine populations concluded that, for the southern New England area, no negative effects are expected for populations of key commercial and recreational fish species (Snyder et al., 2019). Based on this information, it is not expected that fishery resources will be measurably affected by EMF from the cables, and thus indirect impacts on commercial and recreational fisheries are not expected.
Discharges and Releases	Hazardous materials spills Wastewater discharges	Direct, short-term Indirect, short-term	Direct and Indirect Impacts: As discussed for the construction/decommissioning phase, routine discharges of wastewater or liquids (e.g., ballast, bilge, deck drainage, stormwater) are not anticipated to have impacts because all vessel waste will be offloaded, stored, and disposed of in accordance with all applicable local, state and federal regulations. In addition, compliance with applicable Project-

Table 3.1-2			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
			specific management practices and requirements will minimize the potential for negatively impacting water quality and marine life. The operation of the RWF is not anticipated to introduce spills of hazardous material into the marine environment. Per the information requirements outlined in 30 CFR 585.626, a list of solid and liquid wastes generated, including disposal methods and locations, as well as federally regulated chemical products, is found in the Project's ERP/OSRP. The WTGs and OSSs will be designed for secondary levels of containment to prevent accidental discharges of hazardous materials to the marine environment. Most maintenance will occur inside the WTGs, thereby reducing the risk of a spill, and no oils or other wastes are expected to be discharged during maintenance activities. All vessels participating in O&M of the RWF will comply with USCG requirements for management of onboard fluids and fuels, including maintaining and implementing SPCC plans. Vessels will be navigated by trained, licensed vessel operators who will adhere to navigational rules and regulations and vessels will be equipped with spill handling materials adequate to control or clean up an accidental spill. Best management practices (BMPs) for fueling and power equipment servicing will be incorporated into the Project's ERP/OSRP. Accidental releases are minimized by containment and clean-up measures detailed in the OSRP. Given these measures and the very low likelihood of an inadvertent release, potential impacts of a hazardous material spill on commercial and recreational fisheries and fishery resources are not anticipated.
Marine Trash and Debris		**Direct, short-term** **Indirect, short-term**	Direct and Indirect Impacts: As discussed in Table 3.1-1, vessels will adhere to the USCG and EPA marine trash regulations, as well as BOEM guidance, and trash and debris generated during O&M of the RWF will be contained on vessels or at staging areas until disposal at an approved facility. Measures will be implemented prior to and during construction to avoid, minimize, and mitigate impacts related to trash and debris disposal. Given these measures, impacts from trash and debris on commercial and recreational fisheries and fishery resources are not expected.
Traffic		**Direct, long-term**	Direct Impacts: Impacts associated with traffic during O&M are expected to be similar to, but less frequent than, those discussed in the construction phase and may result in direct, long-term impacts.

3.1.2 Revolution Wind Export Cable Corridor

IPFs resulting in potential impacts on commercial and recreational fisheries associated with the RWEC Corridor are described in Table 3.1-3 for the construction and decommissioning phases and in Table 3.1-4 for the O&M phase. At the end of the Project's operational life, the Project will be decommissioned in accordance with a detailed decommissioning plan to be developed in compliance with applicable laws, regulations, and best management practices at that time. All of these activities are anticipated to be similar to or less than those described for construction, unless otherwise noted. The impacts discussed in this section apply to both the RWEC-OCS and RWEC-RI, though the impacts would vary based on fishing activity. In RI state waters fishing activity primarily used pots and traps, followed by fixed nets and the top species landed were scup, channeled whelk and summer flounder. In federal waters, the top fisheries use bottom trawls, mid-water trawls, and pots, with Atlantic herring, lobster, and squid the highest landed species by pound.

Table 3.1-3 IPFs and Characterizations of Potential Impacts on Commercial and Recreational Fisheries for the RWEC Corridor during Construction and Decommissioning

Table 3.1-3			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
Seafloor Disturbance	Seafloor preparation	Direct, short-term Indirect, short-term	Direct Impacts: As discussed in Table 3.1-1, the potential impacts on commercial and recreational fisheries from seafloor preparation are primarily associated with short-term disruption of access to fishing areas for commercial and recreational fisheries. Decommissioning activities are expected to cause similar impacts as construction, but these impacts would be shorter in duration Indirect Impacts: Indirect negative impacts on commercial and recreational fisheries associated with seafloor preparation for the RWEC are expected to be similar to those discussed in Table 3.1-1.
	RWEC installation	Direct, short-term Indirect, short-term	Direct Impacts: Direct impacts on commercial and recreational fisheries associated with the RWEC installation/decommissioning are expected to result in similar negative impacts as those for seafloor preparation. Indirect Impacts: Indirect impacts on commercial and recreational fisheries associated with RWEC installation/decommissioning are expected to result in similar negative impacts as those discussed in Table 3.1-1 for the IAC and OSS-Link Cable.
	Vessel anchoring (including spuds)	Direct, short-term Indirect, short-term	Direct Impacts: Direct impacts on commercial and recreational fisheries associated with vessel anchoring (including spuds) are similar to those discussed in seafloor preparation. Indirect Impacts: Indirect impacts to commercial and recreational fisheries associated with vessel anchoring (including spuds) are similar to those discussed in seafloor preparation
Habitat Alteration	Seafloor Preparation RWEC installation Vessel anchoring (including spuds)	Indirect, long-term	Indirect Impacts: In areas of sediment disturbance and/or increased sedimentation, benthic habitat recovery and benthic infaunal and epifaunal species abundances may take up to 1 to 3 years to recover to pre-impact levels, based on the results of a number of studies on benthic recovery (e.g., AKRF, Inc. et al., 2012; Germano et al., 1994; Hirsch et al., 1978; Kenny and Rees, 1994). Recolonization rates of benthic habitats are driven by the benthic communities inhabiting the area surrounding the impacted region. Communities well adapted to disturbance within their habitats (e.g., sand sheets) are expected to quickly recolonize a disturbed area, while communities not well adapted to frequent disturbance (e.g., cobble and boulder habitats) may take upwards of a year to begin recolonization and several years to become substantially re-established to pre-disturbance levels. This recovery time would result in a small, long-term loss of productivity in the disturbed area and a subsequent indirect, long-term impact on commercial and recreational fisheries. During decommissioning, foundations and other facilities will be removed to a depth of 15 ft (4.6 m) below the mudline, unless otherwise authorized by BOEM (30 CFR § 585.910(a). Recovery from

Table 3.1-3			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
			decommissioning activities is expected to be similar that experienced during seafloor preparation, resulting in an indirect, long-term impact on commercial and recreational fisheries.
Sediment Suspension and Deposition	Seafloor Preparation RWEC installation Vessel anchoring (including spuds)	**Indirect, short-term**	Indirect Impacts: As discussed in Table 3.1-1, seafloor-disturbing activities will result in temporary increases in sediment suspension and deposition. Sediment transport modeling results indicate that sediment plumes with TSS concentrations exceeding the ambient conditions by 100 mg/L could extend up to 4,528 feet (1,380 m) from the RWEC-RI centerline in state waters, and up to 1,542 feet (470 m) from RWEC-OCS centerline in federal waters. The plume is expected to be mostly contained within the bottom of the water column, though in shallower waters it may occupy most of the water column due to the water depth. For the RWEC-OCS, predicted TSS concentrations above ambient for any single circuit installation do not persist in any given location for greater than 24 hours, though in most locations (>75 % of the affected area) concentrations return to ambient within 8 hours. This maximum was predicted to occur along a part of the corridor that will only see one circuit installation. The maximum duration above ambient along the portion of the RWEC where two circuits will be installed was predicted to be 14 hours per circuit. This corresponds to a total of 28 hours above ambient, however the two 14-hour periods will likely be separated by time. For the installation of one circuit of the RWEC-RI, predicted TSS concentrations above ambient do not persist in any given location for greater than 16.3 hours, though in most locations (>75 % of the affected area) concentrations return to ambient within 4 hours). For installation of two circuits, the maximum plume exposure is doubled at 32.6 hours, however, the two 16.3-hour periods will likely be separated by time. The modeling results indicate that sedimentation from RWEC burial may exceed 0.4 inch (10 mm) of deposition up to 919 feet (280 m) from the cable centerline in state waters and up to 328 feet (100 m) in federal waters. This thickness of sedimentation could cover up to 1,126 acres (4,556,760 m^2) in state waters, and 1,020 acres (4,127,794 m^2) in federal waters. For the cable landfall, TSS concentrations exceeding ambient conditions by 100 mg/L could extend up 580 ft (177 m) from the centerline and plume concentrations above ambient could persist for 256 hours for the HDD. This duration is longer relative to the water jet assisted cable installation due to the slower installation rate of the activity and since trenching and backfilling for two circuits are included. Sedimentation greater than 0.4 in (10 mm) may extend up to 509 ft (155 m) from the centerline and could cover up to 19 acres (76,890 m^2). Sediment suspension and deposition associated with decommissioning activities are expected to be similar, but slightly lower in magnitude. Increases in sediment suspension and deposition associated with construction/decommissioning may cause short-term impacts on benthic species and species with limited mobility, and short-term impacts on pelagic species. Commercial fisheries that target species affected by sediment suspension and deposition may experience indirect, short-term impacts due to losses in productivity.
Noise	Vessel noise, equipment noise, aircraft noise	**Indirect, short-term**	Indirect Impacts: Negative indirect impacts on commercial and recreational fisheries resulting from vessel, construction/decommissioning equipment, and aircraft noise are expected to be similar to those discussed in Table 3.1-1.
	Vibratory pile driving (cofferdam) *RWEC-RI only	**Indirect, short-term**	Indirect Impacts: The cofferdam at the RWEC landfall, if required, may be installed as either a sheet piled structure into the sea floor or a gravity cell structure placed on the sea floor using ballast weight. Sheet pile installation would require the use of a vibratory hammer to drive the sidewalls and endwalls into the seabed, which may take approximately up to 3 days. For fishery resources exposed, noise from vibratory pile driving may temporarily reduce habitat quality, result in behavioral changes, or cause mobile species to temporarily vacate the area. As a result, noise impacts may result in indirect, short-term

Table 3.1-3			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
			impacts on fisheries. However, habitat suitability is expected to return to pre-pile driving conditions shortly after cessation of the pile driving activity.
Discharges and Releases	Hazardous materials spills Wastewater discharge	Direct, short-term Indirect, short-term	Direct and Indirect Impacts: Impacts associated with wastewater discharge or an inadvertent release of hazardous material during construction or decommissioning of the RWEC are expected to be similar to those discussed in Table 3.1-1.
Marine Trash and Debris		Direct, short-term Indirect, short-term	Direct and Indirect Impacts: Impacts associated with marine trash and debris are expected to be similar to those discussed in Table 3.1-1.
Traffic		Direct, short-term	Direct Impacts: Negative impacts on commercial and recreational fisheries resulting from sediment suspension and deposition are expected to be similar to those discussed in Table 3.1-1.

Table 3.1-4 IPFs and Characterizations of Potential Impacts on Commercial and Recreational Fisheries for the RWEC Corridor during Operations and Maintenance

Table 3.1-4			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	Discussion
Seafloor Disturbance	RWEC non-routine O&M	Direct, short-term Indirect, short-term	Direct Impacts: Seafloor disturbance during O&M of the RWEC will be limited to non-routine maintenance that may require uncovering and reburial of the cables, as well as maintenance of cable protection. These maintenance activities may result in direct, short-term impacts on fishing activity, as fishing access would be temporarily disrupted. However, the extent of the disturbance would be limited to specific areas along the cable corridor. Indirect Impacts: Indirect impacts on commercial and recreational fisheries associated with O&M activities for the RWEC are expected to result in similar negative impacts as those discussed for the IAC in Table 3.1-1, as fishery resources would be temporarily affected. However, the extent of disturbance would be limited to specific areas.
	Vessel anchoring (including spuds)	Direct, short-term Indirect, short-term	Direct Impacts: During O&M, anchoring will be limited to vessels required to be onsite for an extended duration. Negative impacts on commercial and recreational fisheries resulting from potential vessel anchoring during O&M activities are expected to be similar to those discussed in Table 3.1-1. Indirect Impacts: Indirect impacts on commercial and recreational fisheries due to impacts on fishery resources associated with vessel anchoring (including spuds) are expected to be short-term impacts.

Table 3.1-4			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	Discussion
Habitat Alteration	RWEC O&M	Direct, short-term Indirect, long-term	Direct Impacts: Commercial and recreational fisheries are not expected to experience impacts from the presence of the RWEC-OCS because it will be buried beneath the seabed. The USCG's stated policy is that "in the United States vessels will have the freedom to navigate through [wind farms], including export cable routes." (See Coast Guard Navigation and Vessel Inspection Circular 01-19 dated 1 August 2019.) Therefore, commercial fishermen will have the freedom to continue to fish within the Lease Area and near cable corridors. Therefore, potential impacts on fishing grounds are not anticipated. Indirect Impacts: Cable protection (e.g., concrete mattresses) may be placed in select areas along the RWEC. As discussed in Table 3.1-2 for the RWF IAC and OSS-Link Cable, the presence of the cable protection may result in both negative and beneficial indirect impacts on commercial and recreational fisheries due to conversion of primarily soft-bottom habitat to hard-bottom habitat and the subsequent effects on fishery resources. The cable protection may have a long-term impact on fishery resources associated with soft-bottom habitats and a long-term beneficial impact on species associated with hard-bottom habitats, depending on the quality of the habitat created by the cable protection, and the quality of the benthic community that colonizes that habitat. Commercial dredgers and trawlers (e.g., surfclam/ocean quahog and scallop fisheries) potentially may lose fishing ground if additional cable protection is needed in areas that are fished. In fished areas where the substrate type necessitates additional cable protection, it is possible that commercial dredgers and trawlers (e.g., surfclam/ocean quahog and scallop fisheries) potentially may lose a small amount of fishing ground in association with the altered seabed structure. After recolonization, the cable protection locations may provide indirect, long-term benefits to recreational fisheries if they choose to target recreational species that may favor these hard-bottom habitats, depending on the quality and type of habitat created by the cable protection, and the quality and type of benthic community that colonizes that habitat.
Sediment Suspension and Deposition	RWEC non-routine O&M Vessel anchoring (including spuds)	Indirect, short-term	Indirect Impacts: Increases in sediment suspension and deposition during the O&M phase will result from vessel anchoring and non-routine maintenance activities that require exposing portions of the RWEC. Negative direct and indirect impacts on commercial and recreational fisheries resulting from sediment suspension and deposition during the O&M phase are expected to be similar to the limited impacts discussed for the O&M of the RWF IAC and OSS-Link Cable (Table 3.1-2).
Noise	Vessel and aircraft noise	Indirect, short-term	Indirect Impacts: Commercial and recreational fishery resources are not expected to experience impacts from vessel or aircraft noise during the RWEC O&M phase. Impacts from vessel and aircraft noise during O&M of the RWEC are expected to be similar to, but less frequent than those described for the construction phase.
Electric and Magnetic Fields	RWEC operations	Indirect, long-term	Indirect Impacts: EMF impacts on commercial and recreational fisheries from the RWEC during O&M are not expected.
Discharges and Releases	Hazardous materials spills Wastewater discharge	Direct, short-term Indirect, short-term	Direct and Indirect Impacts: Impacts associated with wastewater discharge or an inadvertent release of hazardous material during O&M of the RWEC are expected to be similar to those discussed in Table 3.1-1.
Marine Trash and Debris		Direct, short-term	Direct Impacts: Impacts associated with marine trash and debris are expected to be similar to those discussed in Table 3.1-1.
Traffic		Direct, long-term	Direct Impacts: Traffic during the O&M of the RWEC is expected to have similar direct, long-term impacts on commercial and recreational fisheries as those described for the RWF in Table 3.1-2.

3.2 Proposed Environmental Protection Measures

To minimize impacts associated with the RWF and RWEC, Revolution Wind is proposing the following measures to avoid, minimize, or mitigate potential impacts on commercial and recreational species.

- Revolution Wind is committed to an indicative layout scenario with WTGs sited in a grid with approximately 1.15 mi (1 nm) by 1.15 mi (1 nm) spacing that aligns with other proposed adjacent offshore wind projects in the RI-MA WEA. This layout has been confirmed through expert analysis to allow for safe navigation without the need for additional designated transit lanes. This layout will also provide a uniform, wide spacing among structures to facilitate search and rescue operations.
- To the extent feasible, installation of the Inter-Array Cable, OSS Interconnector Cable, and RWEC will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
- To the extent feasible, the RWEC, IAC, and OSS-Link Cable will typically target a burial depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment.
- As appropriate and feasible, BMPs will be implemented to minimize impacts on fisheries, as described in the Guidelines for Providing Information on Fisheries Social and Economic Conditions for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 (BOEM, 2015).
- Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region.
- Each WTG will be marked and lit with both USCG and approved aviation lighting. AIS will be installed at the RWF marking the corners of the wind farm to assist in safe navigation.
- Revolution Wind will require all construction and operations vessels to comply with regulatory requirements related to the prevention and control of spills and discharges.
- Accidental spill or release of oils or other hazardous materials offshore will be managed through the Project's ERP/OSRP.
- Communications and outreach with the commercial and recreational fishing industries will be guided by the Project-specific Fisheries Communication and Outreach Plan (Orsted, 2020).
- Project construction, O&M, and decommissioning activities will be coordinated with appropriate contacts at USCG and United States Department of Defense command headquarters.
- A comprehensive communication plan will be implemented during offshore construction to inform all mariners, including commercial and recreational fishermen, and recreational boaters of construction activities and vessel movements. Communication will be facilitated through a Fisheries Liaison, Project website, and public notices to mariners and vessel float plans (in coordination with USCG). Revolution Wind will submit information to the USCG to issue Local Notice to Mariners during offshore installation activities.

3.3 Summary of Characterizations of Impacts on Commercial Recreational Fisheries

3.3.1 RWF

Overall, construction and decommissioning activities of the RWF are expected to have limited impacts on commercial and recreational fisheries. Seafloor disturbance during construction and decommissioning of the RWF is expected to have direct, short-term, impacts on fishing areas for commercial and recreational fisheries due to an expected 1,640 ft (500 yd) radius temporary safety zone established around RWF components and indirect, short-term impacts because of seafloor disturbance and indirect, long-term impacts because of habitat alteration that would affect some commercially and recreationally targeted species. Sediment suspension and deposition are expected to have indirect, short-term impacts due to effects on targeted species with preferred habitat in the RWF. Noise during construction and decommissioning is expected to have indirect, short-term impacts primarily from behavioral responses of targeted fisheries species, such as avoidance behavior for mobile species. Traffic is expected to have direct, short-term impacts, as fisherman may avoid areas of increased vessel activity. Visible structures are expected to have direct, short-term impacts because installation vessels and RWF components will affect fishing activity via the safety zone. Impacts from discharges and releases and marine trash and debris are not expected because vessels will comply with state and federal regulations and implement BMPs.

Operations and Maintenance activities within the RWF are expected to have limited impacts on commercial and recreational fisheries. Seafloor disturbance during operation and maintenance of the RWF is expected to have direct and indirect, short-term impacts on commercial and recreational fisheries. Sediment suspension and deposition are expected to have indirect, short-term impacts due to effects on targeted species with preferred habitat in the RWF. Habitat alteration due to the presence of WTG foundations, scour protection, and cable protection of the IAC and OSS-Link Cable may result in direct, long-term impacts due to the presence of the wind farm structures and related impacts on the use of fishing grounds. Habitat alteration is also expected to result in indirect, long-term benefits that include potential increases in abundances of fishery species that utilize hard-bottom habitats, as well as the WTG marking the location of the fishery resource that was previously a secluded fishing location. Noise and EMF during operation and maintenance is expected to have indirect, long-term impacts. Traffic is expected to have direct, long-term impacts on commercial and recreational fisheries with less frequent disturbances than those discussed in the construction phase. Discharges and releases and marine trash and debris are not expected because the RWF is not anticipated to introduce spills or hazardous material or trash/debris into the marine environment.

3.3.2 RWEC Corridor

In general, RWEC installation and decommissioning activities along the RWEC-OCS and RWEC-RI corridors are expected to have limited impacts on commercial and recreational fisheries. Seafloor disturbance during construction and decommissioning of the RWEC-OCS and RWEC-RI is expected to have direct, short-term impacts on commercial and recreational fisheries because of temporarily restricted access to fishing grounds due to safety restrictions on entering the area, indirect, short-term impacts because of seafloor disturbance, and indirect, long-term impacts because of habitat alteration that would affect some commercially and recreationally targeted species. Sediment suspension and deposition are expected to have indirect, short-term impacts due to effects on targeted species with preferred habitat along the cable corridor. Noise during construction and decommissioning is expected to have indirect, short-term impacts primarily from behavioral responses of targeted fisheries species, such as avoidance behavior for mobile species. Traffic is expected to have direct, short-term impacts, as fisherman may avoid areas of increased vessel activity. Impacts from discharges and releases and marine trash and debris are not expected because vessels will comply with state and federal regulations and implement BMPs.

Operations and Maintenance activities of the RWEC are expected to have limited impacts on commercial and recreational fisheries. Seafloor disturbance during operation and maintenance of the RWEC is expected to have direct and indirect, short-term impacts on commercial and recreational fisheries. Sediment suspension and deposition are expected to have indirect, short-term impacts due to effects on targeted species with preferred habitat in the RWF. Habitat alteration due to the presence of cable protection of RWEC may result in limited impacts due to the presence of the cable protection and related impacts on the use of fishing grounds. Noise and EMF during operation and maintenance are expected to have indirect, long-term impacts. Traffic is expected to have direct, long-term impacts on commercial and recreational fisheries with less frequent disturbances than those discussed in the construction phase. Impacts of discharges and releases and marine trash and debris are not expected.

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Appendix T: Navigation Safety Risk Assessment

Appendix U: Stormwater Management Plan Report

STORMWATER MANAGEMENT REPORT

Revolution Wind Proposed Onshore Substation

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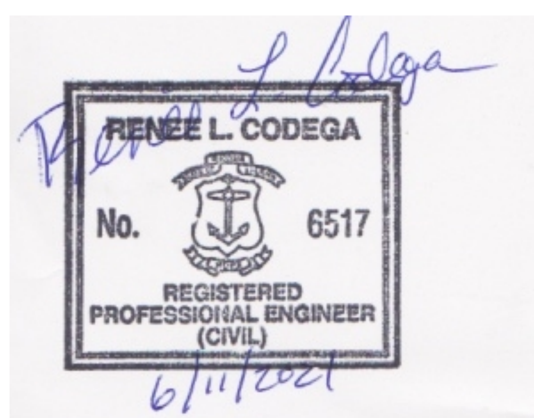

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Project Description

Existing Conditions

The approximately 15.7± acre project site ("the Site") consists of Assessors Map 179, Lots 1 and 30. See Figure 1. The site is bounded by Camp Avenue on the south, the existing National Grid Davisville Substation on the east, undeveloped land which includes an electric transmission right-of-way on the north, and residential neighborhood on the west. Currently the undeveloped site is mostly wooded with an inactive/capped landfill located in the northern lot.

Currently, the majority of stormwater generated within the Site discharges overland to three existing wetland areas in the western and northern portion of the site while a small portion in the southeast of the site drains to an existing depression. The three wetlands have an associated 50-foot buffer. There is an existing unnamed tributary to Mill Creek at the north and west of the Site. The stream is less than 10' wide and includes a 100' Riverbank Wetland. Refer to Figure 2 for existing drainage patterns. There are no associated TMDLs per RIDEM Environmental Resource Map accessed in March 2021.

Elevations on the site range from approximately 6-8' NAVD 88 in the low-lying wetland areas to 28' at the northwestern corner of the Site. Slopes range between 1% and 50% due to previous earthwork operations.

The 100-year floodplain, as shown on FEMA Flood Insurance Rate Map Panels 44009C0104J and 44009C0108J, is located on the site at elevation 13. However, the RI Coastal Resources Management Council has determined this is related to the coastal floodplain and compensation is not required.

Based on the NRCS mapping and VHB testing on site on February 10-17, 2021, the in-situ soils vary and consist of mostly of sand. See Appendix H.

Proposed Conditions

The project involves the construction of a new 165,200 ± square foot substation, 2,340± square foot building, 14,725 ± building, with associated 540 ± foot vehicle access drive that branches midway to the northeast with a second 560 ± foot vehicle access drive. The project also includes landscaping, stormwater infrastructure and utilities. Low impact development (LID) and other best management practices (BMPs) have been proposed to mitigate the impact of this activity. Existing drainage patterns were maintained to the maximum extent practicable in the proposed design to allow to maintain existing wetlands and vernal pools.

The proposed design includes one infiltration/detention basin, qualifying pervious areas, dry swales, and stone diaphragms to treat runoff from the access drives and roof areas. The substation yard is designed to provide storage and treatment for runoff within the substation yard before discharging via underdrains to an infiltration basin. All the required water quality volume is being recharged in to underlying soil. The BMPs ultimately discharge to the three existing wetlands. Pretreatment requirements are achieved using stone diaphragms. All applicable stormwater features have been sized to adequately convey the discharge from the drainage areas.

The stormwater design models the crushed stone and gravel yard as qualifying pervious areas (QPAs) in accordance with guidance provided by RIDEM on the substation design for RIDEM FWW Permit No. 16-0318. Following RIDEM's guidance, a technical justification is allowed for no vegetation within the QPAs based on the prohibition of vegetation within substation yards. Using this methodology, runoff from within the substations' crushed stone and paved areas will be treated by filtering runoff through the crushed stone and gravel base layers. This QPA design approach is the RIDEM preferred methodology for substations based on direction from RIDEM during their review noted above. Underdrains will collect the treated runoff below the gravel base and discharge it to an infiltration/detention basin for recharge and peak mitigation. Runoff from roofs will be connected to the underdrain system and will recharge in the infiltration basin. See Appendix A for peak rate tables.

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0 1000 2000 Feet

vhb

Project Location Map
Revolution Wind
Proposed Onshore Substation
North Kingstown, Rhode Island

Figure 1

Appendix A –RIDEM Stormwater Management Checklist and LID Planning Report

APPENDIX A: STORMWATER MANAGEMENT PLAN CHECKLIST AND LID PLANNING REPORT – STORMWATER DESIGN SUMMARY

PROJECT NAME **Revolution Wind Proposed Onshore Substation**	**(RIDEM USE ONLY)** **STW/WQC File #:** **Date Received:**
TOWN **North Kingstown, Rhode Island 02852**	
BRIEF PROJECT DESCRIPTION: The project proposes to construct an electric substation with associated access drives, stormwater treatment areas, and wetland restoration areas.	

Stormwater Management Plan (SMP) Elements – Minimum Standards

When submitting a SMP,[1] submit four separately bound documents: Appendix A Checklist; Stormwater Site Planning, Analysis and Design Report with Plan Set/Drawings; Soil Erosion and Sediment Control (SESC) Plan, and Post Construction Operations and Maintenance (O&M) Plan. Please refer to Suggestions to Promote Brevity.

Note: **All stormwater construction projects must create a Stormwater Management Plan (SMP). However, not every element listed below is required per the RIDEM Stormwater Rules and the RIPDES Construction General Permit (CGP). This checklist will help identify the required elements to be submitted with an Application for Stormwater Construction Permit & Water Quality Certification.**

PART 1. PROJECT AND SITE INFORMATION

PROJECT TYPE (Check all that apply)				
☐ Residential	☐ Commercial	☐ Federal	☐ Retrofit	☐ Restoration
☐ Road	☒ Utility	☐ Fill	☐ Dredge	☐ Mine
☐ Other (specify):				

SITE INFORMATION
☒ Vicinity Map

INITIAL DISCHARGE LOCATION(S): The WQv discharges to: (You may choose more than one answer if several discharge points are associated with the project.)

☒ **Groundwater**	☒ **Surface Water**	☐ **MS4**
☐ GAA	☒ Isolated Wetland	☐ RIDOT
☒ GA	☐ Named Waterbody	☐ RIDOT Alteration Permit is Approved
☒ GB	☒ Unnamed Waterbody Connected to Named Waterbody RI0007027R-06	☐ Town
		☐ Other (specify):

ULTIMATE RECEIVING WATERBODY LOCATION(S): Include pertinent information that applies to both WQ_v and flow from larger storm events including overflows. Choose all that apply, and repeat table for each waterbody.

☒ Groundwater or Disconnected Wetland	☐ SRWP		
☒ Waterbody Name: No Name	☐ Coldwater	☒ Warmwater	☐ Unassessed
☒ Waterbody ID: RI0007027R-06	☐ 4th order stream of pond 50 acres or more		
☐ TMDL for:	☐ Watershed of flood prone river (e.g., Pocasset River)		
☐ Contributes to a priority outfall listed in the TMDL	☐ Contributes stormwater to a public beach		
☐ 303(d) list – Impairment(s) for:	☐ Contributes to shellfishing grounds		

[1] Applications for a Construction General Permit that do not require any other permits from RIDEM and will disturb less than 5 acres over the entire course of the project do not need to submit a SMP. The Appendix A checklist must still be submitted.

PROJECT HISTORY		
☒ RIDEM Pre- Application Meeting	Meeting Date: 8/27/2020 and 12/17/2020	☐ Minutes Attached
☐ Municipal Master Plan Approval	Approval Date:	☐ Minutes Attached
☐ Subdivision Suitability Required	Approval #:	
☐ Previous Enforcement Action has been taken on the property	Enforcement #:	

FLOODPLAIN & FLOODWAY See Guidance Pertaining to Floodplain and Floodways	
☐ Riverine 100-year floodplain: **FEMA FLOODPLAIN FIRMETTE** has been reviewed and the 100-year floodplain is on site	
☒ Delineated from FEMA Maps Floodplain compensation was done and determined no compensation needed	
NOTE: Per Rule 250-RICR-150-10-8-1.1(B)(5)(d)(3), provide volumetric floodplain compensation calculations for cut and fill/displacement calculated by qualified professional	
☐ Calculated by Professional Engineer	
☐ Calculations are provided for cut vs. fill/displacement volumes proposed within the 100-year floodplain	Amount of Fill (CY): Amount of Cut (CY):
☐ Restrictions or modifications are proposed to the flow path or velocities in a floodway	
☐ Floodplain storage capacity is impacted	
☒ Project area is not within 100-year floodplain as defined by RIDEM	

CRMC JURISDICTION
☒ CRMC Assent required
☒ Property subject to a Special Area Management Plan (SAMP). If so, specify which SAMP: Shoreline Change Special Area Management Plan –Beach SAMP
☒ Sea level rise mitigation has been designed into this project

LUHPPL IDENTIFICATION - MINIMUM STANDARD 8:			
1. OFFICE OF Land Revitalization and Sustainable Materials Management (OLRSMM)			
	☒ Known or suspected releases of HAZARDOUS MATERIAL are present at the site (Hazardous Material is defined in Rule 1.4(A)(33) of 250-140-30-1 of the RIDEM Rules and Regulations for Investigation and Remediation of Hazardous Materials (the Remediation Regulations))		**RIDEM CONTACT:** Jeffrey Crawford
	☐ Known or suspected releases of PETROLEUM PRODUCT are present at the site (Petroleum Product as defined in Rule 1.5(A)(84) of 250-140-25-1 of the RIDEM Rules and Regulations for Underground Storage Facilities Used for Regulated Substances and Hazardous Materials)		
	☒ This site is identified on the RIDEM Environmental Resources Map as one of the following regulated facilities		**SITE ID#:**
		☒ CERCLIS/Superfund (NPL)	110009310049 Camp Ave Dump
		☒ State Hazardous Waste Site (SHWS)	SR-23-1189
		☒ Environmental Land Usage Restriction (ELUR)	SR-23-1189
		☐ Leaking Underground Storage Tank (LUST)	
		☒ Closed Landfill	CAM-FUDS
Note: If any boxes in 1 above are checked, the applicant must contact the RIDEM OLRSMM Project Manager associated with the Site to determine if subsurface infiltration of stormwater is allowable for the project. Indicate if the infiltration corresponds to "Red," "Yellow" or "Green" as described in Section 3.2.8 of the RISDISM Guidance (Subsurface Contamination Guidance). Also, note and reference approval in PART 3, Minimum Standard 2: Groundwater Recharge/Infiltration.			
2. PER MINIMUM STANDARD 8 of RICR 8.14.C.1-6 "LUHPPLS," THE SITE IS/HAS:			
	☐ Industrial Site with RIPDES MSGP, except where No Exposure Certification exists. http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php		
	☐ Auto Fueling Facility (e.g., gas station)		
	☐ Exterior Vehicles Service, Maintenance, or Equipment Cleaning Area		

	☐ Road Salt Storage and Loading Areas (exposed to rainwater)	
	☐ Outdoor Storage and Loading/Unloading of Hazardous Substances	
3.	**STORMWATER INDUSTRIAL PERMITTING**	
	☐ The site is associated with existing or proposed activities that are considered Land Uses with Higher Potential Pollutant Loads (LUHPPLS) (see RICR 8.14.C)	Activities: Sector:
	☐ Construction is proposed on a site that is subject to THE MULTI-SECTOR GENERAL PERMIT (MSGP) UNDER RULE 31(B)15 OF THE RIPDES REGULATIONS.	MSGP permit #
	☐ Additional stormwater treatment is required by the MSGP Explain:	

REDEVELOPMENT STANDARD – MINIMUM STANDARD 6		
Pre Construction Impervious Area		
	☐ Total Pre-Construction Impervious Area (**TIA**) 0 ac	
	☐ Total Site Area (**TSA**) 15.70 ac	
	☐ Jurisdictional Wetlands (**JW**) 3.39 ac	
	☐ Conservation Land (**CL**) 0.14 ac	
☐ Calculate the Site Size (defined as contiguous properties under same ownership)		
	☐ Site Size (**SS**) = (**TSA**) – (**JW**) – (**CL**) 12.17 ac	
	☐ (**TIA**) / (**SS**) = 0 ac	☐ (**TIA**) / (**SS**) >**0.4**?
☐ YES, Redevelopment		

PART 2. LOW IMPACT DEVELOPMENT ASSESSMENT – MINIMUM STANDARD 1

(NOT REQUIRED FOR REDEVELOPMENT OR RETROFITS)

This section may be deleted if not required.

Note: A written description must be provided specifying why each method is not being used or is not applicable at the Site. Appropriate answers may include:

- Town requires … (state the specific local requirement)
- Meets Town's dimensional requirement of …
- Not practical for site because …
- Applying for waiver/variance to achieve this (pending/approved/denied)
- Applying for wavier/variance to seek relief from this (pending/approved/denied)

A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS, AND FLOODPLAINS	**IF NOT IMPLEMENTED, EXPLAIN HERE**
☒ Sensitive resource areas and site constraints are identified (required)	
☒ Local development regulations have been reviewed (required)	
☒ All vegetated buffers and coastal and freshwater wetlands will be protected during and after construction	
☐ Conservation Development or another site design technique has been incorporated to protect open space and pre-development hydrology. **Note:** If Conservation Development has been used, check box and skip to Subpart C	
☒ As much natural vegetation and pre-development hydrology as possible has been maintained	

B) LOCATE DEVELOPMENT IN LESS SENSITIVE AREAS AND WORK WITH THE NATURAL LANDSCAPE CONDITIONS, HYDROLOGY, AND SOILS ☒ Development sites and building envelopes have been appropriately distanced from wetlands and waterbodies ☒ Development and stormwater systems have been located in areas with greatest infiltration capacity (e.g., soil groups A and B) ☒ Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPA's) ☒ Development sites and building envelopes have been positioned outside of floodplains ☒ Site design positions buildings, roadways and parking areas in a manner that avoids impacts to surface water features ☒ Development sites and building envelopes have been located to minimize impacts to steep slopes (≥15%) ☐ Other (describe):	
C) MINIMIZE CLEARING AND GRADING ☒ Site clearing has been restricted to <u>minimum area needed</u> for building footprints, development activities, construction access, and safety. ☒ Site has been designed to position buildings, roadways, and parking areas in a manner that minimizes grading (cut and fill quantities) ☒ Protection for stands of trees and individual trees and their root zones to be preserved has been specified, and such protection extends at least to the tree canopy drip line(s) ☒ Plan notes specify that public trees removed or damaged during construction shall be replaced with equivalent	
D) REDUCE IMPERVIOUS COVER ☐ Reduced roadway widths (≤22 feet for ADT ≤ 400; ≤ 26 feet for ADT 400 - 2,000) ☐ Reduced driveway areas (length minimized via reduced ROW width (≤ 45 ft.) and/or reduced (or absolute minimum) front yard setback; width minimized to ≤ 9 ft. wide one lane; ≤ 18 ft. wide two lanes; shared driveways; pervious surface) ☐ Reduced building footprint: Explain approach: ☐ Reduced sidewalk area (≤ 4 ft. wide; one side of the street; unpaved path; pervious surface) ☐ Reduced cul-de-sacs (radius < 45 ft; vegetated island; alternative turn-around) ☐ Reduced parking lot area: Explain approach ☒ Use of pervious surfaces for driveways, sidewalks, parking areas/overflow parking areas, etc. ☒ Minimized impervious surfaces (project meets or is less than maximum specified by Zoning Ordinance) ☐ Other (describe):	
E) DISCONNECT IMPERVIOUS AREA ☐ Impervious surfaces have been disconnected, and runoff has been diverted to QPAs to the maximum extent possible ☐ Residential street edges allow side-of-the-road drainage into vegetated open swales ☐ Parking lot landscaping breaks up impervious expanse AND accepts runoff ☒ Other (describe):	Roof impervious areas generating runoff are collected and piped to the infiltration / detention basin. Gravel access drive drains to a grass swale then to infiltration basin.
F) MITIGATE RUNOFF AT THE POINT OF GENERATION ☒ Small-scale BMPs have been designated to treat runoff as close as possible to the source	

G) PROVIDE LOW-MAINTENANCE NATIVE VEGETATION ☒ Low-maintenance landscaping has been proposed using native species and cultivars ☒ Plantings of native trees and shrubs in areas previously cleared of native vegetation are shown on site plan ☒ Lawn areas have been limited/minimized, and yards have been kept undisturbed to the maximum extent practicable on residential lots	
H) RESTORE STREAMS/WETLANDS ☐ Historic drainage patterns have been restored by removing closed drainage systems, daylighting buried streams, and/or restoring degraded stream channels and/or wetlands ☐ Removal of invasive species ☒ Other	The project does not present the opportunity to restore stream channels or wetlands or removal of invasive species. The project is restoring wetland buffers that will be disturbed.

PART 3. SUMMARY OF REMAINING STANDARDS

GROUNDWATER RECHARGE – MINIMUM STANDARD 2		
YES	**NO**	
☒	☐	The project has been designed to meet the groundwater recharge standard.
☐	☐	If "No," the justification for groundwater recharge criterion waiver has been explained in the Narrative (e.g., threat of groundwater contamination or physical limitation), if applicable (see RICR 8.8.D);
☐	☐	Your waiver request has been explained in the Narrative, if applicable.
☒	☐	Is this site identified as a Regulated Facility in Part 1, Minimum Standard 8: LUHPPL Identification?
☒	☐	If "Yes," has approval for infiltration by the OLRSMM Site Project Manager, per Part 1, Minimum Standard 8, been requested?

TABLE 2-1: Summary of Recharge (see RISDISM Section 3.3.2)
(Add or Subtract Rows as Necessary)

Design Point	**Impervious Area Treated (sq ft)**	**Total Re_v Required (cu ft)**	**LID Stormwater Credits (see RISDISM Section 4.6.1)** Portion of Re_v directed to a QPA (cu ft)	**Recharge Required by Remaining BMPs (cu ft)**	**Recharge Provided by BMPs (cu ft)**
DP-1:	83,589	4,069	0	4,069	32,614
DP-2:	0	0	0	0	0
DP-3:	0	0	0	0	0
DP-4:	0	0	0	0	0
DP-5	0	0	0	0	0
TOTALS:	83,589	4,069	0	4,069	32,614

Notes:
1. Only BMPs listed in RISDISM Table 3-5 "List of BMPs Acceptable for Recharge" may be used to meet the recharge requirement.
2. Recharge requirement must be satisfied for each waterbody ID.

☐ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.):

Stormwater Report Appendix B

WATER QUALITY – MINIMUM STANDARD 3		
YES	NO	
☒	☐	Does this project meet or exceed the required water quality volume WQv (see RICR 8.9.E-I)?
☒	☐	Is the proposed final impervious cover greater than 20% of the disturbed area (see RICR 8.9.E-I)?
☒	☐	If "Yes," either the Modified Curve Number Method or the Split Pervious/Impervious method in Hydro-CAD was used to calculate WQv; or,
☒	☐	If "Yes," either TR-55 or TR-20 was used to calculate WQv; and,
☐	☐	If "No," the project meets the minimum WQv of 0.2 watershed inches over the entire disturbed area.
☐	☐	Not Applicable
☒	☐	Does this project meet or exceed the ability to treat required water quality flow WQf (see RICR 8.9.I.1-3)?
☐	☒	Does this project propose an increase of impervious cover to a receiving water body with impairments? If "Yes," please indicate below the method that was used to address the water quality requirements of no further degradation to a low-quality water.
☐	☒	RICR 8.36. A Pollutant Loading Analysis is needed and has been completed.
☒	☐	The Water Quality Guidance Document (Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters) has been followed as applicable.
☐	☒	BMPs are proposed that are on the approved technology list . If "Yes," please provide all required worksheets from the manufacturer.
☐	☒	Additional pollutant-specific requirements and/or pollutant removal efficiencies are applicable to the site as the result of a TMDL, SAMP, or other watershed-specific requirements. If "Yes," please describe:

TABLE 3-1: Summary of Water Quality (see RICR 8.9)					
Design Point and WB ID	Impervious area treated (sq ft)	Total WQ_v Required (cu ft)	LID Stormwater Credits (see RICR 8.18) WQv directed to a QPA (cu ft)	Water Quality Treatment Remaining (cu ft)	Water Quality Provided by BMPs (cu ft)
DP-1: RI0007027R-06	83,589	6,966	3,467	3,499	3,552
DP-2: RI0007027R-06	0	0	0	0	0
DP-3: RI0007027R-06	0	0	0	0	0
DP-4: RI0007027R-06	0	0	0	0	0
DP-5 RI0007027R-06	0	0	0	0	0
TOTALS:	83,589	6,966	3,467	3,499	3,552

Notes:
1. Only BMPs listed in RICR 8.20 and 8.25 or the Approved Technologies List of BMPs is Acceptable for Water Quality treatment.
2. For each Design Point, the Water Quality Volume Standard must be met for each Waterbody ID.

☒ YES ☐ NO	This project has met the setback requirements for each BMP. If "No," please explain:

CONVEYANCE AND NATURAL CHANNEL PROTECTION (RICR 8.10) – MINIMUM STANDARD 4			
YES	**NO**		
☒	☐	Is this standard waived? If "Yes," please indicate one or more of the reasons below:	
		☐	The project directs discharge to a large river (i.e., 4th-order stream or larger. See RISDISM Appendix I for State-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters.
		☐	The project is a small facility with impervious cover of less than or equal to 1 acre.
		☒	The project has a post-development peak discharge rate from the facility that is less than 2 cfs for the 1-year, 24-hour Type III design storm event (prior to any attenuation). (Note: LID design strategies can greatly reduce the peak discharge rate).
☐	☐	Conveyance and natural channel protection for the site have been met. If "No,' explain why:	

TABLE 4-1: Summary of Channel Protection Volumes (see RICR 8.10)					
Design Point	**Receiving Water Body Name**	**Coldwater Fishery? (Y/N)**	**Total CPv Required (cu ft)**	**Total CPv Provided (cu ft)**	**Average Release Rate Modeled in the 1-yr storm (cfs)**
DP-1:		n	0	-	
DP-2:		n	0	-	
DP-3:		n	0	-	
DP-4:		n	0	-	
		n	0	-	
TOTALS:					
Note: The Channel Protection Volume Standard must be met in each waterbody ID.					
☐ YES ☐ NO	The CPv is released at roughly a uniform rate over a 24-hour duration (see examples of sizing calculations in Appendix D of the RISDISM).				
☐ YES ☐ NO	Do additional design restrictions apply resulting from any discharge to cold-water fisheries; If "Yes," please indicate restrictions and solutions below.				
☐ Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).					

OVERBANK FLOOD PROTECTION (RICR 8.11) AND OTHER POTENTIAL HIGH FLOWS – MINIMUM STANDARD 5			
YES	**NO**		
☐	☒	Is this standard waived? If yes, please indicate one or more of the reasons below:	
		☐	The project directs discharge to a large river (i.e., 4th-order stream or larger. See Appendix I for state-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters.
		☐	A Downstream Analysis (see RICR 8.11.D and E) indicates that peak discharge control would not be beneficial or would exacerbate peak flows in a downstream tributary of a particular site (e.g., through coincident peaks).
☐	☒	Does the project flow to an MS4 system or subject to other stormwater requirements? If "Yes," indicate as follows:	
		☐	RIDOT
		☐	Other (specify):
Note: The project could be approved by RIDEM but not meet RIDOT or Town standards. RIDOT's regulations indicate that post-volumes must be **less** than pre-volumes for the 10-yr storm at the design point entering the RIDOT system. If you have not already received approval for the discharge to an MS4, please explain below your strategy to comply with RIDEM and the MS4.			
		Indicate below which model was used for your analysis. ☐ TR-55 ☐ TR-20 ☒ HydroCAD ☐ Bentley/Haestad ☐ Intellisolve ☐ Other (Specify):	
YES	**NO**		
☒	☐	Does the drainage design demonstrate that flows from the 100-year storm event through a BMP will safely manage and convey the 100-year storm? If "No," please explain briefly below and reference where in the application further documentation can be found (i.e., name of report/document, page numbers, appendices, etc.): Stormwater Management Report Appendix E	
☒ ☒ ☒	☐ ☐ ☐	Do off-site areas contribute to the sub-watersheds and design points? If "Yes," Are the areas modeled as "present condition" for both pre- and post-development analysis? Are the off-site areas shown on the subwatershed maps?	
☒	☐	Does the drainage design confirm safe passage of the 100-year flow through the site for off-site runoff?	
☐	☒	Is a Downstream Analysis required (see RICR 8.11.E.1)? wetland volume was evaluated & can be found attached.	
☒	☐	Calculate the following:	
		☐	Area of disturbance within the sub-watershed (areas)
		☐	Impervious cover (%)
☐	☒	Is a dam breach analysis required (earthen embankments over six (6) feet in height, or a capacity of 15 acre-feet or more, and contributes to a significant or high hazard dam)?	
☐	☒	Does this project meet the overbank flood protection standard?	

Table 5-1 Hydraulic Analysis Summary								
Subwatershed (Design Point)	**1.2" Peak Flow** (cfs) **		**1-yr Peak Flow** (cfs)		**10-yr Peak Flow** (cfs)		**100-yr Peak Flow** (cfs)	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
DP-1: Wetl 3-100	0.00	0.00	0.00	0.00	0.45	0.33	6.79	4.67
DP-2: Wetl 3-200	0.00	0.00	0.00	0.00	0.15	0.11	0.93	0.83
DP-3: Wetl 4-100	0.00	0.00	0.51	0.39	3.47	3.00	12.43	9.90
DP-4: Depression	0.00	0.00	0.00	0.00	0.03	0.00	1.26	0.20
DP-5: Depression	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.23
TOTALS:	0.00	0.00	0.51	0.39	4.10	3.44	21.65	15.83

** Utilize modified curve number method or split pervious /impervious method in HydroCAD.

<u>Note</u>: The hydraulic analysis must demonstrate no impact to each individual subwatershed DP unless each DP discharges to the same wetland or water resource.

Indicate as follows where the pertinent calculations and/or information for the items above are provided	**Name of report/document, page numbers, appendices, etc.**
Existing conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, and water surface elevations showing methodologies used and supporting calculations.	Stormwater Report, Appendix E
Proposed conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, water surface elevations, and routing showing the methodologies used and supporting calculations.	Stormwater Report, Appendix E
Final sizing calculations for structural stormwater BMPs, including contributing drainage area, storage, and outlet configuration.	Stormwater Report, Appendix C
Stage-storage, inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities).	Stormwater Report, Appendix C

Table 5-2 Summary of Best Management Practices												
BMP ID	**DP #**	**BMP Type** (e.g., bioretention, tree filter)	**BMP Functions**					**Bypass Type**	**Horizontal Setback Criteria are met per RICR 8.21.B.10, 8.22.D.11, and 8.35.B.4**		
			Pre-Treatment (Y/N/ NA)	Re_v	WQ_v	CP_v (Y/N/ NA)	Overbank Flood Reduction (Y/N/NA)	External (E) Internal (I) or NA	Yes/ No	Technical Justification (Design Report page number)	Distance Provided
Inf-1	1	Infiltration Basin	Y	32,702	3,552	NA	Y	I	Yes	-	-
		TOTALS:									

Table 5.3 Summary of Soils to Evaluate Each BMP										
DP #	**BMP ID**	**BMP Type** (e.g., bioretention, tree filter)	**Soils Analysis for Each BMP**							
			Test Pit ID# and Ground Elevation		SHWT Elevation (ft)	Bottom of Practice Elevation* (ft)	Separation Distance Provided (ft)	Hydrologic Soil Group (A, B, C, D)	Exfiltration Rate Applied (in/hr)
			Primary	Secondary					
1	Inf-1	Infiltration Basin	TP#4	TP#5	11.2	14.2	3	A	8.27
		TOTALS:							

* For underground infiltration systems (UICs) bottom equals bottom of stone, for surface infiltration basins bottom equals bottom of basin, for filters bottom equals interface of storage and top of filter layer

LAND USES WITH HIGHER POTENTIAL POLLUTANTS LOADS (LUHPPLs) – MINIMUM STANDARD 8			
YES	**NO**	**N/A**	
☐	☒	☐	Describe any LUHPPLs identified in Part 1, Minimum Standard 8, Section 2. If not applicable, continue to Minimum Standard 9.
☐	☐	☐	Are these activities already covered under an MSGP? If "No," please explain if you have applied for an MSGP or intend to do so?
☐	☐	☐	List the specific BMPs that are proposed for this project that receive stormwater from LUHPPL drainage areas. These BMP types must be listed in RISDISM Table 3-3, "Acceptable BMPs for Use at LUHPPLs." Please list BMPs:
☐	☐	☐	Additional BMPs, or additional pretreatment BMP's if any, that meet RIPDES MSGP requirements; Please list BMPs:
			Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).

ILLICIT DISCHARGES – MINIMUM STANDARD 9			
Illicit discharges are defined as unpermitted discharges to Waters of the State that do not consist entirely of stormwater or uncontaminated groundwater, except for certain discharges identified in the RIPDES Phase II Stormwater General Permit.			
YES	**NO**	**N/A**	
☒	☐	☐	Have you checked for illicit discharges?
☐	☒	☐	Have any been found and/or corrected? If "Yes," please identify.
☒	☐	☐	Does your report explain preventative measures that keep non-stormwater discharges out of the Waters of the State (during and after construction)?

SOIL EROSION AND SEDIMENT CONTROL (SESC) – MINIMUM STANDARD 10				
YES	**NO**	**N/A**		
☒	☐	☐	Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?	
☒	☐	☐	Have you provided a **separately-bound** document based upon the SESC Template? If yes, proceed to Minimum Standard 11 (the following items can be assumed to be addressed).	
			If "No," include a document with your submittal that addresses the following elements of an SESC Plan:	
			☐	Soil Erosion and Sediment Control Plan Project Narrative, including a description of how the fifteen (15) Performance Criteria have been met:
			☐	Provide Natural Buffers and Maintain Existing Vegetation
			☐	Minimize Area of Disturbance
			☐	Minimize the Disturbance of Steep Slopes
			☐	Preserve Topsoil
			☐	Stabilize Soils
			☐	Protect Storm Drain Inlets
			☐	Protect Storm Drain Outlets
			☐	Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures
			☐	Establish Perimeter Controls and Sediment Barriers
			☐	Divert or Manage Run-On from Up-Gradient Areas
			☐	Properly Design Constructed Stormwater Conveyance Channels
			☐	Retain Sediment On-Site
			☐	Control Temporary Increases in Stormwater Velocity, Volume, and Peak Flows
			☐	Apply Construction Activity Pollution Prevention Control Measures
			☐	Install, Inspect, and Maintain Control Measures and Take Corrective Actions
			☐	Qualified SESC Plan Preparer's Information and Certification
			☐	Operator's Information and Certification; if not known at the time of application, the Operator must certify the SESC Plan upon selection and prior to initiating site activities
			☐	Description of Control Measures, such as Temporary Sediment Trapping and Conveyance Practices, including design calculations and supporting documentation, as required

STORMWATER MANAGEMENT SYSTEM OPERATION, MAINTENANCE, AND POLLUTION PREVENTION PLAN – MINIMUM STANDARDS 7 AND 9		
Operation and Maintenance Section		
YES	**NO**	
☒	☐	Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?
☒	☐	Have you provided a **separately bound** Operation and Maintenance Plan for the site and for all of the BMPs, and does it address each element of RICR 8.17 and RISDISM Appendix C and E?
☒	☐	Lawn, Garden, and Landscape Management meet the requirements of RISDISM Section G.7? If "No," why not?
☒	☐	Is the property owner or homeowner's association responsible for the stormwater maintenance of all BMP's? If "No," you must provide a legally binding and enforceable maintenance agreement (see RISDISM Appendix E, page 26) that identifies the entity that will be responsible for maintenance of the stormwater. Indicate where this agreement can be found in your report (i.e., name of report/document, page numbers, appendices, etc.).
☒	☐	Do you anticipate that you will need legal agreements related to the stormwater structures? (e.g. off-site easements, deed restrictions, covenants, or ELUR per the Remediation Regulations). If "Yes," have you obtained them? Or please explain your plan to obtain them: *A modified ELUR is anticipated and will be provided prior to construction.*

☐	☒	Is stormwater being directed from public areas to private property? If "Yes," note the following: Note: This is not allowed unless a funding mechanism is in place to provide the finances for the long-term maintenance of the BMP and drainage, or a funding mechanism is demonstrated that can guarantee the long-term maintenance of a stormwater BMP by an individual homeowner.
Pollution Prevention Section		
☒	☐	Designated snow stockpile locations?
☐	☒	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
☐	☒	Asphalt-only based sealants?
☐	☒	Pet waste stations? (Note: If a receiving water has a bacterial impairment, and the project involves housing units, then this could be an important part of your pollution prevention plan).
☐	☒	Regular sweeping? Please describe: gravel roads with little traffic
☒	☐	De-icing specifications, in accordance with RISDISM Appendix G. (NOTE: If the groundwater is GAA, or this area contributes to a drinking water supply, then this could be an important part of your pollution prevention plan).
☒	☐	A prohibition of phosphate-based fertilizers? (Note: If the site discharges to a phosphorus impaired waterbody, then this could be an important part of your pollution prevention plan).

PART 4. SUBWATERSHED MAPPING AND SITE-PLAN DETAILS

Existing and Proposed Subwatershed Mapping (REQUIRED)			
YES	**NO**		
☒	☐	Existing and proposed drainage area delineations	
☒	☐	Locations of all streams and drainage swales	
☒	☐	Drainage flow paths, mapped according to the DEM *Guidance for Preparation of Drainage Area Maps* (included in RISDISM Appendix K)	
☒	☐	Complete drainage area boundaries; include off-site areas in both mapping and analyses, as applicable	
☒	☐	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report	
☒	☐	Mapped seasonal high-water-table test pit locations	
☒	☐	Mapped locations of the site-specific borings and/or test pits and soils information from the test pits at the locations of the BMPs	
☒	☐	Mapped locations of the BMPs, with the BMPs consistently identified on the Site Construction Plans	
☒	☐	Mapped bedrock outcrops adjacent to any infiltration BMP	
☒	☐	Soils were logged by a:	
		☒	DEM-licensed Class IV soil evaluator Name: Jeffrey Peterson
		☐	RI-registered P.E. Name:

Subwatershed and Impervious Area Summary				
Subwatershed (area to each design point)	**First Receiving Water ID or MS4**	**Area Disturbed (sf)**	**Existing Impervious (sf)**	**Proposed Impervious (sf)**
DP-1:	RI0007027R-06	292,795	0	80,928
DP-2:	RI0007027R-06	1,723	0	0
DP-3:	RI0007027R-06	12,410	0	0
DP-4:	RI0007027R-06	4,063	0	0
DP-5	RI0007027R-06	689	0	0

TOTALS:		311,680	0	80,928

Site Construction Plans (Indicate that the following applicable specifications are provided)		
YES	NO	
☒	☐	Existing and proposed plans (scale not greater than 1" = 40') with North arrow
☒	☐	Existing and proposed site topography (with 1 or 2-foot contours); 10-foot contours accepted for off-site areas
☒	☐	Boundaries of existing predominant vegetation and proposed limits of clearing
☒	☐	Site Location clarification
☒	☐	Location and field-verified boundaries of resource protection areas such as: ▸ freshwater and coastal wetlands, including lakes and ponds ▸ coastal shoreline features Perennial and intermittent streams, in addition to Areas Subject to Storm Flowage (ASSFs)
☒	☐	All required setbacks (e.g., buffers, water-supply wells, septic systems)
☒	☐	Representative cross-section and profile drawings, and notes and details of structural stormwater management practices and conveyances (i.e., storm drains, open channels, swales, etc.), which include: ▸ Location and size of the stormwater treatment practices (type of practice, depth, area). Stormwater treatment practices (BMPs) must have labels that correspond to RISDISM Table 5-2; ▸ Design water surface elevations (applicable storms); ▸ Structural details of outlet structures, embankments, spillways, stilling basins, grade-control structures, conveyance channels, etc.; ▸ Existing and proposed structural elevations (e.g., inverts of pipes, manholes, etc.); ▸ Location of floodplain and, if applicable, floodway limits and relationship of site to upstream and downstream properties or drainage that could be affected by work in the floodplain; ▸ Planting plans for structural stormwater BMPs, including species, size, planting methods, and maintenance requirements of proposed planting
☒	☐	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report and corresponding water tables
☐	☒	Mapping of any OLRSMM-approved remedial actions/systems (including ELURs)
☒	☐	Location of existing and proposed roads, buildings, and other structures including limits of disturbance; ▸ Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements; ▸ Location of existing and proposed conveyance systems, such as grass channels, swales, and storm drains, and location(s) of final discharge point(s) (wetland, waterbody, etc.); ▸ Cross sections of roadways, with edge details such as curbs and sidewalks; ▸ Location and dimensions of channel modifications, such as bridge or culvert crossings
☐	☒	Locations, cross sections, and profiles of all stream or wetland crossings and their method of stabilization

Appendix B – Minimum Standard 2 – Groundwater Recharge Calculations

- Recharge Summary and Calculations
- 1.2-inch Storm Event HydroCAD for Recharge BMPs

Computations

41,6893P roject:	Revolution Wind Proposed Onshore Substation	**Project #**	73032.01
Location:	North Kingstown, RI	**Sheet:**	of
Calculated By:	AEC	**Date:**	March 2021
Checked By:	KC	**Date:**	3/23/2021
Title:	Groundwater Recharge		

Section 3.2.2 Minimum Standard 2: Groundwater Recharge (Re_v.)

- Re_v = X" * (F)*(I)/12

  Where:

  Re_v = required recharge volume (CF)

  F = Recharge Factors Based on Hydrologic Soil Group (HSG) from Table 3-4 of RISDISM (pg 3-11)

HSG	Recharge Factor (F)
A	0.60
B	0.35
C	0.25
D	0.10

  I = Total impervious area (SF)

  X = 1" new impervious area (gravel roads & buildings)

- A Re_v = (1" * 0.6 * 80,928 SF) / 12 **= 4,047 CF**
- D Rev= (1"*0.1* 2661 SF / 12 = 22 **CF**

4,047 CF + 22 CF = 4,069 CF

Recharge for the 1-year Storm

Infiltration Basin 1 = 32,614 CF

32,614 CF > 4,047 CF

Recharge Provided

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond INF-1: Infiltration Basin 1 Peak Elev=14.21' Storage=94 cf Inflow=1.05 cfs 32,615 cf
Discarded=1.01 cfs 32,614 cf Primary=0.00 cfs 0 cf Outflow=1.01 cfs 32,614 cf

Appendix C – Minimum Standard 3 – Water Quality Calculations

- WQ Summary, Calculations and HydroCAD printouts for BMPs

vhb Computations

Project: Rev. Wind PR Substation		**Project #** 73032.01	
Location: North Kingstown, RI		**Sheet:** 1	**of** 1
Calculated By: KC		**Date:** 3/23/2021	
Checked By:		**Date:**	
Title: Water Quality Volume (WQV)			

Section 3.2.3 Minimum Standard 3: Water Quality

According to Section 3.3.3 of the RIDISM, for sites where the proposed impervious cover is less than 20% of the disturbed area, a minimum Water Quality Volume (WQv) of 0.2 watershed-inches is required.

Required:

Total disturbed area = 311,680 sf

Proposed impervious area = 83,589 sf

Percent impervious = (83,589 sf /311,680 sf)*100% = 27% (> 20%)

Alternatively; Water quality volume is calculated as one inch over impervious cover:

Required:

WQV = (1")*(I)/12

Where: I = Total Impervious Cover = 83,589 sf

Area directed to QPA (Qualified Pervious Area) Gravel Roads in Substation Yard: 41601 sf

41,601 sf

Required WQv = 83,589 sf – 41,601= 41,988 sf

Require Water Quality Volume

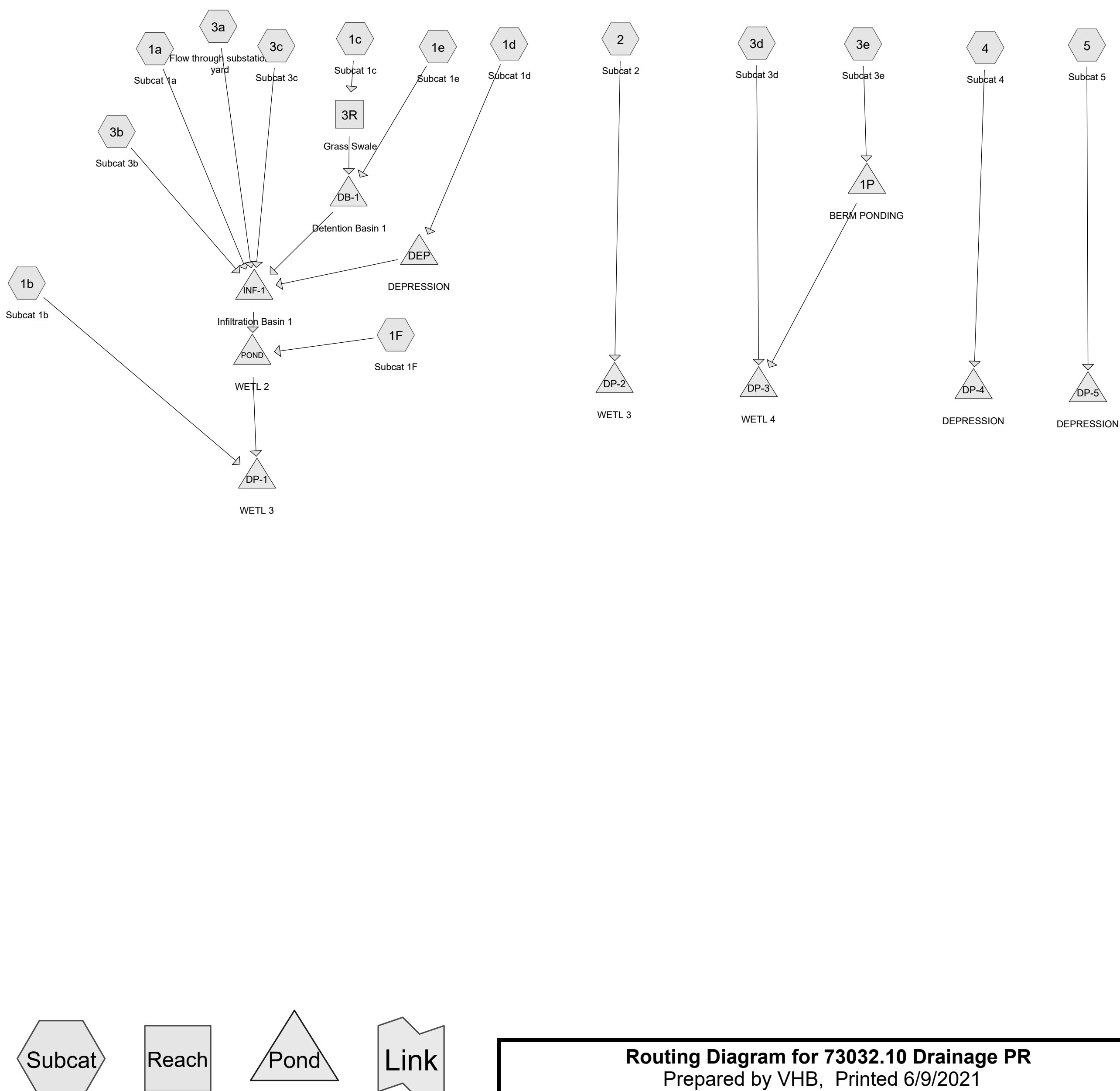
WQV = (1")*(I)/12

Where: I = Total Impervious Cover = 41,988 sf

WQV = (1")(41,988 sf)(1/12) = 3,499 cf

Provided:

Infiltration Basin INF-1 = 3,552 cf (>3,499 cf)



Routing Diagram for 73032.10 Drainage PR
Prepared by VHB, Printed 6/9/2021
HydroCAD® 10.10-5a s/n 01038 © 2020 HydroCAD Software Solutions LLC

Summary for Pond INF-1: Infiltration Basin 1

Inflow Area = 326,877 sf, 5.62% Impervious, Inflow Depth > 0.38" for WQV event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 10,422 cf
Outflow = 0.40 cfs @ 12.11 hrs, Volume= 10,422 cf, Atten= 4%, Lag= 1.4 min
Discarded = 0.40 cfs @ 12.11 hrs, Volume= 10,422 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 14.20' @ 12.11 hrs Surf.Area= 10,444 sf Storage= 38 cf

Plug-Flow detention time= 1.6 min calculated for 10,411 cf (100% of inflow)
Center-of-Mass det. time= 1.5 min (1,393.9 - 1,392.3)

Volume	Invert	Avail.Storage	Storage Description
#1	14.20'	29,588 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.20	10,420	0	0
15.00	15,771	10,476	10,476
16.00	22,452	19,112	29,588

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.20'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	14.51'	**10.0" Round Culvert** L= 180.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 14.51' / 13.00' S= 0.0084 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.55 sf

Discarded OutFlow Max=2.00 cfs @ 12.11 hrs HW=14.20' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.20' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)

Stage-Area-Storage for Pond INF-1: Infiltration Basin 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
14.20	10,420	0
14.22	10,554	210
14.24	10,688	422
14.26	10,821	637
14.28	10,955	855
14.30	11,089	1,075
14.32	11,223	1,299
14.34	11,356	1,524
14.36	11,490	1,753
14.38	11,624	1,984
14.40	11,758	2,218
14.42	11,892	2,454
14.44	12,025	2,693
14.46	12,159	2,935
14.48	12,293	3,180
14.50	12,427	3,427
14.51		3,552
14.52	12,560	3,677
14.54	12,694	3,929
14.56	12,828	4,185
14.58	12,962	4,443
14.60	13,096	4,703
14.62	13,229	4,966
14.64	13,363	5,232
14.66	13,497	5,501
14.68	13,631	5,772
14.70	13,764	6,046
14.72	13,898	6,323
14.74	14,032	6,602
14.76	14,166	6,884
14.78	14,299	7,169
14.80	14,433	7,456
14.82	14,567	7,746
14.84	14,701	8,039
14.86	14,835	8,334
14.88	14,968	8,632
14.90	15,102	8,933
14.92	15,236	9,236
14.94	15,370	9,542
14.96	15,503	9,851
14.98	15,637	10,162
15.00	15,771	10,476
15.02	15,905	10,793
15.04	16,038	11,113
15.06	16,172	11,435
15.08	16,305	11,759
15.10	16,439	12,087
15.12	16,573	12,417
15.14	16,706	12,750
15.16	16,840	13,085
15.18	16,974	13,423
15.20	17,107	13,764
15.22	17,241	14,108
15.24	17,374	14,454
15.26	17,508	14,803
15.28	17,642	15,154
15.30	17,775	15,508
15.32	17,909	15,865
15.34	18,043	16,225
15.36	18,176	16,587
15.38	18,310	16,952
15.40	18,443	17,319
15.42	18,577	17,689
15.44	18,711	18,062
15.46	18,844	18,438
15.48	18,978	18,816
15.50	19,112	19,197
15.52	19,245	19,581
15.54	19,379	19,967
15.56	19,512	20,356
15.58	19,646	20,747
15.60	19,780	21,142
15.62	19,913	21,539
15.64	20,047	21,938
15.66	20,180	22,340
15.68	20,314	22,745
15.70	20,448	23,153
15.72	20,581	23,563
15.74	20,715	23,976
15.76	20,849	24,392
15.78	20,982	24,810
15.80	21,116	25,231
15.82	21,249	25,655
15.84	21,383	26,081
15.86	21,517	26,510
15.88	21,650	26,942
15.90	21,784	27,376
15.92	21,918	27,813
15.94	22,051	28,253
15.96	22,185	28,695
15.98	22,318	29,140
16.00	**22,452**	**29,588**

Version: 4/2015

Project Name: Rev Wind Onshore Substation
Date: 3/23/2021

Water Quality Volume Calculation WorkSheet

This worksheet is designed to assist the project engineer with a determination of the required water quality treatment area. The worksheet leads the designer through redevelopment applicability first and then receiving water requirements. This tool is intended to compliment to the Redevelopment Criteria Guidance and the Water Quality Guidance and assist both the designer and the permit application reviewer towards consistent results. Enter information into only the YELLOW Boxes.

Redevelopment Criteria Guidance
Water Quality Goals "Stormwater Compensation Method"

Step 1 - Determine which office in OWR you are applying to: Application Guidance

Step 2 - Site Information

		value/calculation	units
Total Site Area (total area of project parcels)	TSA=	15.70	acres
Total Jurisdictional Wetlands and/or floodplain within the above TSA	JW1=	3.39	acres
Existing impervious also within the Jurisdictonal Wetlands	-JW2=	0.00	acres
Conservation Land within the TSA	CL=	0.14	acres
Site Size = (TSA)-(JW1-JW2)-CL	**SS=**	**12.17**	acres

Step 3 - Redevelopment Applicability

Total Impervious Area (pre-construction)	TIA=	0.00	acres
% Impervious (if ≥40% - redevelopment standard 3.2.6 applies)		**0.00**	

REPEAT IF NECESSARY Steps 4, 5 and 6 for EACH Waterbody ID (RIVER-ID as found in the GIS Map Server)

Step 4 - Receiving waterbody information

Waterbody ID or RIVER ID from GIS Map Server	
Waterbody Name from GIS Map Server	
Name the sub-watersheds (design-points) contributing to this Waterbody ID	
Is this Waterbody Impaired/TMDL for any Phosphorus, Metals or Bacteria?	NO
Is this Waterbody Impaired for Nitrogen?	NO

Step 5 - Pre-Post Construction Conditions to the Waterbody

Total Pre-Construction Impervious Surface to this Waterbody ID	0.00	acres
Total Disturbed Existing Impervious (DI)	0.00	acres
Total Post-Construction Impervious to this Waterbody ID	1.92	acres
Net Increased Impervious (NII)	1.92	acres

Step 6 - Infiltration and BMP information - Note: Increasing infiltration will likely decrease stormwater treatment area for Metals, Bacteria and Phosporus

I am proposing to infiltrate this percentage WQv to this WBID	0%	%
I am proposing this number of BMP's	1	#

RESULTS - Select the Larger Number of the 2 numbers provided

Applicable Condition	**Min Water Quality Treatment Area**	**Min Treatment w/o WQ consideration**
No Impairement or TMDL - New Development	1.92	1.92
No Impairment or TMDL - Redevelopment		
Only Phosphorus, Metals or Bacteria Impairment - New Development		
Only Phosphorus, Metals or Bacteria Impairment - Redevelopment		
Nitrogen Impairment - New Development		
Nitrogen Impairment - Redevelopment		

REQUIRED STORMWATER TREATMENT AREA **1.9** acres

* Enter the name of the STP (both type and label) which has been designed to treat this particular Rev or Rea.

Appendix D – Minimum Standard 4 – Conveyance and Natural Channel Protection Calculations

- Hydraulic Calculations
- Channel Protection – CPv

Hydraulic Calculations

vhb
1 Cedar Street
Providence, RI 02903

Storm Drainage Computations

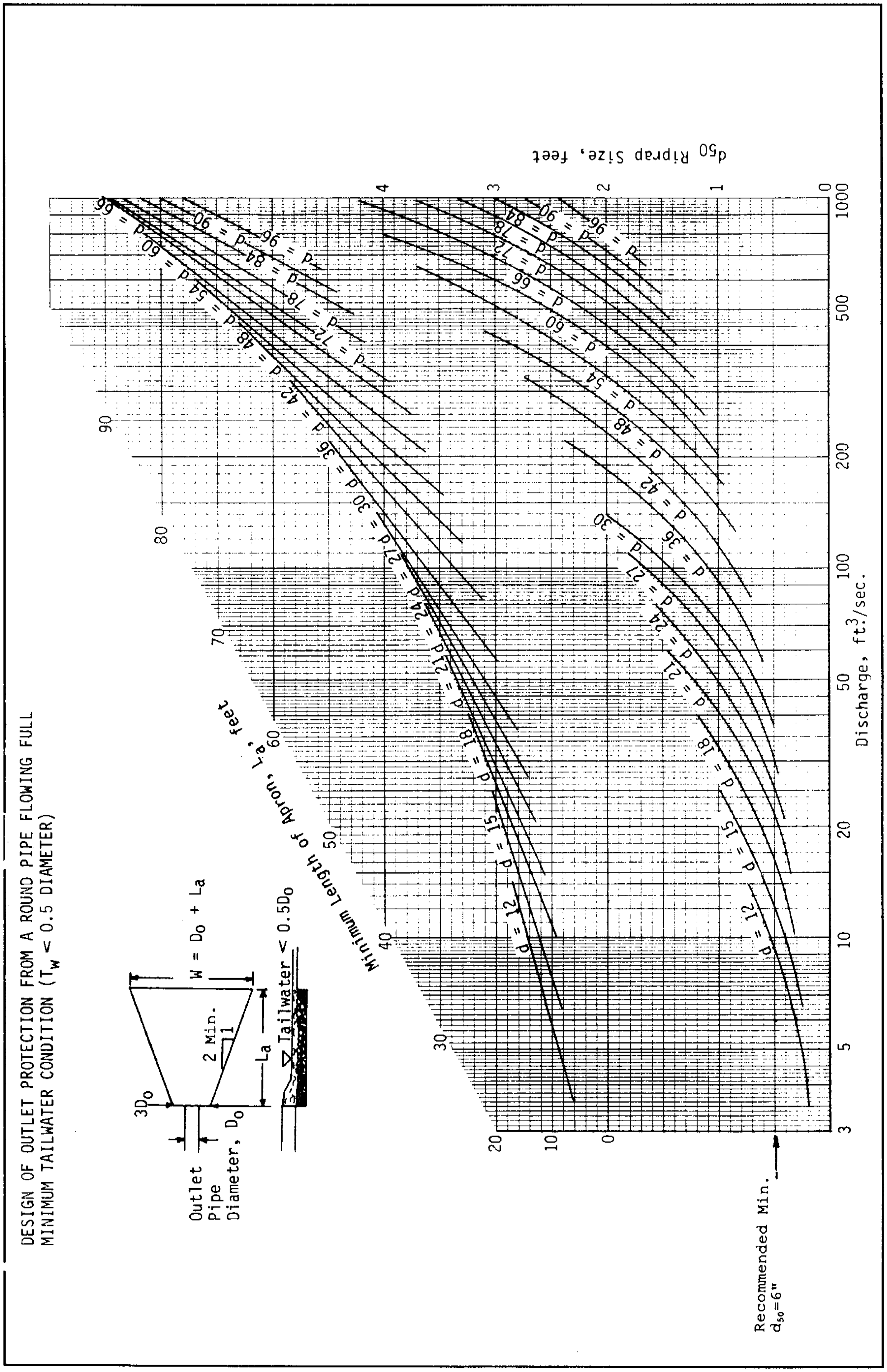
Name: Onshore Substation

Client: DWW Rev, LLC

Proj. No.: **73032.01**
Date: **3.21.2021**
Computed by: KC
Checked by:

Rainfall Intensity - 10 Year Duration TP-40

	LOCATION		AREA	C	C x A	SUM	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PROFILE							
DESCRIPTION	FROM	TO	(AC.)			C x A	PIPE	CONC TIME		Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM	INV UPPER	INV LOWER	W.S.E. ft	Freeboard ft	
	roof	UD	0.338	0.900	0.304	0.304	0.16	5.0	5.4	1.64	4.9	0.01	8	1.09%	1.64	4.7	46	0.50	19.00	16.90	16.40	16.6	2.4	
	roof	INF1	0.053	0.900	0.048	0.048	0.24	5.0	5.4	0.26	3.1	0.01	6	1.30%	0.83	4.2	46	0.60	19.00	14.80	14.20	14.7	4.3	



Source: USDA-SCS

Plate 3.18-3

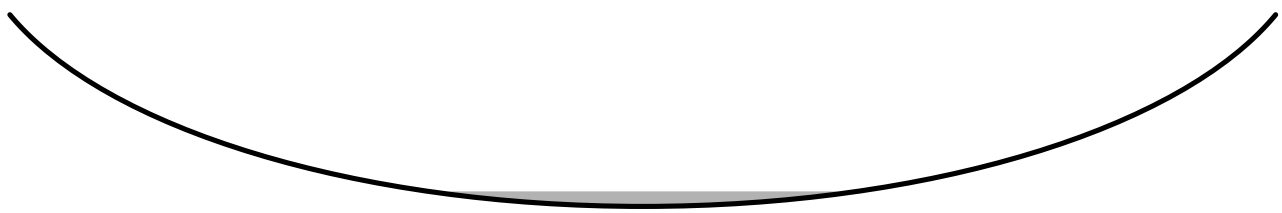
Summary for Reach 3R: Grass Swale

Inflow Area = 31,018 sf, 4.24% Impervious, Inflow Depth = 0.37" for 10-yr event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 957 cf
Outflow = 0.12 cfs @ 12.20 hrs, Volume= 957 cf, Atten= 12%, Lag= 6.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.06 fps, Min. Travel Time= 4.0 min
Avg. Velocity = 0.45 fps, Avg. Travel Time= 9.4 min

Peak Storage= 31 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 2.25'
Bank-Full Depth= 1.00' Flow Area= 5.3 sf, Capacity= 30.00 cfs

8.00' x 1.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 257.0' Slope= 0.0233 '/'
Inlet Invert= 22.00', Outlet Invert= 16.00'



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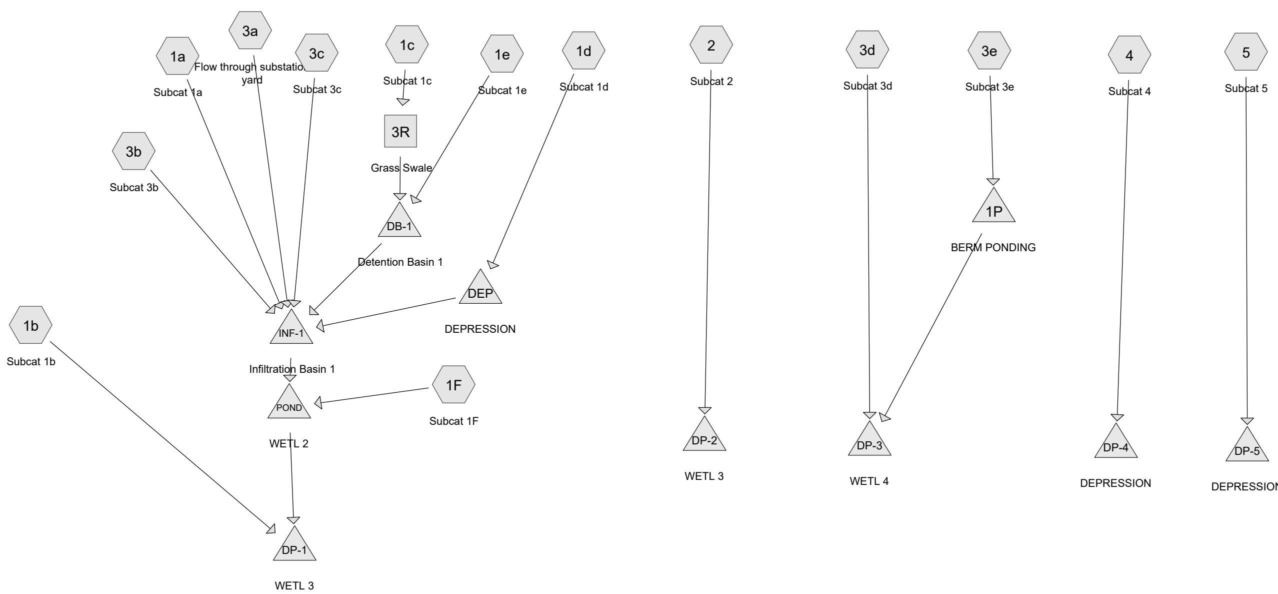
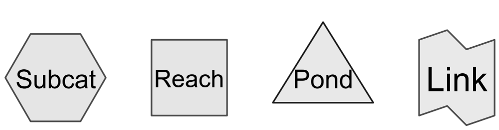
Channel Protection – CPv





Routing Diagram for 73032.10 Drainage PR
Prepared by VHB, Printed 6/9/2021
HydroCAD® 10.10-5a s/n 01038 © 2020 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1a: Subcat 1a Runoff Area=77,432 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=229' Tc=9.0 min CN=41/0 Runoff=0.00 cfs 0 cf

Subcatchment1b: Subcat 1b Runoff Area=205,591 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=205' Tc=24.4 min CN=42/0 Runoff=0.00 cfs 2 cf

Subcatchment1c: Subcat 1c Runoff Area=31,018 sf 4.24% Impervious Runoff Depth=0.11"
Tc=6.0 min CN=39/98 Runoff=0.08 cfs 282 cf

Subcatchment1d: Subcat 1d Runoff Area=11,452 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=145' Tc=6.2 min CN=30/0 Runoff=0.00 cfs 0 cf

Subcatchment1e: Subcat 1e Runoff Area=28,279 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=266' Tc=14.4 min CN=35/0 Runoff=0.00 cfs 0 cf

Subcatchment1F: Subcat 1F Runoff Area=16,913 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30/0 Runoff=0.00 cfs 0 cf

Subcatchment2: Subcat 2 Runoff Area=16,109 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=92' Tc=8.3 min CN=48/0 Runoff=0.00 cfs 47 cf

Subcatchment3a: Flow through Runoff Area=161,631 sf 0.00% Impervious Runoff Depth>2.15"
Flow Length=707' Tc=725.7 min CN=94/0 Runoff=0.62 cfs 28,961 cf

Subcatchment3b: Subcat 3b Runoff Area=14,725 sf 100.00% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=0/98 Runoff=0.89 cfs 3,153 cf

Subcatchment3c: Subcat 3c Runoff Area=2,340 sf 100.00% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=0/98 Runoff=0.14 cfs 501 cf

Subcatchment3d: Subcat 3d Runoff Area=97,014 sf 0.00% Impervious Runoff Depth=0.32"
Flow Length=105' Tc=7.9 min CN=62/0 Runoff=0.39 cfs 2,601 cf

Subcatchment3e: Subcat 3e Runoff Area=9,519 sf 0.00% Impervious Runoff Depth=0.21"
Tc=6.0 min CN=58/0 Runoff=0.02 cfs 169 cf

Subcatchment4: Subcat 4 Runoff Area=12,237 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=34' Slope=0.3500 '/' Tc=6.0 min CN=36/0 Runoff=0.00 cfs 0 cf

Subcatchment5: Subcat 5 Runoff Area=38,592 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=277' Slope=0.0250 '/' Tc=20.8 min CN=32/0 Runoff=0.00 cfs 0 cf

Reach 3R: Grass Swale Avg. Flow Depth=0.06' Max Vel=0.88 fps Inflow=0.08 cfs 282 cf
n=0.030 L=257.0' S=0.0233 '/' Capacity=30.00 cfs Outflow=0.07 cfs 282 cf

Pond 1P: BERM PONDING Peak Elev=0.25' Storage=169 cf Inflow=0.02 cfs 169 cf
Outflow=0.00 cfs 0 cf

Pond DB-1: Detention Basin 1 Peak Elev=14.18' Storage=282 cf Inflow=0.07 cfs 282 cf
6.0" Round Culvert n=0.011 L=38.0' S=0.0026 '/' Outflow=0.00 cfs 0 cf

Pond DEP: DEPRESSION Peak Elev=14.20' Storage=0 cf Inflow=0.00 cfs 0 cf
Discarded=0.00 cfs 0 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf

Pond DP-1: WETL 3 Inflow=0.00 cfs 2 cf
Primary=0.00 cfs 2 cf

Pond DP-2: WETL 3 Inflow=0.00 cfs 47 cf
Primary=0.00 cfs 47 cf

Pond DP-3: WETL 4 Inflow=0.39 cfs 2,601 cf
Primary=0.39 cfs 2,601 cf

Pond DP-4: DEPRESSION Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Pond DP-5: DEPRESSION Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Pond INF-1: Infiltration Basin 1 Peak Elev=14.21' Storage=94 cf Inflow=1.05 cfs 32,615 cf
Discarded=1.01 cfs 32,614 cf Primary=0.00 cfs 0 cf Outflow=1.01 cfs 32,614 cf

Pond POND: WETL 2 Peak Elev=9.70' Storage=0 cf Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 722,852 sf Runoff Volume = 35,714 cf Average Runoff Depth = 0.59"
97.46% Pervious = 704,472 sf 2.54% Impervious = 18,380 sf

TOTAL PEAK DISCHARGE RATE
FROM SITE = 0.39 CFS

Appendix E – Minimum Standard 5 – Overbank Flood Protection – HydroCAD Calculations

- Existing Conditions - HydroCAD Model
- Proposed Conditions – HydroCAD Model
- Drain down Calculation

Existing Conditions – HydroCAD Model

\\vhb\gbl\proj\Providence\73032.01 RWF-Export Cable (2)\cad\ld\Eng\73032 Drainage EX.dwg

vhb.com

vhb

1 Cedar Street
Suite 400
Providence, RI 02903
401.272.8100

Legend

SYMBOLS

- X — DESIGN POINT
- X — DRAINAGE AREA DESIGNATION
- X — POND

LINETYPES

- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION FLOW LINE
- SOIL TYPE BOUNDARY
- AREA OF LAND WITHIN 50'
- 100' RIVERBANK WETLAND
- WETLAND BOUNDARY

SCS SOIL CLASSIFICATIONS

- MU — MERRIMAC-URBAN LAND COMPLEX, 0-8 PERCENT SLOPES, HSG A
- QoC — QUONSET GRAVELLY SANDY LOAM, ROLLING, HSG A
- SwA — SWANSEA MUCK, 0 TO 1 PERCENT SLOPES, HSG B/D
- Wa — WALPOLE SANDY LOAM, 0 TO 3 PERCENT SLOPES, HSG B/D
- WgB — WINDSOR LOAMY SAND, 3 TO 8 PERCENT SLOPES, HSG A

0 25 50 100 Feet

Revolution Wind Proposed Onshore Substation

Camp Avenue
North Kingstown, Rhode Island

No.	Revision	Date	Appvd.

Designed by: AEC
Checked by: RLC
Issued for: Permits
Date: April 26, 2021

Not Approved for Construction

Existing Watershed Map

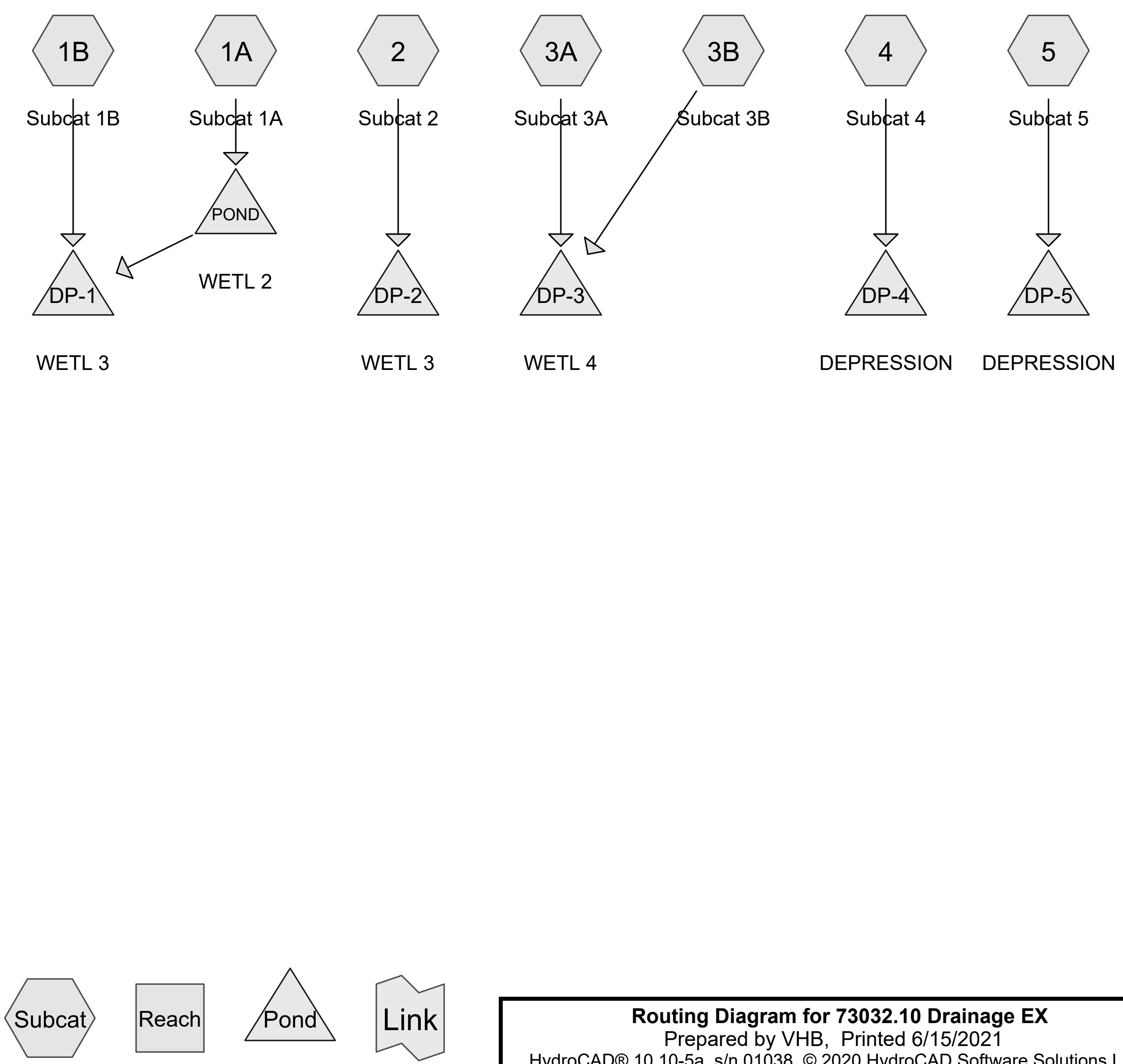
Drawing Number

EX-1

Sheet 1 of 2

Project Number
73032.01

Saved Thursday, April 15, 2021 3:51:20 PM SPEREIRA Plotted Thursday, April 15, 2021 3:58:55 PM Pereira, Stephen



Routing Diagram for 73032.10 Drainage EX
Prepared by VHB, Printed 6/15/2021
HydroCAD® 10.10-5a s/n 01038 © 2020 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Subcat 1A Runoff Area=125,794 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=298' Tc=33.9 min CN=33/0 Runoff=0.00 cfs 0 cf

Subcatchment1B: Subcat 1B Runoff Area=228,996 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=200' Tc=11.5 min CN=42/0 Runoff=0.00 cfs 2 cf

Subcatchment2: Subcat 2 Runoff Area=16,983 sf 0.00% Impervious Runoff Depth=0.06"
Flow Length=72' Tc=10.5 min CN=50/0 Runoff=0.00 cfs 84 cf

Subcatchment3A: Subcat 3A Runoff Area=117,060 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=272' Tc=6.7 min CN=37/0 Runoff=0.00 cfs 0 cf

Subcatchment3B: Subcat 3B Runoff Area=97,544 sf 0.00% Impervious Runoff Depth=0.35"
Tc=6.0 min CN=63/0 Runoff=0.51 cfs 2,864 cf

Subcatchment4: Subcat 4 Runoff Area=98,011 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=238' Tc=15.3 min CN=36/0 Runoff=0.00 cfs 0 cf

Subcatchment5: Subcat 5 Runoff Area=40,644 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=280' Slope=0.0250 '/' Tc=20.8 min CN=32/0 Runoff=0.00 cfs 0 cf

Pond DP-1: WETL 3 Inflow=0.00 cfs 2 cf
Primary=0.00 cfs 2 cf

Pond DP-2: WETL 3 Inflow=0.00 cfs 84 cf
Primary=0.00 cfs 84 cf

Pond DP-3: WETL 4 Inflow=0.51 cfs 2,864 cf
Primary=0.51 cfs 2,864 cf

Pond DP-4: DEPRESSION Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Pond DP-5: DEPRESSION Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Pond POND: WETL 2 Peak Elev=9.70' Storage=0 cf Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 725,032 sf Runoff Volume = 2,950 cf Average Runoff Depth = 0.05"
100.00% Pervious = 725,032 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1A: Subcat 1A

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
42,415	39	>75% Grass cover, Good, HSG A
83,378	30	Woods, Good, HSG A
125,794	33	Weighted Average
125,794	33	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.9	59	0.0100	0.03		**Sheet Flow, Woods** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.4	65	0.0308	2.83		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
1.6	174	0.0132	1.85		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
33.9	298	Total			

Summary for Subcatchment 1B: Subcat 1B

Runoff = 0.00 cfs @ 24.03 hrs, Volume= 2 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
34,819	39	>75% Grass cover, Good, HSG A
140,863	30	Woods, Good, HSG A
45,660	77	Woods, Good, HSG D
7,655	80	>75% Grass cover, Good, HSG D
228,996	42	Weighted Average
228,996	42	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	19	0.0190	0.03		**Sheet Flow, Woods** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.8	82	0.0128	1.82		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
0.7	99	0.0190	2.22		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
11.5	200	Total			

Summary for Subcatchment 2: Subcat 2

Runoff = 0.00 cfs @ 14.95 hrs, Volume= 84 cf, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
9,585	30	Woods, Good, HSG A
276	39	>75% Grass cover, Good, HSG A
1,946	80	>75% Grass cover, Good, HSG D
5,176	77	Woods, Good, HSG D
16,983	50	Weighted Average
16,983	50	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	46	0.1000	0.07		**Sheet Flow, Woods** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.1	26	0.1570	6.38		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
10.5	72	Total			

Summary for Subcatchment 3A: Subcat 3A

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
52,841	39	>75% Grass cover, Good, HSG A
57,185	30	Woods, Good, HSG A
886	80	>75% Grass cover, Good, HSG D
6,148	77	Woods, Good, HSG D
117,060	37	Weighted Average
117,060	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	27	0.0185	0.09		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.30"
0.4	68	0.0290	2.74		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
0.5	60	0.0167	2.08		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
0.5	73	0.0270	2.65		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
0.2	44	0.0694	4.24		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
6.7	272	Total			

Summary for Subcatchment 3B: Subcat 3B

Runoff = 0.51 cfs @ 12.14 hrs, Volume= 2,864 cf, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
1,073	39	>75% Grass cover, Good, HSG A
29,603	30	Woods, Good, HSG A
9,314	80	>75% Grass cover, Good, HSG D
57,554	77	Woods, Good, HSG D
97,544	63	Weighted Average
97,544	63	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct entry**

Summary for Subcatchment 4: Subcat 4

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
63,274	39	>75% Grass cover, Good, HSG A
34,737	30	Woods, Good, HSG A
98,011	36	Weighted Average
98,011	36	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	17	0.4000	0.11		**Sheet Flow, Woods** Woods: Dense underbrush n= 0.800 P2= 3.30"
11.5	33	0.0400	0.05		**Sheet Flow, Woods** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.3	67	0.0420	3.30		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
0.1	20	0.1400	6.02		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
0.7	101	0.0250	2.55		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
15.3	238	Total			

Summary for Subcatchment 5: Subcat 5

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
33,680	30	Woods, Good, HSG A
6,964	39	>75% Grass cover, Good, HSG A
40,644	32	Weighted Average
40,644	32	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.3	50	0.0250	0.04		**Sheet Flow, Woods** Woods: Dense underbrush n= 0.800 P2= 3.30"
1.5	230	0.0250	2.55		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
20.8	280	Total			

Summary for Pond DP-1: WETL 3

Inflow Area = 354,789 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-Year event
Inflow = 0.00 cfs @ 24.03 hrs, Volume= 2 cf
Primary = 0.00 cfs @ 24.03 hrs, Volume= 2 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond DP-2: WETL 3

Inflow Area = 16,983 sf, 0.00% Impervious, Inflow Depth = 0.06" for 1-Year event
Inflow = 0.00 cfs @ 14.95 hrs, Volume= 84 cf
Primary = 0.00 cfs @ 14.95 hrs, Volume= 84 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond DP-3: WETL 4

Inflow Area = 214,604 sf, 0.00% Impervious, Inflow Depth = 0.16" for 1-Year event
Inflow = 0.51 cfs @ 12.14 hrs, Volume= 2,864 cf
Primary = 0.51 cfs @ 12.14 hrs, Volume= 2,864 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond DP-4: DEPRESSION

Inflow Area = 98,011 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond DP-5: DEPRESSION

Inflow Area = 40,644 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond POND: WETL 2

Inflow Area = 125,794 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 9.70' @ 0.00 hrs Surf.Area= 604 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	9.70'	414 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
9.70	604	0	0
10.00	2,155	414	414

Device	Routing	Invert	Outlet Devices
#1	Primary	10.00'	**269.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.70' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Subcat 1A Runoff Area=125,794 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=298' Tc=33.9 min CN=33/0 Runoff=0.01 cfs 349 cf

Subcatchment1B: Subcat 1B Runoff Area=228,996 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=200' Tc=11.5 min CN=42/0 Runoff=0.45 cfs 5,470 cf

Subcatchment2: Subcat 2 Runoff Area=16,983 sf 0.00% Impervious Runoff Depth=0.65"
Flow Length=72' Tc=10.5 min CN=50/0 Runoff=0.15 cfs 923 cf

Subcatchment3A: Subcat 3A Runoff Area=117,060 sf 0.00% Impervious Runoff Depth=0.12"
Flow Length=272' Tc=6.7 min CN=37/0 Runoff=0.04 cfs 1,177 cf

Subcatchment3B: Subcat 3B Runoff Area=97,544 sf 0.00% Impervious Runoff Depth=1.45"
Tc=6.0 min CN=63/0 Runoff=3.47 cfs 11,753 cf

Subcatchment4: Subcat 4 Runoff Area=98,011 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=238' Tc=15.3 min CN=36/0 Runoff=0.03 cfs 772 cf

Subcatchment5: Subcat 5 Runoff Area=40,644 sf 0.00% Impervious Runoff Depth=0.02"
Flow Length=280' Slope=0.0250 '/' Tc=20.8 min CN=32/0 Runoff=0.00 cfs 65 cf

Pond DP-1: WETL 3 Inflow=0.45 cfs 5,470 cf
Primary=0.45 cfs 5,470 cf

Pond DP-2: WETL 3 Inflow=0.15 cfs 923 cf
Primary=0.15 cfs 923 cf

Pond DP-3: WETL 4 Inflow=3.47 cfs 12,930 cf
Primary=3.47 cfs 12,930 cf

Pond DP-4: DEPRESSION Inflow=0.03 cfs 772 cf
Primary=0.03 cfs 772 cf

Pond DP-5: DEPRESSION Inflow=0.00 cfs 65 cf
Primary=0.00 cfs 65 cf

Pond POND: WETL 2 Peak Elev=9.97' Storage=349 cf Inflow=0.01 cfs 349 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 725,032 sf Runoff Volume = 20,510 cf Average Runoff Depth = 0.34"
100.00% Pervious = 725,032 sf 0.00% Impervious = 0 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Subcat 1A Runoff Area=125,794 sf 0.00% Impervious Runoff Depth=0.80"
Flow Length=298' Tc=33.9 min CN=33/0 Runoff=0.76 cfs 8,350 cf

Subcatchment1B: Subcat 1B Runoff Area=228,996 sf 0.00% Impervious Runoff Depth=1.68"
Flow Length=200' Tc=11.5 min CN=42/0 Runoff=6.79 cfs 32,143 cf

Subcatchment2: Subcat 2 Runoff Area=16,983 sf 0.00% Impervious Runoff Depth=2.56"
Flow Length=72' Tc=10.5 min CN=50/0 Runoff=0.93 cfs 3,624 cf

Subcatchment3A: Subcat 3A Runoff Area=117,060 sf 0.00% Impervious Runoff Depth=1.17"
Flow Length=272' Tc=6.7 min CN=37/0 Runoff=2.18 cfs 11,445 cf

Subcatchment3B: Subcat 3B Runoff Area=97,544 sf 0.00% Impervious Runoff Depth=4.07"
Tc=6.0 min CN=63/0 Runoff=10.43 cfs 33,049 cf

Subcatchment4: Subcat 4 Runoff Area=98,011 sf 0.00% Impervious Runoff Depth=1.08"
Flow Length=238' Tc=15.3 min CN=36/0 Runoff=1.26 cfs 8,788 cf

Subcatchment5: Subcat 5 Runoff Area=40,644 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=280' Slope=0.0250 '/' Tc=20.8 min CN=32/0 Runoff=0.24 cfs 2,399 cf

Pond DP-1: WETL 3 Inflow=6.79 cfs 33,148 cf
Primary=6.79 cfs 33,148 cf

Pond DP-2: WETL 3 Inflow=0.93 cfs 3,624 cf
Primary=0.93 cfs 3,624 cf

Pond DP-3: WETL 4 Inflow=12.43 cfs 44,494 cf
Primary=12.43 cfs 44,494 cf

Pond DP-4: DEPRESSION Inflow=1.26 cfs 8,788 cf
Primary=1.26 cfs 8,788 cf

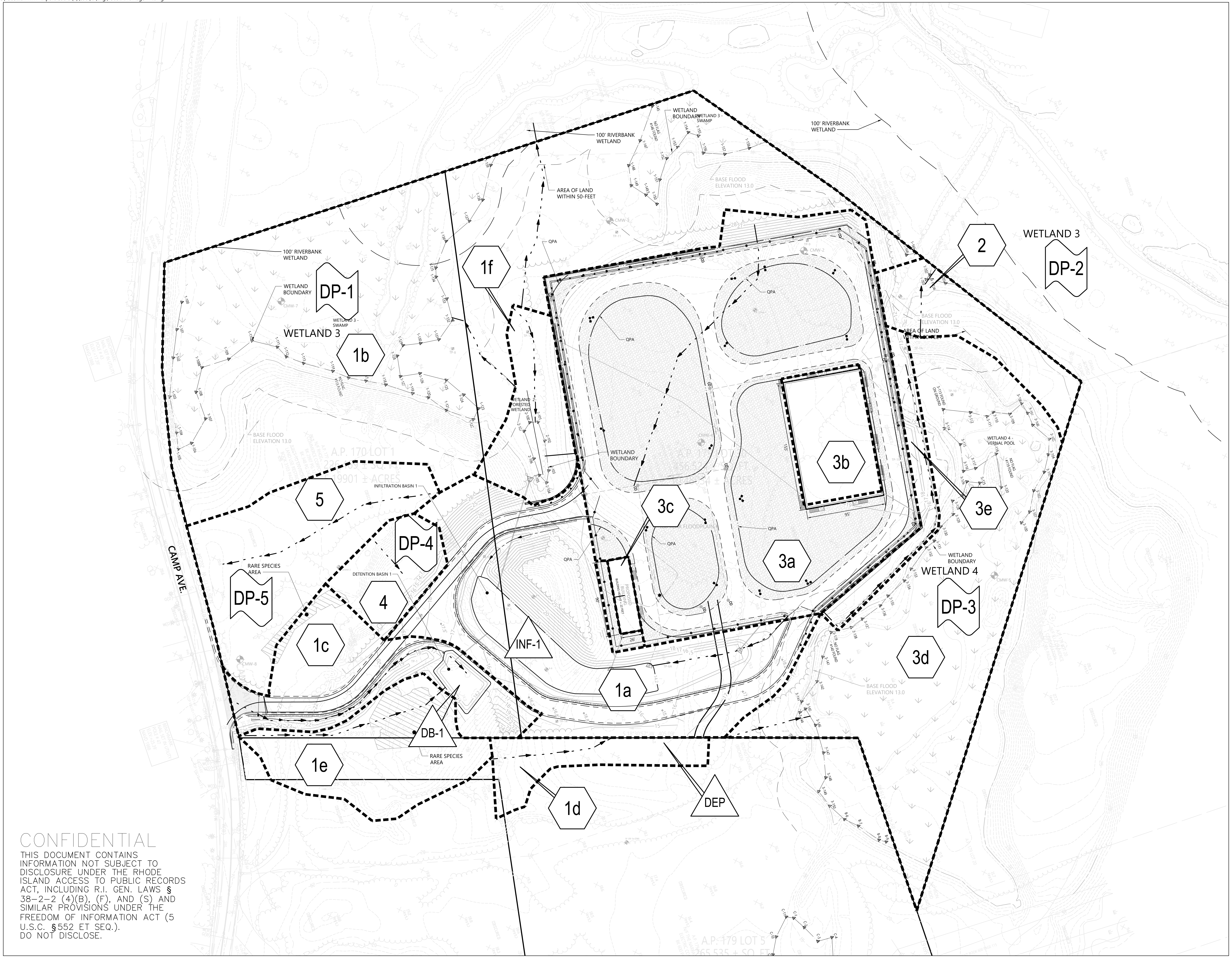
Pond DP-5: DEPRESSION Inflow=0.24 cfs 2,399 cf
Primary=0.24 cfs 2,399 cf

Pond POND: WETL 2 Peak Elev=10.01' Storage=414 cf Inflow=0.76 cfs 8,350 cf
Outflow=0.44 cfs 1,004 cf

Total Runoff Area = 725,032 sf Runoff Volume = 99,798 cf Average Runoff Depth = 1.65"
100.00% Pervious = 725,032 sf 0.00% Impervious = 0 sf

Proposed Conditions – HydroCAD Model

\\vhb\gbl\proj\Providence\73032.01 RWF-Export Cable (2)\cad\ld\Eng\73032 Drainage PR.dwg



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THIS DOCUMENT CONTAINS INFORMATION NOT SUBJECT TO DISCLOSURE UNDER THE RHODE ISLAND ACCESS TO PUBLIC RECORDS ACT, INCLUDING R.I. GEN. LAWS § 38-2-2 (4)(B), (F), AND (S) AND SIMILAR PROVISIONS UNDER THE FREEDOM OF INFORMATION ACT (5 U.S.C. §552 ET SEQ.). DO NOT DISCLOSE.

Saved Monday, June 7, 2021 1:06:43 PM KCRAWFORD Plotted Tuesday, June 15, 2021 2:23:49 PM Stephen Pereira

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Legend

SYMBOLS

X	DESIGN POINT
X	DRAINAGE AREA DESIGNATION
X	POND
QPA	QUALIFIED PERVIOUS AREA

LINETYPES

- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION FLOW LINE
- SOIL TYPE BOUNDARY
- AREA OF LAND WITHIN 50'
- 100' RIVERBANK WETLAND
- WETLAND BOUNDARY

SCS SOIL CLASSIFICATIONS

- MERRIMAC-URBAN LAND COMPLEX, 0-8 PERCENT SLOPES, HSG A
- QUONSET GRAVELLY SANDY LOAM, ROLLING, HSG A
- SWANSEA MUCK, 0 TO 1 PERCENT SLOPES, HSG B/D
- WALPOLE SANDY LOAM, 0 TO 3 PERCENT SLOPES, HSG B/D
- WINDSOR LOAMY SAND, 3 TO 8 PERCENT SLOPES, HSG A

0 25 50 100 Feet

Revolution Wind Proposed Onshore Substation

Camp Avenue
North Kingstown, Rhode Island

No.	Revision	Date	Appvd.

Designed by AEC — Checked by RLC

Issued for: Permits — Date: April 26, 2021

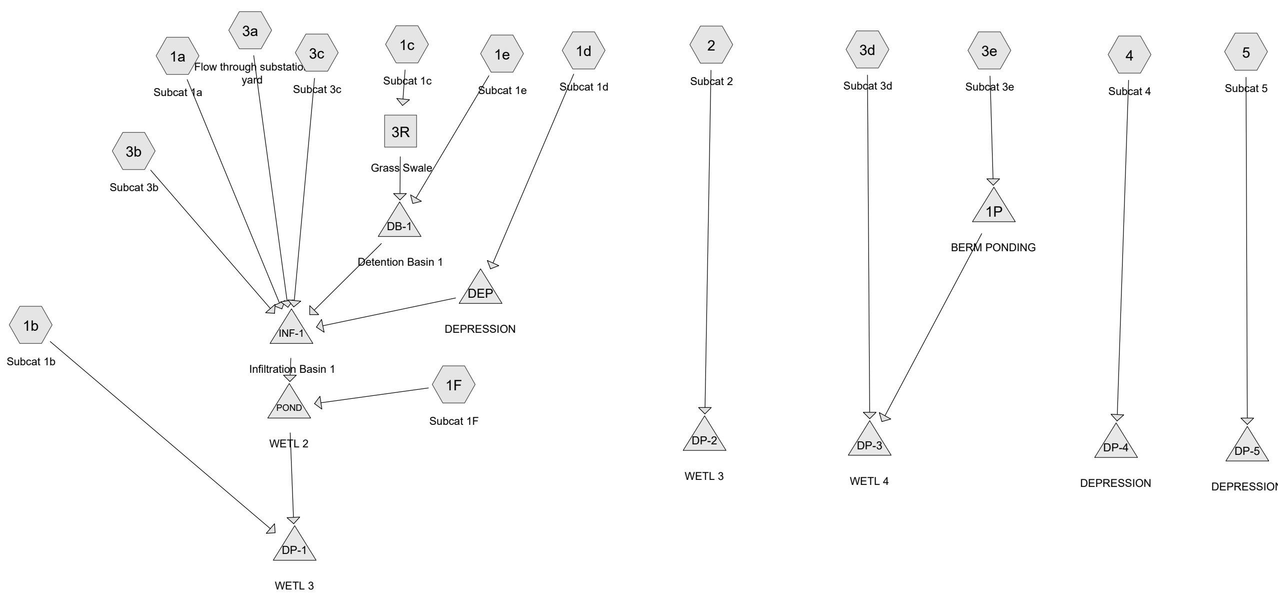
Not Approved for Construction

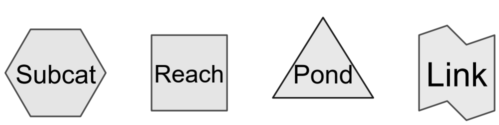
Drawing Title: **Proposed Watershed Map**

Drawing Number: **PR-1**

Sheet 2 of 2

Project Number 73032.01





Routing Diagram for 73032.10 Drainage PR
Prepared by VHB, Printed 6/9/2021
HydroCAD® 10.10-5a s/n 01038 © 2020 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1a: Subcat 1a Runoff Area=77,432 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=229' Tc=9.0 min CN=41/0 Runoff=0.00 cfs 0 cf

Subcatchment1b: Subcat 1b Runoff Area=205,591 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=205' Tc=24.4 min CN=42/0 Runoff=0.00 cfs 2 cf

Subcatchment1c: Subcat 1c Runoff Area=31,018 sf 4.24% Impervious Runoff Depth=0.11"
Tc=6.0 min CN=39/98 Runoff=0.08 cfs 282 cf

Subcatchment1d: Subcat 1d Runoff Area=11,452 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=145' Tc=6.2 min CN=30/0 Runoff=0.00 cfs 0 cf

Subcatchment1e: Subcat 1e Runoff Area=28,279 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=266' Tc=14.4 min CN=35/0 Runoff=0.00 cfs 0 cf

Subcatchment1F: Subcat 1F Runoff Area=16,913 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30/0 Runoff=0.00 cfs 0 cf

Subcatchment2: Subcat 2 Runoff Area=16,109 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=92' Tc=8.3 min CN=48/0 Runoff=0.00 cfs 47 cf

Subcatchment3a: Flow through Runoff Area=161,631 sf 0.00% Impervious Runoff Depth>2.15"
Flow Length=707' Tc=725.7 min CN=94/0 Runoff=0.62 cfs 28,961 cf

Subcatchment3b: Subcat 3b Runoff Area=14,725 sf 100.00% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=0/98 Runoff=0.89 cfs 3,153 cf

Subcatchment3c: Subcat 3c Runoff Area=2,340 sf 100.00% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=0/98 Runoff=0.14 cfs 501 cf

Subcatchment3d: Subcat 3d Runoff Area=97,014 sf 0.00% Impervious Runoff Depth=0.32"
Flow Length=105' Tc=7.9 min CN=62/0 Runoff=0.39 cfs 2,601 cf

Subcatchment3e: Subcat 3e Runoff Area=9,519 sf 0.00% Impervious Runoff Depth=0.21"
Tc=6.0 min CN=58/0 Runoff=0.02 cfs 169 cf

Subcatchment4: Subcat 4 Runoff Area=12,237 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=34' Slope=0.3500 '/' Tc=6.0 min CN=36/0 Runoff=0.00 cfs 0 cf

Subcatchment5: Subcat 5 Runoff Area=38,592 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=277' Slope=0.0250 '/' Tc=20.8 min CN=32/0 Runoff=0.00 cfs 0 cf

Reach 3R: Grass Swale Avg. Flow Depth=0.06' Max Vel=0.88 fps Inflow=0.08 cfs 282 cf
n=0.030 L=257.0' S=0.0233 '/' Capacity=30.00 cfs Outflow=0.07 cfs 282 cf

Pond 1P: BERM PONDING Peak Elev=0.25' Storage=169 cf Inflow=0.02 cfs 169 cf
Outflow=0.00 cfs 0 cf

Pond DB-1: Detention Basin 1 Peak Elev=14.18' Storage=282 cf Inflow=0.07 cfs 282 cf
6.0" Round Culvert n=0.011 L=38.0' S=0.0026 '/' Outflow=0.00 cfs 0 cf

Pond DEP: DEPRESSION Peak Elev=14.20' Storage=0 cf Inflow=0.00 cfs 0 cf
Discarded=0.00 cfs 0 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf

Pond DP-1: WETL 3 Inflow=0.00 cfs 2 cf
Primary=0.00 cfs 2 cf

Pond DP-2: WETL 3 Inflow=0.00 cfs 47 cf
Primary=0.00 cfs 47 cf

Pond DP-3: WETL 4 Inflow=0.39 cfs 2,601 cf
Primary=0.39 cfs 2,601 cf

Pond DP-4: DEPRESSION Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Pond DP-5: DEPRESSION Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Pond INF-1: Infiltration Basin 1 Peak Elev=14.21' Storage=94 cf Inflow=1.05 cfs 32,615 cf
Discarded=1.01 cfs 32,614 cf Primary=0.00 cfs 0 cf Outflow=1.01 cfs 32,614 cf

Pond POND: WETL 2 Peak Elev=9.70' Storage=0 cf Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 722,852 sf Runoff Volume = 35,714 cf Average Runoff Depth = 0.59"
97.46% Pervious = 704,472 sf 2.54% Impervious = 18,380 sf

Summary for Subcatchment 1a: Subcat 1a

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
7,924	30	Woods, Good, HSG A
39,213	30	Brush, Good, HSG A
11,137	30	Meadow, non-grazed, HSG A
22	39	>75% Grass cover, Good, HSG A
19,123	76	Gravel roads, HSG A
13	96	Gravel surface, HSG A
77,432	41	Weighted Average
77,432	41	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
0.1	23	0.1080	5.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.0	156	0.0064	1.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	229	Total			

Summary for Subcatchment 1b: Subcat 1b

Runoff = 0.00 cfs @ 24.10 hrs, Volume= 2 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
45,566	77	Woods, Good, HSG D
7,655	80	>75% Grass cover, Good, HSG D
119	73	Brush, Good, HSG D
14,896	30	Brush, Good, HSG A
639	30	Meadow, non-grazed, HSG A
665	39	>75% Grass cover, Good, HSG A
136,051	30	Woods, Good, HSG A
205,591	42	Weighted Average
205,591	42	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.1	50	0.0160	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.6	67	0.0128	1.82		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	88	0.0190	2.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
24.4	205	Total			

Summary for Subcatchment 1c: Subcat 1c

Runoff = 0.08 cfs @ 12.09 hrs, Volume= 282 cf, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

	Area (sf)	CN	Description
	8,049	30	Woods, Good, HSG A
	9,559	30	Brush, Good, HSG A
	7,649	39	>75% Grass cover, Good, HSG A
	4,446	76	Gravel roads, HSG A
*	1,315	98	Paved Road, HSG A
	31,018	42	Weighted Average
	29,703	39	95.76% Pervious Area
	1,315	98	4.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min**

Summary for Subcatchment 1d: Subcat 1d

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
16	30	Brush, Good, HSG A
49	39	>75% Grass cover, Good, HSG A
11,387	30	Woods, Good, HSG A
11,452	30	Weighted Average
11,452	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1300	0.15		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.30"
0.1	35	0.0860	4.72		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
0.4	60	0.0300	2.79		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
6.2	145	Total			

Summary for Subcatchment 1e: Subcat 1e

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
8,691	30	Woods, Good, HSG A
3,630	30	Brush, Good, HSG A
15,957	39	>75% Grass cover, Good, HSG A
28,279	35	Weighted Average
28,279	35	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	42	0.0470	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.1	39	0.1280	5.76		**Shallow Concentrated Flow, through woods** Unpaved Kv= 16.1 fps
1.2	185	0.0270	2.65		**Shallow Concentrated Flow, through woods** Unpaved Kv= 16.1 fps
14.4	266	Total			

Summary for Subcatchment 1F: Subcat 1F

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
7,548	30	Brush, Good, HSG A
9,364	30	Woods, Good, HSG A
16,913	30	Weighted Average
16,913	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min**

Summary for Subcatchment 2: Subcat 2

Runoff = 0.00 cfs @ 15.49 hrs, Volume= 47 cf, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
2,776	73	Brush, Good, HSG D
3,673	77	Woods, Good, HSG D
9,381	30	Woods, Good, HSG A
278	30	Brush, Good, HSG A
16,109	48	Weighted Average
16,109	48	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	42	0.1570	0.09		**Sheet Flow, Woods** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.2	50	0.0600	3.94		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
8.3	92	Total			

Summary for Subcatchment 3a: Flow through substation yard

Runoff = 0.62 cfs @ 21.75 hrs, Volume= 28,961 cf, Depth> 2.15"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

	Area (sf)	CN	Description
	254	78	Meadow, non-grazed, HSG D
	5,624	96	Gravel surface, HSG D
	3,947	30	Meadow, non-grazed, HSG A
	109,130	96	Gravel surface, HSG A
	467	30	Woods, Good, HSG A
	585	30	Brush, Good, HSG A
	23	76	Gravel roads, HSG A
*	39,056	96	Gravel roads in Substation, HSG A
*	2,545	96	Gravel roads in Substation, HSG D
	161,631	94	Weighted Average
	161,631	94	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	20	0.3300	0.26		**Sheet Flow, Meadow Mix** Grass: Dense n= 0.240 P2= 3.30"
720.0					**Direct Entry, Gravel Yard - 2 in/hr flow through 24" gravel**
4.4	687	0.0048	2.57	0.51	**Pipe Channel, Underdrain** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
725.7	707	Total			

Summary for Subcatchment 3b: Subcat 3b

Runoff = 0.89 cfs @ 12.09 hrs, Volume= 3,153 cf, Depth= 2.57"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
116	98	Roofs, HSG D
14,609	98	Roofs, HSG A
14,725	98	Weighted Average
14,725	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min**

Summary for Subcatchment 3c: Subcat 3c

Runoff = 0.14 cfs @ 12.09 hrs, Volume= 501 cf, Depth= 2.57"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
2,340	98	Roofs, HSG A
2,340	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Large Roof**

Summary for Subcatchment 3d: Subcat 3d

Runoff = 0.39 cfs @ 12.19 hrs, Volume= 2,601 cf, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
4,543	80	>75% Grass cover, Good, HSG D
2,732	30	Brush, Good, HSG A
500	73	Brush, Good, HSG D
27,581	30	Woods, Good, HSG A
60,348	77	Woods, Good, HSG D
654	30	Meadow, non-grazed, HSG A
657	39	>75% Grass cover, Good, HSG A
97,014	62	Weighted Average
97,014	62	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	38	0.0130	0.08		**Sheet Flow, Meadow Mix** Grass: Dense n= 0.240 P2= 3.30"
0.1	27	0.0370	3.10		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
0.1	40	0.1900	7.02		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
7.9	105	Total			

Summary for Subcatchment 3e: Subcat 3e

Runoff = 0.02 cfs @ 12.34 hrs, Volume= 169 cf, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
219	77	Woods, Good, HSG D
2,778	30	Brush, Good, HSG A
5,678	73	Brush, Good, HSG D
486	30	Meadow, non-grazed, HSG A
279	78	Meadow, non-grazed, HSG D
80	30	Woods, Good, HSG A
9,519	58	Weighted Average
9,519	58	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min**

Summary for Subcatchment 4: Subcat 4

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
962	30	Woods, Good, HSG A
2,988	30	Brush, Good, HSG A
8,271	39	>75% Grass cover, Good, HSG A
16	76	Gravel roads, HSG A
12,237	36	Weighted Average
12,237	36	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	34	0.3500	0.11		**Sheet Flow, sheet** Woods: Dense underbrush n= 0.800 P2= 3.30"
1.1					**Direct Entry, Minimum Tc**
6.0	34	Total			

Summary for Subcatchment 5: Subcat 5

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
Type III 24-hr 1-yr Rainfall=2.80"

Area (sf)	CN	Description
750	30	Brush, Good, HSG A
139	30	Meadow, non-grazed, HSG A
6,480	39	>75% Grass cover, Good, HSG A
31,224	30	Woods, Good, HSG A
38,592	32	Weighted Average
38,592	32	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.3	50	0.0250	0.04		**Sheet Flow, Woods** Woods: Dense underbrush n= 0.800 P2= 3.30"
1.5	227	0.0250	2.55		**Shallow Concentrated Flow, Woods** Unpaved Kv= 16.1 fps
20.8	277	Total			

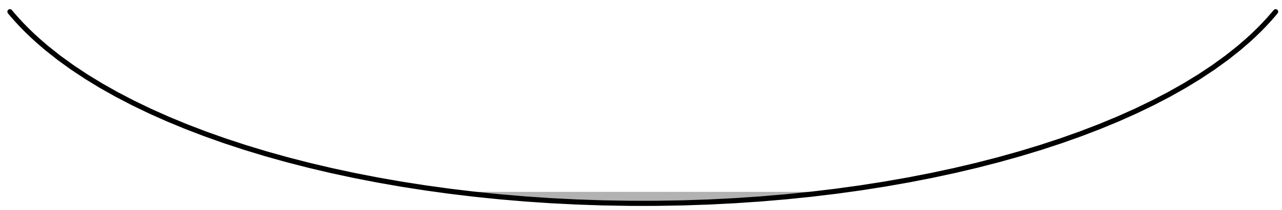
Summary for Reach 3R: Grass Swale

Inflow Area = 31,018 sf, 4.24% Impervious, Inflow Depth = 0.11" for 1-yr event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 282 cf
Outflow = 0.07 cfs @ 12.22 hrs, Volume= 282 cf, Atten= 15%, Lag= 7.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.88 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 13.2 min

Peak Storage= 20 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 1.96'
Bank-Full Depth= 1.00' Flow Area= 5.3 sf, Capacity= 30.00 cfs

8.00' x 1.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 257.0' Slope= 0.0233 '/'
Inlet Invert= 22.00', Outlet Invert= 16.00'



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Summary for Pond 1P: BERM PONDING

Inflow Area =	9,519 sf,	0.00% Impervious,	Inflow Depth = 0.21" for 1-yr event
Inflow =	0.02 cfs @	12.34 hrs, Volume=	169 cf
Outflow =	0.00 cfs @	0.00 hrs, Volume=	0 cf, Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.25' @ 24.40 hrs Surf.Area= 1,363 sf Storage= 169 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	716 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	0	0	0
0.51	2,809	716	716

Device	Routing	Invert	Outlet Devices
#1	Primary	0.50'	**366.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB-1: Detention Basin 1

Inflow Area =	59,297 sf,	2.22% Impervious,	Inflow Depth = 0.06" for 1-yr event
Inflow =	0.07 cfs @	12.22 hrs, Volume=	282 cf
Outflow =	0.00 cfs @	0.00 hrs, Volume=	0 cf, Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 14.18' @ 31.50 hrs Surf.Area= 1,643 sf Storage= 282 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	14.00'	4,212 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.00	1,548	0	0
15.00	2,088	1,818	1,818
16.00	2,699	2,394	4,212

Device	Routing	Invert	Outlet Devices
#1	Primary	14.30'	**6.0" Round Culvert** L= 38.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 14.30' / 14.20' S= 0.0026 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.00' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Summary for Pond DEP: DEPRESSION

Inflow Area =	11,452 sf,	0.00% Impervious,	Inflow Depth = 0.00"	for 1-yr event
Inflow =	0.00 cfs @	0.00 hrs, Volume=	0 cf	
Outflow =	0.00 cfs @	0.00 hrs, Volume=	0 cf,	Atten= 0%, Lag= 0.0 min
Discarded =	0.00 cfs @	0.00 hrs, Volume=	0 cf	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 14.20' @ 0.00 hrs Surf.Area= 1 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	14.20'	800 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.20	1	0	0
15.00	2,000	800	800

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.20'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	15.80'	**25.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.20' (Free Discharge)
↑—**1=Exfiltration** (Passes 0.00 cfs of 0.00 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.20' (Free Discharge)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DP-1: WETL 3

Inflow Area = 549,381 sf, 3.35% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 24.10 hrs, Volume= 2 cf
Primary = 0.00 cfs @ 24.10 hrs, Volume= 2 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond DP-2: WETL 3

Inflow Area = 16,109 sf, 0.00% Impervious, Inflow Depth = 0.03" for 1-yr event
Inflow = 0.00 cfs @ 15.49 hrs, Volume= 47 cf
Primary = 0.00 cfs @ 15.49 hrs, Volume= 47 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond DP-3: WETL 4

Inflow Area = 106,533 sf, 0.00% Impervious, Inflow Depth = 0.29" for 1-yr event
Inflow = 0.39 cfs @ 12.19 hrs, Volume= 2,601 cf
Primary = 0.39 cfs @ 12.19 hrs, Volume= 2,601 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond DP-4: DEPRESSION

Inflow Area = 12,237 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond DP-5: DEPRESSION

Inflow Area = 38,592 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond INF-1: Infiltration Basin 1

Inflow Area = 326,877 sf, 5.62% Impervious, Inflow Depth > 1.20" for 1-yr event
Inflow = 1.05 cfs @ 12.09 hrs, Volume= 32,615 cf
Outflow = 1.01 cfs @ 12.11 hrs, Volume= 32,614 cf, Atten= 4%, Lag= 1.4 min
Discarded = 1.01 cfs @ 12.11 hrs, Volume= 32,614 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 14.21' @ 12.11 hrs Surf.Area= 10,480 sf Storage= 94 cf

Plug-Flow detention time= 1.6 min calculated for 32,580 cf (100% of inflow)
Center-of-Mass det. time= 1.5 min (1,379.0 - 1,377.4)

Volume	Invert	Avail.Storage	Storage Description
#1	14.20'	29,588 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.20	10,420	0	0
15.00	15,771	10,476	10,476
16.00	22,452	19,112	29,588

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.20'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	14.51'	**10.0" Round Culvert** L= 180.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 14.51' / 13.00' S= 0.0084 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.55 sf

Discarded OutFlow Max=2.01 cfs @ 12.11 hrs HW=14.21' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.20' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)

Summary for Pond POND: WETL 2

Inflow Area = 343,790 sf, 5.35% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 9.70' @ 0.00 hrs Surf.Area= 604 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	9.70'	414 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
9.70	604	0	0
10.00	2,155	414	414

Device	Routing	Invert	Outlet Devices
#1	Primary	10.00'	**269.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.70' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1a: Subcat 1a Runoff Area=77,432 sf 0.00% Impervious Runoff Depth=0.25"
Flow Length=229' Tc=9.0 min CN=41/0 Runoff=0.12 cfs 1,607 cf

Subcatchment1b: Subcat 1b Runoff Area=205,591 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=205' Tc=24.4 min CN=42/0 Runoff=0.33 cfs 4,911 cf

Subcatchment1c: Subcat 1c Runoff Area=31,018 sf 4.24% Impervious Runoff Depth=0.37"
Tc=6.0 min CN=39/98 Runoff=0.14 cfs 957 cf

Subcatchment1d: Subcat 1d Runoff Area=11,452 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=145' Tc=6.2 min CN=30/0 Runoff=0.00 cfs 2 cf

Subcatchment1e: Subcat 1e Runoff Area=28,279 sf 0.00% Impervious Runoff Depth=0.07"
Flow Length=266' Tc=14.4 min CN=35/0 Runoff=0.01 cfs 168 cf

Subcatchment1F: Subcat 1F Runoff Area=16,913 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30/0 Runoff=0.00 cfs 3 cf

Subcatchment2: Subcat 2 Runoff Area=16,109 sf 0.00% Impervious Runoff Depth=0.55"
Flow Length=92' Tc=8.3 min CN=48/0 Runoff=0.11 cfs 739 cf

Subcatchment3a: Flow through Runoff Area=161,631 sf 0.00% Impervious Runoff Depth>4.20"
Flow Length=707' Tc=725.7 min CN=94/0 Runoff=1.21 cfs 56,525 cf

Subcatchment3b: Subcat 3b Runoff Area=14,725 sf 100.00% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=0/98 Runoff=1.58 cfs 5,722 cf

Subcatchment3c: Subcat 3c Runoff Area=2,340 sf 100.00% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=0/98 Runoff=0.25 cfs 909 cf

Subcatchment3d: Subcat 3d Runoff Area=97,014 sf 0.00% Impervious Runoff Depth=1.38"
Flow Length=105' Tc=7.9 min CN=62/0 Runoff=3.00 cfs 11,133 cf

Subcatchment3e: Subcat 3e Runoff Area=9,519 sf 0.00% Impervious Runoff Depth=1.11"
Tc=6.0 min CN=58/0 Runoff=0.24 cfs 884 cf

Subcatchment4: Subcat 4 Runoff Area=12,237 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=34' Slope=0.3500 '/' Tc=6.0 min CN=36/0 Runoff=0.00 cfs 96 cf

Subcatchment5: Subcat 5 Runoff Area=38,592 sf 0.00% Impervious Runoff Depth=0.02"
Flow Length=277' Slope=0.0250 '/' Tc=20.8 min CN=32/0 Runoff=0.00 cfs 62 cf

Reach 3R: Grass Swale Avg. Flow Depth=0.08' Max Vel=1.06 fps Inflow=0.14 cfs 957 cf
n=0.030 L=257.0' S=0.0233 '/' Capacity=30.00 cfs Outflow=0.12 cfs 957 cf

Pond 1P: BERM PONDING Peak Elev=0.50' Storage=689 cf Inflow=0.24 cfs 884 cf
Outflow=0.01 cfs 195 cf

Pond DB-1: Detention Basin 1 Peak Elev=14.40' Storage=667 cf Inflow=0.12 cfs 1,125 cf
6.0" Round Culvert n=0.011 L=38.0' S=0.0026 '/' Outflow=0.02 cfs 620 cf

Pond DEP: DEPRESSION Peak Elev=14.20' Storage=0 cf Inflow=0.00 cfs 2 cf
Discarded=0.00 cfs 2 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 2 cf

Pond DP-1: WETL 3 Inflow=0.33 cfs 4,911 cf
Primary=0.33 cfs 4,911 cf

Pond DP-2: WETL 3 Inflow=0.11 cfs 739 cf
Primary=0.11 cfs 739 cf

Pond DP-3: WETL 4 Inflow=3.00 cfs 11,328 cf
Primary=3.00 cfs 11,328 cf

Pond DP-4: DEPRESSION Inflow=0.00 cfs 96 cf
Primary=0.00 cfs 96 cf

Pond DP-5: DEPRESSION Inflow=0.00 cfs 62 cf
Primary=0.00 cfs 62 cf

Pond INF-1: Infiltration Basin 1 Peak Elev=14.22' Storage=170 cf Inflow=1.89 cfs 65,384 cf
Discarded=1.82 cfs 65,383 cf Primary=0.00 cfs 0 cf Outflow=1.82 cfs 65,383 cf

Pond POND: WETL 2 Peak Elev=9.71' Storage=3 cf Inflow=0.00 cfs 3 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 722,852 sf Runoff Volume = 83,720 cf Average Runoff Depth = 1.39"
97.46% Pervious = 704,472 sf 2.54% Impervious = 18,380 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1a: Subcat 1a Runoff Area=77,432 sf 0.00% Impervious Runoff Depth=1.58"
Flow Length=229' Tc=9.0 min CN=41/0 Runoff=2.27 cfs 10,191 cf

Subcatchment1b: Subcat 1b Runoff Area=205,591 sf 0.00% Impervious Runoff Depth=1.68"
Flow Length=205' Tc=24.4 min CN=42/0 Runoff=4.67 cfs 28,858 cf

Subcatchment1c: Subcat 1c Runoff Area=31,018 sf 4.24% Impervious Runoff Depth=1.67"
Tc=6.0 min CN=39/98 Runoff=1.01 cfs 4,304 cf

Subcatchment1d: Subcat 1d Runoff Area=11,452 sf 0.00% Impervious Runoff Depth=0.54"
Flow Length=145' Tc=6.2 min CN=30/0 Runoff=0.05 cfs 516 cf

Subcatchment1e: Subcat 1e Runoff Area=28,279 sf 0.00% Impervious Runoff Depth=0.98"
Flow Length=266' Tc=14.4 min CN=35/0 Runoff=0.31 cfs 2,311 cf

Subcatchment1F: Subcat 1F Runoff Area=16,913 sf 0.00% Impervious Runoff Depth=0.54"
Tc=6.0 min CN=30/0 Runoff=0.07 cfs 762 cf

Subcatchment2: Subcat 2 Runoff Area=16,109 sf 0.00% Impervious Runoff Depth=2.34"
Flow Length=92' Tc=8.3 min CN=48/0 Runoff=0.83 cfs 3,137 cf

Subcatchment3a: Flow through Runoff Area=161,631 sf 0.00% Impervious Runoff Depth>7.76"
Flow Length=707' Tc=725.7 min CN=94/0 Runoff=2.20 cfs 104,478 cf

Subcatchment3b: Subcat 3b Runoff Area=14,725 sf 100.00% Impervious Runoff Depth=8.26"
Tc=6.0 min CN=0/98 Runoff=2.76 cfs 10,136 cf

Subcatchment3c: Subcat 3c Runoff Area=2,340 sf 100.00% Impervious Runoff Depth=8.26"
Tc=6.0 min CN=0/98 Runoff=0.44 cfs 1,611 cf

Subcatchment3d: Subcat 3d Runoff Area=97,014 sf 0.00% Impervious Runoff Depth=3.95"
Flow Length=105' Tc=7.9 min CN=62/0 Runoff=9.46 cfs 31,916 cf

Subcatchment3e: Subcat 3e Runoff Area=9,519 sf 0.00% Impervious Runoff Depth=3.48"
Tc=6.0 min CN=58/0 Runoff=0.86 cfs 2,760 cf

Subcatchment4: Subcat 4 Runoff Area=12,237 sf 0.00% Impervious Runoff Depth=1.08"
Flow Length=34' Slope=0.3500 '/' Tc=6.0 min CN=36/0 Runoff=0.20 cfs 1,097 cf

Subcatchment5: Subcat 5 Runoff Area=38,592 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=277' Slope=0.0250 '/' Tc=20.8 min CN=32/0 Runoff=0.23 cfs 2,278 cf

Reach 3R: Grass Swale Avg. Flow Depth=0.20' Max Vel=1.98 fps Inflow=1.01 cfs 4,304 cf
n=0.030 L=257.0' S=0.0233 '/' Capacity=30.00 cfs Outflow=0.93 cfs 4,304 cf

Pond 1P: BERM PONDING Peak Elev=0.51' Storage=710 cf Inflow=0.86 cfs 2,760 cf
Outflow=0.89 cfs 2,077 cf

Pond DB-1: Detention Basin 1 Peak Elev=14.93' Storage=1,668 cf Inflow=1.16 cfs 6,615 cf
6.0" Round Culvert n=0.011 L=38.0' S=0.0026 '/' Outflow=0.43 cfs 6,108 cf

Pond DEP: DEPRESSION Peak Elev=14.29' Storage=11 cf Inflow=0.05 cfs 516 cf
Discarded=0.04 cfs 516 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 516 cf

Pond DP-1: WETL 3 Inflow=4.67 cfs 29,206 cf
Primary=4.67 cfs 29,206 cf

Pond DP-2: WETL 3 Inflow=0.83 cfs 3,137 cf
Primary=0.83 cfs 3,137 cf

Pond DP-3: WETL 4 Inflow=9.90 cfs 33,993 cf
Primary=9.90 cfs 33,993 cf

Pond DP-4: DEPRESSION Inflow=0.20 cfs 1,097 cf
Primary=0.20 cfs 1,097 cf

Pond DP-5: DEPRESSION Inflow=0.23 cfs 2,278 cf
Primary=0.23 cfs 2,278 cf

Pond INF-1: Infiltration Basin 1 Peak Elev=14.46' Storage=2,901 cf Inflow=5.27 cfs 132,523 cf
Discarded=2.32 cfs 132,521 cf Primary=0.00 cfs 0 cf Outflow=2.32 cfs 132,521 cf

Pond POND: WETL 2 Peak Elev=10.00' Storage=414 cf Inflow=0.07 cfs 762 cf
Outflow=0.04 cfs 348 cf

Total Runoff Area = 722,852 sf Runoff Volume = 204,355 cf Average Runoff Depth = 3.39"
97.46% Pervious = 704,472 sf 2.54% Impervious = 18,380 sf

Hydrograph for Pond INF-1: Infiltration Basin 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	14.20	0.00	0.00	**0.00**
1.00	0.01	1	14.20	0.01	0.01	0.00
2.00	0.02	2	14.20	0.02	0.02	0.00
3.00	0.03	3	14.20	0.03	0.03	0.00
4.00	0.04	3	14.20	0.04	0.04	0.00
5.00	0.04	4	14.20	0.04	0.04	0.00
6.00	0.05	5	14.20	0.05	0.05	0.00
7.00	0.08	7	14.20	0.08	0.08	0.00
8.00	0.10	10	14.20	0.10	0.10	0.00
9.00	0.16	15	14.20	0.16	0.16	0.00
10.00	0.22	21	14.20	0.22	0.22	0.00
11.00	0.33	31	14.20	0.33	0.33	0.00
12.00	**2.82**	**254**	**14.22**	**2.03**	**2.03**	0.00
13.00	**1.36**	**1,753**	**14.36**	**2.20**	**2.20**	0.00
14.00	1.11	104	14.21	1.12	1.12	0.00
15.00	1.16	108	14.21	1.16	1.16	0.00
16.00	1.30	121	14.21	1.30	1.30	0.00
17.00	1.57	146	14.21	1.56	1.56	0.00
18.00	1.88	175	14.22	1.88	1.88	0.00
19.00	2.15	319	14.23	2.03	2.03	0.00
20.00	2.33	972	14.29	2.11	2.11	0.00
21.00	2.38	1,723	14.36	2.20	2.20	0.00
22.00	2.35	2,259	14.40	2.26	2.26	0.00
23.00	2.23	2,359	14.41	2.27	2.27	0.00
24.00	2.06	1,985	14.38	2.23	2.23	0.00
25.00	1.74	894	14.28	2.10	2.10	0.00
26.00	1.49	140	14.21	1.50	1.50	0.00
27.00	1.28	120	14.21	1.29	1.29	0.00
28.00	1.11	104	14.21	1.11	1.11	0.00
29.00	0.96	90	14.21	0.96	0.96	0.00
30.00	0.82	77	14.21	0.83	0.83	0.00
31.00	0.70	66	14.21	0.71	0.71	0.00
32.00	0.59	56	14.21	0.59	0.59	0.00
33.00	0.50	47	14.20	0.50	0.50	0.00
34.00	0.41	39	14.20	0.41	0.41	0.00
35.00	0.34	32	14.20	0.34	0.34	0.00
36.00	0.28	26	14.20	0.28	0.28	0.00
37.00	0.22	21	14.20	0.23	0.23	0.00
38.00	0.18	17	14.20	0.18	0.18	0.00
39.00	0.15	14	14.20	0.15	0.15	0.00
40.00	0.12	12	14.20	0.12	0.12	0.00
41.00	0.10	9	14.20	0.10	0.10	0.00
42.00	0.08	8	14.20	0.08	0.08	0.00
43.00	0.07	6	14.20	0.07	0.07	0.00
44.00	0.06	5	14.20	0.06	0.06	0.00
45.00	0.05	4	14.20	0.05	0.05	0.00
46.00	0.04	3	14.20	0.04	0.04	0.00
47.00	0.03	3	14.20	0.03	0.03	0.00
48.00	0.02	2	14.20	0.02	0.02	0.00

vhb

Computations

Project:	Revolution Wind Proposed Onshore Substation	Project #	73032.01
Location:	North Kingstown, RI	Sheet:	1 of 1
Calculated By:	KC	Date:	March 24, 2021
Checked By:		Date:	
Title:	Drain Down		

Drain down must be less than 48 hours.

Infiltration Basin 1

Volume provided below outlet elev of 14.51 = 3,552 cf

Basin bottom area at elevation 14.2 = 10,420 sf

3,552 cf / 10,420 sf = 0.34' feet or 4.1 inches

Infiltration rate = 8.27 in/hour

Drain down time= 4.1 inches/8.27 in/hr = 0.5 hours

To: File

Date: March 24, 2021

Project #: 73032.01

From:

Re: Revolution Wind Proposed Onshore Substation
North Kingstown, Rhode Island
Mounding Analysis

Introduction

This memorandum has been prepared to describe the compliance of the infiltration systems proposed as part of the stormwater management system at the above referenced site with the Rhode Island Department of Environmental Management (RIDEM) Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8) and Coastal Resources Management Council, 650-RICR-20-00-2 Rules and Regulations Governing the Protection and Management of Freshwater Wetlands in the Vicinity of the Coast, specifically the required mounding analysis. Details of the mounding analysis, including assumptions and findings, are provided herein.

Mounding Analysis Methodology

In compliance with the RIDEM Rules, a mounding analysis was performed using the Hantush method (1967) to evaluate the temporary rise in the groundwater elevation below the infiltration basins following a storm event. Soil properties were selected using the results of on-site evaluations and literature values as described in the Assumptions section of this memorandum. Hydraulic loading rates were taken as 80 percent of the total storm flow distributed evenly during the peak 5 hours of the storm event. This is a reasonable assumption because the infiltration basin storage provides peak rate attenuation for the inflow hydrograph; the basin does not need to be able to infiltrate flows at the rate they occur, rather only infiltrate the storm volume and drawdown within 48 hours.

The input parameters for the model were determined as follows:

Data Sources

The following materials were used to gather the appropriate information to accurately model the stormwater infiltration system at the site.

- Test Pit data completed by VHB, Inc. was used to determine soil types, groundwater elevations. Test Pit TP#4 and test pit TP-5 were selected as representative of conditions in Infiltration Basin 1.
- Boring logs completed by GZA GeoEnvironmental Inc. Boring #s 8 and 9.

- Saturated hydraulic conductivity was assumed based on Rawls[1] rates.
- Specific yield was assumed to be 0.26, a typical value for medium sands.

The boring and test pit locations are shown on the Site Plans. The boring and test pit logs are provided in Appendix H of this Stormwater Management Report.

Assumptions

The following assumptions were used in the preparation of the groundwater model. These were established based on site investigations:

- Soils are generally classified as sands.
- Seasonal High Groundwater is at elevation 11.2 based on Test Pit information described in Appendix H of this Stormwater Management Report.
- The soil underlying the infiltration basin has a conductivity of 8.27 inches per hour based on the Rawls rate for sand.
- Specific yield of the soil is 0.26, based on the literature range for medium sands[2].
- Restrictive layer is at elevation -39 as determined by boring #9.
- Mounding analysis is insensitive to changes in specific yield acceptable ranges therefore the use of literature values is warranted.

The following conclusions have been determined from VHB's mounding analysis:

- The temporary water table rise will reach to elevation 15.2 and be contained within the basin.

---

[1] Rawls, Brakensiek and Saxton, 1982, Estimation of Soil Water Properties, Transactions American Society of Agricultural Engineers 25(5): 1316-1320, 1328.

[2] Fetter, C. W. *Applied Hydrogeology* 4ed. Prentice Hall, 2000.

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.

Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

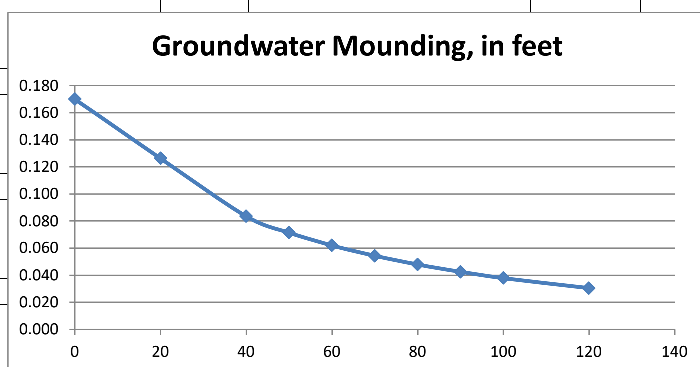
		use consistent units (e.g. feet & days **or** inches & hours)	**Conversion Table**	
Input Values			**inch/hour**	**feet/day**
2.0400	***R***	**Recharge (infiltration) rate (feet/day)**	0.67	1.33
0.170	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**		
20.40	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***	2.00	4.00
16.500	**x**	**1/2 length of basin (x direction, in feet)**		
2.000	**y**	**1/2 width of basin (y direction, in feet)**	**hours**	**days**
2.200	**t**	**duration of infiltration period (days)**	36	1.50
38.900	**hi(0)**	**initial thickness of saturated zone (feet)**		

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

39.070	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.170	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.170	**0**
0.126	**20**
0.083	**40**
0.071	**50**
0.062	**60**
0.054	**70**
0.048	**80**
0.042	**90**
0.038	**100**
0.030	**120**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Appendix F – Minimum Standard 7 and 11 – Stormwater Management System Operation and Maintenance Plan and Source Control and Pollution Prevention Plan (Bound Separately)

Appendix G – Minimum Standard 10 – Soil Erosion and Sediment Control Plan (Bound Separately)

Appendix H – Soils Information

- Test Pit Logs
- NRCS Soils Data

Test Pit Logs

Draft Test Pits on Quonset Development Corporation Property
Abutting Davisville Substation, Camp Avenue, North Kingstown, Rhode Island
February 10, 11, 12, 15, 16, and 17, 2021
Recorded by Jeffrey Peterson, CPSS 25010, Rhode Island Class IV License D4039

OnSS Test Pit 11

^C1	0 to 13 inches	Dark yellowish brown (10YR 4/4) stony sandy loam; weak medium subangular blocky structure; friable; few fine roots; abrupt smooth boundary.
^A/B	13 to 16 inches	Very dark brown (10YR 2/2) and dark gray (10YR 4/1) mechanically mixed fine sandy loam and silt loam; massive; friable; many fine roots; abrupt smooth boundary.
Bw	16 to 20 inches	Light olive brown (2.5Y 5/3) loamy sand with common, coarse, brown (10YR 4/3) redox concentrations; massive; friable; no roots; abrupt smooth boundary.
BC	20 to 32 inches	Dark grayish brown (2.5Y 4/2) loamy sand; common, medium, brown (10YR 4/3) redox concentrations; massive; friable; no roots; clear smooth boundary.
C2	32 to 55 inches	Dark grayish brown (2.5Y 4/2) loamy sand; massive; friable; no roots. SHWT estimated at 20 inches. Water at 39 inches.

OnSS Test Pit 12

^A	0 to 1 inch	Dark brown (10YR 3/3) loamy sand; weak medium granular structure; friable; many medium and coarse roots; abrupt smooth boundary.
^C1	1 to 13 inches	Light olive brown (2.5Y 5/4) loamy sand; massive; friable; many medium roots; abrupt smooth boundary.
^Cu2	13 to 21 inches	Dark gray (2.5Y 4/1) loamy sand; 5 percent rusted metal shards and other fine solid waste; massive; friable; few fine roots; clear smooth boundary.
^C3	21 to 38 inches	Olive brown (2.5Y 4/3) loamy sand; massive; friable; no roots; clear smooth boundary.
Bwb	38 to 44 inches	Olive brown (2.5Y 4/4) loamy sand, with many, coarse, brown (7.5YR 4/4) redox concentrations; massive; friable; no roots; clear smooth boundary.
2C4	44 to 72 inches	Dark gray (2.5Y 4/1) sand with many coarse dark yellowish brown (10YR 4/6) redox concentrations; single grain; loose; no roots. Water at 40 inches, SHWT estimated at 38 inches.

A	0 to 1 inch	Black (10YR 2/1) fine sandy loam; frozen; many fine and medium roots; abrupt smooth boundary.
AB	1 to 12 inches	Brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; friable; common medium roots; abrupt smooth boundary.
Bw	12 to 27 inches	Dark yellowish brown (10YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; friable, many medium roots; clear smooth boundary.
BC	27 to 35 inches	Dark yellowish brown (10YR 4/4) very gravelly loamy coarse sand; single grain; loose; few medium roots; clear smooth boundary.
2C1	35 to 70 inches	Light olive brown (2.5Y 5/3) very gravelly loamy coarse sand interbedded with 1 inch or less thick layers of light olive brown (2.5Y 5/4) sand; single grain; loose; no roots; clear smooth boundary.
3C2	70 to 85 inches	Grayish brown (2.5Y 5/2) sand interbedded with layers of light olive brown (2.5Y 5/4) fine sand; single grain; loose; no roots; gradual smooth boundary.
3C3	85 to 107 inches	Light olive brown (2.5Y 5/3) sand; single grain; loose; clear smooth boundary.
3C4	107 to 126 inches	Light brownish gray (2.5Y 6/2) sand; single grain; loose; clear smooth boundary.
4C5	126 to 150 inches	Light yellowish brown (2.5Y 6/3) fine sand; massive; very friable; abrupt smooth boundary.
5C6	150 to 162 inches	Light yellowish brown (2.5Y 6/3) very gravelly coarse sand; single grain; loose; clear smooth boundary.
6C7	162 to 174 inches	Light gray (2.5Y 7/2) fine sand; weak medium platy structure (geogenic); friable; clear smooth boundary.
6C8	174 to 198 inches	Dark gray (2.5Y 4/1) fine sand interbedded with thin layers of very dark grayish brown 2.5Y3/2 silt loam.
		No water.

OnSS TP-5

A	0 to 5 inches	Very dark grayish brown (10YR 3/2) loamy sand; single grain; loose; many medium roots; clear smooth boundary.
1C1	5 to 16 inches	Brown (10YR 5/3) sand interbedded with yellowish brown (10YR 5/4) and very dark grayish brown (10YR 3/2) coarse sand; single grain; loose; few medium roots; clear smooth boundary.
1C2	16 to 31 inches	Light brownish gray (2.5Y 6/2) loamy fine sand; massive; friable; few medium roots; clear smooth boundary
2C3	31 to 116 inches	Light gray (2.5Y 7/2) very fine sand interbedded with thin lamella of dark grayish brown (2.5Y 4/2) silt and silt loam; massive; friable; abrupt smooth boundary.
2C4	116 to 130 inches	Very dark gray (2.5Y 3/1) loamy fine sand; interbedded with layers of sand and olive brown (2.5Y 4/3) redox concentrations; massive; friable.
		No water Assumed SHWT at 116 inches.

February 15, 2021

OnSS TP-4

^A	0 to 6 inches	Very dark grayish brown (10YR 3/2) loamy sand; weak medium granular structure; friable; common medium and fine roots; clear smooth boundary.
A/C	6 to 12 inches	Very dark grayish brown (10YR 3/2) and olive brown (2.5Y4/3) loamy sand; single grain; loose; common medium roots; clear smooth boundary.
1C1	12 to 23 inches	Light yellowish brown (2.5Y 6/3) sand with thin bands of 2.5Y 4/3 sand; single grain; loose; no roots; abrupt smooth boundary.
2C2	23 to 26 inches	Light yellowish brown (2.5Y 6/4) coarse sand; single grain; loose; abrupt smooth boundary.
3C3	26 to 43 inches	Pale yellow (2.5Y 7/3) fine sand; massive; very friable; abrupt smooth boundary.
4C4	43 to 53 inches	Light yellowish brown (2.5Y 4/2) fine sand; interbedded with thin (1 to 2 mm) layers of very dark grayish brown (2.5Y3/2) silt; massive to very weak fine and medium platy (geogenic); friable; abrupt smooth boundary.
5C5	53 to 62 inches	Light brownish gray (2.5Y 6/2) sand; single grain; loose; clear smooth boundary.
6C6	62 to 65 inches	Gray (2.5Y 6/1) loamy fine sand; massive; friable; abrupt smooth boundary.
6C7	65 to 67 inches	Gray (2.5Y 6/1) fine sand with common coarse olive yellow (2.5Y 6/6) redox concentrations; massive; very friable; abrupt smooth boundary.
6C8	67 to 82 inches	Gray (2.5Y 6/1) fine sand; with masses of dark gray (2.5Y 4/1) silt loam throughout; single grain; loose; clear smooth boundary.
7C9	82 to 86 inches	Light gray (2.5Y 7/2) sand with 40 percent black grains; single grain; loose; abrupt smooth boundary.
8C10	86 to 126 inches	Light gray (2.5Y 7/2) fine sand; massive; very friable; abrupt smooth boundary.
9Cg11	126 to 140 inches	Very dark gray (5Y 3/1) loamy fine sand with prominent common coarse brown (7.5YR 4/3) redox concentrations; weak medium platy (geogenic structure) to massive; friable; abrupt smooth boundary.
10Cg12	140 to 149 inches	Very dark gray (5Y 3/1,) dark gray (5Y4/1), and very dark grayish brown (5Y 3/2) thinly banded alternating layers of very fine sand, silt, and silty clay loam; weak to moderate medium platy (geogenic) structure; saturated throughout.

Excavation terminated due to instability.
SHWT assumed to be 126 inches BGS.

GZA GeoEnvironmental Inc.

530 Broadway Providence
Rhode Island 02903
(401) 421-4140

Project:

File No.

Date: 12/19/16
Sheet 1 of 2
By: ABU
Check by:

Estimate Hydraulic Conductivity from Grain Size

Soil Description from gradation test:

RIDOT spec M.01.02.2 and M.01.09 type 1b modified for 1" max with no reclaimed materials

Assumed Basic Properties

$emax := .95$ Maximum void Ratio

$emin := 0.2$ Minimum void Ratio

$Dr := 0.8$ Relative Densitiy (95 % modified proctor)

$Gs := 2.67$ Specific gravity of the solids (Gs)

Computed Void Ratio

$$e := emax - Dr \cdot (emax - emin)$$

$$e = 0.35$$

Calculate Porosity

$$n := \frac{e}{1 + e}$$

$$n = 0.26$$

Calculate Unit Weight of Soil

$$\gamma d := Gs \cdot 62.4(1 - n) \qquad \gamma t := \gamma d + (n \cdot 62.4)$$

$\gamma d = 123$ Lbs/Cubic Ft Dry unit weight

$\gamma t = 140$ Lbs/Cubic Ft Saturated unit weight

Calculations were used to determine the time of concentration through the gravel layers of the substation

GZA GeoEnvironmental Inc.

530 Broadway Providence
Rhode Island 02903
(401) 421-4140

Project:

File No.

Date: 12/19/16
Sheet 2 of 2
By: ABU
Check by:

Estimate Hydraulic Conductivity from Grain Size

Effective Grain Size

Using $D_{10} := 0.01$ (cm)

Hydraulic Conductivity (Kozeny- Carman)

$\rho := .999$ Unit weight of water (g/cc)

$\mu := 0.011$ Viscosity of water (g/sec-cm)

$g := 981.5$ Gravity (cm/sec^2)

$c_s := 1.68$ Shape Constant (unitless)

$T_o := 1.85$ Tortuosity (unitless)

$D_e := D_{10}$ Effective particle diameter (cm^2)

$S_s := \frac{6}{D_e}$ Specific Surface (1/cm) 6/d for spheres or cubes

$e = 0.35$ Void Ratio

$$Kkc := \frac{\rho \cdot g}{\mu} \cdot \frac{1}{c_s \cdot T_o^2 \cdot S_s^2} \cdot \left(\frac{e^3}{1+e}\right)$$

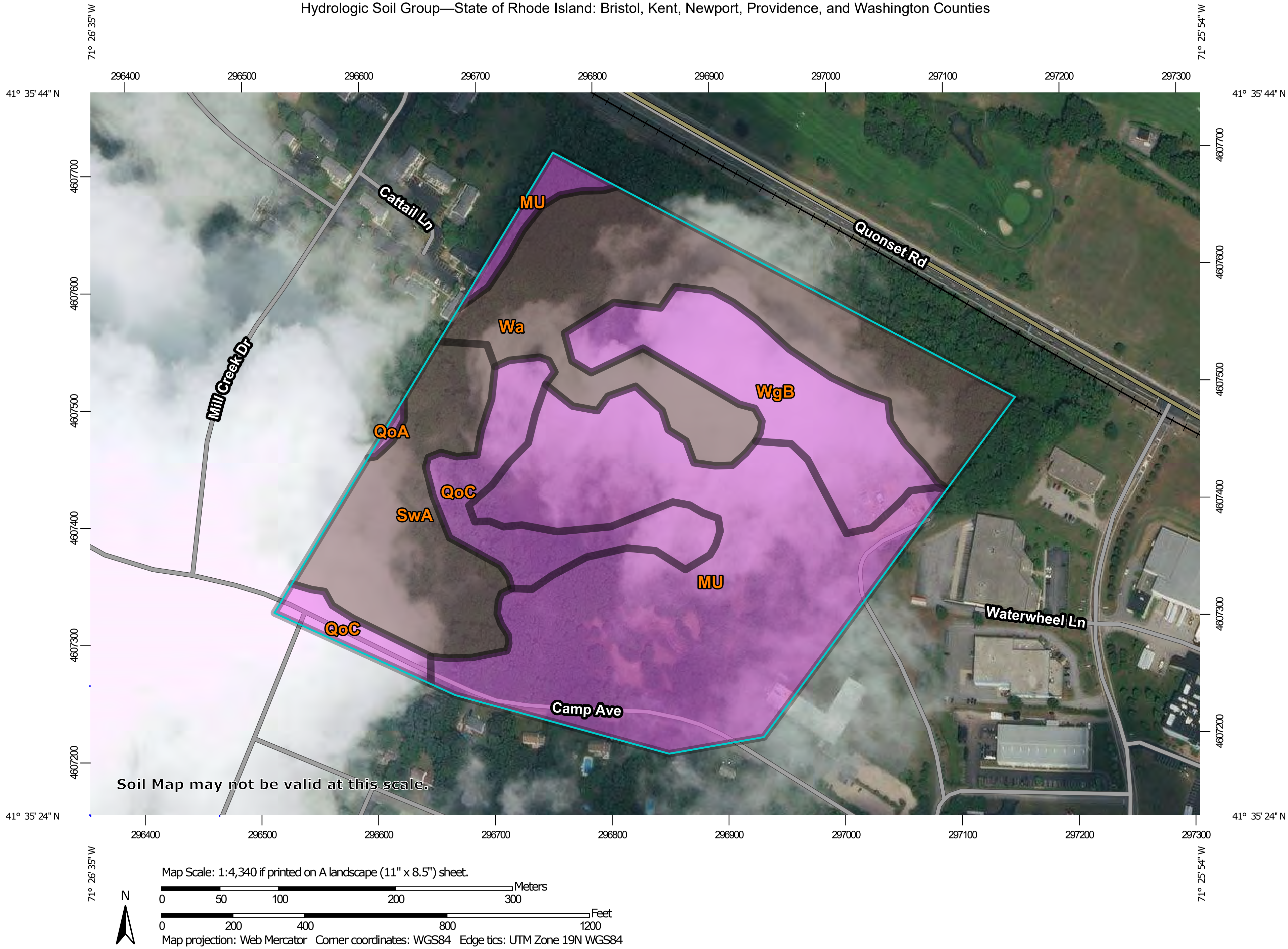
$Kkc = 1.368 \times 10^{-3}$ cm/sec $\quad Kkc := Kkc \cdot 2835$

$Kkc = 4$ ft/day

K= 4 feet/day

Test Pit	Redox Depth	Water Depth	Assumed SHWT	GWL Reading (3/8)	GWL Reading (3/8) with 16" Adjustment Factor	Plan elevation
1	-	66"	48"	54"	38"	~12'
2	-	58"	48"	-	-	
3	-	58"	-	66"	50"	~12'
4	65-67", 126-140"	-	126"	122.4"	106.4"	`11.2'
5	116-130"	-	116"	116.4"	100.4"	~11'
6	10-35", 35-73", 79-84"	-	-	57.6"	41.6"	~11'
7	57-65", 65-93", 93-105", 105-110"	-	93"	-	-	
8	2-12", 12-34"	34"	-	-	-	
9	-	-	-	None, bot. of well = 108"	92", assuming GWL @ bot. of well	~12.5'
10	33-40"	-	40"	-	-	
11	16-20", 20-32"	39"	20"	-	-	
12	38-44", 44-72"	40"	38"	32.4"	16.4"	~9.1'
13	29-35", 172-178"	-	-	136.8"	120.8"	~10'
14	-	-	74"	76.8"	60.8"	~13'
15	112-130"	130"	112"	108"	92"	~9.8'

NRCS Soils Data



Map Scale: 1:4,340 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MU	Merrimac-Urban land complex, 0 to 8 percent slopes	A	18.5	40.4%
QoA	Quonset gravelly sandy loam, 0 to 3 percent slopes	A	0.1	0.2%
QoC	Quonset gravelly sandy loam, rolling	A	4.4	9.7%
SwA	Swansea muck, 0 to 1 percent slopes	B/D	6.3	13.8%
Wa	Walpole sandy loam, 0 to 3 percent slopes	B/D	10.9	23.7%
WgB	Windsor loamy sand, 3 to 8 percent slopes	A	5.6	12.2%
Totals for Area of Interest			**45.8**	**100.0%**

Appendix V: Onshore Substation Long-term Stormwater Operation and Maintenance and Pollution Prevention and Source Control

LONG TERM STORMWATER OPERATION AND MAINTENANCE PLAN AND POLLUTION PREVENTION AND SOURCE CONTROL

Revolution Wind Proposed Onshore Substation

Camp Avenue
North Kingstown, Rhode Island

PREPARED FOR

Revolution Wind, LLC
56 Exchange Terrace, Suite 300
Providence, Rhode Island 02903

PREPARED BY

vhb

1 Cedar Street, Suite 400
Providence, RI 02903
401.272.8100

May 5, 2021

Rev. June 11, 2021

Table of Contents

1

Long Term Stormwater Operation and Maintenance Measures

Owner/Operator Responsible for Operation and Maintenance

Revolution Wind, LLC

Maintenance of Stormwater Systems

The following maintenance program shall ensure the continued effectiveness of the structural water quantity and quality controls shown on the project Site Plans prepared by VHB. Refer to the attached Operation and Maintenance Location Plan.

Structural Stormwater Management Devices

Roof Drain Leaders

- Perform routine roof inspections twice per year.
- Keep roofs clean and free of debris.
- Keep roof drainage systems clear.
- Keep roof access limited to authorized personnel.
- Clean inlets twice per year as necessary.

Vegetated Stormwater Management Devices

Surface Infiltration/Detention Basins

- Initial Post-Construction Inspection.
- Infiltration basins should be inspected after every major storm for the first few months to ensure proper stabilization and function. After that, inspections shall be done on an annual basis and after storm events greater than or equal to the 1-year storm or 2.7 inches of rainfall.

Long-Term Maintenance

- The grass on the side slopes and in the buffer areas should be mowed at least 4 times annually, and grass clippings, organic matter, and accumulated trash and debris removed, at least twice during the growing season.
- Eroded or barren spots should be reseeded immediately after inspection to prevent additional erosion and accumulation of sediment.
- Deep tilling can be used to break up a clogged surface area.
- Sediment should be removed from the basin as necessary. Removal procedures should not take place until the floor of the basin is thoroughly dry.

Inspections and Cleaning

- Infiltration basins should be inspected at least twice a year to ensure proper stabilization and function.
- Visual inspection for erosion and gullying, damage to structural components, embankment stability, and accumulation of sediment.
- Light equipment, which will not compact the underlying soil, should be used to remove the top layer.

Stone Diaphragm and Rip-rap Maintenance

- The stone areas shall be inspected annually for missing or dislodged stones. Replace stone as necessary.
- Deposited sediments shall be removed manually at least once per year.
- Trash and debris shall be removed as necessary.

Clean Outs in Substation Yard

- The clean outs shall be inspected at least twice each year by removing the screw cap and determining if there is standing water. If water is found in the clean out, then there is most likely a blockage in the underdrains.
- If water is found in the clean out, the underdrains shall be cleaned by flushing clean water via the cleanouts and removing sediment/blockage using a vactor truck.

Stone in Substation Yard

- Inspect twice per year. Remove any deposited sediment, leaf litter and debris. Inspect bottom of crushed stone layer for sediment along edges of paved surfaces. Remove sediment and replace stone.
- Remove 6 inches of gravel and replace if sediment extends into gravel layer and clogging is occurring.

Grass Swale

- Inspect annually and after storms of greater than or equal to the 1-year, 2.7 inch rainfall event for sediment buildup, erosion, vegetative conditions, etc.
- Remove sediment build-up within the bottom of the channel.
- Every five years, the channel bottom should be scraped to remove sediment and to restore original cross section.
- Correct erosion gullies and maintain healthy stand of vegetation.

General Vegetated Areas Maintenance

Although not a structural component of the drainage system, the maintenance of vegetated areas may affect the functioning of stormwater management practices. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves and yard trimmings.

- Inspect planted areas on a semi-annual basis and remove any litter.
- Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.
- Pesticide/Herbicide Usage – No pesticides are to be used unless a single spot treatment is required for a specific control application.
- Fertilizer usage should be avoided. If deemed necessary, slow release fertilizer should be used. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas, but should not be applied on a regular basis unless necessary.

2

Pollution Prevention and Source Control

A comprehensive source control program will be implemented at the Site, which includes the following components:

- Spill Prevention training. Maintenance personnel will be instructed in the proper clean-up procedures for spilled materials and the location of clean-up materials.
- Deicing chemicals shall not be used or stored on-site.
- Snow storage areas will be managed to prevent blockage of stormwater drainage swales. Snow combined with sand and debris may block a storm drainage system, diminishing the infiltration capacity of the system and causing localized flooding.
- Snow shall not be dumped into any water body, pond, or wetland resource area.
- Grounds Management:
  - Thatch management.
  - Weed management.

Inspection Date: ____/____/____ Inspection Performed By: ________________________

***Roof Runoff Downspouts* – Inspect downspouts and roofs twice per year. Keep roofs clean of debris. Clean inlets twice per year.**					
RD #	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
RD 1				/ /	
RD 2				/ /	

***Surface Infiltration/Detention Basins* – Upon construction completion for 12 months, inspect after every rainfall event of 2 inches or more for proper function and stabilization. Inspect once per year and after rainfall events of 2.7 inches or more. Revegetate eroded and bare side slopes and bottom as needed. Keep grass mowed to 4-inches. Remove sediment annually. Use light equipment to avoid compaction of soils. If water remains in the basin for longer than 48 hours after rain event, the top few inches of material should be removed and replaced with clean material and revegetated.**					
Basin	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Sediment, Damage)
INF 1				/ /	

***Conveyance Swale* – Inspect annually, replace any dislodged rip-rap, remove sediment and excess vegetation, and remove any debris.**					
Grassed Channel	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
SW-1				/ /	
SW-2					

***Stone Diaphragms, Outfalls*– Inspect annually, replace any dislodged rip-rap, remove sediment and excess vegetation, and remove any debris.**					
Outfall	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
OF 1				/ /	
SD 1				/ /	
SD 2				/ /	

Inspection Date: ____/____/____ Inspection Performed By: ________________________

Landscape Areas **- Inspect twice per year. Remove any deposited sediment, leaf litter and debris. Reseed or replace any vegetation that has died. Keep mowed to about 4-inches. Fertilizer usage should be avoided. If needed, a slow release fertilizer should be used.**					
Areas	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
Perimeter				/ /	

Clean Outs in Substation Yard **– Inspect twice per year, clean by flushing and remove sediments/ blockage using vactor truck.**					
Outfall	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
CO 1				/ /	
CO 2				/ /	
CO 3				/ /	
CO 4				/ /	
CO 5				/ /	
CO 6				/ /	
CO 7				/ /	
CO 8				/ /	
CO 9				/ /	
CO 10				/ /	
CO 11				/ /	
CO 12				/ /	
CO 13				/ /	

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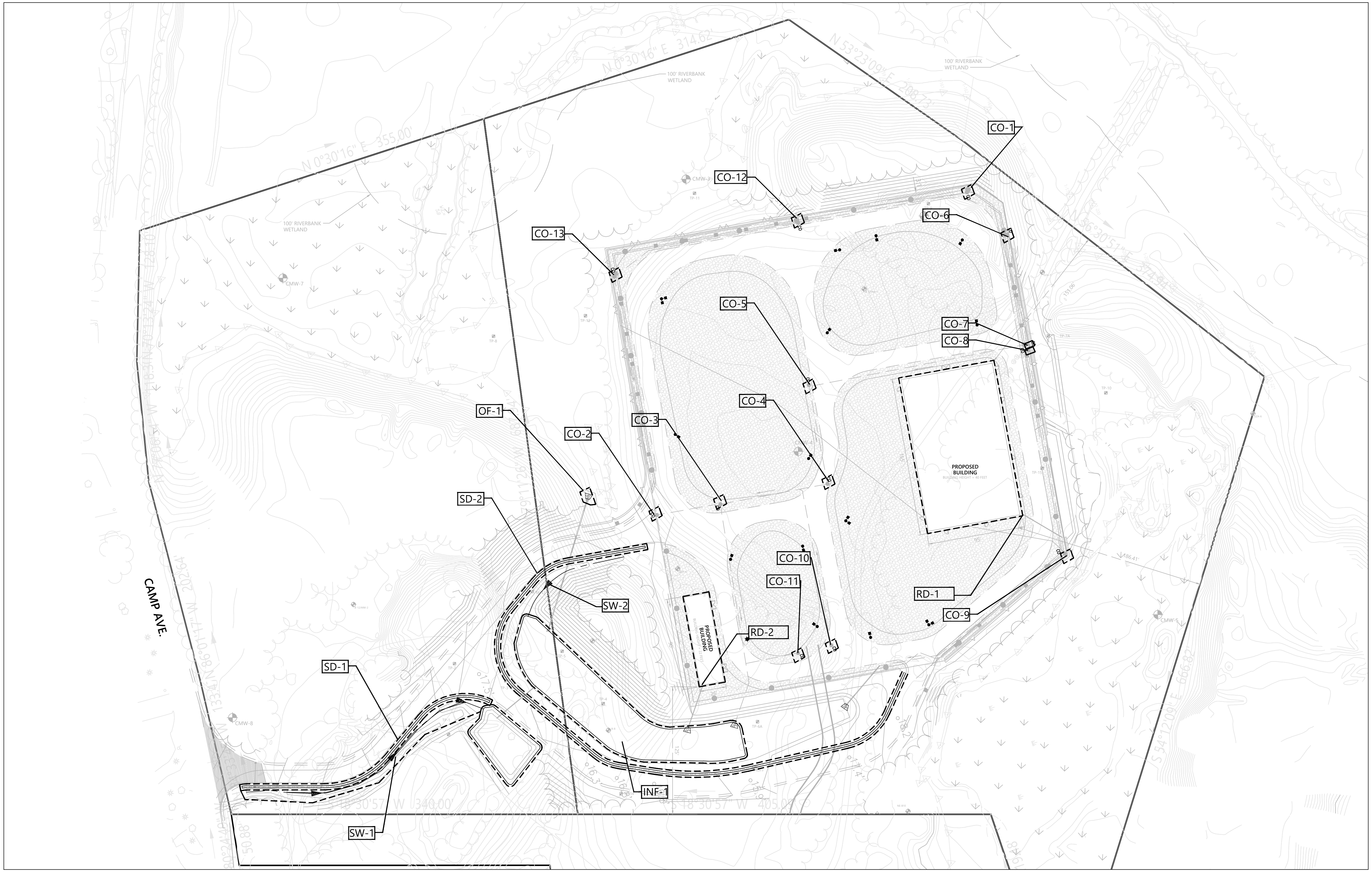

LEGEND	
RD	ROOF DRAIN
CO	CLEAN OUT
INF	INFILTRATION BASIN
SD	STONE DIAPHRAGM
OF	OUTFALL
SW	GRASS SWALE

Operations and Maintenance Location Plan

Revolution Wind Proposed Onshore Substation

Camp Avenue, North Kingstown, RI

Source: **VHB**
Prepared for: **Permits**
Date: **June 11, 2021**

0 50 100 Feet

Appendix W: Preliminary Determination Report of Findings

RHODE ISLAND COASTAL RESOURCES MANAGEMENT COUNCIL
REPORT OF FINDINGS -- PRELIMINARY DETERMINATION

STATEMENT OF LIMITATIONS

The contents of this staff determination report shall be valid only for the period on and preceding the date of this report. This report is neither an approval nor denial of the subject proposal. It is an evaluation of CRMC regulations in effect as of 4/20/2021 as they pertain to the below stated proposal, including preliminary staff recommendations.

Modifications to the below stated proposal may, upon the discretion of the CRMC, render this determination null and void.

APPLICANT INFORMATION

NAME: Ørsted & Eversource **CRMC FILE NO.** A2021-02-031
LOCATION/POLE: Camp Avenue, Circuit Drive and Burlingham Avenue
CITY/TOWN: North Kingstown, Quonset Business Park
PLAT: 185,179 **LOT**: Lots 001, 005, 011 and 030, & Lots 001, 004 and 008

CONTACT PERSON(S) & ADDRESS:

Mark Roll
Revolution Wind Permitting Manager, Ørsted North America
Revolution Wind, LLC
Onshore Facilities
North Kingstown, Rhode Island

PRELIMINARY REVIEW INFORMATION

PROPOSAL: Construction of associated upland transmission into facilities related to the Revolution Wind offshore wind farm by Ørsted. These transmission facilities will include a new substation and interconnection facility.

PLAN(S) REVIEWED: Ørsted

INVESTIGATOR	DATE	TIME
Justin Wolf Skenyon	Office Review Only	
David Ciochetto	"	
David Reis	"	
Rich Lucia	"	

MEASUREMENTS & OBSERVATIONS:

This CRMC staff review is primarily based on familiarity with the site location and collateral data sources. These included state GIS mapping for eel grass and mapping for FEMA Special Flood Hazard Area, along with both aerial and satellite mapping.

NAME: **Ørsted**
CRMC FILE NUMBER:**D 2021-02-031**

PREVIOUS CRMC ACTIONS FOR SITE:

The proposed cable route affects the following activities previously approved by the CRMC:

- Plat 185, Lot 008: File No. 2014-04-089, 2012-11-099, 2009-08-054, and 2004-10-009. CRMC permitted a patio and an office building. Ørsted has an easement area depicted in exhibit 'A' Premises, Easement Area & Utility Permit Area. This easement area overlaps the office building.
- Plat 179, Lot 001: File No. 1996-03-034, CRMC permitted underground line by the Narragansett Energy Company in 1996.
- Plat 179, Lot 011, 021: File No. 1997-10-061 & 1998-09-096, CRMC permitted a stormwater infiltration system filed. There are two stormwater infiltration system

SUMMARY OF FINDINGS

CRMC JURISDICTION: (YES) NO

TYPE WATER: Type 6; Industrial Waterfronts and Commercial Navigation Channels, Narragansett Bay in the vicinity of Quonset Point

COASTAL FEATURE(s): For the purpose of this review the coastal feature(s) at the cable landing site shall be the coastal beach and manmade shoreline (revetment) and the inland edge of coastal feature shall be the top of the revetment.

Applicability of CRMP and SAM Plans (as amended): See Red Book 650-RICR-20-00-1

CRMP Sections: **1.1.4(D)**, 1.1.7, 1.1.8, **1.1.9**, 1.1.10, **1.1.11**, **1.2.1(G)**, **1.2.2(A)**, 1.2.2(B), **1.2.2(C)**, 1.2.2(D), **1.2.2(E)**, 1.2.2(F), **1.3.1(A)**, **1.3.1(B)**, 1.3.1(C), 1.3.1(D), 1.3.1(E), 1.3.1(F), **1.3.1(G)**, **1.3.1(H)**, 1.3.1(I), **1.3.1(J)**, 1.3.2, **1.3.3**, 1.3.4, 1.3.5, other.

SAMP(s): Ocean Special Area Management Plan 650-RICR-20-05-11

STAFF CONCERNS/COMMENTS/INFORMATION REQUIREMENTS:

A. Comments regarding the proposed Inland Cable Route after landfall and Submerged Cable Route in State Waters:

1. Designs: Please clarify what methods and designs are being considered for the cable landfall location and onshore cable route.

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2. Stormwater infiltration system concerns: The submitted plans indicate the proposed cable will cut through, and/or will be constructed in very close proximity to an existing stormwater infiltration system. As shown in figures 1 through 5. Excavation and open trench construction within the basin has the potential of permanently damaging the system by compacting soils and liberating fine soil particles. Accordingly, CRMC would recommend avoiding entirely any infiltration systems (ref. Sheet PG-17 of the proposed plans).

Figure 1 Stormwater infiltration system highlighted in Red along Circuit Drive

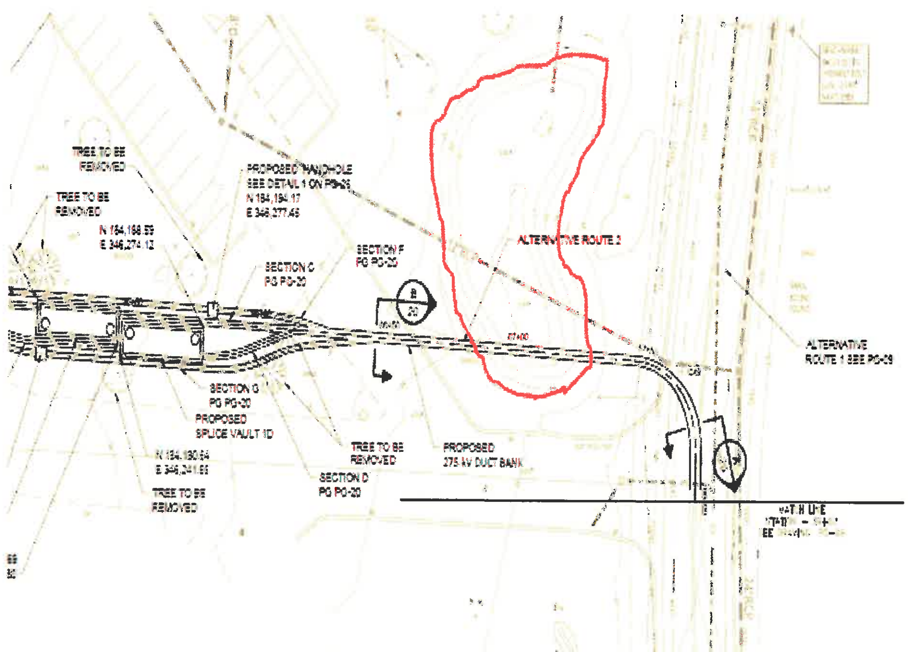

Figure 2 Stormwater infiltration system highlighted in Red Seen in Sheet PG-17

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Please be advised the proposed cable route also passes in close proximity to a second stormwater infiltration system (see figure 3 below and sheet PG-08 of the proposed plans). Any earthwork within the basin or any sediment discharge to the infiltration basin may permanently damage the infiltrative capacity of the system by introducing soil fines. Accordingly, appropriate soil erosion and sediment controls should be used to avoid impacts to the existing stormwater system.

Figure 3 Stormwater infiltration system highlighted in Red along Circuit Drive

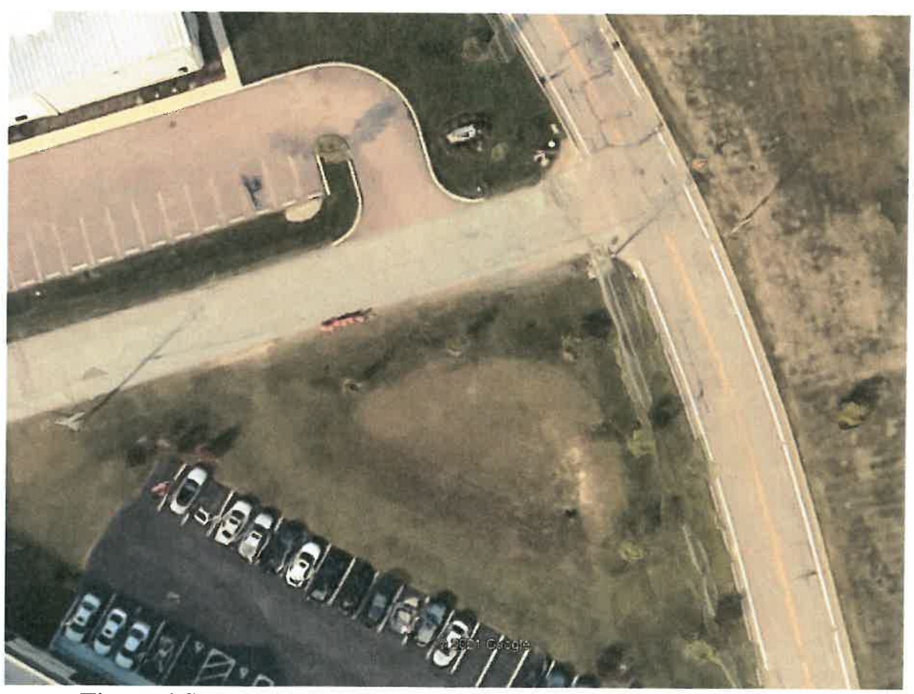

Figure 4 Stormwater infiltration system as seen from google earth

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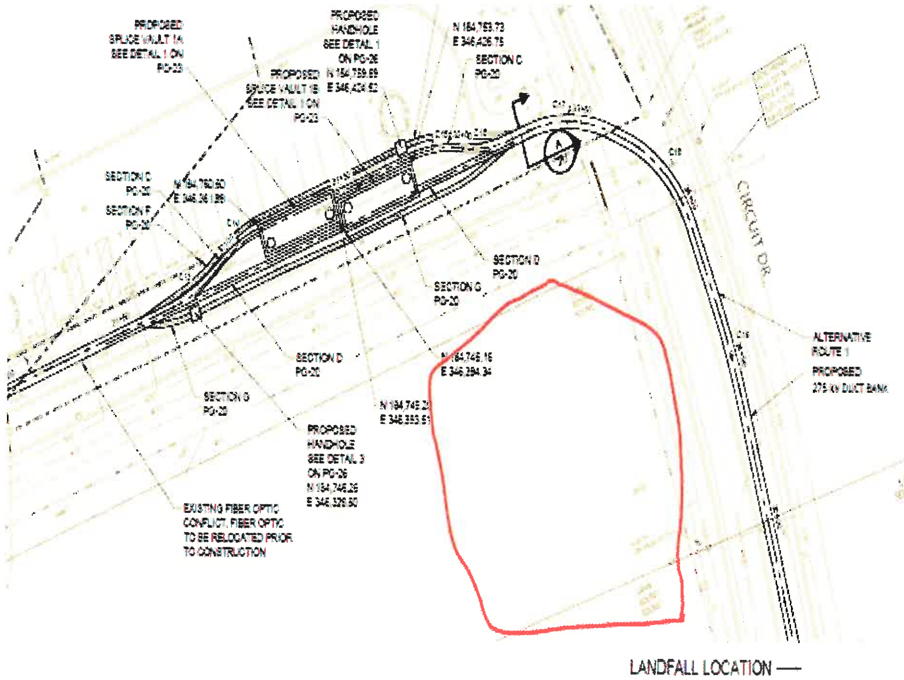

Figure 5 Stormwater infiltration system highlighted in Red Seen in PG-08

3. **On Shore Landing:** The proposed cable landing is located within CRMC designated Type 6 waters: Industrial Waterfronts and Commercial Navigation Channels. The cable landing is considered to be consistent with the designated priority of use for Type 6 waters. However, Ørsted will be required to minimize impact to the shoreline as much as is possible. In addition, erosion and sedimentation impacts and disturbance of the coastal buffer zone present at the landing location should be minimized.

4. **Cable Installation Method:** It is CRMC opinion that horizontal directional drilling would minimize impacts to the shoreline and existing shoreline protection. Directional drilling from offshore will minimize the risk associated with open trench installation and sand migration causing the cables to become exposed. If the cables become exposed CRMC will require corrective action and mitigation similar to what has been required for the Block Island Wind Farm. The landside cable emergence point should be landward of the CRMC defined coastal feature. The use of the adjacent parking lot designated in the easement should meet this requirement.

5. **Shoreline Restoration:** Open trench cable installation method will require that any damage to the coastal feature be repaired. The stone and rip rap removed during the open trench excavation will need to be returned or replaced and meet the standards of the shoreline protection section of the Red Book (§ 1.3.1(G).

6. **Building to be Demolished near cable shore landing:** Please clarify what the purpose of demolishing the buildings on Plat 185, Lot 008. Who would be responsible for the demolition and is it related to the easement? As described in Option in Easement Agreement page 3 section 5 and displayed in Exhibit 'D' (the Demolition).

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7. CRMC proposed Regulations for Submerged Cable Route in State Waters: Please be advised that CRMC has issued an Advanced Notice of Proposed Rulemaking for submerge cables in state waters. The posting is on the Secretary of State website. See:
https://rules.sos.ri.gov/promulgations/organization/650

Any application submitted after the rule adoption will be required to meet the applicable regulatory standards in effect at that time.

B. Freshwater Wetland Impact Review Comments:

1. The following Wetland description was provided by the applicant:

Two wetlands characterized as forested swamp are present in the northern and western portion of the proposed OnSS site (wetlands 3 and 4). Refer to attached **Figure 3 Wetland Resources.** Vegetation along the wetland boundary includes a mixture of red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), sweet pepperbush (*Clethra alnifolia*), glossy buckthorn (*Frangula alnus*), Asiatic bittersweet (*Celastrus orbiculatus*), greenbrier (*Smilax* sp.) and poison ivy (*Toxicodendron radicans*). There is Area of Land within 50-feet of the wetland boundary (Wetland Buffer) associated with the wetlands in accordance with the Freshwater Wetland Rules. Wetland 3 drains via narrow stream channels north and west of the parcel boundary to Mill Creek. Wetland 4 is isolated with no surficial hydrological connection to nearby wetlands or waterways.

Wetland 2 is an isolated forested wetland formed in a depression south of the capped landfill. Wetland 5 is an isolated wetland characterized by standing water with a sapling fringe. Wetland 5 drains to wetland 4 via an Area Subject to Storm Flowage (ASSF). There are no surface waters within the OnSS or ICF limit of work, with the closest stream being approximately 192 feet to the northwest of the OnSS limit of work.

Wetland 4 contains a vernal pool that was confirmed by a survey for vernal pool obligate species in the spring of 2020. Wetland 5 may provide suitable vernal pool habitat, but a vernal pool survey has not been performed yet. Vernal pool survey for wetland 5 is planned for spring 2021.

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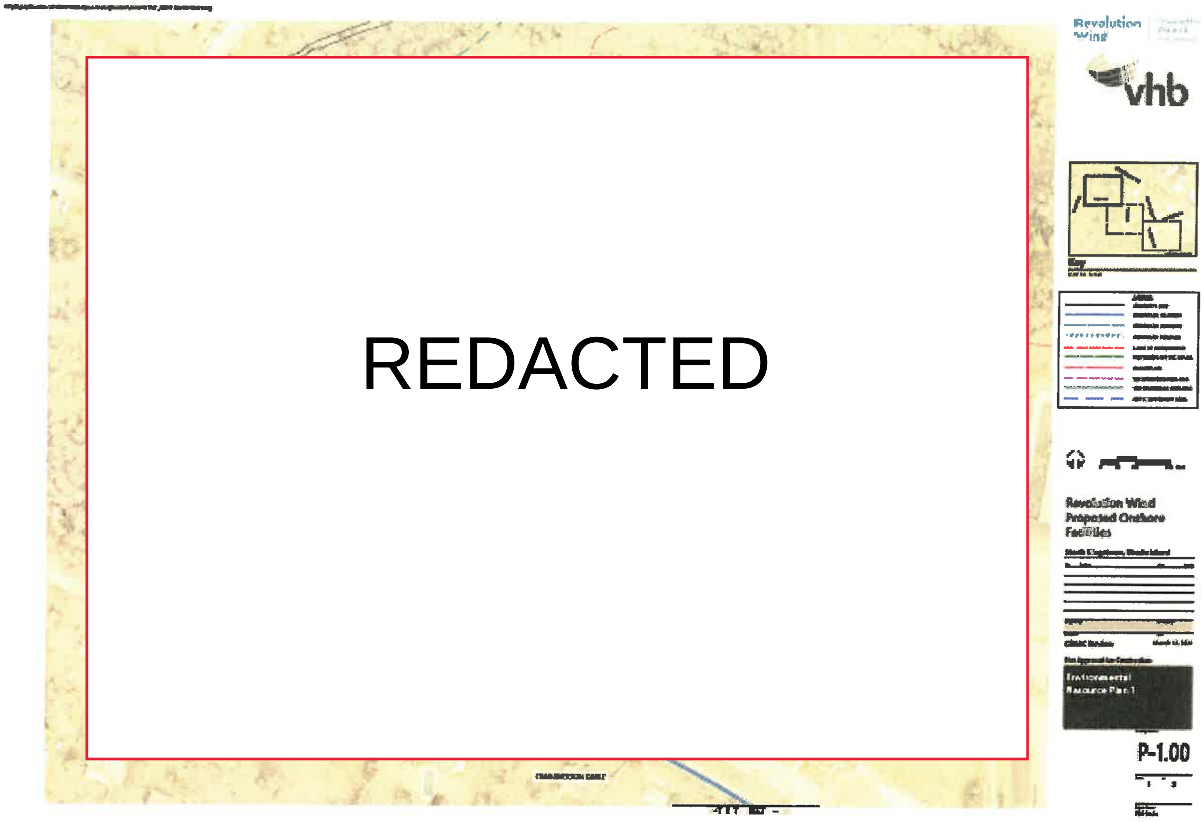

Figure 6 Proposed Onshore Facilities

2. **The following Wetland Impact description from applicant:**

Construction of the OnSS will impact approximately 21,127 square feet (0.5 ac) of Wetland Buffer from grading, retaining wall construction, access road construction, and substation equipment. Of this, approximately 8,197 square feet (0.2 ac) is permanent and 12,930 square feet (0.3 ac) is temporary. Construction of the ICF and TNEC ROW will temporarily impact approximately 3,800 square feet (0.09 ac) of an isolated wetland (wetland 5), 800 square feet (0.02 ac) of a forested swamp (wetland 4), and 8,600 square feet (0.2 ac) of Wetland Buffer due to clearing of vegetation. In addition, the new access road on the ICF parcel for the TNEC ROW will cross the ASSF between wetlands 4 and 5. The ASSF will be culverted to maintain drainage under the roadway, which will result in approximately 40 linear feet (12.2 m) of impact to ASSF. Fill alterations to palustrine wetlands have been avoided by the proposed design.

3. **CRMC Wetland Comments and Concerns:** Based on the wetland description and impact assessment information provided by the applicant, the following comments and recommendations are provided:

a) The degree of wetland impact appears to warrant a significant alteration under CRMC's FW wetland rules. The requirements for an application to alter should be met.

b) Kindly be advised that wetland edges have not been confirmed for purposes of the preliminary review. However, CRMC staff will conduct an inspection of the site prior to processing an application to alter and all wetland flagging must be present in order to allow for a wetland edge confirmation. A CRMC Staff inspection will be scheduled after the spring emergence of vernal pool breeding amphibians.

c) Mitigation should be proposed by increasing the perimeter/buffer to FW wetlands where it can be accommodated to compensate for wetland buffer lost. The wetlands, remaining wetland buffers not disturbed, and mitigation/compensation buffers should be placed in a conservation easement to provide permanent protection. While the CRMC understands the applicant's interest in not determining mitigation measures at this time, the CRMC must consider Rhode Island's FW Wetland rules state (in part) under "mitigation measures":

"Measures, methods, or best management practices to avoid alterations and minimize impacts to wetlands include but are not limited to:

- Preserving natural areas in and around wetlands.
- Minimizing the extent of disturbed areas and encouraging the preservation of land in its natural state."

In this regard, the applicant should consider that the rules do not provide for other types of mitigation such as "mitigation banking" or off-site enhancement or preservation of wetlands. Adherence to these mitigation measures must be implemented on-site to be considered consistent with the rules. Please see: 650-RICR-20-00-02 §2.10(B)(4)(c) & § 2.9(B)(1)(d)(3).

d) Vernal Pool(s): The wetland descriptions provided indicate a confirmed vernal pool exists in Wetland # 4 but it is not shown on the plans. The description further indicates Wetland # 5 may provide vernal pool habitat and a survey is planned for spring 2021. CRMC staff concurs a 2021 survey is necessary, and any confirmed vernal pools **must be shown on the plans**. Please consider that CRMC Staff may not be able to support project clearing and development in close proximity to confirmed vernal pools (special aquatic sites). Please see the review criteria in § 2.10(E).

e) Describe how the flowage connection between FW Wetland # 4 and FW Wetland # 5 was determined to be an ASSF as opposed to an intermittent stream. Please investigate this area for evidence of flow before or after a rain event to determine if there is flow absent precipitation. Please also determine if this area provides a travel corridor for amphibians.

f) Wetland impact plans - The following concerns are noted:

- Please clearly label the wetland impact area(s) provided by the narrative descriptions on the plans.

- Please describe why a UT Pole must be installed immediately adjacent to FW Wetland # 5 with an OHW over the wetland. Also describe impacts to the wetland associated with maintaining an OHW over the wetland.

- Please describe the need for an OHW immediately adjacent to the 50' wetland buffer (Area of Land Within 50 feet) of FW Wetland #4. Describe any impacts on this buffer needed to install and maintain an OHW in this location. Describe any impact on the confirmed vernal pool in FW Wetland # 4 including any removal of vegetation which may protect breeding amphibians from predators.

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C. Stormwater Management approach

1. QPAs: Please note these areas are not considered as QPAs but the washed crushed stone yards (this should not be a gravel but a washed stone at a depth of 6" minimum) can be considered as a pervious pavement in this case, assuming that they can be considered to be low traffic areas (i.e. only used for infrequent inspection and maintenance activity). The distance to the Seasonal High Ground Water table should be indicated. 3' separation is required. Protection is required of this stone surface from sediments during the construction phase

Also treat the required WQv for all impervious areas (including equipment pads and gravel roads) according to Minimum Standard 3 (Water Quality) of the Stormwater Rules with appropriate water quality Best Management Practices (BMPs). It appears that a infiltration trench is proposed. The design should meet the latest RI Stormwater Design and Installation manual.

2. Hydrologic Analysis: Additionally, address the following in the existing vs. proposed condition hydrologic analysis:

Model the pre-and post-project 1, 10, and 100-year Type III 24-hour rainfall events and the post-project 1.2" Type III 24-hour water quality rainfall event.

3. Regulated Wetlands: For culverts involving regulated wetlands, address any increases in peak water levels up-gradient of the culvert. Include the peak water levels up-gradient of each proposed culvert in the 1, 10, and 100-year 24-hour Type III storm events

a) The design must address Minimum Standard 4 (Conveyance and Natural Channel Protection) of the Stormwater Rules for flow which is released in a concentrated source (i.e., pipe, swale or basin outlet) for each waterbody ID number by providing extended detention of the total runoff volume from the 1-year 24-hour Type III storm event. Drainage areas that collectively have concentrated discharges from an area that totals less than 5 acres can be excluded from this requirement.

b) Provide peak runoff discharge rate control of 10- and 100-year Type III storm events in accordance with Minimum Standard 5 (Overbank Flood Protection, Qp) of the Stormwater Rules.

c) If the amount of proposed disturbance exceeds 50 acres, a downstream analysis is required for each design/analysis point.

d) It is recommended to avoid any new concentrated discharges from stormwater BMPs to adjacent and/or down-gradient properties.

D. CRMC Responses to Questions submitted to the CRMC by Orsted:

1. Confirm Permitting approach: CRMC Category B Assent for Offshore Export Cable in state waters, Landfall, Onshore Transmission Cable, and Onshore Substation (Applicant: Revolution Wind)

This application will be processed as a single Category "B" application for the above noted activities.

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2. Confirm Stormwater Management approach (e.g., modeling OnsSS/ICF yard as qualifying previous area for water quality treatment and recharge requirements).

See section C Stormwater Management approach for CRMC response.

3. CRMC Freshwater wetland permit for Interconnection Facility and associated transmission system improvements (Applicant: Revolution Wind and TNEC.)

The application may be processed as a single Category B application. However, please address the freshwater wetland rules for jurisdictional activities bordering freshwater wetlands and the coastal program rules for other aspects of this overall project. The TNEC may apply for a separate FW Wetlands permit if needed.

4. Identify CRMC and Rhode Island Department of Environmental Management (RIDEM) jurisdiction over Onshore Facilities.

All work associated with the cable landing and route to the onshore substation and interconnection facility appears to be on CRMC's side of the freshwater wetlands' jurisdiction line and therefore only subject to CRMC jurisdiction. CRMC has jurisdiction south of Roger Williams Way. See Figure 7 below, CRMC jurisdiction is highlighted below in blue and RI DEM is highlighted in green.

Figure 7 Juridical lines between CRMC (Blue) and RIDEM (Green)

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5. Confirm that the Category B Assent application and the Freshwater Wetland Permit application be processed under the same CRMC docket to allow for consolidated hearing process.

Yes, the Freshwater Wetland application requirements (application to alter) may be combined with the Red Book (coastal zone application) requirements into one CRMC Category B application. Please complete only the CRMC Assent application form but provide responses to the regulatory requirements of both programs.

6. Confirm floodplain status (coastal/riverine) and applicable compensation requirements

CRMC has determined that the project has a coastal floodplain status. FEMA Special Flood Hazard Areas indicates this area is Zone AE 13. This will not require flooding compensation for the affected area

E. Additional Comments and Concerns:

1. Coastal Hazard Worksheet: CRMC requires that the Coastal Hazard Worksheet must be completed and submitted with the application in accordance with 650-RICR-20-00-1.1.6(I). The Coastal Hazard Worksheet is an informative exercise that is recommended to be completed for the cable landing and the inshore facilities.
See: http://www.crmc.ri.gov/coastalhazardapp.html

2. Public Notice: The CRMC will issue a 30 day public notice for the project and will require a subsequent 20 day notice in a newspaper of wide distribution once the staff review and reports are complete. A public hearing will be required before the Coastal Council. Currently, due to health concerns regarding the spread of COVID-19 (Coronavirus) in RI, the CRMC is hosting virtual Council meetings only at this time in accordance with the Governor's Executive Orders.

SIGNATURE: ________________ STAFF ENGINEER

Appendix X: Safety Management System

CONFIDENTIAL: Contains confidential commercial information not subject to disclosure under APRA (RIGL § 38-2-1) or FOIA (5 U.S.C. § 552)

Appendix Y: Construction and Operations Plan Contents – Ocean SAMP §11.10.5(C)(2) Application Requirements

Table Y1 Contents of the Construction and Operations Plan

Project information	Including	Response
(1) Contact information	*The name, address, e-mail address, and phone number of an authorized representative.*	COP Section 1.6-Authorized Representative and Designated Operator
(2) Designation of operator, if applicable		COP Section 1.6-Authorized Representative and Designated Operator
(3) The construction and operation concept	*A discussion of the objectives, description of the proposed activities, tentative schedule from start to completion, and plans for phased development.*	COP Section 1.1-Project Overview COP Section 1.3- Project Purpose COP Section 3-Description of Proposed Activity COP Section 3.2- Project Schedule
(4) Commercial lease stipulations and compliance	*A description of the measures you took, or will take, to satisfy the conditions of any lease stipulations related to your proposed activities.*	COP Executive Summary (Table ES-1) COP Section 4.7-Summary of Potential Impacts and Environmental Protection Measures
(5) A location	*The surface location and water depth for all proposed and existing structures, facilities, and appurtenances located both offshore and onshore, including all anchor/mooring data.*	COP Section 1.1-Project Overview COP Section 3-Description of Proposed Activity
(6) General structural and project design, fabrication, and installation	*Information for each type of structure associated with the project and, unless the Council provides otherwise, how the applicant shall use a CVA to review and verify each stage of the project.*	COP Section 1.7-Certified Verification Agent COP Section 3-Description of Proposed Activity COP Appendix C-Certified Verification Agent COP Appendix H- Supplemental Project Information and Conceptual Project Engineering Design Drawings
(7) All cables and pipelines, including cables on project easements	*Location, design and installation methods, testing, maintenance, repair, safety devices, exterior corrosion protection, inspections, and decommissioning. The applicant shall prior to construction also include location of all cable crossings and appropriate clearance from the owners of existing cables.*	COP Section 3-Description of Proposed Activity
(8) A description of the deployment activities	*Safety, prevention, and environmental protection features or measures that the applicant shall use.*	COP Section 3-Description of Proposed Activity COP Section 4.7- Summary of Potential Impacts and Environmental Protection Measures

Project information	Including	Response
		COP Appendix D-Emergency Response Plan/Oil Spill Response Plan COP Appendix E-Safety Management System COP Appendix R-Navigation Safety Risk Assessment
(9) A list of solid and liquid wastes generated.	*Disposal methods and locations.*	COP Section 3-Description of Proposed Activity COP Section 4.1.6-Discharges and Releases
(10) A list of chemical products used (if stored volume exceeds Environmental Protection Agency (EPA) Reportable Quantities.	*A list of chemical products used; the volume stored on location; their treatment, discharge, or disposal methods used; and the name and location of the onshore waste receiving, treatment, and/or disposal facility. A description of how these products would be brought onsite, the number of transfers that may take place, and the quantity that shall be transferred each time.*	COP Section 3-Description of Proposed Activity COP Section 4.1.6-Discharges and Releases
(11) A description of any vessels, vehicles, and aircraft you will use to support your activities.	*An estimate of the frequency and duration of vessel/vehicle/aircraft traffic.*	COP Section 3-Description of Proposed Activity COP Section 4.1.8-Traffic (Vessels, Vehicles, Air)
(12) A general description of the operating procedures and systems.	*(i) Under normal conditions.* *(ii) In the case of accidents or emergencies, including those that are natural or manmade.*	COP Section 3.5-Operations and Maintenance COP Appendix D-Emergency Response Plan/Oil Spill Response Plan COP Appendix R-Navigation Safety Risk Assessment
(13) Decommissioning and site clearance procedures	*A discussion of general concepts and methodologies.*	COP Section 3.6-Decommissioning
(14) A list of all Federal, State, and local authorizations, approvals, or permits that are required to conduct the proposed activities, including commercial operations.	*A list of all Federal, State, and local authorizations, approvals, or permits that are required to conduct the proposed activities, including commercial operations. In addition, a statement indicating whether the applicant has applied for or obtained such authorizations, approvals, or permits.*	COP Section 1.4-Regulatory Framework
(15) The applicant's proposed measures for avoiding, minimizing,	*A description of the measures the applicant shall take to avoid or minimize adverse effects and any*	COP Section 4.7-Summary of Potential Impacts and Proposed Environmental Protection Measures

Project information	Including	Response
reducing, eliminating, and monitoring environmental impacts	*potential incidental take before conducting activities on the project site, and how the applicant shall minimize environmental impacts from proposed activities, including a description of the measures.*	
(16) Information the applicant incorporates by reference	*A list of the documents referenced and the actual document if requested.*	COP Section 5-References COP Appendices A–DD
(17) A list of agencies and persons with whom the applicant has communicated, or with whom the applicant shall communicate, regarding potential impacts associated with the proposed activities	*Contact information, issues discussed and the actual document if requested*	COP Section 1.5-Agency and Public Outreach COP Appendix A-Agency Correspondence
(18) Reference	*Contact information.*	COP Section 5-References COP Appendices A–DD
(19) Financial assurance	*Statements attesting that the activities and facilities proposed in the applicant's COP are or shall be covered by an appropriate bond or security, as required by § 11.9.8(D)(2) of this Part.*	COP Section 1.10-Financial Assurance
(20) CVA nominations	*CVA nominations for reports required.*	COP Section 1.7-Certified Verification Agent Nomination COP Appendix C-Certified Verification Agent
(21) Construction schedule	*A reasonable schedule of construction activity showing significant milestones leading to the commencement of commercial operations.*	COP Section 3.2-Project Schedule
(22) Air quality information	*Information required for the Clean Air Act (42 U.S.C. § 7409) and implementing regulations.*	COP Section 4.2.1-Air Quality COP Appendix T-Air Emissions Calculations and Methodology
(23) Other information	*Additional information as required by the Council.*	

Table Y2 Necessary Data and Information to be provided in the Construction and Operations Plan-Surveys

Information	Report contents	Including	Response
(1) Shallow hazards	*The results of the shallow hazards survey with supporting data, if required.*	*Information sufficient to determine the presence of the following features and their likely effects on the proposed facility, including:* *(i) Shallow faults;* *(ii) Gas seeps or shallow gas;* *(iii) Slump blocks or slump sediments;* *(iv) Hydrates; or* *(v) Ice scour of seabed sediments.*	COP Section 4.2.3-Geological Resources COP Section 4.2.4-Physical Oceanography and Meteorology COP Appendix O1-Revolution Wind Integrated Geotechnical and Geophysical Site Characterization Study
(2) Geological survey relevant to the siting and design of the facility	*The results of the geological survey with supporting data.*	*Assessment of:* *(i) Seismic activity at the proposed site;* *(ii) Fault zones;* *(iii) The possibility and effects of seabed subsidence; and* *(iv) The extent and geometry of faulting attenuation effects of geologic conditions near the site.*	COP Section 4.2.3-Geological Resources COP Appendix J-Hydrodynamic and Sediment Transport Modeling Report COP Appendix O1-Revolution Wind Integrated Geotechnical and Geophysical Site Characterization Study COP Appendix O2-Revolution Wind 2017-2020 Geophysical Surveys, Data Acquisition and Processing Report COP Appendix O3-Field Operations and Final Results Report Revolution Wind Export Cable Route Geotechnical Investigation COP Appendix O4-Measured and Derived Geotechnical Parameters and Final Results: REV01 GT1BInter Array Cable and Export Cable Route (IAC/ECR) Locations COP Appendix O5-Measured and Derived Geotechnical Parameters and Final Results COP Appendix O6-Preliminary Field Results Report: REV01 Inter-Array Cable and Export Cable Route (IAC/ECR) Locations COP Appendix O7-Preliminary Field Results Report: REV01 Offshore Substation (OSS) Locations COP Appendix O8-Preliminary Field Results Report: REV01 GT1B Wind Turbine Generator (WTG) Locations
(3) Biological Survey	*The results of the biological survey*	*A description of the results of biological surveys used to*	COP Section 4.2.3-Geological Resources

Information	Report contents	Including	Response
	with supporting data.	*determine the presence of live bottoms, hard bottoms, and topographic features, and surveys of other marine resources such as fish populations (including migratory populations) not targeted by commercial or recreational fishing, marine mammals, sea turtles, and sea birds.*	COP Section 4.2.4-Physical Oceanography and Meteorology COP Section 4.3.2-Benthic and Shellfish Resources COP Section 4.3.3-Finfish and Essential Fish Habitat COP Section 4.3.4-Marine Mammals COP Section 4.3.5-Sea Turtles COP Section 4.3.6-Avian Species COP Appendix O1-Revolution Wind Integrated Geotechnical and Geophysical Site Characterization Study COP Appendix X-Benthic Assessment COP Appendix Z-Assessment of Impacts to Marine Mammals, Sea Turtles, and ESA-Listed Fish Species
(4) Fish and Fisheries Survey	*The results from the fish and fisheries survey with supporting data.*	*A report that describes the results of:* *(i) A biological assessment of commercially and recreationally targeted species. This assessment shall assess the relative abundance, distribution, and different life stages of these species at all four seasons of the year. This assessment shall comprise a series of surveys, employing survey equipment and methods that are appropriate for sampling finfish, shellfish, and crustacean species at the project's proposed location. This assessment may include evaluation of survey data collected through an existing survey program, if data are available for the proposed site.* *(ii) An assessment of commercial and recreational fisheries effort, landings, and landings value. Assessment shall focus on the proposed project area and alternatives across all four seasons of the year must. Assessment may use existing fisheries monitoring data but shall be supplemented by interviews with commercial and recreational fishermen.*	COP Section 4.3.2-Benthic and Shellfish Resources COP Section 4.3.3-Finfish and Essential Fish Habitat COP Appendix X-Benthic Assessment COP Appendix L-Essential Fish Habitat Assessment

Information	Report contents	Including	Response
		(iii) For more information on these assessments see § 11.9.9(C)of this Part.	
(5) Geotechnical survey	*The results of any sediment testing program with supporting data, the various field and laboratory tests employed, and the applicability of these methods as they pertain to the quality of the samples, the type of sediment, and the anticipated design application. The applicant shall explain how the engineering properties of each sediment stratum affect the design of the facility. In the explanation, the applicant shall describe the uncertainties inherent in the overall testing program, and the reliability and applicability of each method.*	*(i) The results of a testing program used to investigate the stratigraphic and engineering properties of the sediment that may affect the foundations or anchoring systems of the proposed facility.* *(ii) The results of adequate in situ testing, boring, and sampling at each foundation location, to examine all important sediment and rock strata to determine its strength classification, deformation properties, and dynamic characteristics. A minimum of one boring shall be taken per turbine planned, and the boring shall be taken within 50 feet (15.24 m) of the final location of the turbine.* *(iii) The results of a minimum of one deep boring (with soil sampling and testing) at each edge of the project area and within the project area as needed to determine the vertical and lateral variation in seabed conditions and to provide the relevant geotechnical data required for design.*	COP Section 4.2.3-Geological Resources COP Appendix J-Hydrodynamic and Sediment Transport Modeling Report COP Appendix O1-Revolution Wind Integrated Geotechnical and Geophysical Site Characterization Study COP Appendix O2-Revolution Wind 2017-2020 Geophysical Surveys, Data Acquisition and Processing Report
(6) Archaeological and visual resources, if required	*The results of the archaeological resource survey with supporting data.*	*A description of the historic and prehistoric archaeological resources, as required by the National Historic Preservation Act and Antiquities Act (16 U.S.C. § 470 et. seq.), as amended, the Rhode Island Historical Preservation Act and Antiquities Act and §§ 00-1.2.3 and 00-1.3.5 of this Chapter, as applicable.*	COP Section 4.1.9-Visible Structures COP Section 4.4-Cultural Resources COP Section 4.5-Visual Resources COP Appendix M-Marine Archaeological Resources Assessment COP Appendix N-Terrestrial Archaeological Resources Assessment Appendix U1-Visual Impact Assessment and Historic Resources Visual Effects Analysis - Revolution Wind Onshore Facilities

Information	Report contents	Including	Response
			Appendix U2-Historic Resources Visual Effects Analysis - Revolution Wind Farm
(7) Overall site investigation.	*An overall site investigation report for the proposed facility that integrates the findings of the shallow hazards surveys and geologic surveys, and, if required, the subsurface surveys with supporting data.*	*An analysis of the potential for:* *(i) Scouring of the seabed;* *(ii) Hydraulic instability;* *(iii) The occurrence of sand waves;* *(iv) Instability of slopes at the facility location;* *(v) Liquefaction, or possible reduction of sediment strength due to increased pore pressures;* *(vi) Cyclic loading;* *(vii) Lateral loading;* *(viii) Dynamic loading;* *(ix) Settlements and displacements;* *(x) Plastic deformation and formation collapse mechanisms; and* *(xi) Sediment reactions on the facility foundations or anchoring systems.*	COP Appendix O-Marine Site Investigation Report

Table Y3 Resources, Conditions and Activities that shall be described in the Construction and Operations Plan – Resources, Conditions and Activities

Type of Information	Including	Response
(1) Hazard information and sea level rise	*Meteorology, oceanography, sediment transport, geology, and shallow geological or manmade hazards. Provide an analysis of historic and project (medium and high) rates of sea level rise and shall at minimum assess the risks for each alternative on public safety and environmental impacts resulting from the project (see Ocean SAMP Chapter 3, Section 350.2 for more information).*	The modeled 5 feet (1.5 m) of SLR during the life of the project is not expected to impact the onshore Project components so as to threaten public safety or impact the environment. See attached Coastal Hazard Application Worksheets for the OnSS and TJB. COP Section 4.2.4 Physical Oceanography and Meteorology
(2) Water quality and circulation	*Turbidity and total suspended solids from construction.* *Modeling of circulation and stratification to ensure that water flow patterns and velocities are not altered in ways that would lead to major ecosystem change.*	COP Section 4.2.2-Water Quality and Water Resources COP Appendix J-Hydrodynamic and Sediment Transport Modeling Report

Type of Information	Including	Response
(3) Biological resources	*Benthic communities, marine mammals, sea turtles, coastal and marine birds, fish and shellfish not targeted by commercial or recreational fishing, plankton, seagrasses, and plant life.*	COP Section 4.2.3-Geological Resources COP Section 4.2.4-Physical Oceanography and Meteorology COP Section 4.3.2-Benthic and Shellfish Resources COP Section 4.3.3-Finfish and Essential Fish Habitat COP Section 4.3.4-Marine Mammals COP Section 4.3.5-Sea Turtles COP Section 4.3.6-Avian Species COP Appendix O1-Revolution Wind Integrated Geotechnical and Geophysical Site Characterization Study COP Appendix X-Benthic Assessment COP Appendix Z-Assessment of Impacts to Marine Mammals, Sea Turtles, and ESA-Listed Fish Species
(4) Threatened or endangered species	*As defined by the ESA (16 U.S.C. § 1531 et. seq.)*	COP Section 4.3.3-Finfish and Essential Fish Habitat COP Section 4.3.4-Marine Mammals COP Section 4.3.5-Sea Turtles COP Section 4.3.6-Avian Species COP Section 4.3.7-Bat Species COP Appendix Z-Assessment of Impacts to Marine Mammals, Sea Turtles, and ESA-Listed Fish Species COP Appendix AA-Assessment of the Potential Effects of the Revolution Offshore Wind Farm on Birds & Bats COP Appendix K-Onshore Natural Resources and Biological Assessment
(5) Sensitive biological resources or habitats	*Essential fish habitat, refuges, preserves, Areas of Particular Concern, sanctuaries, rookeries, hard bottom habitat, barrier islands, beaches, dunes, and wetlands.*	COP Section 4.2.3-Geological Resources COP Section 4.3.1-Coastal and Terrestrial Habitat COP Section 4.3.2-Benthic and Shellfish Resources COP Section 4.3.3-Finfish and Essential Fish Habitat COP Section 4.6.8-Other Marine Uses COP Appendix L-Essential Fish Habitat Assessment COP Appendix T-Benthic Assessment
(6) Fisheries resources and uses	*Commercially and recreationally targeted species, recreational and commercial fishing (including fishing seasons, location, and type),*	COP Section 4.6.5 Commercial and Recreational Fishing

Type of Information	Including	Response
	commercial and recreational fishing activities, effort, landings, and landings value.	COP Section 4.3.2-Benthic and Shellfish Resources COP Section 4.3.3-Finfish and Essential Fish Habitat COP Appendix X-Benthic Assessment COP Appendix L-Essential Fish Habitat Assessment COP Appendix CC-Commercial and Recreational Fisheries
(6) Archaeological resources	*As required by the NHPA (16 U.S.C. § 470 et. seq.), as amended.*	COP Section 4.4-Cultural Resources COP Appendix M-Marine Archaeological Resources Assessment COP Appendix N-Terrestrial Archaeological Resources Assessment
(7) Social and economic resources	*As determined by the Council in coordination with the Joint Agency Working Group*	COP Section 4.6 Socioeconomic Resources COP Appendix BB-Assessment of Economic Development and Jobs Analysis Report
(8) Coastal and marine uses	*Military activities, vessel traffic, and energy and non-energy mineral exploration or development.*	COP Section 4.6.6-Commercial Shipping COP Section 4.6.8-Other Marine Uses COP Appendix R-Navigation Safety Risk Assessment

Appendix Z: Abutter List

Abutter List compiled for North Kingstown Assessor Database (https://northkingstownri.mapgeo.io/datasets/properties?abuttersDistance=120&latlng=41.576039%2C-71.451491)

AP-Lot	Owner (First Name)	Owner (Last Name)	Co-Owner (First Name)	Address (Full)	City	State	Zip Code	Address (Mailing)	City (Mailing)	State (Mailing)	Zip Code (Mailing)
178-002	MILLCREEK LIMITED LIABILITY CO.		C/O THE GROSSMAN COMPANIES INC	MILLCREEK DR	NORTH KINGSTOWN	RI	02852	ONE ADAMS PLACE 859 WILLARD ST, STE 501	QUINCY	MA	02169
178-003	MILLCREEK LLC		C/O THE GROSSMAN COMPANIES INC	MILLCREEK DR	NORTH KINGSTOWN	RI	02852	ONE ADAMS PLACE 859 WILLARD ST, STE 501	QUINCY	MA	02169
179-020	R I COMMERCE CORPORATION			614 CAMP AVE	NORTH KINGSTOWN	RI	02852	95 CRIPE ST	NORTH KINGSTOWN	RI	02852
179-030	R I COMMERCE CORPORATION			594 CAMP AVE	NORTH KINGSTOWN	RI	02852	95 CRIPE ST	NORTH KINGSTOWN	RI	02852
179-001	R I COMMERCE CORPORATION			574 CAMP AVE	NORTH KINGSTOWN	RI	02852	95 CRIPE ST	NORTH KINGSTOWN	RI	02852
179-009	Grey Ledge Holdings Inc			21 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	C/O Kennedy Inc. 21 CIRCUIT DR	NORTH KINGSTOWN	RI	02852
179-005	NARRAGANSETT ELECTRIC CO			109 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	C/O PROPERTY TAX DEPT 40 SYLVAN RD	WALTHAM	MA	02451
179-016	QPS Associates LLC			51 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	50 WHITECAP DR, SUITE 302	NORTH KINGSTOWN	RI	02852
179-017	Kiefer Park Associates LLC			75 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	50 WHITECAP DR, SUITE 302	NORTH KINGSTOWN	RI	02852
179-003	N KINGSTOWN CAMP AVE REAL ESTATE INC			646 CAMP AVE	NORTH KINGSTOWN	RI	02852	2425 NEW HOLLAND PIKE	LANCASTER	PA	17605
141-070	DEBORAH K AND GERALD JR	HORNUNG		10 GATEWAY RD	NORTH KINGSTOWN	RI	02852	10 GATEWAY RD	NORTH KINGSTOWN	RI	02852
141-072	WILLIAM G AND ANNIE D	KUIEE		511 CAMP AVE	NORTH KINGSTOWN	RI	02852	511 CAMP AVE	NORTH KINGSTOWN	RI	02852
141-066	MICHAEL J	FERRIS		525 CAMP AVE	NORTH KINGSTOWN	RI	02852	525 CAMP AVE	NORTH KINGSTOWN	RI	02852
141-078	KYLE M	SULLIVAN		541 CAMP AVE	NORTH KINGSTOWN	RI	02852	541 CAMP AVE	NORTH KINGSTOWN	RI	02852
141-079	LORRAINE RITA	JOHNSON		553 CAMP AVE	NORTH KINGSTOWN	RI	02852	553 CAMP AVE	NORTH KINGSTOWN	RI	02852
141-080	JOHN J AND JACLYNN R	KURPEWSKI		571 CAMP AVE	NORTH KINGSTOWN	RI	02852	571 CAMP AVE	NORTH KINGSTOWN	RI	02852
141-067	TIN HUU AND STEPHANIE M	HA		595 CAMP AVE	NORTH KINGSTOWN	RI	02852	595 CAMP AVE	NORTH KINGSTOWN	RI	02852
141-073	BRADLEY F AND KIMBERLY B	EVANS		613 CAMP AVE	NORTH KINGSTOWN	RI	02852	613 CAMP AVE	NORTH KINGSTOWN	RI	02852
141-074	RHETT S AND TAMAR P	BISHOP		629 CAMP AVE	NORTH KINGSTOWN	RI	02852	629 CAMP AVE	NORTH KINGSTOWN	RI	02852
141-075	JULIE E	NONNENMACHER		643 CAMP AVE	NORTH KINGSTOWN	RI	02852	643 CAMP AVE	NORTH KINGSTOWN	RI	02852
141-076	GARDINER GROUP LLC			9 WINDWARD WALK	NORTH KINGSTOWN	RI	02852	110 FLETCHER RD	NORTH KINGSTOWN	RI	02852
141-045	DONALD J JR AND ALISON M	DENNEHY		10 WINDWARD WALK	NORTH KINGSTOWN	RI	02852	10 WINDWARD WALK	NORTH KINGSTOWN	RI	02852
179-019	SPL Associates, LLC			101 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	101 CIRCUIT DR	NORTH KINGSTOWN	RI	02852
179-032	R I COMMERCE CORPORATION			CAMP AVE	NORTH KINGSTOWN	RI	02852	95 CRIPE ST	NORTH KINGSTOWN	RI	02852
179-011	135 Circuit Drive LLC			135 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	C/O EN INVESTMENT ASSOCIATION LLC 98 FALCON RIDGE DR	EXETER	RI	02822
179-012	Supfina Machine Co., Inc.			181 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	ATTN: ACCOUNTS PAYABLE 181 CIRCUIT DR	NORTH KINGSTOWN	RI	02852
179-008	FUJIFILM Electronic Materials USA			40 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	80 CIRCUIT DR	NORTH KINGSTOWN	RI	02852
179-010	Circuit Real Estate Inc			200 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	200 CIRCUIT DR	NORTH KINGSTOWN	RI	02852
185-009	Hexagon Holdings Inc.			250 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	250 CIRCUIT DR	NORTH KINGSTOWN	RI	02852
179-018	Miester Abrasives USA, Inc.			201 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	201 CIRCUIT DR	NORTH KINGSTOWN	RI	02852
179-013	Altis Development Group LLC			211 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	C/O Dominion Diagnostics, LLC 211 CIRCUIT DR	NORTH KINGSTOWN	RI	02852
179-021	Circuit Drive Drainage Association			CIRCUIT DR	NORTH KINGSTOWN	RI	02852	C/O MARK A MCSALLY, ESQ 211 CIRCUIT DR	NORTH KINGSTOWN	RI	02852
179-024	R I COMMERCE CORPORATION			CIRCUIT DR	NORTH KINGSTOWN	RI	02852	95 CRIPE ST	NORTH KINGSTOWN	RI	02852
179-022	R I COMMERCE CORPORATION			CIRCUIT DR	NORTH KINGSTOWN	RI	02852	95 CRIPE ST	NORTH KINGSTOWN	RI	02852
179-033	R I COMMERCE CORPORATION			255 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	95 CRIPE ST	NORTH KINGSTOWN	RI	02852
179-025	Goldline Properties, LLC			CIRCUIT DR	NORTH KINGSTOWN	RI	02852	61 WHITECAP DR	NORTH KINGSTOWN	RI	02852
185-023	Jaysea Enterprises Inc.			275 CIRCUIT DR	NORTH KINGSTOWN	RI	02852	275 CIRCUIT DR	NORTH KINGSTOWN	RI	02852
185-021	Vantage Point Properties, LLC			40 WHITECAP DR	NORTH KINGSTOWN	RI	02852	50 WHITECAP DR, SUITE 302	NORTH KINGSTOWN	RI	02852
185-008	Vantage Point Properties, LLC			50 WHITECAP DR	NORTH KINGSTOWN	RI	02852	50 WHITECAP DR, SUITE 302	NORTH KINGSTOWN	RI	02852
185-020	Falvey Realty, LLC			66 WHITECAP DR	NORTH KINGSTOWN	RI	02852	66 WHITECAP DR	NORTH KINGSTOWN	RI	02852
185-004	Newton Properties, LLC			BURLINGHAM AVE	NORTH KINGSTOWN	RI	02852	50 WHITECAP DRIVE SUITE 102	NORTH KINGSTOWN	RI	02852
185-001	Newton Properties, LLC			244 BURLINGHAM AVE	NORTH KINGSTOWN	RI	02852	50 WHITECAP DRIVE SUITE 102	NORTH KINGSTOWN	RI	02852
185-012	R I COMMERCE CORPORATION			120 BURLINGHAM AVE	NORTH KINGSTOWN	RI	02852	95 CRIPE ST	NORTH KINGSTOWN	RI	02852
185-002	Electric Boat Corporation			180 MACNAUGHT ST	NORTH KINGSTOWN	RI	02852	75 EASTERN POINT RD DEPT 613, J88-10	GROTON	CT	06340
185-029	R I COMMERCE CORPORATION			10 MACNAUGHT ST	NORTH KINGSTOWN	RI	02852	95 CRIPE ST	NORTH KINGSTOWN	RI	02852