



Proactive by Design



Coastal Resources Management Council

CZMA - Federal Consistency Review

Liquefaction Facility

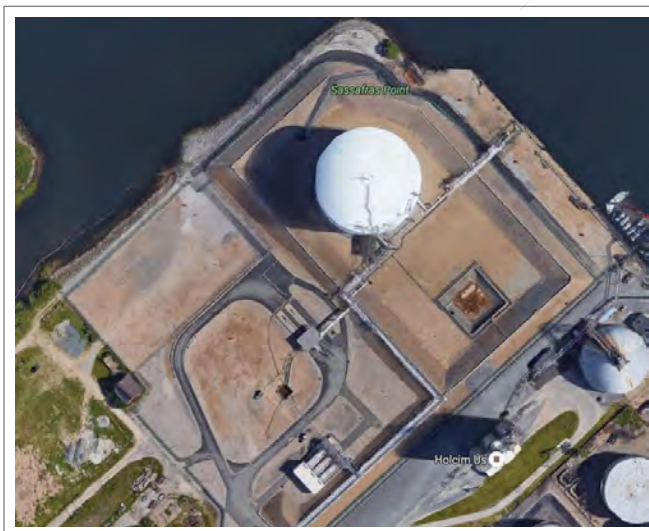
National Grid LNG LLC

121 Terminal Road

Providence, Rhode Island

October 2016

File No. 03.0033554.60



PREPARED FOR:

National Grid LNG LLC

Providence, Rhode Island

GZA GeoEnvironmental, Inc.

530 Broadway | Providence, RI 02909

401-421-41405848

26 Offices Nationwide

www.gza.com



Proactive by Design

GEOTECHNICAL

ENVIRONMENTAL

ECOLOGICAL

WATER

CONSTRUCTION
MANAGEMENT

530 Broadway
Providence, RI 02909
T: 401.421.4140
F: 401.751.8613
www.gza.com



October 27, 2016
File No. 03.033554.60

Mr. Grover J. Fugate
Executive Director
Coastal Resources Management Council
Stedman Government Center – Suite 3
4808 Tower Hill Road
Wakefield, Rhode Island 02879

Re: Application for Liquefaction Facility
Assessor's Plat 56 Lots 316, 5 and Plat 101 Lot 1
121 Terminal Road
Providence, Rhode Island

Dear Mr. Fugate:

On behalf of our Client, National Grid LNG LLC ("NGLNG"), this application for federal consistency review is being submitted by GZA GeoEnvironmental, Inc. (GZA), pursuant to the federal consistency requirements outlined in Section 307 of the Coastal Zone Management Act (CZMA). Specifically, NGLNG is seeking Federal Energy Regulatory Commission ("FERC") approval for the construction of a natural gas liquefaction facility adjacent to its existing liquefied natural gas (LNG) tank along the Providence River. The CZMA and the applicable federal consistency regulations, specifically, 15 CFR § 930 Subpart D, require that construction of this proposed facility be consistent with Rhode Island's federally approved coastal zone management program. As the entity with control over the site, NGLNG must submit a consistency certification to Rhode Island's coastal zone management agency, the Coastal Resource Management Council (CRMC), certifying that the proposed activity will be consistent with Rhode Island's federally approved Coastal Resources Management Program (RICRMP), which CRMC implements. Furthermore, we are concurrently filing a copy of this Consistency Certification with the FERC in accordance with 15 CFR § 930.57.

As described in CRMC's *Federal Consistency Manual*, Rhode Island's coastal zone boundary is a three-tiered system that is dependent on the type and location of the proposed activity. In this case, the proposed liquefaction facility falls within all three tiers. It is:

- within 200 feet inland of a coastal feature (Tier 1),
- within one of Rhode Island's 21 coastal communities (Tier 2), and
- an energy related (generation, transfer, processing, or storage) activity (Tier 3).

The federal consistency review process will follow the requirements of 15 CFR Part 930, Subpart D for activities requiring a federal license or permit. Because the proposed liquefaction facility will require a FERC approval, a copy of the CZMA federal consistency certification with all supporting



information provided to FERC is being filed with the CRMC. Consistent with CRMC's *Federal Consistency Manual* and 15 CFR Part 930.58, the narrative accompanying this cover letter will include:

- A detailed description of the site, nature, and extent of the proposed liquefaction facility, its effects on any coastal use or resource, and the necessary data and information to support certification including maps, diagrams, and technical material;
- An assessment relating to potential coastal zone effects of the proposed project and its associated facilities to the enforceable policies of the RI Coastal Resources Management Plan (RICRMP); and
- An analysis indicating that the proposed liquefaction facility and associated activities are consistent with the RICRMP.

In applying for federal approval from FERC for this activity, pursuant to Section 7 of the Natural Gas Act (15 USC § 717f), NGLNG will not be required to obtain state and local permits such as compliance under local zoning ordinances, and certain environmental permits. However, NGLNG is required to obtain authorization for this activity under two other federal programs: The National Pollutant Discharge Elimination System (NPDES) and Section 401 of the Clean Water Act. RIDEM is the federally delegated authority to administer these programs in Rhode Island, which are commonly referred to as the Rhode Island Pollutant Discharge Elimination System (RIPDES) program and the Water Quality Certification (WQC) program, respectively. Applications for RIPDES and WQC authorization were filed directly with RIDEM on September 14, 2016 (cover letter of that submittal is attached). Additionally, because the liquefaction facility is anticipated to include a small emergency generator, authorization under the Clean Air Act will be needed, which is another federal program delegated to Rhode Island. This will be accomplished by submitting an application to RIDEM's Office of Air Resources under Air Pollution Control Regulation No. 43 (General Permits for Smaller-Scale Electric Generator Facilities).

We trust that the following materials will satisfy the necessary data and information required under 15 CFR § 930.58 and sufficiently detail the proposed activity and its compliance with the enforceable policies of the Coastal Resources Management Program. If you require any additional information, please do not hesitate to contact Igor Runge at (401) 427-2710 or igor.runge@gza.com.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Sara Haupt
Project Engineer

Igor Runge, Ph.D., P.H.
Consultant/Reviewer

Margaret S. Kilpatrick P.E.
Associate Principal

Attachments: Narrative and Supporting Documentation
Cc: William Howard, National Grid



1.0	INTRODUCTION	1
1.1	SITE DESCRIPTION	1
1.2	SITE HISTORY	2
2.0	PROJECT DESCRIPTION	2
2.1	CONSTRUCTION SEQUENCE AND SCHEDULE.....	3
3.0	COASTAL RESOURCES MANAGEMENT PLAN – ENFORCEABLE POLICIES	4
3.1	SECTION 140 SETBACKS	4
3.1.1	SECTION 120 VARIANCES	4
3.2	SECTION 145 CLIMATE CHANGE AND SEA LEVEL RISE.....	5
3.3	SECTION 200.6 TYPE 6 INDUSTRIAL WATERFRONTS AND COMMERCIAL NAVIGATION CHANNELS	6
3.4	SECTION 210.6 MANMADE SHORELINES	6
3.5	SECTION 300.1 CATEGORY B REQUIREMENTS.....	6
3.6	SECTION 300.2 FILLING, REMOVING, OR GRADING OF SHORELINE FEATURES.....	7
3.7	SECTION 300.3 RESIDENTIAL, COMMERCIAL, INDUSTRIAL AND RECREATIONAL STRUCTURES.....	7
3.8	SECTION 300.6 TREATMENT OF SEWAGE AND STORMWATER	8
3.8.1	EXISTING STORMWATER MANAGEMENT	8
3.8.2	PROPOSED STORMWATER MANAGEMENT	8
3.9	SECTION 300.8 ENERGY RELATED ACTIVITIES AND STRUCTURES.....	8
3.10	CRMP 1978 ENERGY AMENDMENT	9
3.11	SECTION 400 FEDERAL CONSISTENCY REVIEW	9

FIGURES

FIGURE 1 COVER SHEET WITH SITE LOCUS

FIGURE 2 EXISTING CONDITIONS PLAN

FIGURE 3 EXISTING IMPERVIOUS CONDITIONS PLAN



TABLE OF CONTENTS

October 27, 2016

File No. 33554.60

CRMC Assent

Page | ii

FIGURE 4 TEMPORARY LAYDOWN EROSION AND SEDIMENT CONTROL PLAN

FIGURE 5 EROSION AND SEDIMENT CONTROL DETAILS

FIGURE 6 SOIL STORAGE AREA PLAN

FIGURE 7 LIQUEFACTION WORK AREA EROSION AND SEDIMENT CONTROLS

FIGURE 8 LIQUEFACTION WORK AREA EXISTING CONDITIONS AT REVETMENT AND CROSS SECTIONS

FIGURE 9 LIQUEFACTION WORK AREA - PROPOSED SLOPE ARMORING, EXISTING CONDITIONS AT REVETMENT AND CROSS SECTIONS

FIGURE 10 LIQUEFACTION STORMWATER MANAGEMENT PLAN

FIGURE 11 STORMWATER MANAGEMENT DETAILS

FIGURE 12 STORMWATER MANAGEMENT DETAILS

FIGURE 13 MONITORING WELL RE-INSTALLATION PLAN

FIGURE 14 PROPOSED FINAL CONDITIONS PLAN

FIGURE 15 PROPOSED IMPERVIOUS CONDITIONS PLAN

APPENDICES

APPENDIX A WATER QUALITY CERTIFICATION LETTER

APPENDIX B REVETMENT WALL DESIGN MEMO

APPENDIX C WATER QUALITY VOLUME CALCULATIONS



1.0 INTRODUCTION

National Grid LNG LLC (“NGLNG”) proposes to construct a natural gas liquefaction facility at its liquefied natural gas (LNG) facility (the “Project”). The construction activities associated with this Project will take place on a portion of the approximately 42-acre property owned by The Narragansett Electric Company d/b/a National Grid (“TNEC”), and leased to NGLNG under a long term lease henceforth referred to as the “Site”.¹

This narrative and supporting information is intended to satisfy the three broad requirements under 15 CFR Part 930, Subpart D:

- a) The proposed activity (liquefaction facility) complies with the enforceable policies of Rhode Island’s approved Coastal Resource Management Program (“CRMP”) and will be conducted in a manner consistent with such program. (reference 15 CFR § 930.57(b))
- b) Materials supporting compliance with the CRMP are in subsequent sections of this narrative.
- c) A copy of the application for Federal Energy Regulatory Commission (“FERC”) approval is found at <https://www.ferc.gov/docs-filing/elibrary.asp> under docket No. CP16-121-000.

A comprehensive set of figures is attached with this Narrative.

1.1 SITE DESCRIPTION

The Site is located at 121 Terminal Road and is identified in the City of Providence Tax Assessor's Office as Assessors Plat (A.P.) 56, Lots 5, 316, and 317, and as A.P. 101, Lot 1. A Site Locus is provided on Figure 1 of the attached plan set. The Site is bounded to the west by Allens Avenue, to the east by the Providence River, to the south by Terminal Road, and a cove area of the Providence River to the north. This section of the Providence River is listed as Type 6 Industrial Waterfront and Commercial Navigation Channel. The Providence River is currently listed by the Rhode Island Department of Environmental Management (“RIDEM”) Office of Water Resources on the State of Rhode Island 2015 303(d) List of Impaired Waters. The Providence River is impaired for fecal coliform, total nitrogen, and dissolved oxygen. The water quality classification of the Providence River adjacent to the Site is SB1{a}. SB1 waters are saline water bodies that are designated for primary and secondary contact recreational activities and fish and wildlife habitat. The Providence River has a partial use designation {a} due to combined sewer overflows that are directed to the river. According to the FEMA Flood Insurance Rate Map for the area (44007C0317J), portions of the Site are mapped as Zone AE flood zones with a base flood elevation (“BFE”) of 12 feet. The flood zones are depicted on Figure 2 Existing Conditions Plan.

The Site is listed with the RIDEM Office of Waste Management due to contaminant concentrations present in soil and groundwater that represent Method 1 exceedances (as defined in the Remediation Regulations) as a result of historical operations/activities. The Site is listed as RIDEM Site Remediation File No. SR-28-1152 (formerly Case No. 98-004).

¹ NGLNG has control of the site pursuant to a long term lease with TNEC dated March 31, 1999, as amended, and is responsible for complying with all applicable laws, rules, regulations and orders of governmental authorities having jurisdiction over NGLNG and the use of the leased premises, including without limitation securing and maintaining the necessary and applicable state and local permits to permit the installation and operation of LNG facilities and equipment upon the leased premises.



NGLNG operates the existing LNG facility and TNEC operates two natural gas regulating facilities adjacent to the Site. Currently, LNG is brought onsite by tanker trucks and is loaded into the LNG tank during the non-heating season for storage. Filling the tank requires approximately 2,540 truck deliveries. The LNG brought to the Site is mainly supplied by the Everett Terminal LNG facility in Massachusetts. The LNG stored at the facility is utilized during winter months when the demand for natural gas (for heating purposes) is highest. During peak demand, the LNG is pumped from the LNG tank and is warmed to a gaseous state for injection into the local distribution system through existing pipelines. The LNG tank is located within a diked area of the Site. The diked area drains any residual rain water into a sump pit located within the diked area. Additionally, a 200 pounds per square inch gauge pressure ("psig") gas line enters the Site from East Providence under the Providence River at the river crossing and ends at the 642 Allens Avenue regulating station. The existing gas line runs along the Providence River and cove area on the northern perimeter of the Site. The LNG facility is monitored 24-hours a day 7 days a week for security and safety purposes. The proposed liquefaction facility will allow NGLNG to fill the LNG tank by pipeline in lieu of truck transport by adding capability to liquefy the natural gas from the gas line.

The existing LNG facility is equipped with a revetment wall along the northern perimeter of the Site. This revetment wall will not be impacted as a result of constructing the liquefaction facility. The existing revetment wall is in compliance with Section 300.7 (Construction of Shoreline Protection Facilities) of the Coastal Resources Management Program.

1.2 SITE HISTORY

From 1910 until 1954, a Manufactured Gas Plant ("MGP") occupied the Site. Other occupants included B.P. Clapp in 1910 (ammonia works, including the recycling and sale of ammonia by-products), and in 1918, the United States Government operated a toluene facility at the Site. Portions of the Site included the Sassafras Point Rifle Range, which was a small arms range that operated during the late 1800s. A LNG facility has occupied the eastern/southeastern portion of the Site since 1972, and Holcim (formerly St. Lawrence Cement Company) has occupied the southeastern portion of the Site since 1961. TNEC's Compressed Natural Gas ("CNG") Fueling Area has occupied the southwestern portion of the Site since at least 1995. TNEC's Natural Gas Regulation Facility occupies the remainder of the Site.

The former washer and tar house (also known as the former propane house, refer to Figure 2) is located to the southwest of the Project area. This building was utilized for purification processes during the MGP era of the plant and for propane vaporizing. The former propane house was renovated in 1978 and remains on-Site but is not currently being used.

The former engine/power house, former boiler house, former exhaust house, former storage/battery room, former water gas generator house, and the former coal bin were demolished at some point between 1972 and 1981, during the construction of the present-day LNG tank. It is presumed that foundations associated with these former structures are still present below grade and would likely be encountered during construction activities in this area of the Site.

2.0 **PROJECT DESCRIPTION**

The proposed liquefaction facility will tie into the existing gas line located adjacent to the Providence River on the northern border of the Site. LNG is natural gas cooled to a temperature of -260 degrees Fahrenheit, turning it into liquid form. This is achieved through a process called liquefaction. Converting natural gas to LNG reduces its volume, making it more convenient to store and transport. There are no harmful chemicals used in the liquefaction process. The only substance



involved is nitrogen, a safe element that makes up approximately 80 percent of the air we breathe. The LNG will then be stored in the existing LNG tank with a connection to the existing tank fill lines associated with the existing truck unloading station. Currently the LNG tank is filled by tanker trucks through this tank fill line. Constructing the liquefaction facility will reduce the need to truck LNG to the facility for storage. Adding the liquefaction facility will improve the stability of the LNG supply to customers during high demand winter months. LNG storage provides needed capacity in gas supply during times of peak use from heating loads of residential and commercial customers. The demand for natural gas worldwide has increased, which has led to more volatility in LNG prices. Adding liquefaction equipment to the existing LNG facility will help to stabilize these prices and costs for National Grid's customers in the New England area.

The liquefaction facility will result in the creation of additional impervious area at the Site. The existing impervious areas are shown on Figure 3 of the attached plan set. The runoff generated from the new impervious areas will be treated in accordance with the *Rhode Island Stormwater Design and Installation Standards Manual (RISDISM)*. The layout of the stormwater collection and treatment system is depicted on Figure 10, and the details for the treatment system are depicted on Figure 11 of the attached plan set.

The proposed liquefaction facility area will be raised approximately 9 to 11-feet above existing grade. Raising the area will help to protect the liquefaction facility from damage during storm events. The northern slope of the raised area will be protected from wave action using rip rap slope armoring. The rip rap for the slope armoring has been sized to withstand the 100-year storm event and anticipated 25-year sea level rise (design life of the facility is 25 years). Figures 8 and 9 depict the profile and details of the proposed slope armoring.

The construction of the liquefaction facility will require the use of a temporary laydown area. The temporary laydown area is depicted on Figure 4 of the attached plan set.

2.1 CONSTRUCTION SEQUENCE AND SCHEDULE

Mobilization is expected to begin in early 2017. Mobilization will consist of the following:

- Install sediment and erosion controls around the perimeter of the Site and existing catch basins.
- Install crushed stone over the temporary laydown area.
- Construct the temporary office building, break room building, safety building, and warehouse.

Construction activities are expected to begin in early 2017 following FERC approvals, and will consist of the following:

- Stripping of the existing crushed stone and preparation of the liquefaction area for construction is expected to be complete by approximately March 2017.
- Relocation of the fire suppression water line is expected to be complete by approximately May of 2017.
- Pile driving for the liquefaction area is expected to be complete by approximately September 2017.
- Raising the grade of the liquefaction area will begin in approximately February 2017, and be complete by approximately May 2017.
- The revetment wall will be completed by approximately June 2017.
- Installation of the stormwater collection system will begin in approximately April 2017, and be complete by approximately November 2017.
- The sand filter and sediment forebay treatment system will be completed by approximately August 2018.



- The cast in place concrete foundations for the liquefaction facility equipment are expected to be complete by approximately March 2018.
- The equipment for the liquefaction facility will be installed by approximately March 2018.
- Final Site stabilization including paving access roads and placing crushed stone and gravel at the Site will be complete by approximately November 2018.

Demobilization will begin in approximately December 2018, and will consist of the following:

- Removing the temporary office building, break room building, safety building, and warehouse.
- Removing the erosion and sediment controls.

3.0 COASTAL RESOURCES MANAGEMENT PLAN – ENFORCEABLE POLICIES

This section addresses the requirements of the CRMP.

3.1 SECTION 140 SETBACKS

The proposed liquefaction facility will require construction activities within 50 feet of a coastal feature. Therefore, this application also includes a variance request. Portions of the proposed slope armoring lie within 50 feet of the shoreline, and the outfall for the proposed stormwater system lies within 50 feet of the shoreline.

3.1.1 SECTION 120 VARIANCES

(1) The proposed alteration conforms with applicable goals and policies of the Coastal Resources Management Program.

The slope armoring and stormwater outfall conform to the goals and policies of the CRMP. The slope armoring has been designed to protect the liquefaction facility during storm events and the design has incorporated the anticipated sea level rise over the design life of the liquefaction facility (25 years). The stormwater outfall has been designed in accordance with the *Rhode Island Stormwater Design and Installation Standards Manual*.

(2) The Proposed Alteration will not result in significant adverse environmental impacts or use conflicts, including but not limited to, taking into account cumulative impacts.

The proposed slope armoring will help prevent soil erosion and potential discharge of sediment to the Providence River from the liquefaction facility area. The stormwater outfall will be equipped with rip rap to prevent scouring and soil erosion. The stormwater treatment system will minimize pollutant loading to the Providence River by treating runoff generated at the Site in accordance with the *Rhode Island Stormwater Design and Installation Standards Manual*.

(3) Due to the conditions at the Site, the applicable standard(s) cannot be met.

CRMP requires a minimum distance of 50 feet between a shoreline feature and construction activities (the construction setback). The slope armoring and stormwater outfall must be constructed within the 50-foot



construction setback. The location of the liquefaction facility was selected due to access to the existing 200 psig gas line and available open space not used by the NGLNG for other operations. No other location on the parcel is suitable. The proposed slope armoring is necessary in order to protect the proposed liquefaction facility during flooding and storm events. The slope of the liquefaction facility area must be 1.5:1 in keeping with engineering principles to avoid filling in areas that would increase the loading on the existing buried gas line, and to minimize the footprint of proposed fill and minimize work within the CRMP 50-foot setback area. The stormwater outfall must be located within 50-feet of the shoreline in order for the stormwater conveyance to function properly. The depth of the treatment system is dictated by the level of the groundwater in the area and, in turn, this governs the placement (and slope) of the outfall pipe. In order for the treatment system to function properly, stormwater runoff must be able to pass through the treatment process without eroding or overflowing the treatment system. Moving the stormwater outfall to a different location would impact the slope of the drainage lines and reduce the effectiveness of the stormwater treatment system.

(4) The modification requested by the applicant is the minimum variance to the applicable standard(s) necessary to allow a reasonable alteration or use of the Site.

The installation of slope armoring and the stormwater outfall within 50 feet of the coastal feature requested are minimal variances necessary for the liquefaction facility to operate in accordance with policies of the CRMP and the RISDISM. Placement of the liquefaction facility further inland would require additional piping to access the existing gas line and would require the reconstruction/relocation of existing infrastructure at the LNG facility such as the existing access road to the truck scale. In order to relocate the stormwater outfall to be outside of the 50-foot setback, the outfall invert would have to be raised. This would, in turn, require raising the elevation of the entire stormwater treatment system or risk compromising the effectiveness of the treatment system. Considerable additional filling, grading, and other land disturbance would be required. Locating these structures farther inland, albeit outside of the setback will severely impair the project design and mandate extensive site disturbance activities.

(5) The requested variance to the applicable standard(s) is not due to any prior action of the applicant or the applicant's predecessor in title.

This alteration is not the result of a previous action by NGLNG, TNEC, or its predecessor in title at the Site.

(6) Due to the conditions of the Site in question, the standards will cause the applicant an undue hardship.

The Site does not have any other open space suitable for the placement of the liquefaction facility. The location of the liquefaction facility limits the length of LNG piping needed to reach the storage tank. Relocating the stormwater outfall farther inland would also require additional earthwork/land disturbance and would reduce the efficiency of the stormwater conveyance system.

3.2 SECTION 145 CLIMATE CHANGE AND SEA LEVEL RISE

NGLNG's anticipated design life for the liquefaction facility is 25 years. Therefore, the slope armoring supporting the liquefaction facility has incorporated anticipated sea level rise over a 25-year period as well as the wave action associated with a 100-year design storm. The most recent updates to Coastal Resources Management Program's Section 145 –



Climate Change and Sea Level Rise (effective February 22, 2016) notes that the Council relies upon the most recent NOAA sea level rise data to address planning horizons for infrastructure. As of 2015, the range in sea level rise change is projected by NOAA to be a maximum of approximately 1.0 foot in 2035, 2.0 feet in 2050, and 7.0 feet in 2100. For the design life of this facility, the anticipated sea level rise for the area over the next 25 years is estimated at 1.5 feet. Details regarding the slope armoring design are included in Appendix B.

3.3 SECTION 200.6 TYPE 6 INDUSTRIAL WATERFRONTS AND COMMERCIAL NAVIGATION CHANNELS

The proposed liquefaction facility is consistent with existing industrial activities and will continue to promote the use of the Providence Harbor as an industrial waterfront and will not impede commercial activity within the port related to shipping. This Project will not interfere with or detract from priority uses for port facilities. The liquefaction facility will improve the efficiency of the LNG tank operation by utilizing the existing natural gas line to provide a continuous supply of liquefied natural gas for the tank and by considerably reducing the incoming truck traffic presently used to fill the LNG tank. The facility will not be serviced by marine vessels. National Grid's existing storage facility at this waterfront has operated without incident for more than 40 years. Consistent with the policies of the CRMC, the liquefaction facility will modernize the commercial activity within the Providence Harbor and will incorporate advanced and modern safety designs.

3.4 SECTION 210.6 MANMADE SHORELINES

NGLNG will assure that the existing shoreline protection structures as well as the new shoreline protection/armoring structures associated with the proposed Project are properly maintained. The stormwater outfall and shoreline along the northern perimeter of the Site will be inspected on a monthly basis after construction. When in operation, personnel will monitor the liquefaction facility, which will provide additional opportunities to observe the adjacent shoreline and conduct maintenance if needed. The slope protection/armoring has been designed to withstand the 100-year storm event. With the exception of the placement of rip rap to prevent erosion at the drainage outfall, there are no modifications proposed below mean high water. Therefore, this Project is not anticipated to alter the current erosion-accretion processes occurring within the Project area.

3.5 SECTION 300.1 CATEGORY B REQUIREMENTS

Many Rhode Islanders rely on natural gas for heating and cooking purposes. Natural gas is much cleaner burning than oil or coal and produces no ash particles.

The proposed liquefaction facility capacity has been fully subscribed by customers and enhances the use of the LNG facility and promotes economic growth. The proposed Project will require review and approval by the FERC, and will adhere to all applicable federal building codes, safety codes, and fire codes. The proposed Project does not include any filling or dredging within tidal waters, and will not affect water circulation, flushing, erosion, or deposition processes along the shoreline. The entire project Site is currently developed, and the addition of the liquefaction facility will not impact plant and animal life in the area. The LNG facility is a secure facility, and there is no public access to the shoreline at the Site. The LNG facility is secured with primary and secondary fencing around the entire perimeter of the facility. Security guards perform regular perimeter inspections, and the facility is staffed and monitored 24-hours per day. Stormwater runoff emanating from the new impervious areas will be treated in accordance with the *Rhode Island Stormwater Design and Installation Standards Manual*. Required applicable federal permits and authorizations will be obtained prior to



construction of the new stormwater treatment system. Details regarding the stormwater management system are included in the attached Stormwater Management Plan (SWMP).

3.6 SECTION 300.2 FILLING, REMOVING, OR GRADING OF SHORELINE FEATURES

The Project will include filling in an upland section of the Site for the proposed liquefaction facility. Under the current conditions the area for the proposed liquefaction facility is located within a FEMA AE flood zone – areas subject to inundation by the 100-year storm event. The area will be raised approximately 9-11 feet above the existing grade. In order to raise the area for the liquefaction facility, the northern slope of the project area will be equipped with rip rap slope armoring. The equipment in the Project area will also be supported by a series of piles, to provide additional stability under load and therefore an additional factor of safety for the equipment. The base of the rip rap slope armoring begins at the access road along the cove area. Due to an existing underground gas line located underneath the access road, there will be no filling on the northern shoreline of the Site. Additional details of the slope armoring, specifically addressing compliance with CRMC policy 300.7 are discussed in Section 3.9.

A Site-specific Soil Erosion and Sediment Control Plan (SESC) will be prepared and implemented in accordance with the most recent edition of the *Rhode Island Soil Erosion and Sediment Control Handbook*. Erosion and sediment controls consisting of fiber rolls or Filtrexx Soxxs and crushed stone will be installed prior to the start of construction and will be maintained until final site stabilization has been achieved. The laydown area will be covered with crushed stone to prevent migration of sediment. Work areas that involve land disturbance or material management (i.e. the liquefaction work area) will be equipped with Filtrexx Soxx to prevent migration of sediment. Soil stockpiles will be covered with polyethylene/plastic sheeting to eliminate the migration of sediments during rainfall events. Entrance pads will be employed to reduce off-site tracking of sediment (anti-tracking pads). The liquefaction facility will be stabilized with crushed stone, rip rap, and asphalt pavement as final surface stabilization treatments.

All excavated material will be managed in accordance with the Site specific SESC and the Soil Management Plan (SMP) that was developed and submitted to RIDEM in September 2012 for all earthwork activities that occur at the Site. Any imported material will be tested and/or certified as clean prior to being brought on Site in accordance with the SMP. Import testing analysis includes sampling for Volatile Organic Compounds, Total Petroleum Hydrocarbons, Polynuclear Aromatic Hydrocarbons, arsenic, and lead. All excavated material will be disposed of in accordance with the Soil Management Plan. The Project does not propose any fill within tidal waters.

3.7 SECTION 300.3 RESIDENTIAL, COMMERCIAL, INDUSTRIAL AND RECREATIONAL STRUCTURES

The area for the liquefaction facility will be raised between 9-11 feet above existing grade. The proposed slope armoring has been designed to protect the fill material used to elevate the new liquefaction facility and protect it from potential storm surge damage. Raising the liquefaction facility to elevation 21-feet (NAVD88) will also help protect the facility throughout its 25-year design life from the expected sea level rise. Public access will not be impacted since the LNG facility is currently a secure facility that does not allow public access due to safety concerns. The liquefaction facility will be additionally secured with two rows of fencing, intrusion detection, and other measures. There are no industrial or commercial activities proposed within tidal waters. The liquefaction facility will be raised such that it is not located within a potential flood inundation area. The Project will adhere to the federal building requirements in accordance with FERC and the environmental and safety regulations promulgated by the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration.



3.8 SECTION 300.6 TREATMENT OF SEWAGE AND STORMWATER

The proposed Project does not involve any new sanitary sewage connections or onsite wastewater treatment. Stormwater runoff emanating from the new impervious surfaces will be managed in accordance with the RISDISM. The ground cover at the Site is approximately 47% impervious, and the proposed Project will disturb more than 10,000 square feet of existing impervious area. Therefore, the Project meets the definition of a redevelopment pursuant to Section 3.2.6 of the RISDISM. Accordingly, the Project will adhere to Standards 2, 3, and 7-11 of the RISDISM. The Project will obtain a Water Quality Certification issued by the RIDEM pursuant to Section 402 of the Clean Water Act. A copy of the Water Quality Certification request letter that was submitted to RIDEM on September 14, 2016 is attached as Appendix A.

3.8.1 EXISTING STORMWATER MANAGEMENT

Under existing conditions (with no stormwater treatment), precipitation falling on the proposed Project area infiltrates through the crushed stone without any treatment. Under the proposed Project, there will be better stormwater management and treatment to improve water quality from the Site. See discussion in Section 3.8.2 below.

3.8.2 PROPOSED STORMWATER MANAGEMENT

Under the proposed conditions, stormwater runoff emanating from the Project area will be collected by a series of catch basins and directed to a new stormwater treatment system consisting of a sediment forebay pretreatment system and a lined sand filter before it is discharged to the Providence River. The proposed treatment system has been sized to treat 100% of runoff generated by new impervious surfaces, and 50% of runoff generated by existing impervious surfaces that will remain impervious. The total water quality volume for the liquefaction facility is 4,880 cubic feet. The proposed treatment system will provide treatment for 6,121 cubic feet. Water quality volume calculations are included in Appendix C. The stormwater management system has been oversized to accommodate all of the runoff generated by the liquefaction facility and an additional 25% of runoff to further improve water quality from the Site. The sand filter has been designed in accordance with Section 5.5 Filtering Systems, of the RISDISM. The sediment forebay has been designed in accordance with Section 6.4 Sediment Forebay of the RISDISM. The stormwater treatment system for the proposed liquefaction facility complies with the standards in the RISDISM.

3.9 SECTION 300.8 ENERGY RELATED ACTIVITIES AND STRUCTURES

The proposed Project is required to adhere to federal building codes and fire codes. The entire Site is zoned by the City of Providence as W-3 Port/Maritime Industrial Waterfront District. The proposed liquefaction facility is consistent with the designated local zoning for the Site. Flood hazards in the area will be mitigated by elevating the liquefaction facility as described above and impacts of wave action will be mitigated by the proposed slope armoring. Incorporating anticipated sea level rise, the 100-year still water level flood elevation for the Site is 13.5-feet (NAVD88), and the anticipated wave height for the 100-year storm event is 2.9 feet.



3.10 CRMP 1978 ENERGY AMENDMENT

In accordance with Section 610.2 Siting of Energy Facilities of the 1978 Energy Amendments to the CRMP, the proposed liquefaction facility will support and maintain the public welfare and the state's economy. The construction of the liquefaction facility is not anticipated to impact future development at the Site or in the surrounding area. Considering the already built-up nature of the waterfront in the area, the liquefaction facility will not impact or detract from the existing scenic quality of the area – an industrial waterfront as defined in Section 200.6 of the CRMP. The proposed liquefaction facility does not conflict with the Providence Harbor Special Area Management Plan. The liquefaction facility will help to improve utilization of the shoreline within Providence Harbor. Constructing the liquefaction facility in an alternative location would require additional pipelines and land disturbance. The operation of the liquefaction facility is not anticipated to adversely impact water quality in the Providence River. The operation of the liquefaction facility will not result in the production of hazardous wastes at the facility. The construction and operation of the liquefaction facility will create in-state employment opportunities. As a fuel storage facility rather than a power generation facility, the addition of the liquefaction facility is not anticipated to result in significant air emissions once operational. The liquefaction facility will not result in any new petroleum transfer facilities, but rather will improve efficiency at the existing LNG facility by reducing the need to truck in LNG.

Although the liquefaction facility alone is not considered a liquefied gas storage facility, the existing LNG tank is considered a liquefied gas storage facility and therefore the project will comply with Section 640.2 Storage and Processing of Liquefied Gases in the CRMC 1978 Energy Amendments. In accordance with Section 640.2 the liquefaction facility will be equipped with dikes or berms capable of containing spills, automatic and continuous monitoring alarms/shutdown devices will be installed, an emergency generator will be installed for essential operating equipment, and a fire suppression system will be installed. The entire existing LNG facility is already equipped with safety and security measures including the secondary containment dike around the existing tank and 24-hour monitoring for potential leaks or equipment malfunctions.

3.11 SECTION 400 FEDERAL CONSISTENCY REVIEW

This Project requires approval from the FERC pursuant to Section 7 of the Natural Gas Act and therefore requires a Federal Consistency Review by the CRMC in accordance with 15 CFR § 930 Subpart D. Specific requirements are presented in Section 1 of this narrative.

Summary and Conclusions

- Construction activities associated with installation of the proposed liquefaction facility have the potential to directly impact the coastal zone. The majority of these potential impacts would be temporary and, without proper protection, would take the form of erosion of shoreline features and migration of sediment into waters of the state. However, these temporary impacts will be effectively mitigated by implementing a site-specific Soil Erosion and Sediment Control Plan during construction activities. This plan will follow all guidelines presented in the most recent edition of the *Rhode Island Soil Erosion and Sediment Control Handbook*. The best management practices proposed to be implemented will include perimeter fiber rolls, anti-tracking pads, and covering of temporary soil storage areas until the project site is fully stabilized.
- The construction and operation of the proposed liquefaction facility will not alter the use of the Providence River. This Project will not result in secondary (indirect) impacts to coastal use or coastal resources. The Site is currently



fully developed with little vegetation or wildlife. The addition of the liquefaction facility will not reduce or alter wildlife habitat. Operation of the liquefaction facility will improve how the existing LNG tank is filled during the low-demand summer months, as filling of the tank by truck will be virtually eliminated. The location of the proposed liquefaction facility was chosen to reduce impacts by minimizing the need for additional pipelines and land disturbance.

- The proposed Project has many benefits. Changing the way the existing LNG storage tank is filled from tanker trucks to onsite liquefaction using the existing gas pipeline will result in long-term benefits in reliability and pricing. Demand for LNG has increased around the world, creating volatility in pricing and supply. Unforeseen events can also place the reliability of imported LNG deliveries at risk. This Project will allow customers to avoid worldwide market price fluctuations related to the international LNG trade, providing more stable, predictable natural gas costs for customers in the years to come.

The proposed liquefaction facility complies with the enforceable policies of Rhode Island's approved Coastal Resources Management Program, as detailed above, and will be conducted in a manner consistent with such program.



FIGURES

NATIONAL GRID LIQUEFACTION PLANT 642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND OCTOBER 2016

PREPARED FOR:



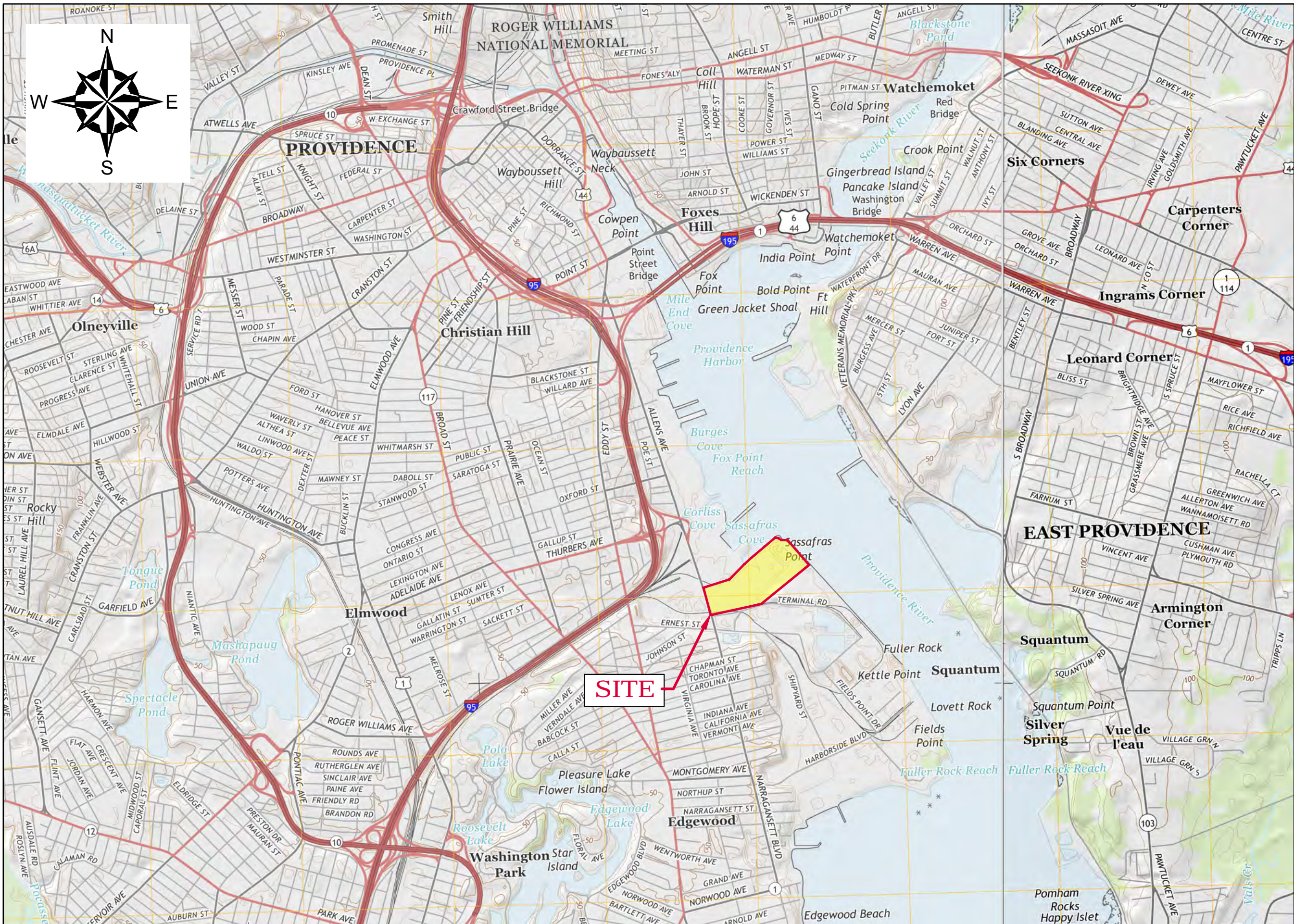
PREPARED BY:



GZA GEOENVIRONMENTAL, INC.
530 BROADWAY
PROVIDENCE, RHODE ISLAND 02909

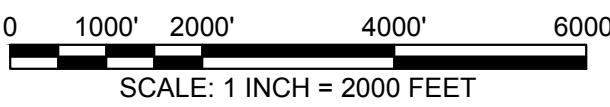
DESIGNED BY:

KIEWIT ENGINEERING AND DESIGN CO.
9401 RENNER BOULEVARD
LENEXA, KANSAS 66219



PROJECT LOCUS MAP

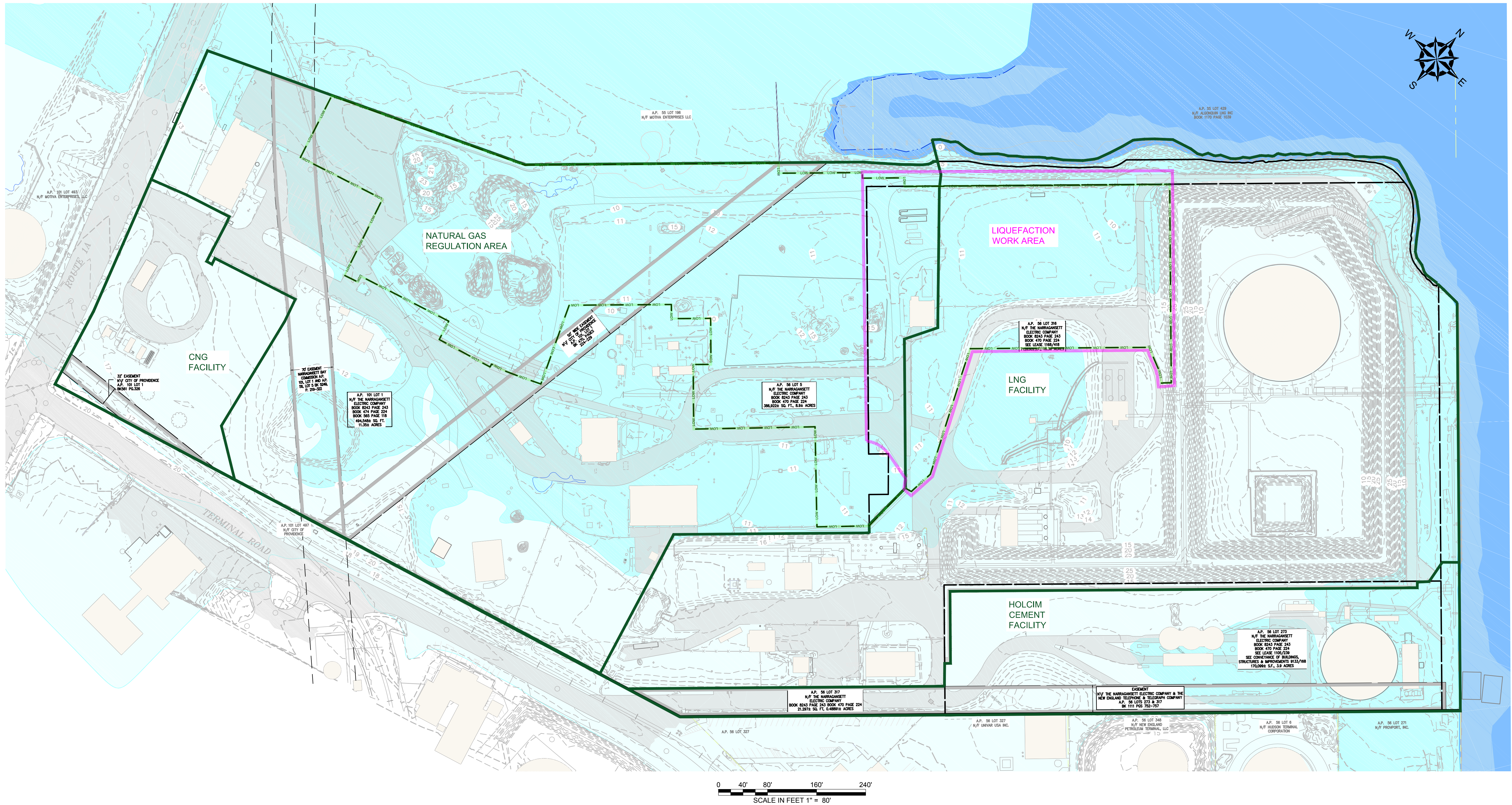
SOURCE: USGSSTORE.GOV



FOR PERMITTING
ONLY

INDEX OF DRAWINGS	
Sheet #	Sheet Title
1	COVER
2	EXISTING CONDITIONS PLAN
3	EXISTING IMPERVIOUS CONDITIONS PLAN
4	TEMPORARY LAYDOWN AREA EROSION AND SEDIMENTATION CONTROLS
5	TEMPORARY SEDIMENTATION AND EROSION CONTROL DETAILS
6	SOIL STORAGE AREA PLAN
7	LIQUEFACTION WORK AREA - EROSION AND SEDIMENTATION CONTROLS
8	LIQUEFACTION WORK AREA - EXISTING REVETMENT AND CROSS SECTIONS
9	LIQUEFACTION WORK AREA - PROPOSED SLOPE ARMORING, EXISTING REVETMENT AND CROSS SECTIONS
10	STORMWATER MANAGEMENT PLAN
11	STORMWATER MANAGEMENT DETAILS - SAND FILTER
12	STORMWATER MANAGEMENT DETAILS - CONCRETE FOREBAY
13	PROPOSED MONITORING WELL RE-INSTALLATION PLAN
14	PROPOSED FINAL CONDITIONS PLAN
15	PROPOSED IMPERVIOUS CONDITIONS PLAN

THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.



GENERAL NOTES:

- 1) BASE MAP DEVELOPED FROM THE FOLLOWING:
 - ELECTRONIC CAD FILE "ACAD-7257PL.DWG" PROVIDED BY VANASSE HANGEN BRUSTLIN (VHB) ENTITLED "EXISTING CONDITIONS PLAN," PROJECT TITLE "NATIONAL GRID LNG TERMINAL ROAD LNG FACILITY" DATED MARCH 10, 2014, ORIGINAL SCALE 1" = 50', DRAWING NO. SV-1 THROUGH SV-3 AND AERIAL MAPPING BY WSP TRANSPORTATION AND INFRASTRUCTURE DATED JANUARY 15, 2014 PREPARED FOR NATIONAL GRID LAND SURVEYING DEPARTMENT, WALTHAM, MASSACHUSETTS AND CAD FILE NO. 09303023.052-1.DWG. PLANS PROVIDED BY NATIONAL GRID.
 - DESCRIPTIONS PROVIDED IN THE CITY OF PROVIDENCE DEED BOOK (BK) 470 PAGES 224 - 229, BK 561 PAGES 326 - 328, BK 1111 PAGES 752 - 756 AND BK 5249 PAGES 219 - 322.
 - ELECTRONIC CAD FILE 14-152_SU1_REV2.DWG, TITLED "TOPOGRAPHIC SURVEY PLAN, PORTION OF A.P. 56 LOT 5" DATED OCTOBER 27, 2014 AND PROVIDED BY NATIONAL GRID.
 - ELECTRONIC CAD FILE 5153_COO.DWG, TITLED "EXISTING CONDITIONS PLAN" PREPARED BY PROCESS PIPELINE SERVICES, DATED DECEMBER 18, 2014 AND PROVIDED BY NATIONAL GRID.
- 2) HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY VHB.
- 3) VERTICAL DATUM IS BASED ON NAVD 1988 FROM BASE MAPPING PROVIDED BY VHB.
- 4) ON-SITE INVESTIGATIONS AND SURVEYS BY GZA PERSONNEL DURING VARIOUS SITE VISITS BETWEEN 2011 AND 2016.
- 5) PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY. THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.
- 6) SITE BOUNDARIES ARE APPROXIMATE.
- 7) FLOOD ZONE HAZARD AREA DATA WERE PROVIDED BY RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM (RIGIS) AND DERIVED FROM STATEWIDE DIGITAL FLOOD INSURANCE RATE MAP (DFIRM) DATABASE, ORIGINALLY PUBLISHED BY FEMA IN OCTOBER 2015.

LEGEND:

- | | | | |
|--|--|--|--------------------------|
| | EXISTING BUILDING | | ABUTTING PROPERTY LINE |
| | EXISTING CONTOUR (MAJOR 5 FOOT INTERVAL) | | EDGE OF WATER |
| | EXISTING CONTOUR (MINOR 1 FOOT INTERVAL) | | EXISTING RAILROAD TRACKS |
| | PAVEMENT | | EXISTING FENCE |
| | EASEMENT AREA | | OPERATIONS BOUNDARY |
| | PROPERTY LINE | | LIQUEFACTION WORK AREA |
| | INTERIOR PROPERTY LINE | | EXISTING CONCRETE PAD |
| | LIMIT OF WORK | | UTILITY POLE |
| | | | LIGHT POLE |
| | | | HYDRANT |

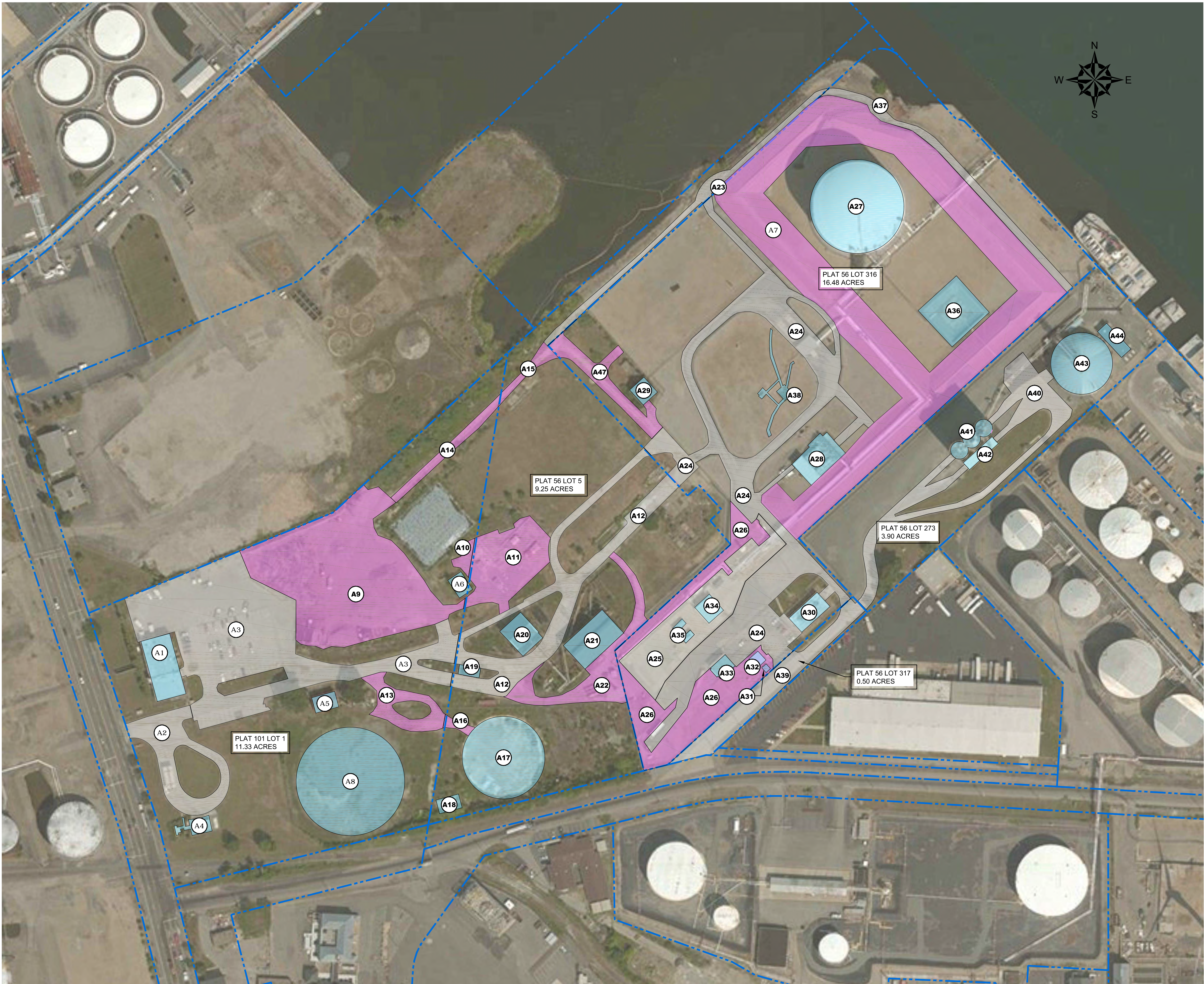
FLOOD HAZARD AREAS:

- | | |
|--|------------------------|
| | FLOOD ZONE VE (EL. 14) |
| | FLOOD ZONE AE (EL. 12) |
| | FLOOD ZONE X (EL. 14) |

THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

NATIONAL GRID LIQUEFACTION PLANT 642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND			
EXISTING CONDITIONS PLAN			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: MSK	REVIEWED BY: SJH	CHECKED BY: IR	FIGURE
DESIGNED BY: SJH	DRAWN BY: LDT	SCALE: AS NOTED	2
DATE: OCTOBER, 2016	PROJECT NO. 33554.60	REVISION NO. 1	SHEET NO. 2 OF 15

FOR PERMITTING
ONLY



LEGEND

- PROPERTY LINES
- STRUCTURE
- ASPHALT
- OTHER

REFERENCE NOTES:

- THIS MAP CONTAINS THE ESRI ARCGIS ONLINE BING MAPS AERIAL LAYER PACKAGE. IMAGE COURTESY OF USGS EARTHSTAR GEOGRAPHICS SIO © MICROSOFT CORPORATION 2015.
- PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY. THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.
- SITE BOUNDARIES ARE APPROXIMATE.

IMPERVIOUS AREAS					
PLAT	LOT	NO.	AREA (SQ. FT.)	SURFACE TYPE	
101	1	A1	8,037.44	ROOF	
101	1	A2	17,913.35	ASPHALT	
101	1	A3	90,158.79	ASPHALT	
101	1	A4	1,786.65	STRUCTURE	
101	1	A5	1,640.44	ROOF	
101	1	A6	1,445.11	STRUCTURE	
56	1	A7	156,852.04	CONTAINMENT DIKE	
101	1	A8	38,796.73	TANK FOUNDATION	
101	1	A9	79,909.64	COMPACTED GRAVEL	
101	1	A10	1,933.34	COMPACTED GRAVEL	
56	5	A11	21,898.19	COMPACTED GRAVEL	
56	5	A12	33,764.16	ASPHALT	
101	1	A13	8,857.25	COMPACTED GRAVEL	
101	1	A14	5,114.04	COMPACTED GRAVEL	
56	5	A15	2,860.86	COMPACTED GRAVEL	
56	5	A16	1,196.51	COMPACTED GRAVEL	
56	5	A17	23,127.00	TANK FOUNDATION	
56	5	A18	1,425.31	STRUCTURE	
56	5	A19	898.87	ROOF	
56	5	A20	4,099.05	ROOF	
56	5	A21	7,273.42	ROOF	
56	5	A22	16,442.64	COMPACTED GRAVEL	
56	5	A23	11,249.94	ASPHALT	
56	316	A24	93,429.89	ASPHALT	
56	316	A25	29,735.26	CONCRETE	
56	316	A26	40,494.92	COMPACTED GRAVEL	
56	316	A27	29,930.34	LNG TANK	
56	316	A28	6,084.97	STRUCTURE	
56	316	A29	1,686.87	ROOF	
56	316	A30	3,197.19	ROOF	
56	316	A31	164.24	ROOF	
56	316	A32	638.42	ROOF	
56	316	A33	1,346.21	ROOF	
56	316	A34	1,845.52	ROOF	
56	316	A35	712.24	ROOF	
56	316	A36	10,912.10	SUMP PIT	
56	316	A37	10,655.36	ASPHALT	
56	316	A38	2,392.36	STRUCTURE	
56	317	A39	18,586.35	ASPHALT	
56	273	A40	28,623.42	ASPHALT	
56	273	A41	3,112.29	STRUCTURE	
56	273	A42	1,576.65	ROOF	
56	273	A43	12,924.79	TANK	
56	273	A44	1,893.69	STRUCTURE	
56	316	A47	10,294.60	COMPACTED GRAVEL	
TOTAL IMPERVIOUS			847,918.45		

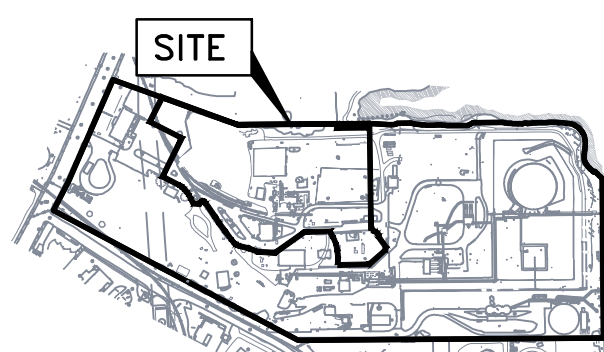
847918.45 SQ. FT. IMPERVIOUS AREA
1807724.79 SQ. FT. TOTAL AREA = 46.91% IMPERVIOUS




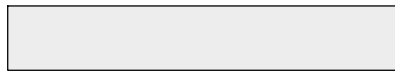
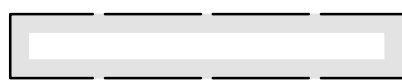







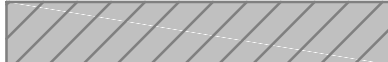







THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

NATIONAL GRID LIQUEFACTION PLANT 642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND			
EXISTING IMPERVIOUS CONDITIONS PLAN			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: MSK	REVIEWED BY: SJH	CHECKED BY: JR	FIGURE
DESIGNED BY: SJH	DRAWN BY: LDT	SCALE: AS NOTED	3
DATE: OCTOBER, 2016	PROJECT NO: 33554.60	REVISION NO: 0	SHEET NO. 3 OF 15

FOR PERMITTING
ONLY



	EXISTING BUILDING
	EXISTING CONTOUR (MAJOR 10 FOOT INTERVAL)
	EXISTING CONTOUR (MINOR 1 FOOT INTERVAL)
	EXISTING PAVEMENT
	EASEMENT AREA
	UTILITY POLE
	LIGHT POLE
	HYDRANT
	PROPERTY LINES
	INTERIOR PROPERTY LINE
	TEMPORARY LAYDOWN AREA
	PROPOSED PERMANENT PAVEMENT
	PROPOSED TEMPORARY PAVEMENT
	PROPOSED TEMPORARY BUILDING
	PROPOSED CRUSHED STONE
	STAKED FILTREXX SOXX (SEE DETAIL ON SHEET 5)
	LIMIT OF WORK
	CONSTRUCTION ENTRANCE



1) BASE MAP DEVELOPED FROM THE FOLLOWING:

- ELECTRONIC CAD FILE# "ACAD-7257PLW.DWG" PROVIDED BY VANASSE HANGEN BRUSTLIN (VHB) ENTITLED "EXISTING CONDITIONS PLAN," PROJECT TITLE "NATIONAL GRID LONG TERMINAL ROAD LING FACILITY" DATED MARCH 10, 2014, ORIGINAL SCALE 1" = 50', DRAWING NO. SV-1 THROUGH SV-3 AND AERIAL MAPPING BY WSP TRANSPORTATION AND INFRASTRUCTURE DATED JANUARY 15, 2014, PREPARED FOR NATIONAL GRID LAND SURVEYING DEPARTMENT, WALTHAM, MASSACHUSETTS AND CAD FILE NO. 09303023.052-1.DWG. PLANS PROVIDED BY NATIONAL GRID.
- DESCRIPTIONS PROVIDED IN THE CITY OF PROVIDENCE DEED BOOK (BK) 4704 PAGES 224 - 229, BK 561 PAGES 326 - 328, BK 1111 PAGES 752 -756 AND BK 5249 PAGES 219 - 322.
- ELECTRONIC CAD FILE#14-152_SU1_REV2.DWG, TITLED "TOPOGRAPHIC SURVEY PLAN, PORTION OF A.P. 56 LOT 5" DATED

OCTOBER 27, 2014 AND PROVIDED BY NATIONAL GRID.

- ELECTRONIC CAD FILE 5153_COO.DWG, TITLED "EXISTING CONDITIONS PLAN" PREPARED BY PROCESS PIPELINE SERVICES, DATED DECEMBER 18, 2014 AND PROVIDED BY NATIONAL GRID.
- ELECTRONIC CAD FILES PROVIDED BY KIEWIT
 - 1. "ACAD-102761-CIV_SITE.DWG"
 - 2. "A2007EXP_102761-CIV_LAYDOWN.DWG"
 - 3. "102761_MEC_STR_BASE.DWG"
 - 4. "102761-SURVEY_SITE.DWG"
 - 5. "A2007EXP_102761-CIV_STORM.DWG"
 - 6. "ACAD-102761-CIV_SURFACING.DWG"
 - 7. "ACAD-102761-PROP-CONT_.DWG"
 - 8. "POST DEVELOPMENT DRAINAGE MAP.DWG"
- PDFS OF THE FOLLOWING DRAWINGS PROVIDED BY NATIONAL GRID
 - 1. "CATCH BASINS AND SANITARY SEWER SYSTEM" PREPARED BY PROVENTURE GAS COMPANY, DATED SEPTEMBER 25, 1981.

2. "PLAN SHOWING UNDERGROUND UTILITIES LNG FACILITY" DATED OCTOBER 6, 1983, "SUBSURFACE UTILITY ENGINEERING" PREPARED BY BAYSTATE SUBSURFACE INVESTIGATION, INC., DATED MAY 17, 2005.
- HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY VHB.
- VERTICAL DATUM IS BASED ON NAVD 1988 FROM BASE MAPPING PROVIDED BY VHB.
- EXISTING PRESENTED SITE UTILITIES WERE TAKEN FROM HISTORIC RECORDS PROVIDED BY NATIONAL GRID. ALL UTILITY LOCATIONS ARE APPROXIMATE AND HAVE BEEN ALIGNED AND ADJUSTED FOR THE "BEST AVAILABLE DATA". THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE EXTENT IMPLIED BY THE METHOD USED. UTILITIES ARE SHOWN FOR REFERENCE ONLY. **OTHER LOCATIONS MAY EXIST.**
- ADDITIONAL SITE INVESTIGATIONS AND SURVEYS BY GZA PERSONNEL DURING FUTURE SITE VISITS BETWEEN 2011 AND 2016.

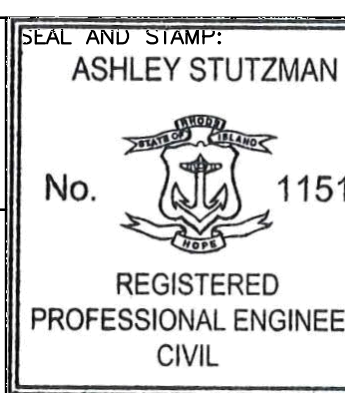
- 6) PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY. THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.
- 7) SITE BOUNDARIES ARE APPROXIMATE.

CONFIDENTIAL

THESE DRAWINGS ARE CONFIDENTIAL IN NATURE, ANY MISUSE OR UNAUTHORIZED DISTRIBUTION OF THE DRAWINGS CONTAINED HEREIN WILL BE A VIOLATION OF THIS CONFIDENTIALITY REQUIREMENT AND SUBJECT THE VIOLATOR TO LIABILITY. REVIEW OF THESE MATERIALS BY RECIPIENT SHALL CONSTITUTE AN ACCEPTANCE OF THESE TERMS AND THE TERMS OF ANY UNDERLYING AGREEMENT WE MAY HAVE EXECUTED IN OBTAINING THIS INFORMATION FROM A THIRD PARTY. IF THE RECIPIENT IS NOT THE ORIGINAL SOURCE OF THE INFORMATION, THEN THE DRAWINGS SHALL BE RETURNED TO THE ORIGINATOR.

[illegible]

GENERAL NOTES AND COMMENTS:



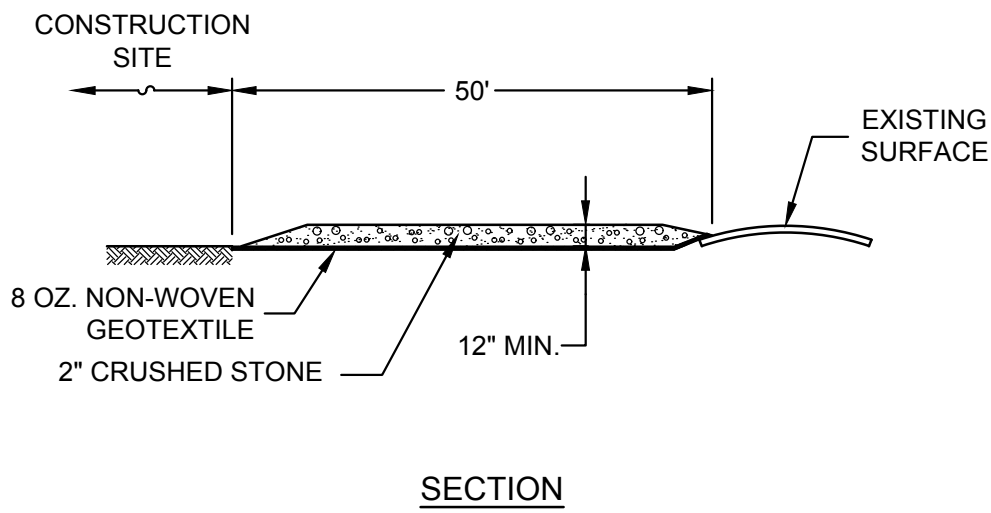
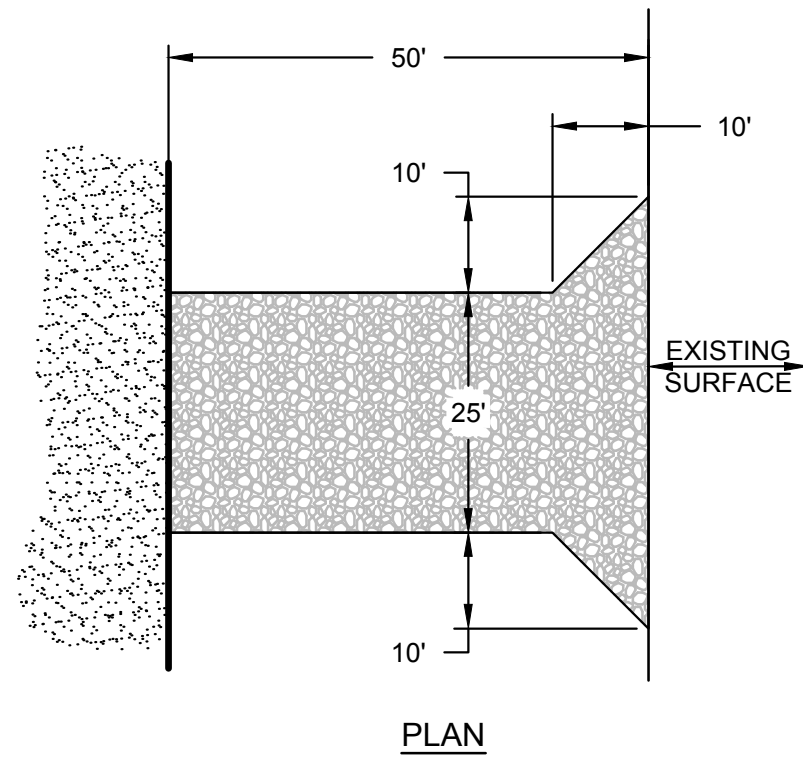
PROFESSIONAL CERTIFICATION:
 I HEREBY CERTIFY THAT THESE DOCUMENTS
 WERE PREPARED OR APPROVED BY ME, AND
 I AM A LICENSED PROFESSIONAL
 ENGINEER UNDER THE LAWS OF THE STATE
 OF CALIFORNIA.
 LICENSE NO. 11512
 EXPIRATION DATE 06/30/2017

ENG/DESIGN ORIG: A. STUTZMAN
 LEAD ENG: A. STUTZMAN
 ENG. MGR: J. BOCKELMUELLER
 PROJ. MGR: T. PARRACK

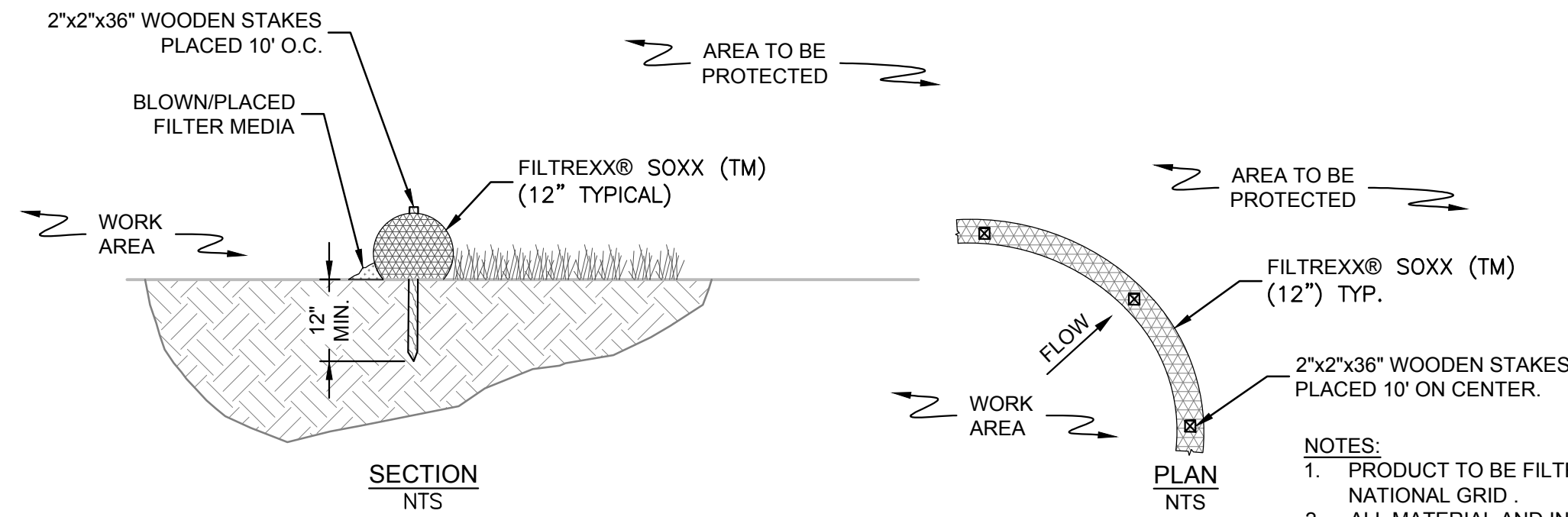
NATIONAL GRID LNG LLC			
FIELDS POINT LIQUEFACTION PROJECT			
TEMPORARY LAYDOWN AREA			
EROSION AND SEDIMENT CONTROLS			
DRAWING NO:	PROJECT NO:	SHT:	REV.
FIGURE 4	33554.60	040F15	0

WHEEL WASH/CONSTRUCTION ENTRANCE NOTES

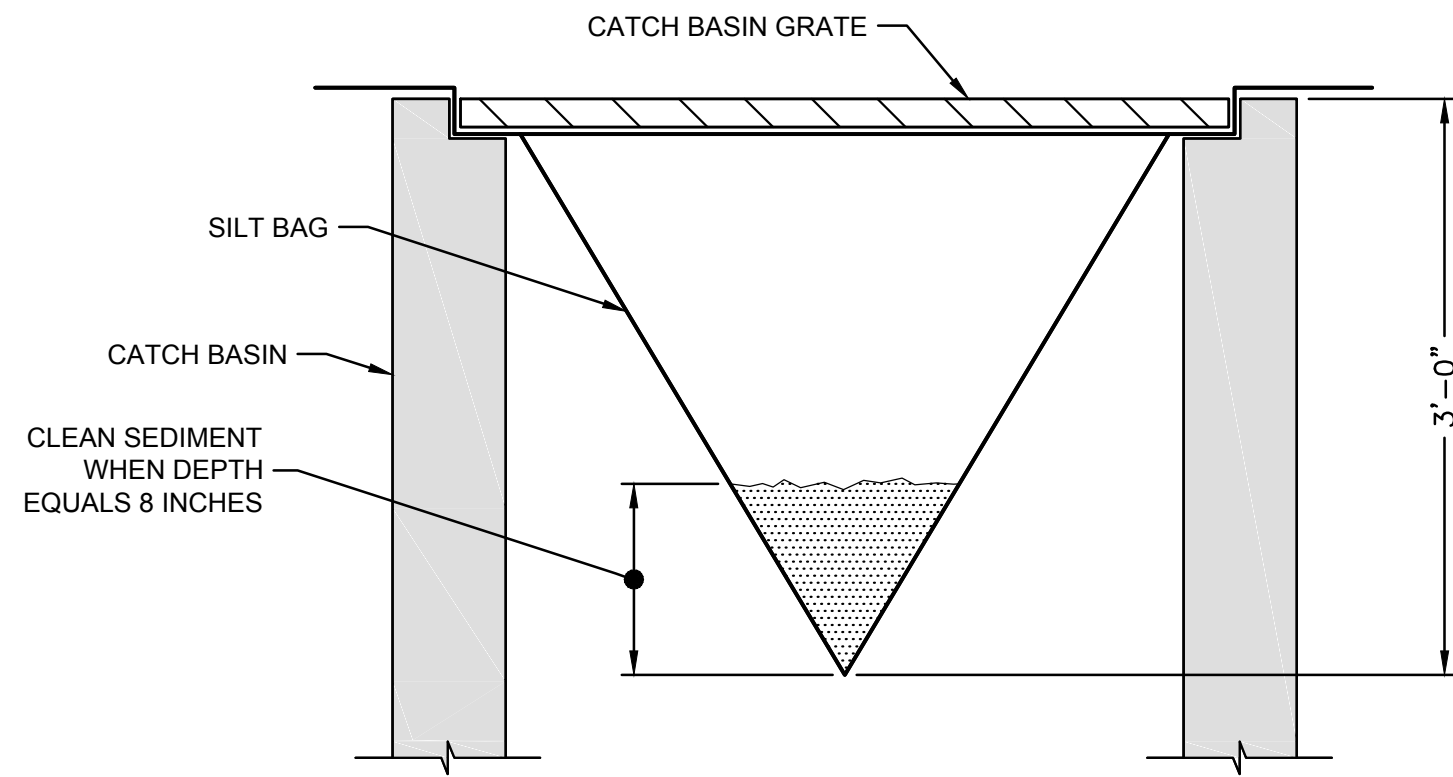
- ENTRANCE WIDTH SHALL BE TWENTY-FIVE (25) FEET MINIMUM.
- THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH SHALL PREVENT TRACKING OR FLOWING OF SEDIMENT OUT OF THE LIMITS OF WORK. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED OUT OF THE LIMITS OF WORK MUST BE REMOVED IMMEDIATELY. PERIODIC INSPECTION AND MAINTENANCE SHALL BE PROVIDED AS NEEDED.



WHEEL WASH/CONSTRUCTION ENTRANCE/EXIT
NOT TO SCALE

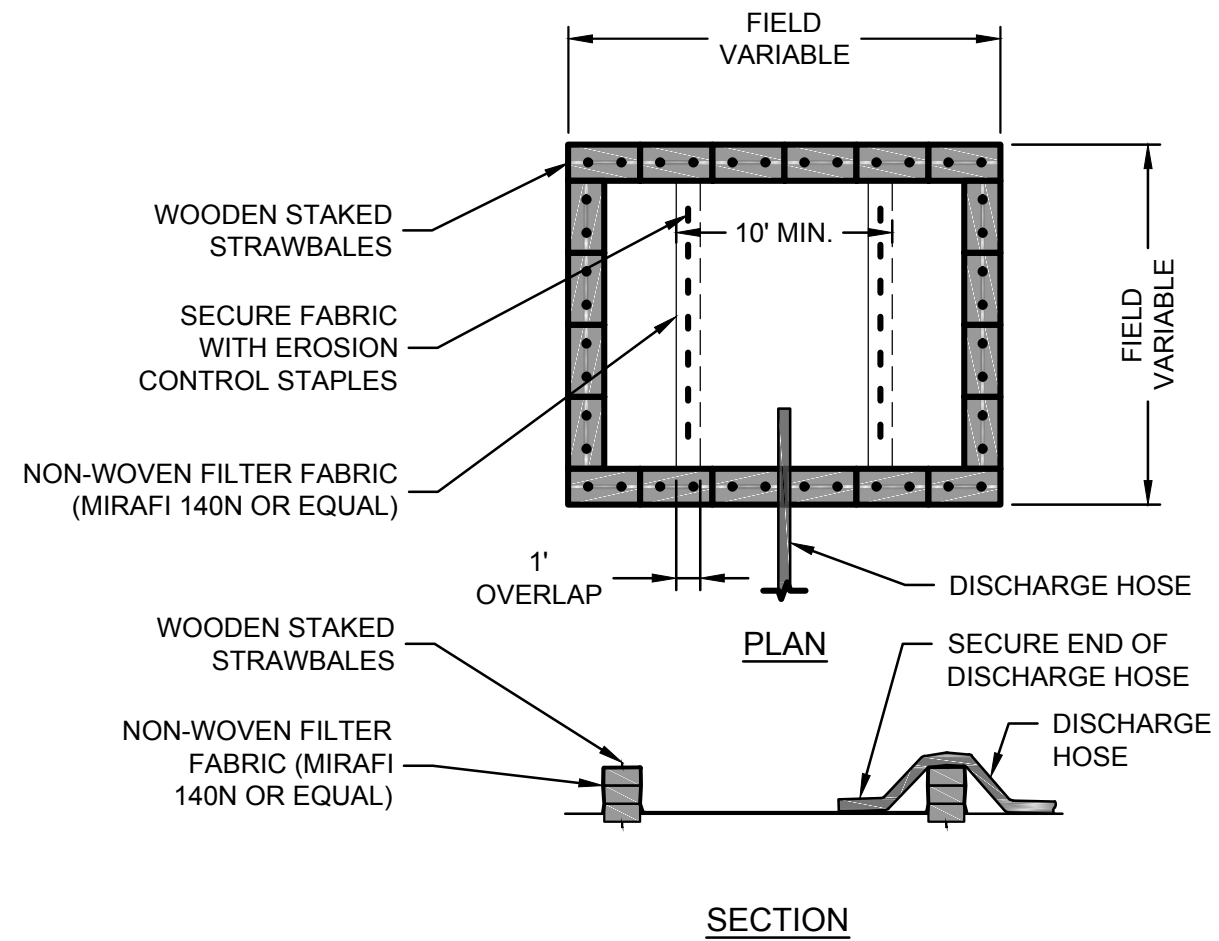


FILTREXX® SOXX SEDIMENT CONTROL DETAIL
NOT TO SCALE

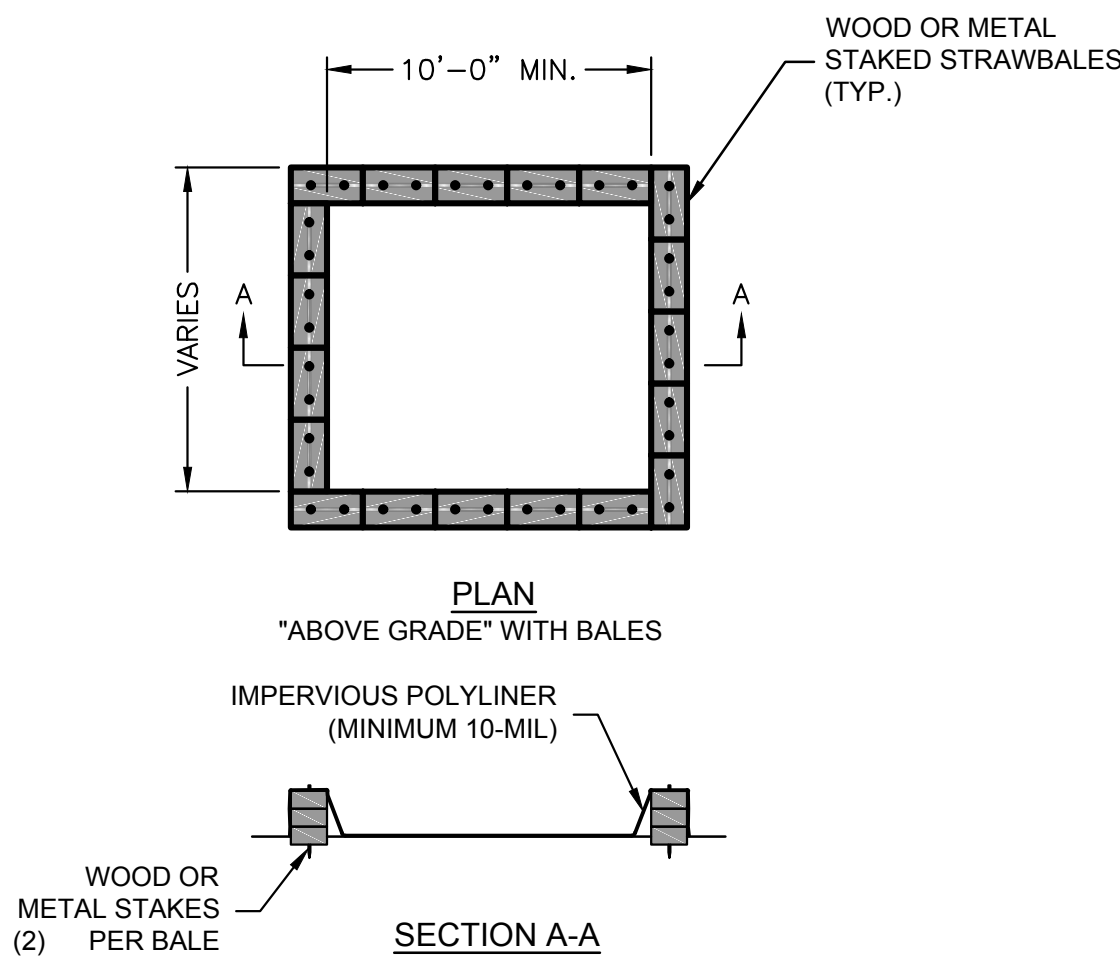


NOTE:
SEDIMENT BAG INLET PROTECTION TO BE SILTSACK
MANUFACTURED BY ATLANTIC CONSTRUCTION FABRICS
INC. RICHMOND, VA OR APPROVED EQUAL.

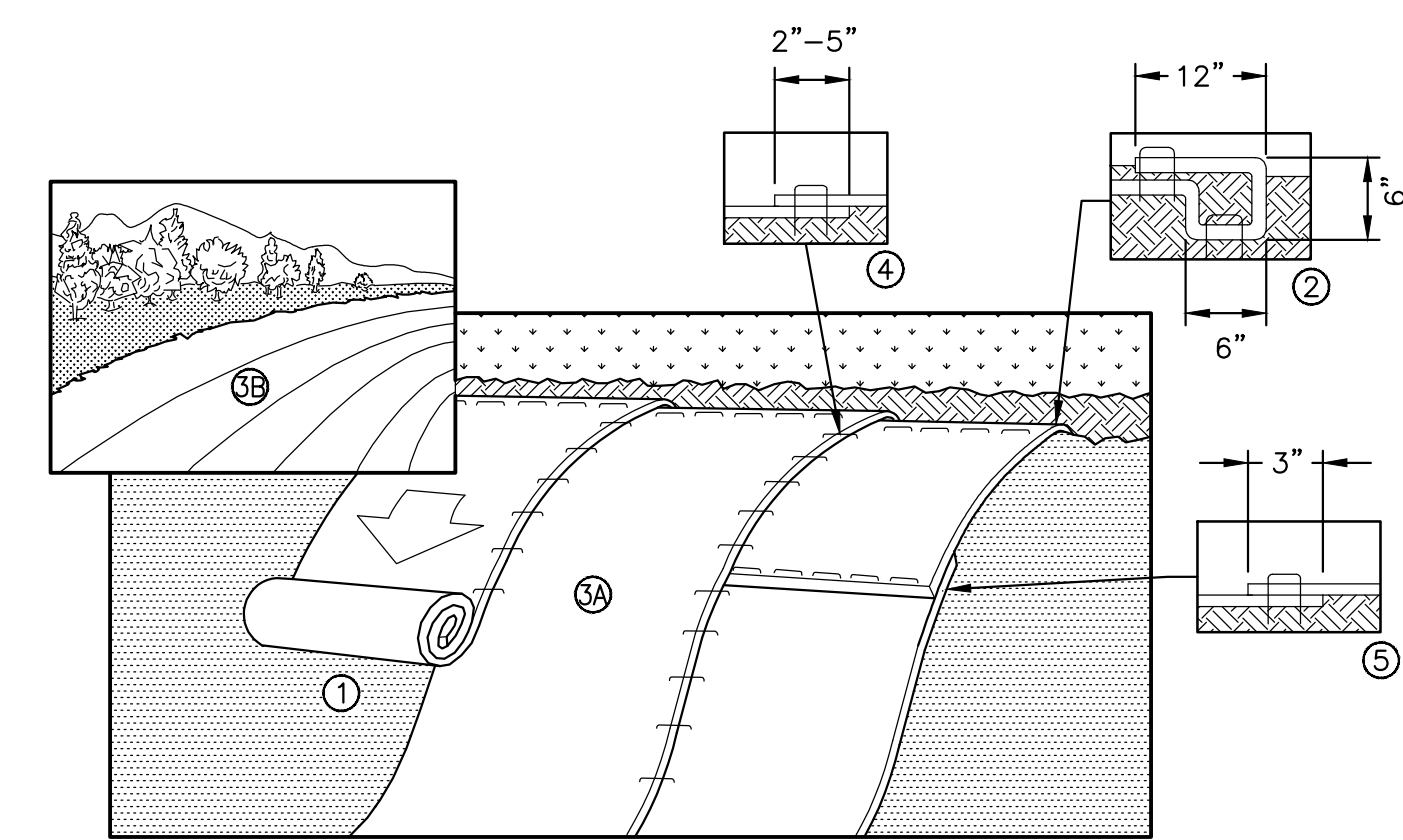
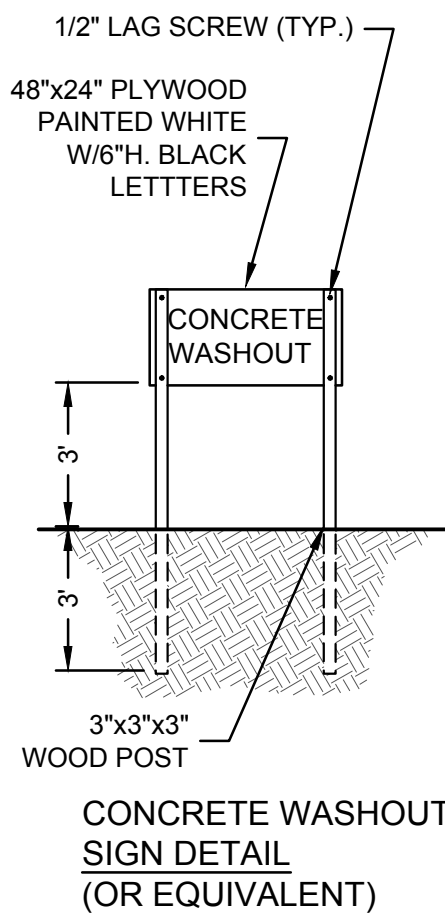
SILT SACK DETAIL
NOT TO SCALE



DEWATERING BASIN (SMALL SCALE)
NOT TO SCALE



CONCRETE WASHOUT
NOT TO SCALE



SLOPE INSTALLATION DETAIL OF EROSION CONTROL BLANKET

NOT TO SCALE

NOTES:

- PRODUCT TO BE NORTH AMERICAN GREEN EROSION CONTROL BLANKET OR APPROVED EQUAL BY NATIONAL GRID.
 - IN LOOSE SOIL CONDITIONS, THE USE OF STAPLES OR STAKE LENGTHS GREATER THAN 6" (15 cm) MAY BE NECESSARY TO PROPERLY SECURE THE RECP's.
- INSTALLATION NOTES:
- PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP's), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
 - BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECP's IN A 6" (15cm) DEEP x 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF RECP's EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP's WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF RECP's BACK OVER SEED AND COMPACTED SOIL. SECURE RECP's OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE RECP's.
 - ROLL THE RECP's (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. RECP's WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECP's MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE(tm). WHEN USING THE DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
 - THE EDGES OF PARALLEL RECP's MUST BE STAPLED WITH APPROXIMATELY 2'-5" (5cm - 12.5cm) OVERLAP DEPENDING ON RECP's TYPE.
 - CONSECUTIVE RECP's SPICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5cm) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30cm) APART ACROSS ENTIRE RECP's WIDTH.

CONCRETE WASHOUT NOTES

CONCRETE WASHOUT SPECIFICATIONS

- LOCATE WASHOUT AREA AT LEAST 50 FEET FROM SENSITIVE AREAS SUCH AS STORM DRAINS, OPEN DITCHES, OR WATER BODIES INCLUDING JURISDICTIONAL WETLANDS.
- ALLOW CONVENIENT TRUCK ACCESS.
- THE NUMBER OF FACILITIES SHOULD DEPEND ON THE DEMAND FOR STORAGE CAPACITY.
- CONCRETE WASHOUT FACILITIES SHALL BE CONSTRUCTED AND MAINTAINED IS SUFFICIENT QUANTITY AND SIZE TO CONTAIN ALL LIQUID AND CONCRETE WASTE GENERATED.

CONCRETE WASHOUT INSTALLATION REQUIREMENTS

- THE CONCRETE WASHOUT SHOULD BE A MINIMUM OF 10 FOOT BY 10 FOOT AREA.
- THE WASHOUT WILL BE CONSTRUCTED WITH STRAW BALES ARRANGED AROUND THE PERIMETER AND LINED WITH TWO LAYERS OF 10 MIL POLYETHYLENE SHEETING. THE POLYETHYLENE SHEETING WILL WRAP OVER THE STRAW BALES (OR APPROVED EQUAL) AND WILL BE SECURED WITH SAND BAGS.
- THE WASHOUT SHALL BE SIZED TO ACCOMMODATE ALL OF THE WASHOUT WATER AND CONCRETE AND SHOULD INCLUDE 12-INCHES OF FREEBOARD ABOVE THE WASHOUT WASTE.

CONCRETE WASHOUT MAINTENANCE

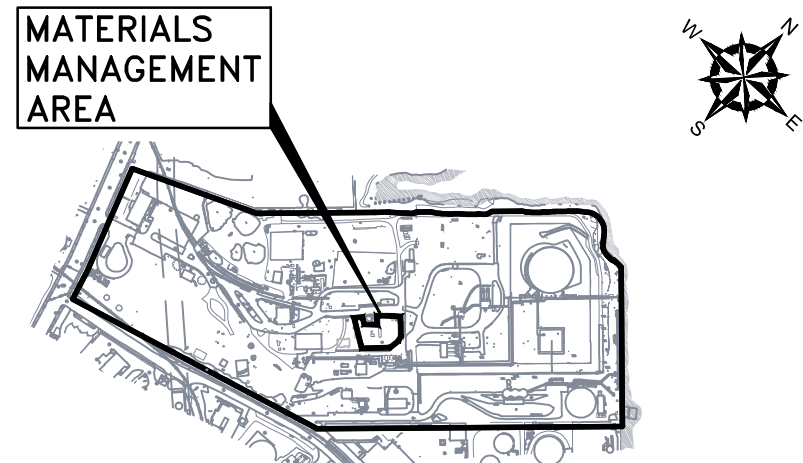
- INSPECT AND VERIFY THAT THE CONCRETE WASHOUT HAS BEEN PROPERLY CONSTRUCTED PRIOR TO THE COMMENCEMENT OF CONCRETE WORK.
- INSPECT DAILY FOR DAMAGE OR ISSUES.
- CHECK REMAINING CAPACITY.
- VERIFY THAT LINERS ARE INTACT.
- WASHOUT FACILITIES MUST BE CLEANED, OR NEW FACILITIES MUST BE CONSTRUCTED ONCE THE WASHOUT IS 75% FULL.
- IF WASHOUT IS NEARING CAPACITY, VACUUM AND DISPOSE OF THE WASTE MATERIAL IN AN APPROVED MANNER.
- DO NOT DISCHARGE LIQUID OR SLURRY TO WATERWAYS, STORM DRAINS, OR ONTO THE GROUND SURFACE.
- COVER THE WASHOUT WITH A NON-WATER COLLECTING COVER PRIOR TO STORM EVENTS TO PREVENT OVERFLOW.
- REMOVE AND DISPOSE OF HARDENED CONCRETE AND RETURN THE WASHOUT TO FUNCTIONAL CONDITION.

FOR PERMITTING
ONLY

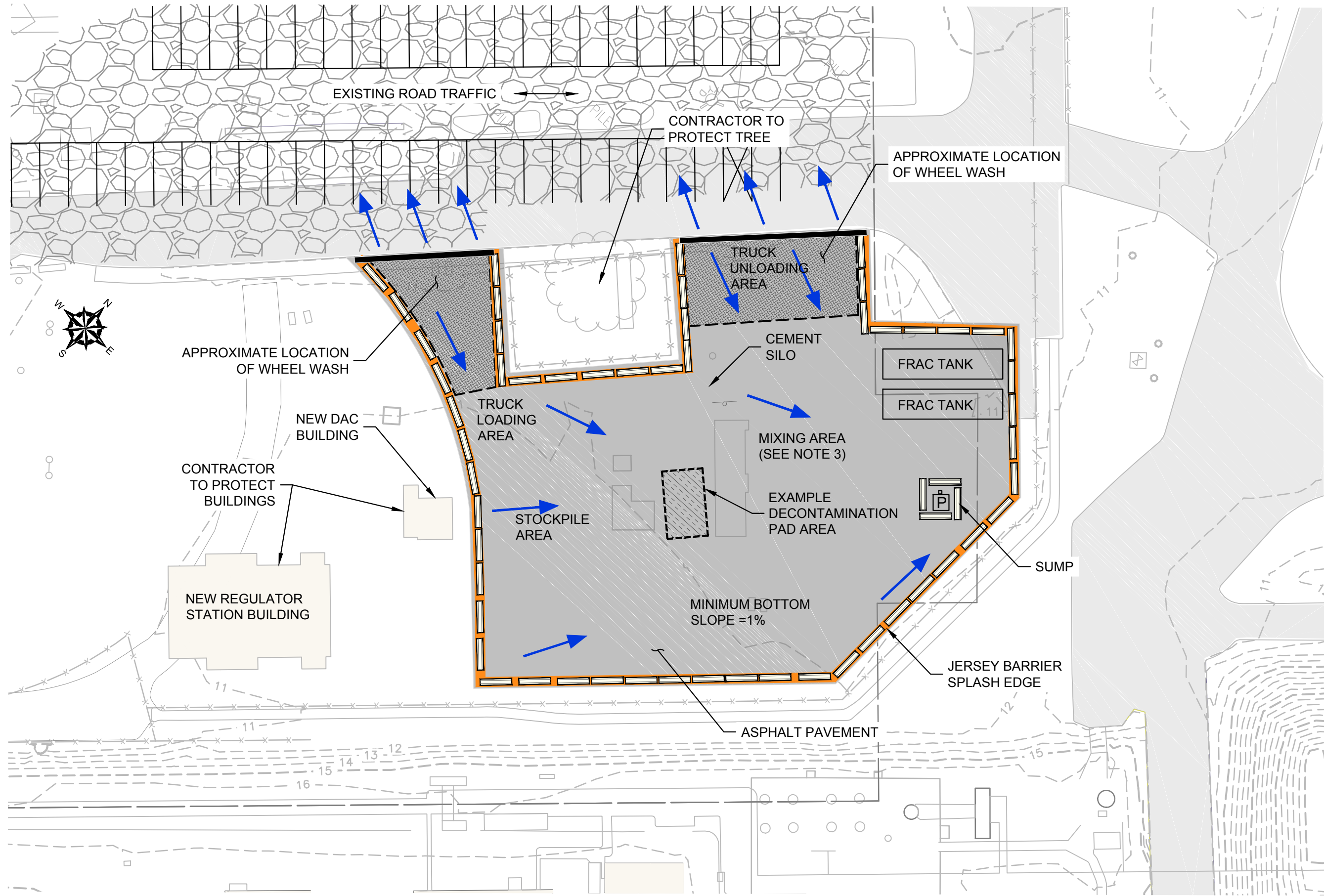
THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

NATIONAL GRID LIQUEFACTION PLANT 642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND			
TEMPORARY SEDIMENTATION AND EROSION CONTROL DETAILS			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: MSK	REVIEWED BY: SJH	CHECKED BY: IR	FIGURE
DESIGNED BY: SJH	DRAWN BY: LDT	SCALE: AS NOTED	5
DATE: OCTOBER, 2016	PROJECT NO. 33554.60	REVISION NO. 0	SHEET NO. 5 OF 15

2016 - GZA GeoEnvironmental, Inc. G2A-23-DNA-33554-60-MSK-FIGURES-CAD-DWG-01 SOIL MANAGEMENT AREA\33554-60_SOIL MANAGEMENT.DWG SOIL STORAGE -F8 OCTOBER 12, 2016 1:43 PM USA THERMALT

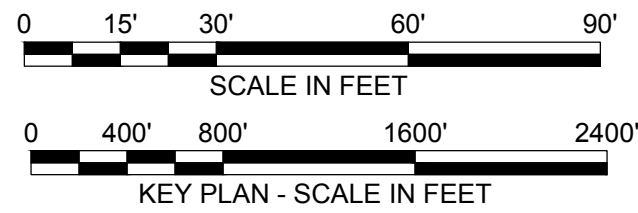


KEY PLAN:
SCALE: 1"=800'



MATERIALS MANAGEMENT AREA: PLAN VIEW
SCALE: 1"=30'

- LEGEND:
- EXISTING BUILDING
 - EXISTING CONTOUR (MAJOR 5 FOOT INTERVAL)
 - EXISTING CONTOUR (MINOR 1 FOOT INTERVAL)
 - EXISTING PAVEMENT
 - UTILITY POLE
 - LIGHT POLE
 - HYDRANT
 - PROPERTY LINES
 - INTERIOR PROPERTY LINE
 - PROPOSED PERMANENT PAVEMENT
 - PROPOSED CRUSHED STONE
 - PROPOSED GRAVEL
 - EXISTING FENCE
 - JERSEY BARRIERS
 - JERSEY BARRIER SPLASH EDGE
 - WHEEL WASH
 - PROPOSED GRADING
 - DECONTAMINATION PAD



GENERAL NOTES:

1) BASE MAP DEVELOPED FROM THE FOLLOWING:

- ELECTRONIC CAD FILE "ACAD-7257PL.DWG" PROVIDED BY VANASSE HANGEN BRUSTLIN (VHB) ENTITLED "EXISTING CONDITIONS PLAN," PROJECT TITLE "NATIONAL GRID TERMINAL ROAD LNG FACILITY" DATED MARCH 10, 2014, ORIGINAL SCALE 1" = 50', DRAWING NO. SV-1 THROUGH SV-3 AND AERIAL MAPPING BY WSP TRANSPORTATION AND INFRASTRUCTURE DATED JANUARY 15, 2014 PREPARED FOR NATIONAL GRID LAND SURVEYING DEPARTMENT, WALTHAM, MASSACHUSETTS AND CAD FILE NO. 09303023.052-1.DWG. PLANS PROVIDED BY NATIONAL GRID.
- DESCRIPTIONS PROVIDED IN THE CITY OF PROVIDENCE DEED BOOK (BK) 470 PAGES 224 - 229, BK 561 PAGES 326 - 328, BK 1111 PAGES 752 - 756 AND BK 5249 PAGES 219 - 322.
- ELECTRONIC CAD FILE 14-152_SU1_REV2.DWG, TITLED "TOPOGRAPHIC SURVEY PLAN, PORTION OF A.P. 56 LOT 5" DATED OCTOBER 27, 2014 AND PROVIDED BY NATIONAL GRID.

ELECTRONIC CAD FILE 5153_COO.DWG, TITLED "EXISTING CONDITIONS PLAN" PREPARED BY PROCESS PIPELINE SERVICES, DATED DECEMBER 18, 2014 AND PROVIDED BY NATIONAL GRID.

- ELECTRONIC CAD FILES PROVIDED BY KIEWIT
 - "ACAD-102761-CIV_SITE.DWG"
 - "2007EXP_102761-CIV_LAYDOWN.DWG"
 - "102761_MEC_STR_BASE.DWG"
 - "102761-SURVEY_SITE.DWG"
 - "2007EXP_102761-CIV_STORM.DWG"
 - "ACAD-102761-CIV_SURFACING.DWG"
 - "ACAD-102761-PROP-CONT.DWG"
 - "POST DEVELOPMENT DRAINAGE MAP.DWG"

- PDFS OF THE FOLLOWING DRAWINGS PROVIDED BY NATIONAL GRID
 - "CATCH BASINS AND SANITARY SEWER SYSTEM" PREPARED BY PROVIDENCE GAS COMPANY, DATED SEPTEMBER 25, 1981.
 - "PLAN SHOWING UNDERGROUND UTILITIES LNG FACILITY" DATED OCTOBER 6, 1983, "SUBSURFACE UTILITY ENGINEERING" PREPARED BY BAYSTATE SUBSURFACE INVESTIGATION, INC., DATED MAY 17, 2005.

- HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY VHB.
- VERTICAL DATUM IS BASED ON NAVD 1988 (MSL) FROM BASE MAPPING PROVIDED BY VHB.
- SELECT PRESENTED SITE UTILITIES WERE TAKEN FROM HISTORIC FIGURES PROVIDED BY NATIONAL GRID. ALL UTILITY LOCATIONS ARE APPROXIMATE AND HAVE BEEN ALIGNED AND ADJUSTED FOR THE "BEST FIT" AND THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED. UTILITIES ARE SHOWN FOR REFERENCE ONLY. **OTHER LOCATIONS MAY EXIST.**
- ON-SITE INVESTIGATIONS AND SURVEYS BY GZA PERSONNEL DURING VARIOUS SITE VISITS BETWEEN 2011 AND 2016.
- PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY. THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.
- SITE BOUNDARIES ARE APPROXIMATE.

MATERIALS MANAGEMENT AREA NOTES:

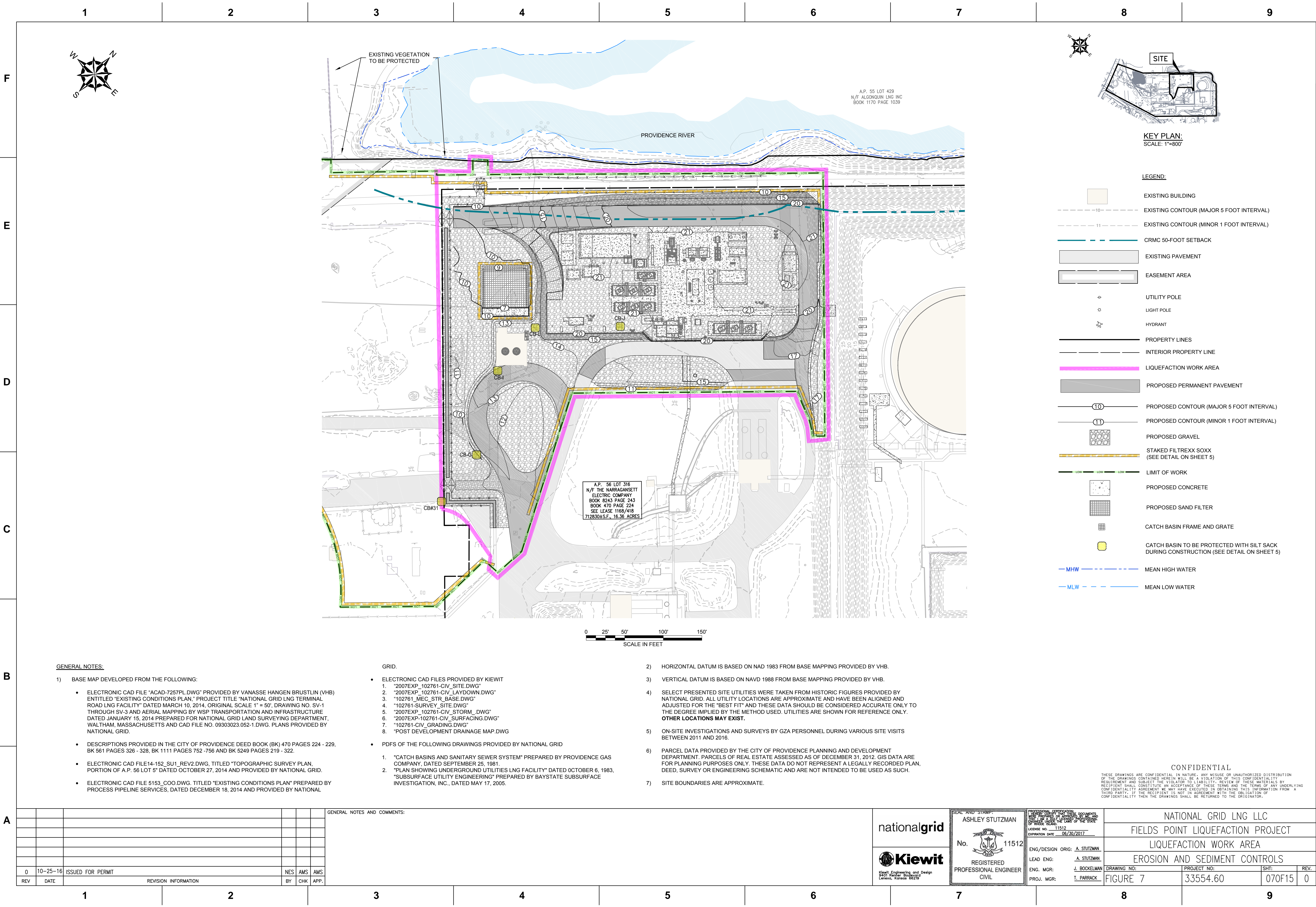
- REGRADE LAND TO FACILITATE DRAINAGE TO THE SUMP, REMOVE EXISTING PAVEMENT AS NEEDED. THE MINIMUM BOTTOM SLOPE OF THE PAVED SURFACE SHALL BE 1%.
- TRUCK LOADING AND UNLOADING AREAS SHALL BE USED AS WHEEL WASH AREAS. AS NECESSARY TRUCK UNLOADING AREA SHALL BE CONSTRUCTED WITH A MINIMUM BOTTOM SLOPE OF 1% TO DRAIN INTO SUMP.
- MIXING AREA SHALL BE USED AS DECONTAMINATION PAD. PRIOR TO USE AS A DECONTAMINATION PAD, THE SURFACE SHALL BE POWER WASHED TO REMOVE ANY REMAINING MATERIAL.
- IF THE MIXING AREA IS NOT USED AS A DECONTAMINATION PAD, CONSTRUCT STAND-ALONE DECONTAMINATION PAD, AS SHOWN IN DETAIL ON SHEET ENV-3.

FOR PERMITTING
ONLY

THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

NATIONAL GRID LIQUEFACTION PLANT 642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND			
SOIL STORAGE AREA PLAN			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: MSK	REVIEWED BY: SJH	CHECKED BY: IR	FIGURE
DESIGNED BY: SJH	DRAWN BY: LDT	SCALE: AS NOTED	6
DATE: OCTOBER, 2016	PROJECT NO. 33554.60	REVISION NO. 0	SHEET NO. 6 OF 15

DRAWING NAME: I:\102761-National_Grid_Liquefaction\DWG\CAD Exchange\In\2016-10-24 GZA Revised Permit\33554.60_CRMV PERMITTING_FOR STAMPING_Kiewit.dwg



GENERAL NOTES:

- BASE MAP DEVELOPED FROM THE FOLLOWING:
 - ELECTRONIC CAD FILE "ACAD-7257PL.DWG" PROVIDED BY VANASSE HANGEN BRUSTLIN (VHB) ENTITLED "EXISTING CONDITIONS PLAN," PROJECT TITLE "NATIONAL GRID LNG TERMINAL ROAD LNG FACILITY" DATED MARCH 10, 2014, ORIGINAL SCALE 1" = 50', DRAWING NO. SV-1 THROUGH SV-3 AND AERIAL MAPPING BY WSP TRANSPORTATION AND INFRASTRUCTURE DATED JANUARY 15, 2014 PREPARED FOR NATIONAL GRID LAND SURVEYING DEPARTMENT, WALTHAM, MASSACHUSETTS AND CAD FILE NO. 09303023.052-1.DWG. PLANS PROVIDED BY NATIONAL GRID.
 - DESCRIPTIONS PROVIDED IN THE CITY OF PROVIDENCE DEED BOOK (BK) 470 PAGES 224 - 229, BK 561 PAGES 326 - 328, BK 1111 PAGES 752 - 756 AND BK 5249 PAGES 219 - 322.
 - ELECTRONIC CAD FILE 14-152_SU1_REV2.DWG, TITLED "TOPOGRAPHIC SURVEY PLAN, PORTION OF A.P. 56 LOT 5" DATED OCTOBER 27, 2014 AND PROVIDED BY NATIONAL GRID.
 - ELECTRONIC CAD FILE 5153_COO.DWG, TITLED "EXISTING CONDITIONS PLAN" PREPARED BY PROCESS PIPELINE SERVICES, DATED DECEMBER 18, 2014 AND PROVIDED BY NATIONAL

GRID.

- ELECTRONIC CAD FILES PROVIDED BY KIEWIT
 - "2007EXP-102761-CIV_SITE.DWG"
 - "2007EXP-102761-CIV_LAYDOWN.DWG"
 - "102761_MEC_STR_BASE.DWG"
 - "102761-SURVEY_SITE.DWG"
 - "2007EXP-102761-CIV_STORM.DWG"
 - "2007EXP-102761-CIV_SURFACING.DWG"
 - "102761-CIV_GRADING.DWG"
 - "POST DEVELOPMENT DRAINAGE MAP.DWG"
- PDFS OF THE FOLLOWING DRAWINGS PROVIDED BY NATIONAL GRID
 - "CATCH BASINS AND SANITARY SEWER SYSTEM" PREPARED BY PROVIDENCE GAS COMPANY, DATED SEPTEMBER 25, 1981.
 - "PLAN SHOWING UNDERGROUND UTILITIES LNG FACILITY" DATED OCTOBER 6, 1983, "SUBSURFACE UTILITY ENGINEERING" PREPARED BY BAYSTATE SUBSURFACE INVESTIGATION, INC., DATED MAY 17, 2005.

- HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY VHB.
- VERTICAL DATUM IS BASED ON NAVD 1988 FROM BASE MAPPING PROVIDED BY VHB.
- SELECT PRESENTED SITE UTILITIES WERE TAKEN FROM HISTORIC FIGURES PROVIDED BY NATIONAL GRID. ALL UTILITY LOCATIONS ARE APPROXIMATE AND HAVE BEEN ALIGNED AND ADJUSTED FOR THE "BEST FIT" AND THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED. UTILITIES ARE SHOWN FOR REFERENCE ONLY. **OTHER LOCATIONS MAY EXIST.**
- ON-SITE INVESTIGATIONS AND SURVEYS BY GZA PERSONNEL DURING VARIOUS SITE VISITS BETWEEN 2011 AND 2016.
- PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY. THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.
- SITE BOUNDARIES ARE APPROXIMATE.

CONFIDENTIAL

THESE DRAWINGS ARE CONFIDENTIAL IN NATURE. ANY MISUSE OR UNAUTHORIZED DISTRIBUTION OF THE DRAWINGS CONTAINED HEREIN WILL BE A VIOLATION OF THIS CONFIDENTIALITY REQUIREMENT AND SUBJECT THE VIOLATOR TO LIABILITY. REVIEW OF THESE MATERIALS BY RECIPIENT SHALL CONSTITUTE AN ACCEPTANCE OF THESE TERMS AND THE TERMS OF ANY UNDERLYING CONFIDENTIALITY AGREEMENT WE MAY HAVE EXECUTED IN OBTAINING THIS INFORMATION FROM A THIRD PARTY. IF THE RECIPIENT IS NOT IN AGREEMENT WITH THE OBLIGATION OF CONFIDENTIALITY THEN THE DRAWINGS SHALL BE RETURNED TO THE ORIGINATOR.

REV	DATE	ISSUED FOR PERMIT	REVISION INFORMATION	NES	AMS	AMS
0	10-25-16	ISSUED FOR PERMIT		NES	AMS	AMS
REV	DATE	ISSUED FOR PERMIT	REVISION INFORMATION	BY	CHK	APP.

GENERAL NOTES AND COMMENTS:

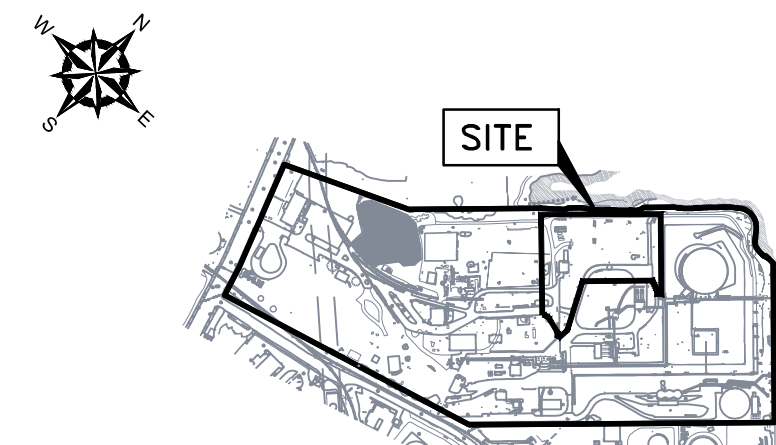
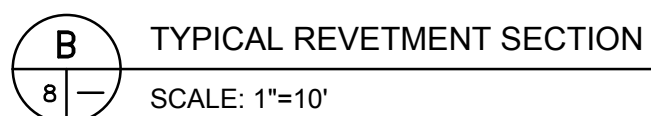
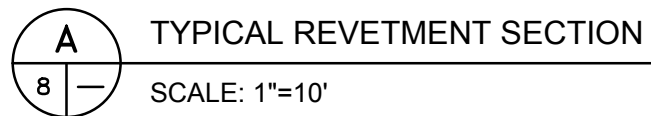
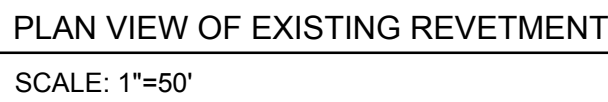
nationalgrid



SEAL AND STAMP: ASHLEY STUTZMAN No. 11512 REGISTERED PROFESSIONAL ENGINEER CIVIL

ENG/DESIGN ORIG: A. STUTZMAN LEAD ENG: A. STUTZMAN ENG. MGR: J. BOCKELMAN PROJ. MGR: T. PARRACK
--

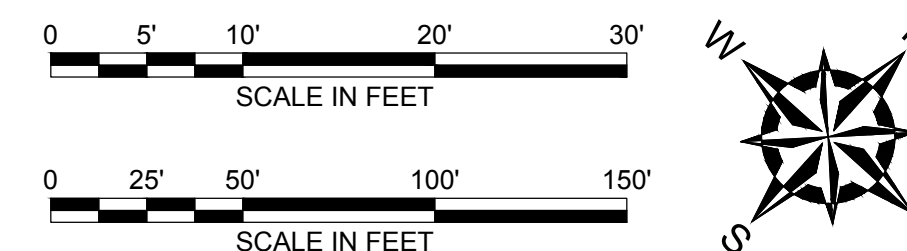
NATIONAL GRID LNG LLC FIELDS POINT LIQUEFACTION PROJECT LIQUEFACTION WORK AREA EROSION AND SEDIMENT CONTROLS			
DRAWING NO: FIGURE 7	PROJECT NO: 33554.60	SHT: 07OF15	REV: 0



KEY PLAN:
SCALE: 1"=800'

1) BASE MAP DEVELOPED FROM THE FOLLOWING:

- ELECTRONIC CAD FILE "ACAD-7257.PLD.DWG" PROVIDED BY VANASSE HANGEN BRUSTLIN (VHB) ENTITLED "EXISTING CONDITIONS PLAN," PROJECT TITLE "NATIONAL GRID LNG TERMINAL ROAD LNG FACILITY" DATED MARCH 10, 2014, ORIGINAL SCALE 1" = 50', DRAWING NO. SV-1 THROUGH SV-3 AND AERIAL MAPPING BY WSP TRANSPORTATION AND INFRASTRUCTURE DATED JANUARY 15, 2014 PREPARED FOR NATIONAL GRID LAND SURVEYING DEPARTMENT, WALTHAM, MASSACHUSETTS AND CAD FILE NO. 09303023.052-1.DWG. PLANS PROVIDED BY NATIONAL GRID.
 - DESCRIPTIONS PROVIDED IN THE CITY OF PROVIDENCE DEED BOOK (BK) 470 PAGES 224 - 229, BK 561 PAGES 326 - 328, BK 1111 PAGES 752 -756 AND BK 5249 PAGES 219 - 322.
 - ELECTRONIC CAD FILE 14-152_SU1_REV2.DWG, TITLED "TOPOGRAPHIC SURVEY PLAN, PORTION OF A.P. 56 LOT 5" DATED OCTOBER 27, 2014 AND PROVIDED BY NATIONAL GRID.
 - ELECTRONIC CAD FILE 5153_COO.DWG, TITLED "EXISTING CONDITIONS PLAN" PREPARED BY PROCESS PIPELINE SERVICES, DATED DECEMBER 18, 2014 AND PROVIDED BY NATIONAL GRID.
 - ELECTRONIC CAD FILES PROVIDED BY KIEWIT
 1. "ACAD-102761-CIV_SITE.DWG"
 2. "2007EXP_102761-CIV_LAYDOWN.DWG"
 3. "102761_MEC_STR_BASE.DWG"
 4. "102761-SURVEY_SITE.DWG"
 5. "A2007EXP_102761-CIV_STORM.DWG"
 6. "ACAD-102761-CIV_SURFACING.DWG"
 7. "ACAD-102761-PROP-CONT.DWG"
 8. "POST DEVELOPMENT DRAINAGE MAP.DWG"
 - PDFS OF THE FOLLOWING DRAWINGS PROVIDED BY NATIONAL GRID
 1. "CATCH BASINS AND SANITARY SEWER SYSTEM" PREPARED BY PROVIDENCE GAS COMPANY, DATED SEPTEMBER 25, 1981.
 2. "PLAN SHOWING UNDERGROUND UTILITIES LIGN FACILITY" DATED OCTOBER 6, 1983, "SUBSURFACE UTILITY ENGINEERING" PREPARED BY BAYSTATE SUBSURFACE INVESTIGATION, INC., DATED MAY 17, 2005.
- 2) HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY VHB.
- 3) VERTICAL DATUM IS BASED ON NAVD 1988 FROM BASE MAPPING PROVIDED BY VHB.
- 4) SELECT PRESENTED SITE UTILITIES WERE TAKEN FROM HISTORIC FIGURES PROVIDED BY NATIONAL GRID. ALL UTILITY LOCATIONS ARE APPROXIMATE AND HAVE BEEN ALIGNED AND ADJUSTED FOR THE "BEST FIT" AND THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED. UTILITIES ARE SHOWN FOR REFERENCE ONLY. **OTHER LOCATIONS MAY EXIST.**
- 5) ON-SITE INVESTIGATIONS AND SURVEYS BY GZA PERSONNEL DURING VARIOUS SITE VISITS BETWEEN 2011 AND 2016.
- 6) PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY, THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.
- 7) SITE BOUNDARIES ARE APPROXIMATE.



THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID, OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT, AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE REPRODUCED, TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, REPRODUCTION, OR ALTERATION OF THE DRAWING WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

NATIONAL GRID
LIQUEFACTION PLANT
642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND

LIQUEFACTION WORK AREA - EXISTING
REVETMENT AND CROSS SECTIONS

PREPARED BY:

 **GZA** GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

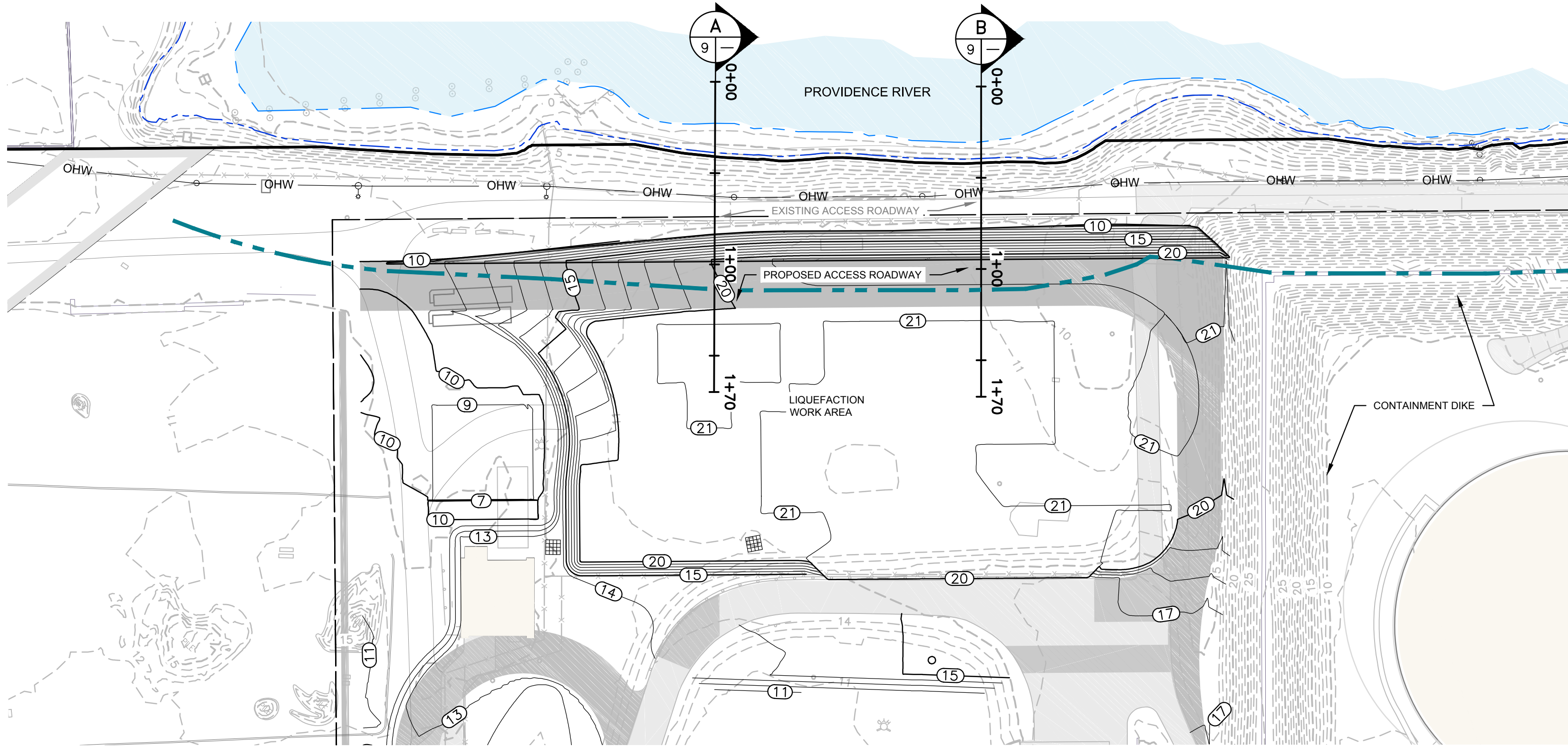
PREPARED FOR:

nationalgrid

PROJ MGR: MSK	REVIEWED BY: SJH
DESIGNED BY: SJH	DRAWN BY: LDT
DATE: OCTOBER, 2016	PROJECT NO. 33554.60

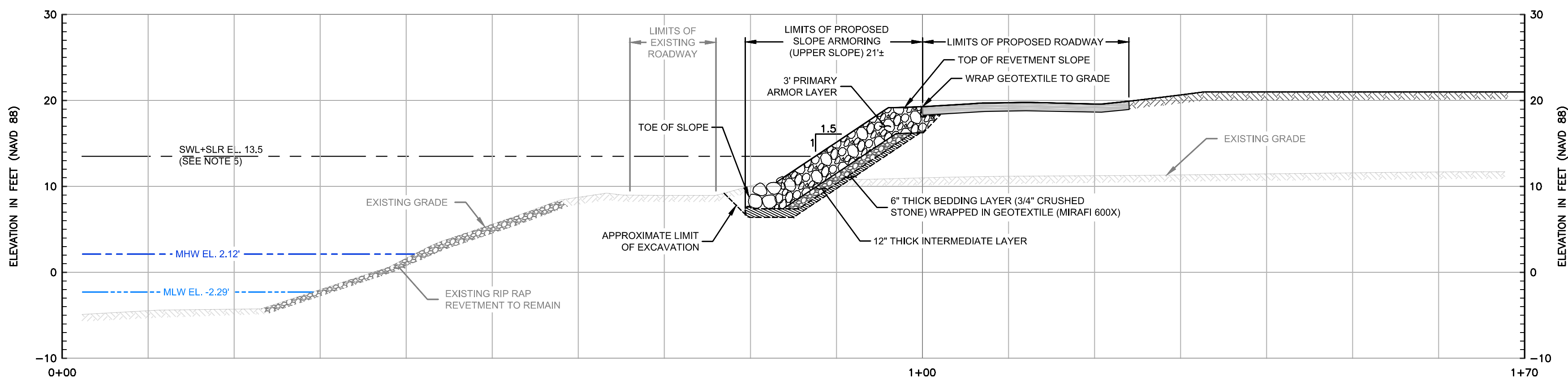
CHECKED BY: IR	FIGURE <div style="font-size: 2em; text-align: center;">8</div> SHEET NO. 8 OF 1
SCALE: AS NOTED	
REVISION NO. <div style="text-align: center;">0</div>	

FOR PERMITTING
ONLY



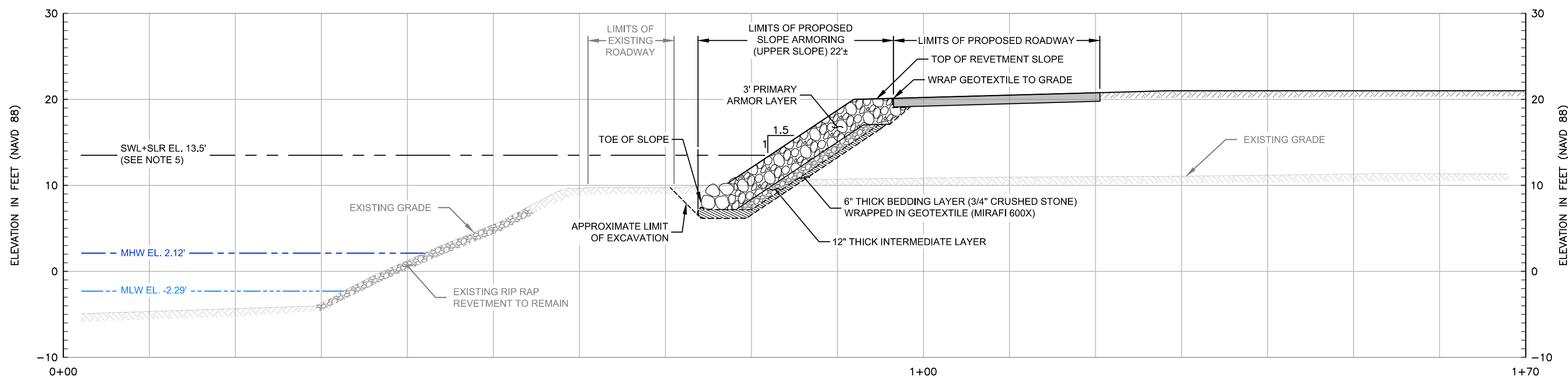
PLAN VIEW OF PROPOSED SLOPE ARMORING AND RETMENT IMPROVEMENTS

SCALE: 1"=50'



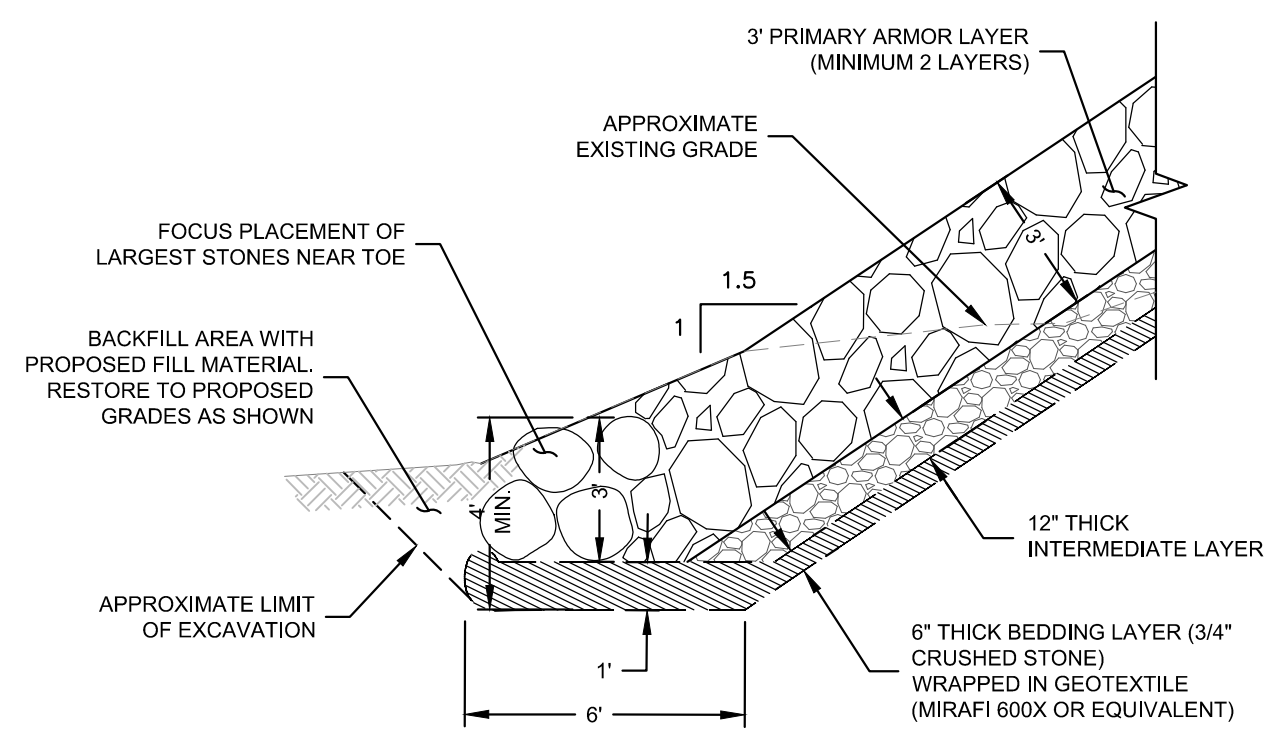
TYPICAL RETMENT SECTION

SCALE: 1"=10'



TYPICAL RETMENT SECTION

SCALE: 1"=10'



PROPOSED RETMENT (UPPER SLOPE) (TYP.)

SCALE: 1"=4'

RIP RAP GRADATION REQUIREMENTS			
PRIMARY ARMOR LAYER		INTERMEDIATE LAYER	
RIDOT R-6		RIDOT R-2	
% LESS THAN	STONE SIZE (IN.)	% LESS THAN	STONE SIZE (IN.)
0-15%	8	0-15%	1
0-50%	13	0-50%	2
100%	26	100%	4

3/4" CRUSHED STONE GRADATION REQUIREMENTS	
% LESS THAN	SIEVE SIZE
100	3/4 INCH
90-100	1/2 INCH
30-60	3/8 INCH
0-15	No. 4
0-5	No. 8

LEGEND:

	EXISTING BUILDING
	EXISTING CONTOUR (MAJOR 5 FOOT INTERVAL)
	EXISTING CONTOUR (MINOR 1 FOOT INTERVAL)
	CRMC 50-FOOT SETBACK
	EXISTING PAVEMENT
	UTILITY POLE
	LIGHT POLE
	HYDRANT
	PROPERTY LINES
	INTERIOR PROPERTY LINE
	MEAN HIGH WATER
	MEAN LOW WATER
	EASEMENT AREA
	PROPOSED CONTOUR (MAJOR 5 FOOT INTERVAL)
	PROPOSED CONTOUR (MINOR 1 FOOT INTERVAL)
	STILL WATER LEVEL AND PREDICTED SEA LEVEL RISE (SEE NOTE #5)
	EXISTING OVERHEAD WIRE
	LIMIT OF PROPOSED RETMENT (UPPER SLOPE)
	PROPOSED PERMANENT PAVEMENT

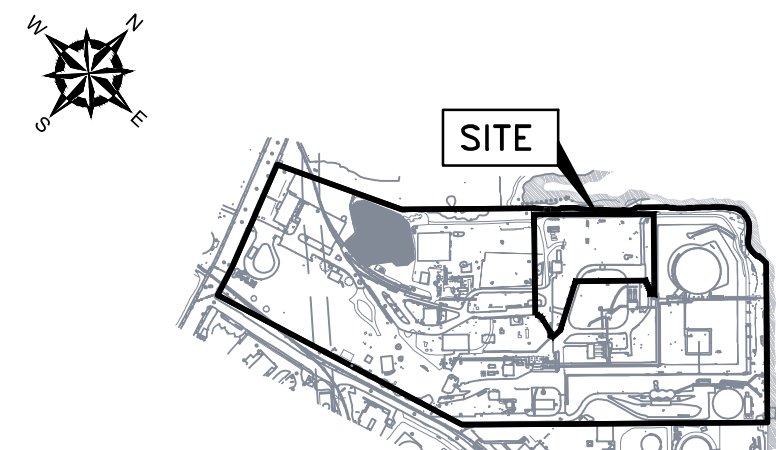
NOTE:

- TO CONVERT FROM NAVD88 TO MLW ADD 2.29 FT.
- TIDAL DATUM BASED UPON NOAA STATION 8454000.

NAVD 88	MLW
+2.37' (MHHW)	+4.66' (MHHW)
+2.12' (MHW)	+4.41' (MHW)
0.0' (NAVD 88)	+2.29'
-2.29' (MLW)	0.0' (MLW)
-2.47' (MLLW)	-0.18' (MLLW)

TIDAL DATUM

FOR PERMITTING ONLY



KEY PLAN:
SCALE: 1"=800'

GENERAL NOTES:

- BASE MAP DEVELOPED FROM THE FOLLOWING:
 - ELECTRONIC CAD FILE "ACAD-7257PL.DWG" PROVIDED BY VANASSE HANGEN BRUSTLIN (VHB) ENTITLED "EXISTING CONDITIONS PLAN," PROJECT TITLE "NATIONAL GRID LNG TERMINAL ROAD LNG FACILITY" DATED MARCH 10, 2014, ORIGINAL SCALE 1" = 50', DRAWING NO. SV-1 THROUGH SV-3 AND AERIAL MAPPING BY WSP TRANSPORTATION AND INFRASTRUCTURE DATED JANUARY 15, 2014 PREPARED FOR NATIONAL GRID LAND SURVEYING DEPARTMENT, WALTHAM, MASSACHUSETTS AND CAD FILE NO. 09303023.052-1.DWG. PLANS PROVIDED BY NATIONAL GRID.
 - DESCRIPTIONS PROVIDED IN THE CITY OF PROVIDENCE DEED BOOK (BK) 470 PAGES 224 - 229, BK 561 PAGES 326 - 328, BK 1111 PAGES 752 - 756 AND BK 5249 PAGES 219 - 322.
 - ELECTRONIC CAD FILE 14-152_SU1_REV2.DWG, TITLED "TOPOGRAPHIC SURVEY PLAN, PORTION OF A.P. 56 LOT 5" DATED OCTOBER 27, 2014 AND PROVIDED BY NATIONAL GRID.
 - ELECTRONIC CAD FILE 5153_COO.DWG, TITLED "EXISTING CONDITIONS PLAN" PREPARED BY PROCESS PIPELINE SERVICES, DATED DECEMBER 18, 2014 AND PROVIDED BY NATIONAL GRID.
 - ELECTRONIC CAD FILES PROVIDED BY KIEWIT
 - "ACAD-102761-CIV_SITE.DWG"
 - "2007EXP_102761-CIV_LAYDOWN.DWG"
 - "102761_MEC_STR_BASE.DWG"
 - "102761-SURVEY_SITE.DWG"
 - "A2007EXP_102761-CIV_STORM.DWG"
 - "ACAD-102761-CIV_SURFACING.DWG"
 - "ACAD-102761-PROP-CONT.DWG"
 - "POST DEVELOPMENT DRAINAGE MAP.DWG"
 - PDFS OF THE FOLLOWING DRAWINGS PROVIDED BY NATIONAL GRID
 - "CATCH BASINS AND SANITARY SEWER SYSTEM" PREPARED BY PROVIDENCE GAS COMPANY, DATED SEPTEMBER 25, 1981.
 - "PLAN SHOWING UNDERGROUND UTILITIES LNG FACILITY" DATED OCTOBER 6, 1983, "SUBSURFACE UTILITY ENGINEERING" PREPARED BY BAYSTATE SUBSURFACE INVESTIGATION, INC., DATED MAY 17, 2005.
- HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY VHB.
- VERTICAL DATUM IS BASED ON NAVD 1988 FROM BASE MAPPING PROVIDED BY VHB.
- SELECT PRESENTED SITE UTILITIES WERE TAKEN FROM HISTORIC FIGURES PROVIDED BY NATIONAL GRID. ALL UTILITY LOCATIONS ARE APPROXIMATE AND HAVE BEEN ALIGNED AND ADJUSTED FOR THE "BEST FIT" AND THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED. UTILITIES ARE SHOWN FOR REFERENCE ONLY. OTHER LOCATIONS MAY EXIST.
- ON-SITE INVESTIGATIONS AND SURVEYS BY GZA PERSONNEL DURING VARIOUS SITE VISITS BETWEEN 2011 AND 2016.
- PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY. THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.
- SITE BOUNDARIES ARE APPROXIMATE.

SCALE IN FEET 1"=4'

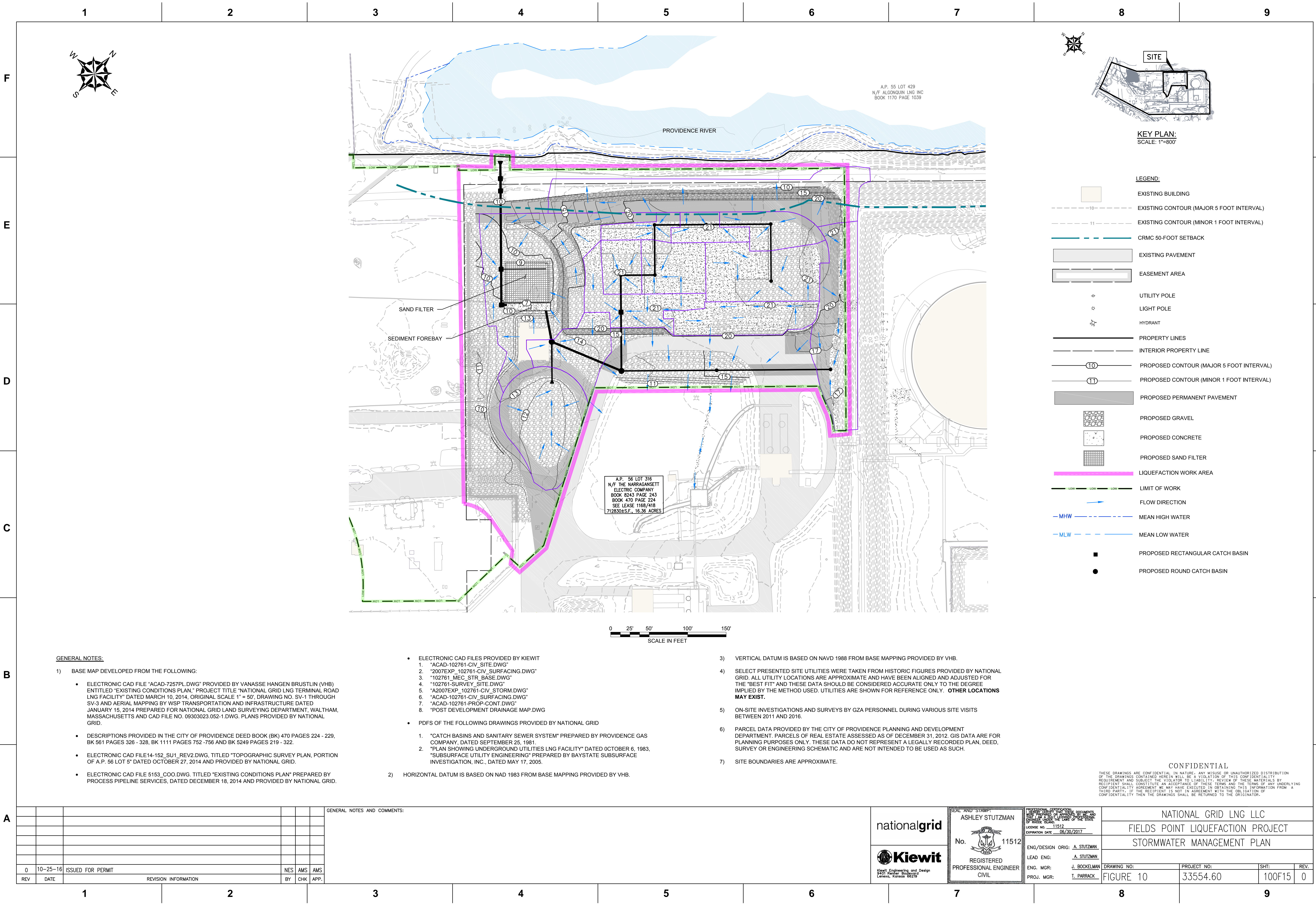
SCALE IN FEET 1"=10'

SCALE IN FEET 1"=50'

THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

NATIONAL GRID LIQUEFACTION PLANT 642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND			
LIQUEFACTION WORK AREA - PROPOSED SLOPE ARMORING, EXISTING RETMENT AND CROSS SECTIONS			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	PREPARED FOR: nationalgrid		
PROJ MGR: MSK	REVIEWED BY: SJH	CHECKED BY: IR	FIGURE 9
DESIGNED BY: SJH	DRAWN BY: LDJ	SCALE: AS NOTED	
DATE: OCTOBER, 2016	PROJECT NO. 33554.60	REVISION NO. 0	SHEET NO. 9 OF 15

DRAWING NAME: I:\102761-National_Grid_Liquefaction\DWG\CAD Exchange\In\2016-10-24 GZA Revised Permit\33554.60_CRMV PERMITTING_FOR STAMPING_Kiewit.dwg



GENERAL NOTES:

1) BASE MAP DEVELOPED FROM THE FOLLOWING:

- ELECTRONIC CAD FILE "ACAD-7257PL.DWG" PROVIDED BY VANASSE HANGEN BRUSTLIN (VHB) ENTITLED "EXISTING CONDITIONS PLAN," PROJECT TITLE "NATIONAL GRID LNG TERMINAL ROAD LNG FACILITY" DATED MARCH 10, 2014, ORIGINAL SCALE 1" = 50', DRAWING NO. SV-1 THROUGH SV-3 AND AERIAL MAPPING BY WSP TRANSPORTATION AND INFRASTRUCTURE DATED JANUARY 15, 2014 PREPARED FOR NATIONAL GRID LAND SURVEYING DEPARTMENT, WALTHAM, MASSACHUSETTS AND CAD FILE NO. 09303023.052-1.DWG. PLANS PROVIDED BY NATIONAL GRID.
- DESCRIPTIONS PROVIDED IN THE CITY OF PROVIDENCE DEED BOOK (BK) 470 PAGES 224 - 229, BK 561 PAGES 326 - 328, BK 1111 PAGES 752 -756 AND BK 5249 PAGES 219 - 322.
- ELECTRONIC CAD FILE 14-152_SU1_REV2.DWG, TITLED "TOPOGRAPHIC SURVEY PLAN, PORTION OF A.P. 56 LOT 5" DATED OCTOBER 27, 2014 AND PROVIDED BY NATIONAL GRID.
- ELECTRONIC CAD FILE 5153_COO.DWG, TITLED "EXISTING CONDITIONS PLAN" PREPARED BY PROCESS PIPELINE SERVICES, DATED DECEMBER 18, 2014 AND PROVIDED BY NATIONAL GRID.

- ELECTRONIC CAD FILES PROVIDED BY KIEWIT
 - "ACAD-102761-CIV_SITE.DWG"
 - "2007EXP_102761-CIV_SURFACING.DWG"
 - "102761_MEC_STR_BASE.DWG"
 - "102761-SURVEY_SITE.DWG"
 - "A2007EXP_102761-CIV_STORM.DWG"
 - "ACAD-102761-CIV_SURFACING.DWG"
 - "ACAD-102761-PROP-CONT.DWG"
 - "POST DEVELOPMENT DRAINAGE MAP.DWG"

- PDFS OF THE FOLLOWING DRAWINGS PROVIDED BY NATIONAL GRID
 - "CATCH BASINS AND SANITARY SEWER SYSTEM" PREPARED BY PROVIDENCE GAS COMPANY, DATED SEPTEMBER 25, 1981;
 - "PLAN SHOWING UNDERGROUND UTILITIES LNG FACILITY" DATED OCTOBER 6, 1983, "SUBSURFACE UTILITY ENGINEERING" PREPARED BY BAYSTATE SUBSURFACE INVESTIGATION, INC., DATED MAY 17, 2005.

2) HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY VHB.

3) VERTICAL DATUM IS BASED ON NAVD 1988 FROM BASE MAPPING PROVIDED BY VHB.

4) SELECT PRESENTED SITE UTILITIES WERE TAKEN FROM HISTORIC FIGURES PROVIDED BY NATIONAL GRID. ALL UTILITY LOCATIONS ARE APPROXIMATE AND HAVE BEEN ALIGNED AND ADJUSTED FOR THE "BEST FIT" AND THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED. UTILITIES ARE SHOWN FOR REFERENCE ONLY. **OTHER LOCATIONS MAY EXIST.**

5) ON-SITE INVESTIGATIONS AND SURVEYS BY GZA PERSONNEL DURING VARIOUS SITE VISITS BETWEEN 2011 AND 2016.

6) PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY. THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.


7) SITE BOUNDARIES ARE APPROXIMATE.

CONFIDENTIAL

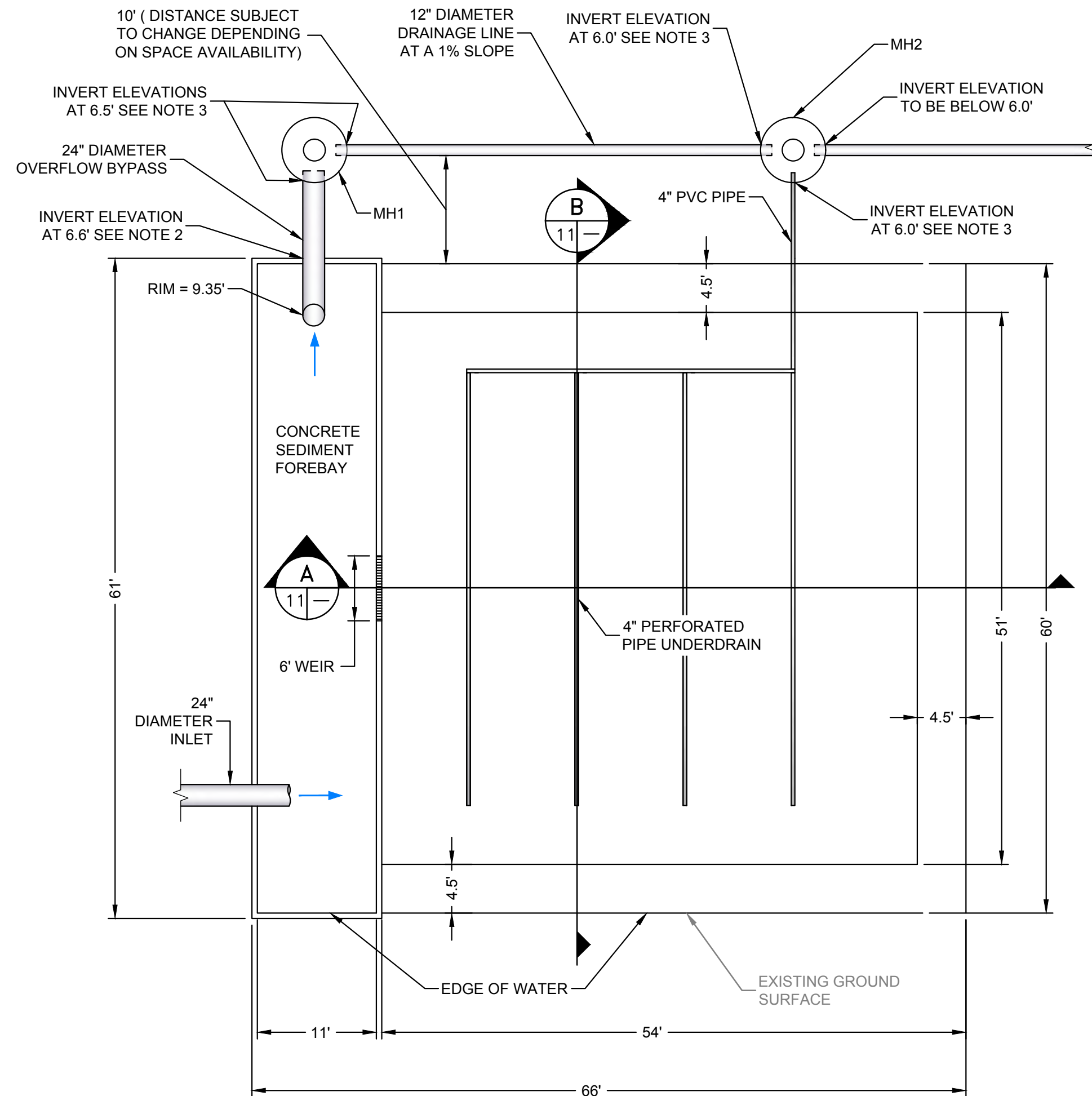
THESE DRAWINGS ARE CONFIDENTIAL IN NATURE. ANY MISUSE OR UNAUTHORIZED DISTRIBUTION OF THE DRAWINGS CONTAINED HEREIN WILL BE A VIOLATION OF THIS CONFIDENTIALITY REQUIREMENT AND SUBJECT THE VIOLATOR TO LIABILITY. REVIEW OF THESE MATERIALS BY RECIPIENT SHALL CONSTITUTE AN ACCEPTANCE OF THESE TERMS AND THE TERMS OF ANY UNDERLYING CONFIDENTIALITY AGREEMENT WE MAY HAVE EXECUTED IN OBTAINING THIS INFORMATION FROM A THIRD PARTY. IF THE RECIPIENT IS NOT IN AGREEMENT WITH THE OBLIGATION OF CONFIDENTIALITY THEN THE DRAWINGS SHALL BE RETURNED TO THE ORIGINATOR.

REV	DATE	ISSUED FOR PERMIT	REVISION INFORMATION	BY	CHK	APP.
0	10-25-16	ISSUED FOR PERMIT		NES	AMS	AMS

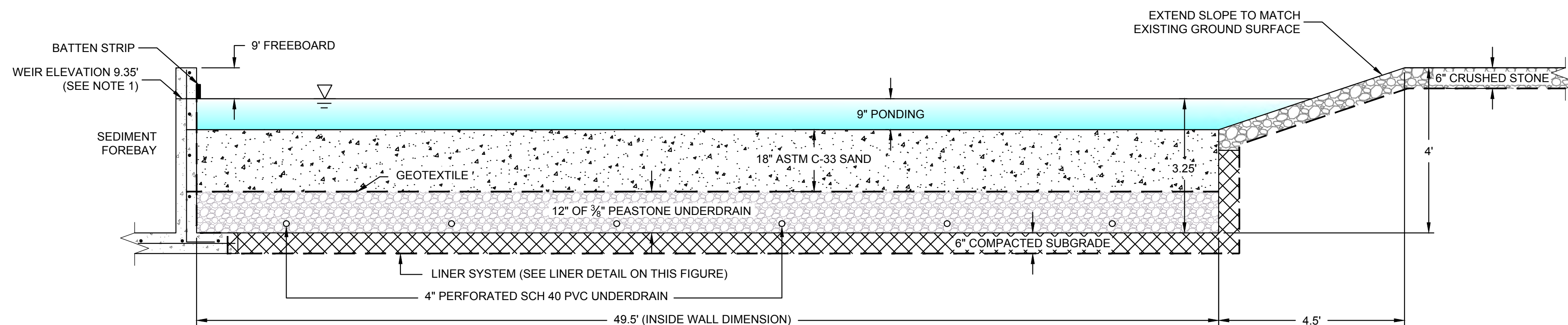
GENERAL NOTES AND COMMENTS:

nationalgrid	<div>REAL AND STAMP: ASHLEY STUTZMAN</div> <div>No. 11512</div> <div></div> <div>REGISTERED PROFESSIONAL ENGINEER CIVIL</div>	<div>PREPARED BY: A. STUTZMAN DATE: 10/25/2016 EXPIRATION DATE: 06/30/2017</div> <div>ENGINEERING AND DESIGN 2401 RARITAN BOULEVARD LENOEX, KANSAS 66049</div>				NATIONAL GRID LNG LLC			
						FIELDS POINT LIQUEFACTION PROJECT			
						STORMWATER MANAGEMENT PLAN			
						DRAWING NO:	PROJECT NO:	SHT:	REV:
						FIGURE 10	33554.60	100F15	0

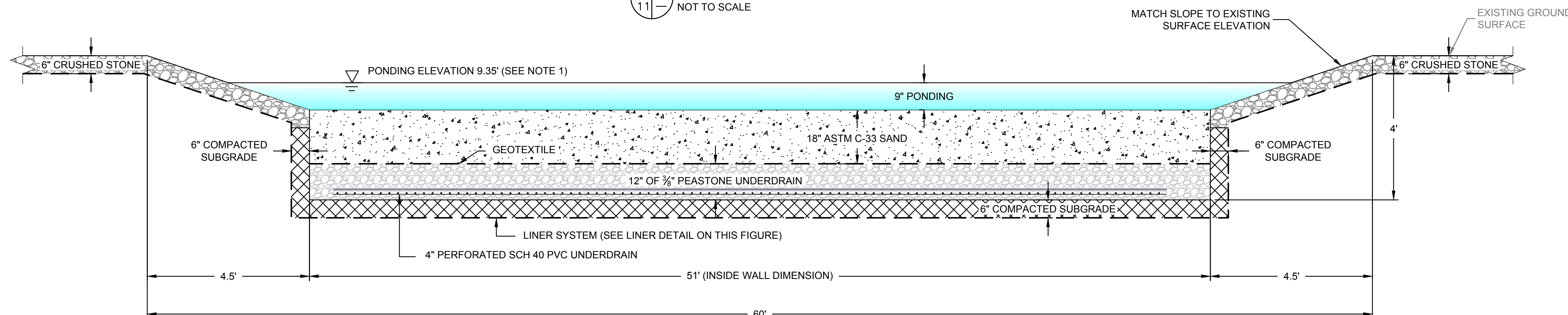
2016- GZA GeoEnvironmental, Inc. G2A-33554-60.MSK\PROJECTS\642 ALLENS AVENUE LIQUEFACTION PLANT\DWG\11 SAND FILTER-DETAILS.DWG FIG 11 SAND FILTER (4) OCTOBER 12, 2016 1:04 PM USA THERMAL



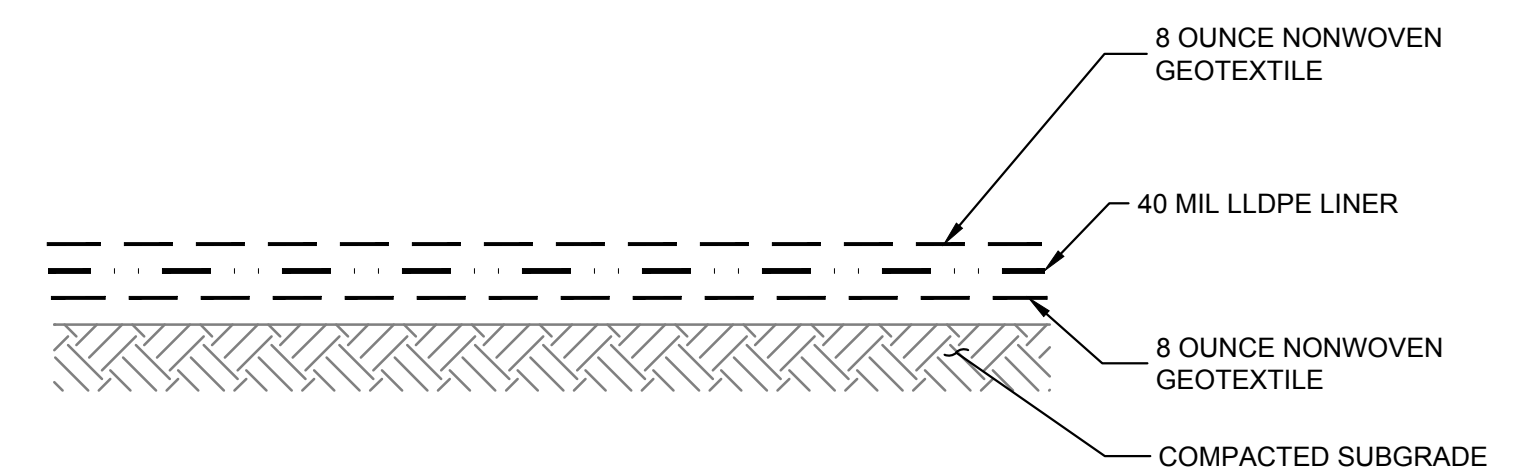
PLAN VIEW - SEDIMENT FOREBAY AND SAND FILTER
SCALE: 1"=10'



SECTION - SAND FILTER (EARTHEN W/ CONCRETE FOREBAY)
NOT TO SCALE



SECTION - SAND FILTER (EARTHEN)
NOT TO SCALE



SECTION - LINER DETAIL
NOT TO SCALE

NOTES:

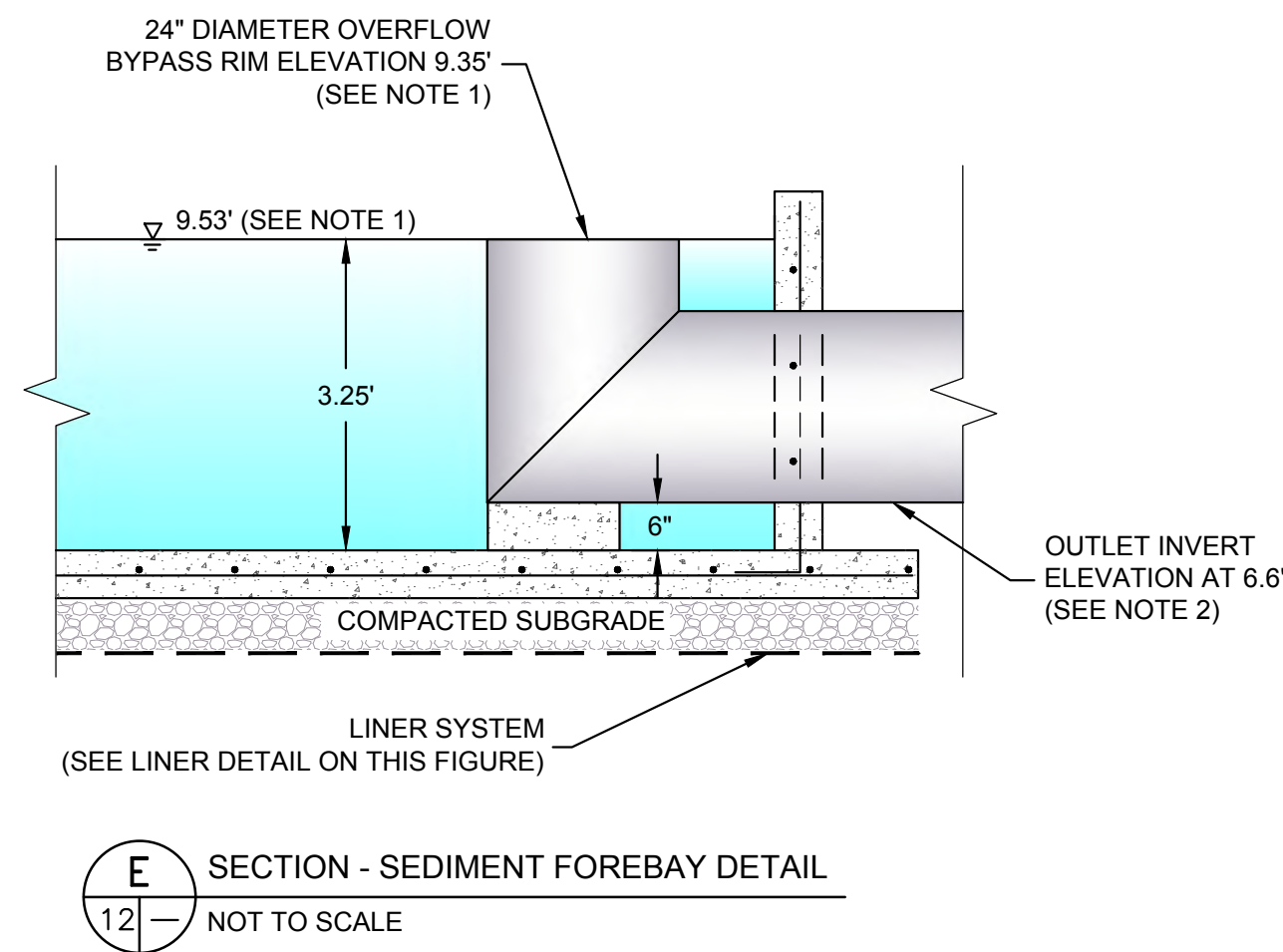
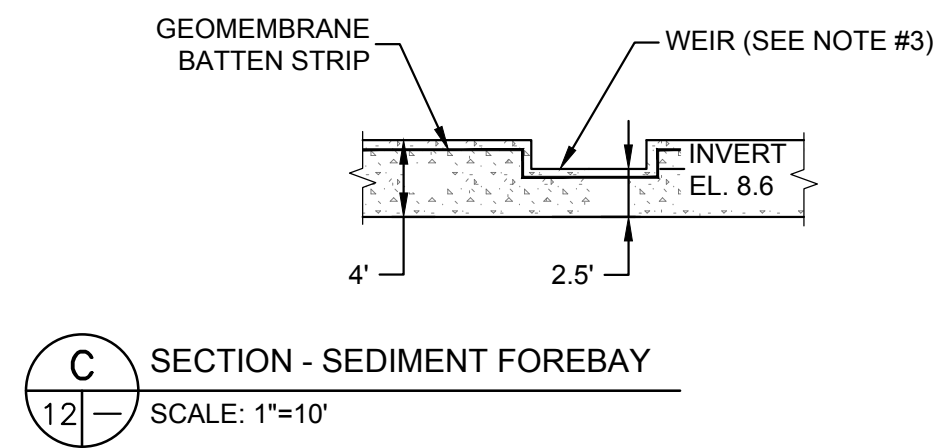
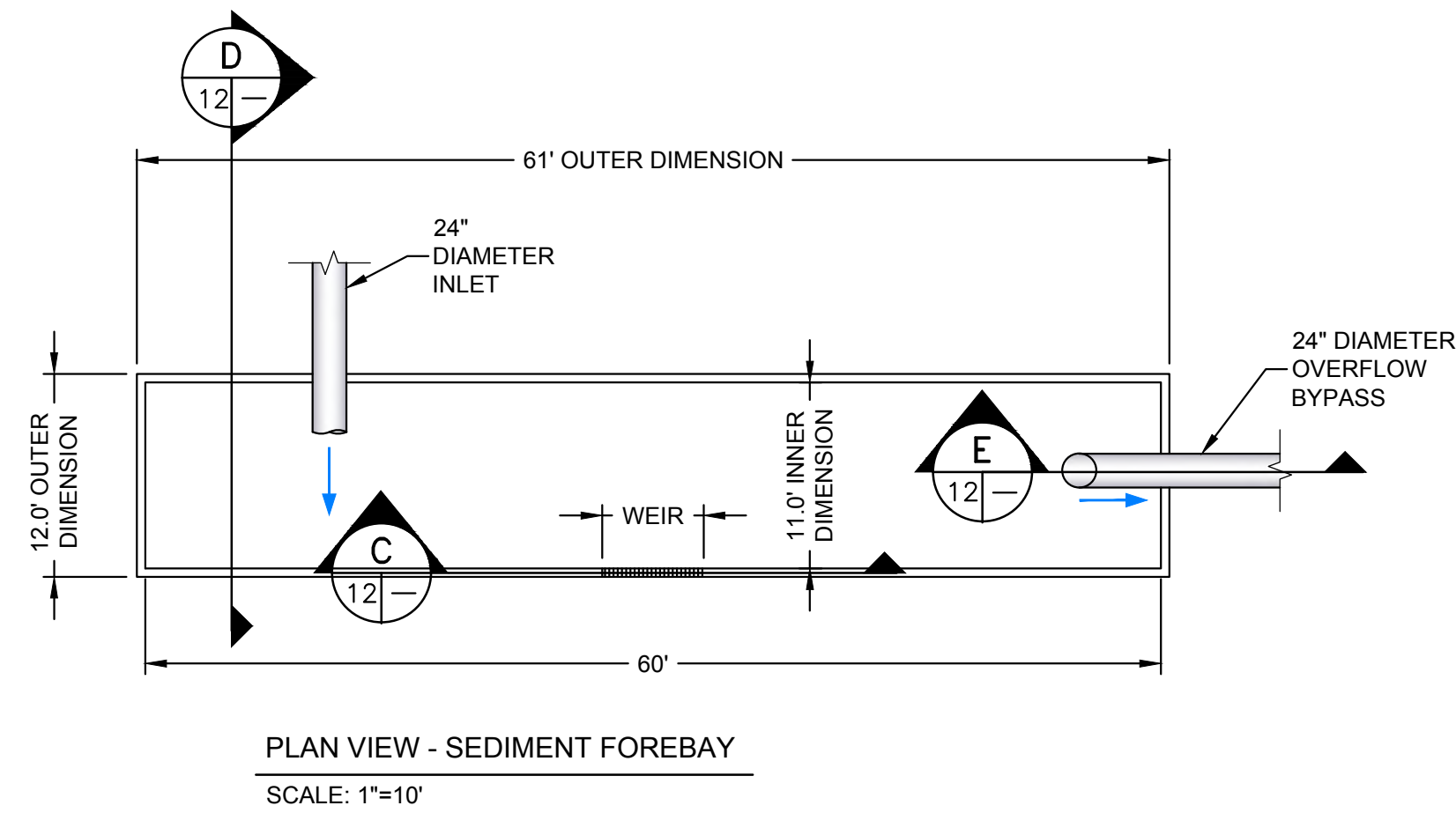
- PONDING ELEVATION TO BE SET AT INLET INVERT ELEVATION (CURRENTLY SET AT 9.35' BASED ON AUGUST 31, 2016 DRAINAGE CALCULATIONS).
- OUTLET INVERT ELEVATION FOR 24" OVERFLOW BYPASS TO BE 2.75' BELOW PONDING ELEVATION.
- INVERT ELEVATIONS TO BE SET BASED ON AUGUST 31, 2016 DRAINAGE CALCULATIONS.



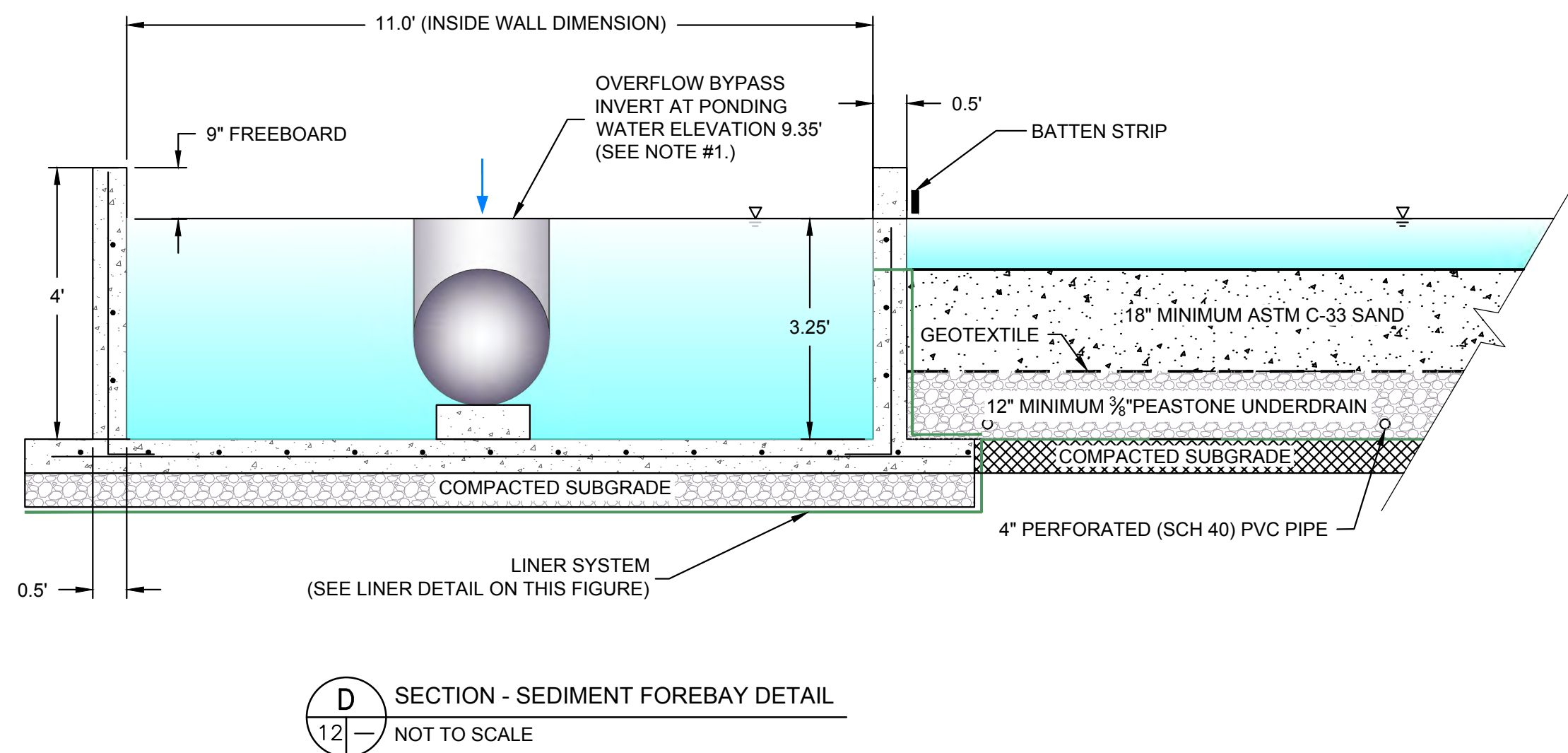
THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

NATIONAL GRID LIQUEFACTION PLANT 642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND			
STORMWATER MANAGEMENT DETAILS SAND FILTER			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: MSK	REVIEWED BY: SJH	CHECKED BY: IR	FIGURE
DESIGNED BY: SJH	DRAWN BY: LDT	SCALE: AS NOTED	11
DATE: OCTOBER, 2016	PROJECT NO. 33554.60	REVISION NO. 0	SHEET NO. 11 OF 15

FOR PERMITTING
ONLY



NOTE:
OVERFLOW BYPASS PIPE DIAMETER TO BE SIZED FOR 100-YEAR PEAK FLOW RATE

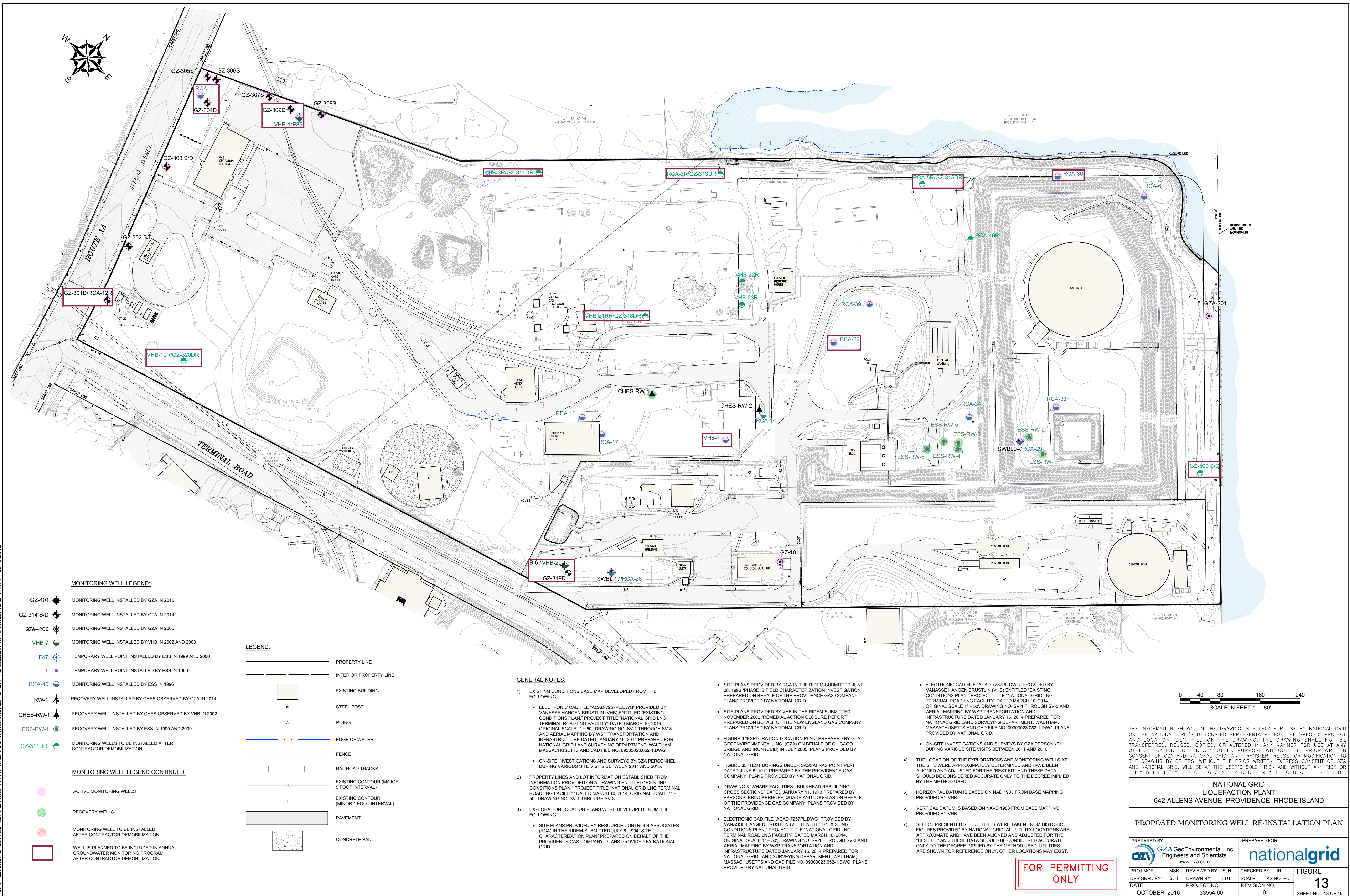


- NOTES:
- PONDING ELEVATION TO BE SET AT INLET INVERT ELEVATION (CURRENTLY SET AT 9.35' BASED ON AUGUST 31, 2016 DRAINAGE CALCULATIONS).
 - OUTLET INVERT ELEVATION FOR 24" OVERFLOW BYPASS TO BE 2.75' BELOW PONDING ELEVATION.
 - SIZE WIDTH OF WEIR BASED ON WATER QUALITY PEAK FLOW RATE.
- 0 5' 10' 20' 30'
SCALE IN FEET

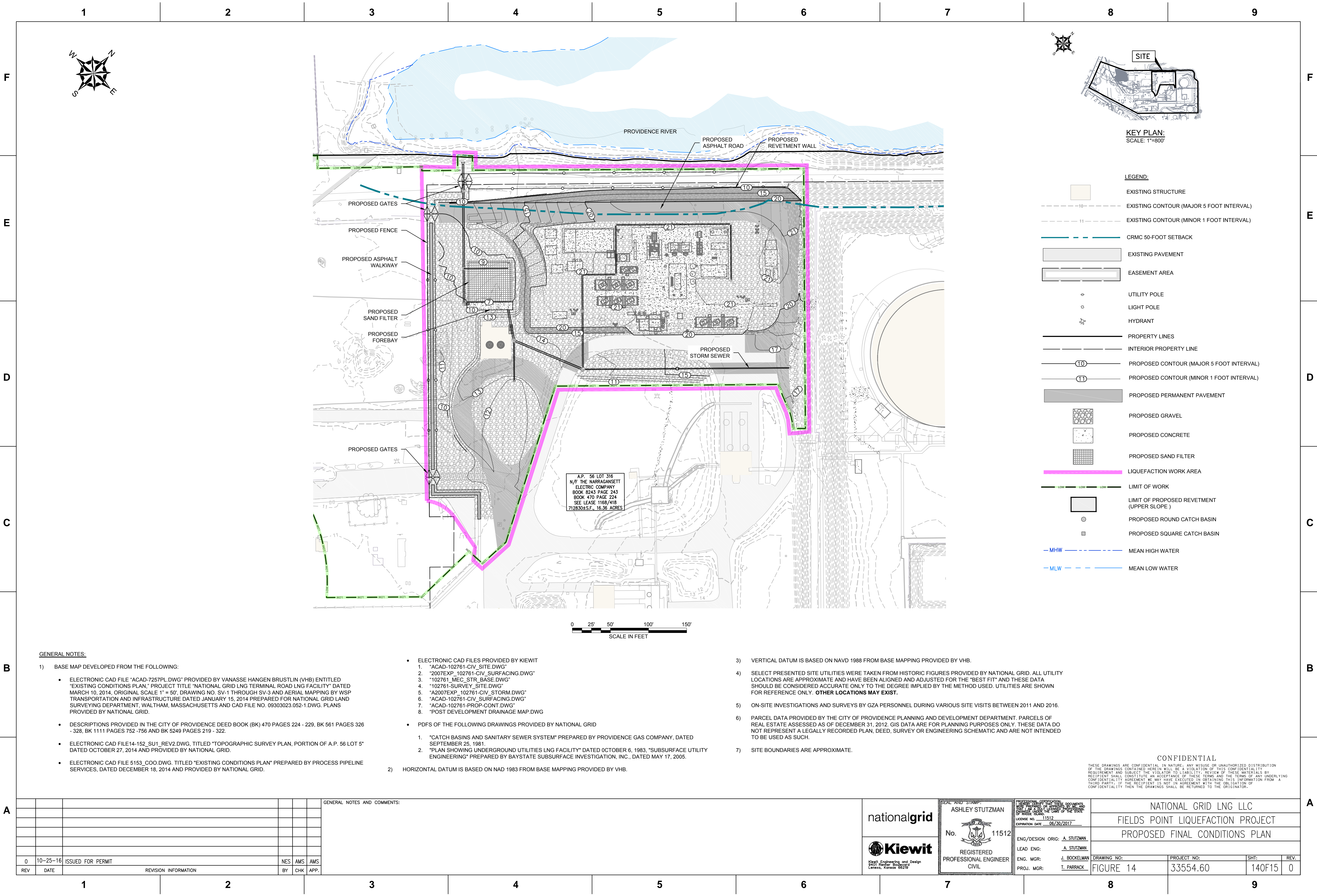
THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

NATIONAL GRID LIQUEFACTION PLANT 642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND			
STORMWATER MANAGEMENT DETAILS CONCRETE FOREBAY			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: MSK	REVIEWED BY: SJH	CHECKED BY: IR	FIGURE
DESIGNED BY: SJH	DRAWN BY: LDT	SCALE: AS NOTED	12
DATE: OCTOBER, 2016	PROJECT NO. 33554.60	REVISION NO. 0	SHEET NO. 12 OF 15

FOR PERMITTING
ONLY



OCT 25, 2016 - 10:39am DRAWING NAME: I:\102761-National_Grid_Liquefaction\DWG\CAD Exchange\In\2016-10-24 GZA Revised Permit\33554.60_CRMC PERMITTING_FOR STAMPING_Kiewit.dwg



GENERAL NOTES:

1) BASE MAP DEVELOPED FROM THE FOLLOWING:

- ELECTRONIC CAD FILE "ACAD-7257PL.DWG" PROVIDED BY VANASSE HANGEN BRUSTLIN (VHB) ENTITLED "EXISTING CONDITIONS PLAN," PROJECT TITLE "NATIONAL GRID LNG TERMINAL ROAD LNG FACILITY" DATED MARCH 10, 2014, ORIGINAL SCALE 1" = 50', DRAWING NO. SV-1 THROUGH SV-3 AND AERIAL MAPPING BY WSP TRANSPORTATION AND INFRASTRUCTURE DATED JANUARY 15, 2014 PREPARED FOR NATIONAL GRID LAND SURVEYING DEPARTMENT, WALTHAM, MASSACHUSETTS AND CAD FILE NO. 09303023.052-1.DWG. PLANS PROVIDED BY NATIONAL GRID.
- DESCRIPTIONS PROVIDED IN THE CITY OF PROVIDENCE DEED BOOK (BK) 470 PAGES 224 - 229, BK 561 PAGES 326 - 328, BK 1111 PAGES 752 -756 AND BK 5249 PAGES 219 - 322.
- ELECTRONIC CAD FILE 14-152_SU1_REV2.DWG, TITLED "TOPOGRAPHIC SURVEY PLAN, PORTION OF A.P. 56 LOT 5" DATED OCTOBER 27, 2014 AND PROVIDED BY NATIONAL GRID.
- ELECTRONIC CAD FILE 5153_COO.DWG, TITLED "EXISTING CONDITIONS PLAN" PREPARED BY PROCESS PIPELINE SERVICES, DATED DECEMBER 18, 2014 AND PROVIDED BY NATIONAL GRID.

- ELECTRONIC CAD FILES PROVIDED BY KIEWIT
 - "ACAD-102761-CIV_SITE.DWG"
 - "2007EXP_102761-CIV_SURFACING.DWG"
 - "102761_MEC_STR_BASE.DWG"
 - "102761-SURVEY_SITE.DWG"
 - "A2007EXP_102761-CIV_STORM.DWG"
 - "ACAD-102761-CIV_SURFACING.DWG"
 - "ACAD-102761-PROP-CONT.DWG"
 - "POST DEVELOPMENT DRAINAGE MAP.DWG"

- PDFS OF THE FOLLOWING DRAWINGS PROVIDED BY NATIONAL GRID

- "CATCH BASINS AND SANITARY SEWER SYSTEM" PREPARED BY PROVIDENCE GAS COMPANY, DATED SEPTEMBER 25, 1981.
- "PLAN SHOWING UNDERGROUND UTILITIES LNG FACILITY" DATED OCTOBER 6, 1983, "SUBSURFACE UTILITY ENGINEERING" PREPARED BY BAYSTATE SUBSURFACE INVESTIGATION, INC., DATED MAY 17, 2005.

2) HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY VHB.

3) VERTICAL DATUM IS BASED ON NAVD 1988 FROM BASE MAPPING PROVIDED BY VHB.

4) SELECT PRESENTED SITE UTILITIES WERE TAKEN FROM HISTORIC FIGURES PROVIDED BY NATIONAL GRID. ALL UTILITY LOCATIONS ARE APPROXIMATE AND HAVE BEEN ALIGNED AND ADJUSTED FOR THE "BEST FIT" AND THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED. UTILITIES ARE SHOWN FOR REFERENCE ONLY. **OTHER LOCATIONS MAY EXIST.**

5) ON-SITE INVESTIGATIONS AND SURVEYS BY GZA PERSONNEL DURING VARIOUS SITE VISITS BETWEEN 2011 AND 2016.

6) PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY. THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.


7) SITE BOUNDARIES ARE APPROXIMATE.

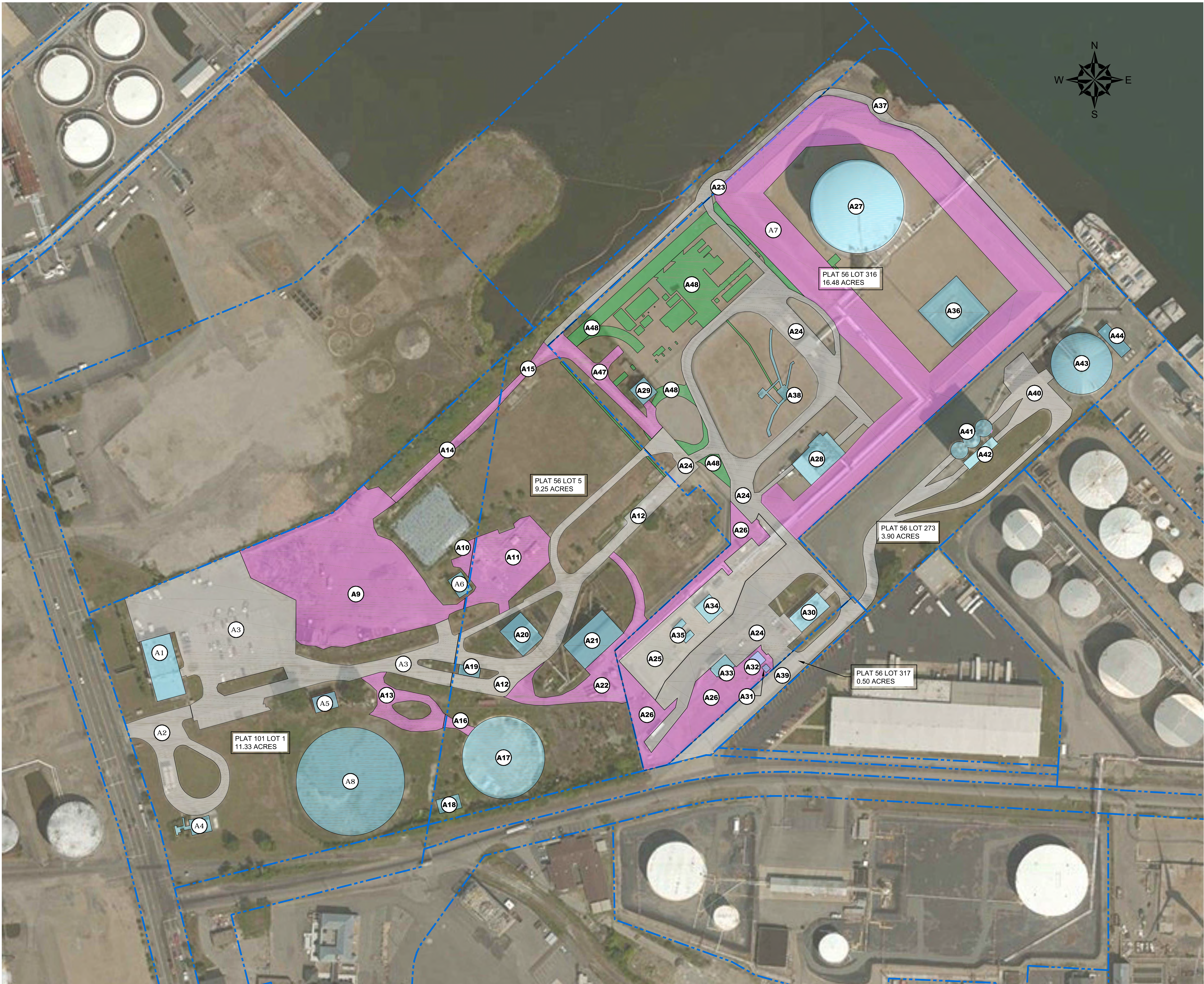
CONFIDENTIAL

THESE DRAWINGS ARE CONFIDENTIAL IN NATURE. ANY MISUSE OR UNAUTHORIZED DISTRIBUTION OF THE DRAWINGS CONTAINED HEREIN WILL BE A VIOLATION OF THIS CONFIDENTIALITY REQUIREMENT AND SUBJECT THE VIOLATOR TO LIABILITY. REVIEW OF THESE MATERIALS BY RECIPIENT SHALL CONSTITUTE AN ACCEPTANCE OF THESE TERMS AND THE TERMS OF ANY UNDERLYING CONFIDENTIALITY AGREEMENT WE MAY HAVE EXECUTED IN OBTAINING THIS INFORMATION FROM A THIRD PARTY. IF THE RECIPIENT IS NOT IN AGREEMENT WITH THE OBLIGATION OF CONFIDENTIALITY THEN THE DRAWINGS SHALL BE RETURNED TO THE ORIGINATOR.

REV	DATE	ISSUED FOR PERMIT	REVISION INFORMATION	NES	AMS	AMS
0	10-25-16	ISSUED FOR PERMIT				

GENERAL NOTES AND COMMENTS:

nationalgrid	<div>SEAL AND STAMP: ASHLEY STUTZMAN No. 11512  REGISTERED PROFESSIONAL ENGINEER CIVIL</div>	PROFESSIONAL ENGINEER DOCUMENTS NO. 11512 DATE OF ISSUE: 06/30/2017 EXPIRATION DATE: 06/30/2017				NATIONAL GRID LNG LLC					
		ENG/DESIGN ORIG: A. STUTZMAN				FIELDS POINT LIQUEFACTION PROJECT					
		LEAD ENG: A. STUTZMAN				PROPOSED FINAL CONDITIONS PLAN					
		ENG. MGR: J. BOCKELMAN				DRAWING NO:		PROJECT NO:		SHT:	REV:
		PROJ. MGR: T. PARRACK				FIGURE 14		33554.60		140F15	0



LEGEND

- PROPERTY LINES
- PERVIOUS PROPOSED TO BE IMPERVIOUS
- STRUCTURE
- ASPHALT
- OTHER

- REFERENCE NOTES:**
- THIS MAP CONTAINS THE ESRI ARCGIS ONLINE BING MAPS AERIAL LAYER PACKAGE. IMAGE COURTESY OF USGS EARTHSTAR GEOGRAPHICS SIO © MICROSOFT CORPORATION 2015.
 - PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY. THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.
 - SITE BOUNDARIES ARE APPROXIMATE.

IMPERVIOUS AREAS				
PLAT	LOT	NO.	AREA (SQ. FT.)	SURFACE TYPE
101	1	A1	8,037.44	ROOF
101	1	A2	17,913.35	ASPHALT
101	1	A3	90,158.79	ASPHALT
101	1	A4	1,786.65	STRUCTURE
101	1	A5	1,640.44	ROOF
101	1	A6	1,445.11	STRUCTURE
56	316	A7	156,852.04	CONTAINMENT DIKE
101	1	A8	39,796.73	TANK FOUNDATION
101	1	A9	78,909.64	COMPACTED GRAVEL
101	1	A10	1,933.34	COMPACTED GRAVEL
56	5	A11	21,898.19	COMPACTED GRAVEL
56	5	A12	37,777.70	ASPHALT
101	1	A13	8,857.25	COMPACTED GRAVEL
101	1	A14	5,114.04	COMPACTED GRAVEL
56	5	A15	2,860.86	COMPACTED GRAVEL
56	5	A16	1,196.51	COMPACTED GRAVEL
56	5	A17	23,127.00	TANK FOUNDATION
56	5	A18	1,923.75	STRUCTURE
56	5	A19	898.87	ROOF
56	5	A20	4,099.05	ROOF
56	5	A21	7,273.42	ROOF
56	5	A22	12,124.48	COMPACTED GRAVEL
56	5	A23	11,249.94	ASPHALT
56	316	A24	92,586.35	ASPHALT
56	316	A25	29,735.26	CONCRETE
56	316	A26	40,494.92	COMPACTED GRAVEL
56	316	A27	29,930.34	LNG TANK
56	316	A28	6,084.97	STRUCTURE
56	316	A29	1,686.87	ROOF
56	316	A30	3,197.19	ROOF
56	316	A31	164.24	ROOF
56	316	A32	638.42	ROOF
56	316	A33	1,346.21	ROOF
56	316	A34	1,845.52	ROOF
56	316	A35	712.24	ROOF
56	316	A36	10,912.10	SUMP PIT
56	316	A37	12,642.27	ASPHALT
56	316	A38	2,392.36	STRUCTURE
56	317	A39	17,080.05	ASPHALT
56	273	A40	28,623.42	ASPHALT
56	273	A41	3,112.29	STRUCTURE
56	273	A42	1,576.65	ROOF
56	273	A43	12,924.79	TANK
56	273	A44	1,893.69	STRUCTURE
56	273	A45	10,294.60	COMPACTED GRAVEL
56	316	A46	54,454.00	NEW IMPERVIOUS AREAS
TOTAL IMPERVIOUS			902,203.34	

894480.34 SQ. FT. IMPERVIOUS AREA
1807724.79 SQ. FT. TOTAL AREA = 49.48% IMPERVIOUS



THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

NATIONAL GRID LIQUEFACTION PLANT 642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND			
PROPOSED IMPERVIOUS CONDITIONS PLAN			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: MSK	REVIEWED BY: SJM	CHECKED BY: JR	FIGURE
DESIGNED BY: SJM	DRAWN BY: LDT	SCALE: AS NOTED	15
DATE: OCTOBER, 2016	PROJECT NO: 33554.60	REVISION NO: 0	SHEET NO. 15 OF 15

FOR PERMITTING
ONLY



APPENDIX A

WATER QUALITY CERTIFICATION LETTER



Proactive by Design

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION
MANAGEMENT

530 Broadway
Providence, RI 02909
T: 401.421.4140
F: 401.751.8613
www.gza.com



September 12, 2016
File No. 03.0033554.60

Mr. Neal Personeus
Office of Water Resources
Rhode Island Department of Environmental Management
235 Promenade Street
Providence, RI 02908

Re: Water Quality Certification and RIPDES Construction General Permit Application
Liquefaction Plant
Providence, Rhode Island

Dear Mr. Personeus:

On behalf of our Client, The Narragansett Electric Company, dba National Grid, this application is being submitted under the coordinated stormwater permitting process by GZA GeoEnvironmental, Inc. (GZA), pursuant to the *Water Quality Regulations* (amended December 2010), and the Rhode Island Pollutant Discharge Elimination System (RIPDES) Program.

The proposed project involves constructing a natural gas liquefaction plant at the existing Liquefied Natural Gas (LNG) facility in Providence, Rhode Island. The liquefaction plant will tie into the existing high pressure gas line that enters the Site from the east (Providence River). The liquefaction plant will be used to fill the existing LNG tank during low-demand summer months, so that there is a stable and sufficient supply of natural gas for heating during high-demand winter months. The project will result in the creation of more than 10,000 square feet of impervious area and will include a new storm water outfall into the Providence River. The new outfall will direct treated stormwater runoff from the Site onto an energy dissipation pad and into the River. This will trigger the need for a Water Quality Certification (WQC) from RIDEM. This project will also disturb more than 1-acre during construction, and will be defined as a Redevelopment Project under the *Rhode Island Stormwater Design and Installation Standards Manual* dated 2015 (RISDISM). Therefore, this project will also require a Construction General Permit (CGP) under the RIPDES program.

The stormwater management system for the proposed project has been designed in accordance with the RISDISM. A Stormwater Management Plan (SWMP) and Sediment and Erosion Control Plan (SESC) have been prepared for the project and are enclosed with this application. The plans provide an estimate of anticipated runoff volumes during various storm events, detail the design of the collection and treatment system (lined sand filter) and outlines the best management practices that will be used during construction activities to minimize migration of sediment to the waters of the State.



We trust that this application will satisfactorily address the requirements for the WQC and RIPDES CGP. If you have any questions or require any additional information regarding this application, please contact Igor Runge at igor.runge@gza.com or (401)427-2710.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

A handwritten signature in blue ink, appearing to read 'S. Haupt'.

Sara Haupt, EIT
Project Engineer

A handwritten signature in blue ink, appearing to read 'Igor Runge'.

Igor Runge, Ph.D., P.H.
Consultant/Reviewer

A handwritten signature in blue ink, appearing to read 'M. Kilpatrick'.

Margaret Kilpatrick, P.E.
Associate Principal

Attachments: Water Quality Certification Application Form
Application Fee \$400.00
Stormwater Management Plan

J:\ENV\33554.60.MSK\WORK\CRMC PERMITTING\STORMWATER\SWMP\33554.60 WQC RIPDES COVER LETTER FINAL.DOCX



APPENDIX B

REVETMENT WALL DESIGN MEMO



Proactive by Design

GEOTECHNICAL

ENVIRONMENTAL

ECOLOGICAL

WATER

CONSTRUCTION
MANAGEMENT



MEMORANDUM

To: William Howard (National Grid)

Cc: Igor Runge, Margaret Kilpatrick (GZA)

From: Matthew Page, P.E., Russell J. Morgan P.E. (GZA)

Date: April 18, 2016

File No.: 03.0033554.60

Re: Rip Rap Revetment Design – REV1
Proposed Liquefaction Facility
642 Allens Avenue
Providence, Rhode Island

GZA is pleased to provide you with this revised memorandum pertaining to the design of the riprap revetment for the proposed Liquefaction Facility located at 642 Allens Avenue in Providence, Rhode Island. The primary objectives of our work were to perform a preliminary assessment and design of the proposed riprap revetment slope, prepare documents for the Coastal Resources Management Council (CRMC) assent application package, and prepare a summary of our findings and recommendations presented herein.

BACKGROUND

A 166,000 square-foot Liquefaction Facility is proposed to be constructed along the northwest portion of the existing LNG facility. The project site area is bordered to the north by an existing riprap revetment and access roadway, to the east by the LNG tank containment dike, to the south by the LNG processing area, and to the east by 642 Allens Ave. The existing riprap revetment provides slope protection from storm water runoff and wave action from the Providence River.

It is GZA's understanding that the construction of the proposed Liquefaction Facility will require an increase in elevation between 9 and 11 feet across the project site area. A 1.5H:1V slope along the northern limits of the site is proposed to be constructed from existing grade (approximate elevation (El.) +10 feet) to meet final grade (approximate El. +21 feet). The new slope is within the limits of the CRMC 200-foot contiguous area. Additionally, the slope will be constructed within the FEMA 1% annual chance (100-year) still water level (SWL) and may be subjected to wave action during an event of this magnitude. As a result, the new slope will require riprap slope protection. Per the request of CRMC and National Grid, GZA developed a preliminary design of the revetment system. Refer to the attached drawings illustrating existing and proposed conditions.

Summary of Design Parameters

Based on correspondence with National Grid, the revetment is to be designed for the 1% annual chance (100-year) storm and a design life of 25 years. The 1% annual chance SWL for the site is El. +12 feet (NAVD88)¹.



A site specific wave study performed by VHB² resulted in a wave height of 2.9 feet with an associated wave period of 2.2 seconds for a 100-year storm. The sea level rise presented in the VHB report is considered outdated by CRMC and has been updated for this design. The range of sea level rise change is projected to be a maximum of approximately 1.0 foot in 2035, 2.0 feet in 2050 and 7.0 feet in 2100, based on CRMC "Red Book" Section 145³. This prediction results in an approximate sea level rise of 1.5 feet for the anticipated 25-year design life of the structure. For the purposes of design of the riprap revetment, it was assumed that the SWL was equal to the 1% annual chance SWL plus the 25-year sea level rise, or El. +13.5 feet, and the 1% annual chance significant wave height was equal to 2.9 feet.

The riprap revetment system was designed in accordance with the Coastal Engineering Manual (CEM)⁴. Wave run-up and overtopping were assessed for the proposed revetment (upper slope).

Summary of Findings and Recommendations

The following summarizes our findings and recommendations for construction of the proposed revetment (upper slope).

Proposed Revetment (Upper Slope)

Based on the design parameters stated above, the riprap revetment along the proposed fill area (upper slope) should have a minimum of a 3-foot thick armor layer, a 12-inch thick intermediate layer and a 6-inch thick bedding layer. The armor layer should have a minimum of 2 layers of stone and should be comprised of stones with an equivalent diameter for the 50-percent less than gradation (D_{50}) of 1.2 feet which corresponds to a weight (W_{50}) of 310 pounds (lbs), and an equivalent diameter for the 100-percent less than gradation (D_{100}) of 2 feet which corresponds to a weight (W_{100}) of 1240 lbs. The RIDOT riprap gradation "R-6" (Section M.10.03.2⁵) was selected as the primary armor layer based on the above design parameters and its availability. The intermediate layer should be comprised of stones that meet the gradation requirements for the RIDOT stone size "R-2". The bedding layer should be comprised of ¾-inch crushed stone wrapped in a geotextile that is a minimum of Mirafi 600X, or equivalent.

For a 25-year facility design life, and a 100-year storm event, wave overtopping of the structure was not indicated. Scouring of the upland area (above El. 19 feet) is not anticipated. However, scouring of the new access roadway along the northern portion of the Site will likely occur during a 100-year event due to wave run-up and overtopping. GZA recommends that the roadway is designed to prevent significant erosion or a contingency is made for repairing the roadway post-storm events.

Design Considerations

The design provided herein is preliminary and is for permitting purposes only. The revetment was evaluated for the purpose of providing erosion protection from wave action and flooding. Additional design (by others) should include an analysis of the slope stability of the proposed and existing slopes as a result of the addition of the riprap revetment and fill area. The presence of organic silt on the site may result in low factors of safety for slope stability. It is GZA's understanding that pre-design explorations (by others) are continuing to be performed to gain additional information and that the proposed structures may be supported on deep foundation systems. The use of the deep foundations systems may mitigate any slope stability issues; however, it should be analyzed as part of the future design to be conducted by others.



The proposed revetment (upper slope) was designed for the 100-year storm event. Should National Grid decide to design the site for the 500-year storm event it is anticipated that wave run-up and overtopping of the revetment structure will occur and will result in scour and erosion of the upland area. If the site is to be designed for the 500-year storm event, additional scour protection will be required.

It is anticipated that during a 100-year storm event, the existing revetment (lower slope) will not provide adequate protection. During a storm event it is likely that stones will be displaced and erosion and scour of the existing revetment will occur. The predicted erosion and scour will likely result in undermining of and damage to the existing roadway. Damage to the existing revetment; however, will likely not result in the undermining of the proposed revetment (upper slope). GZA recommends the following options for the existing revetment (lower slope):

1. National Grid may choose to supplement the existing revetment stone in order to provide adequate protection for a 100-year storm event. This would likely require leaving the existing stones in place to act as an intermediate riprap layer and installing an approximately 2.5 foot thick armor layer over the existing stones. The new stones for the armor layer should meet the minimum requirements for the RIDOT riprap gradation "R-6", in accordance with Section M.10.03.2⁵.
2. Alternatively, National Grid can choose to carry a contingency to repair the damage to the existing revetment and roadway post-storm events.

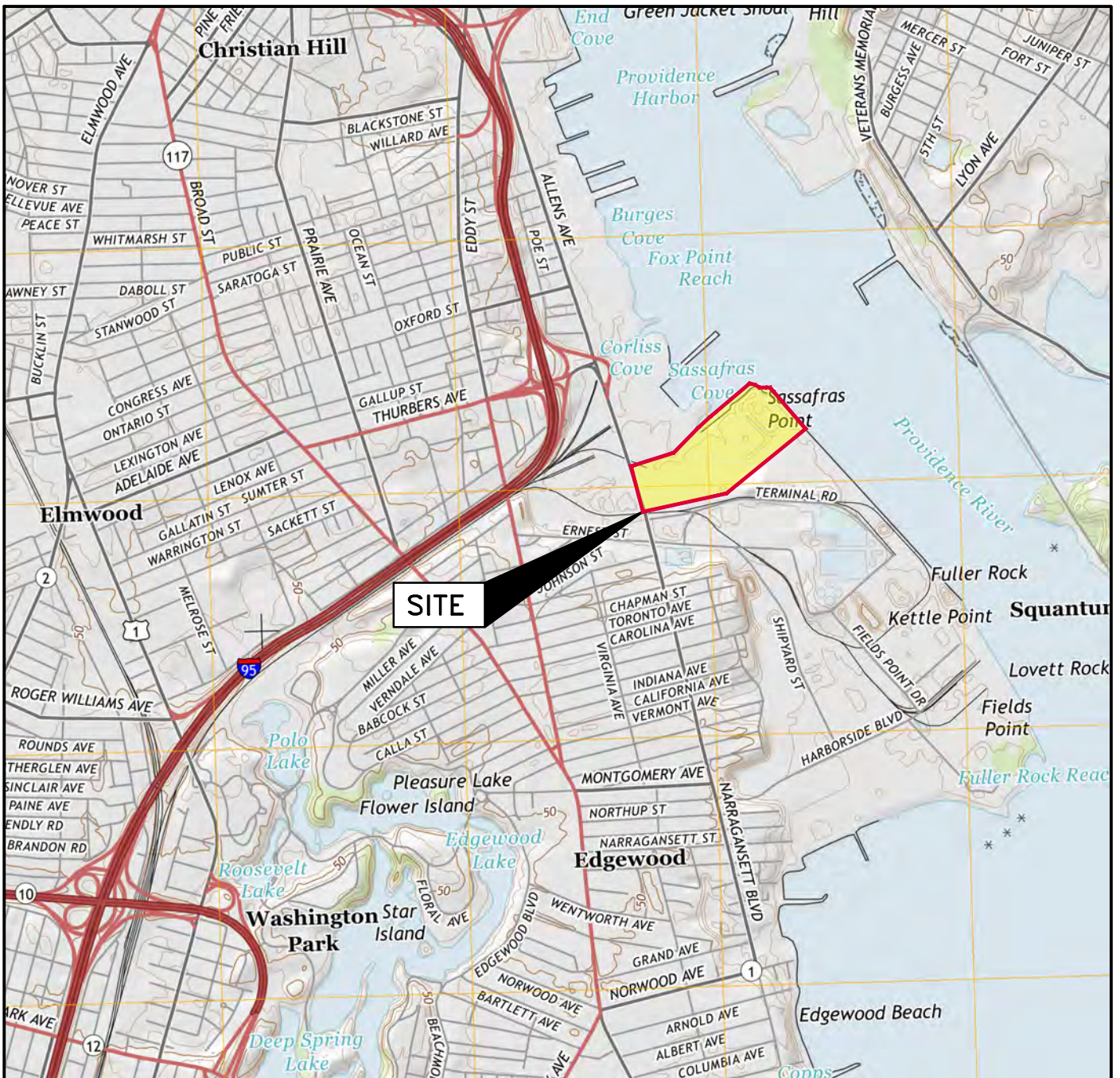
Based on recent discussions with National Grid, they have decided to repair damage to the existing revetment and roadway post-storm events. As a result, Figure 2 presents construction of the new revetment (upper slope) and does not reflect improvements to the lower slope.

We trust that this memo meets the current needs of the project at this time. If you have any questions, please call us at (401) 421-4140.

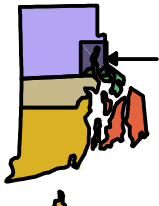
Attachments:	Figures:	Figure 1 – Locus Plan Figure 2 – Liquefaction Work Area – Proposed Revetment and Cross Sections
	Appendix A:	Limitations
	Appendix B:	References



FIGURES



RHODE ISLAND



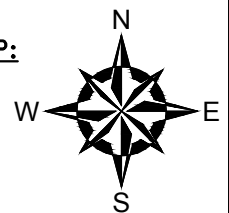
QUADRANGLE LOCATION

SOURCE:

**BASE MAP FROM THE FOLLOWING USGS QUADRANGLE MAP:
PROVIDENCE, RHODE ISLAND (2015)**

DIGITAL TOPOGRAPHIC MAPS PROVIDED BY USGSSTORE.GOV.

CONTOUR ELEVATIONS REFERENCE NAVD 88,
CONTOURS ARE SHOWN IN FEET AT 10' INTERVALS



THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

LIQUEFACTION FACILITY
642 ALLENS AVENUE
PROVIDENCE, RHODE ISLAND

PREPARED BY:



GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:

nationalgrid

LOCUS PLAN

PROJ MGR: MSK

REVIEWED BY: MJP

CHECKED BY: MEA

FIGURE

DESIGNED BY: SMF

DRAWN BY: LDT

SCALE: AS NOTED

1

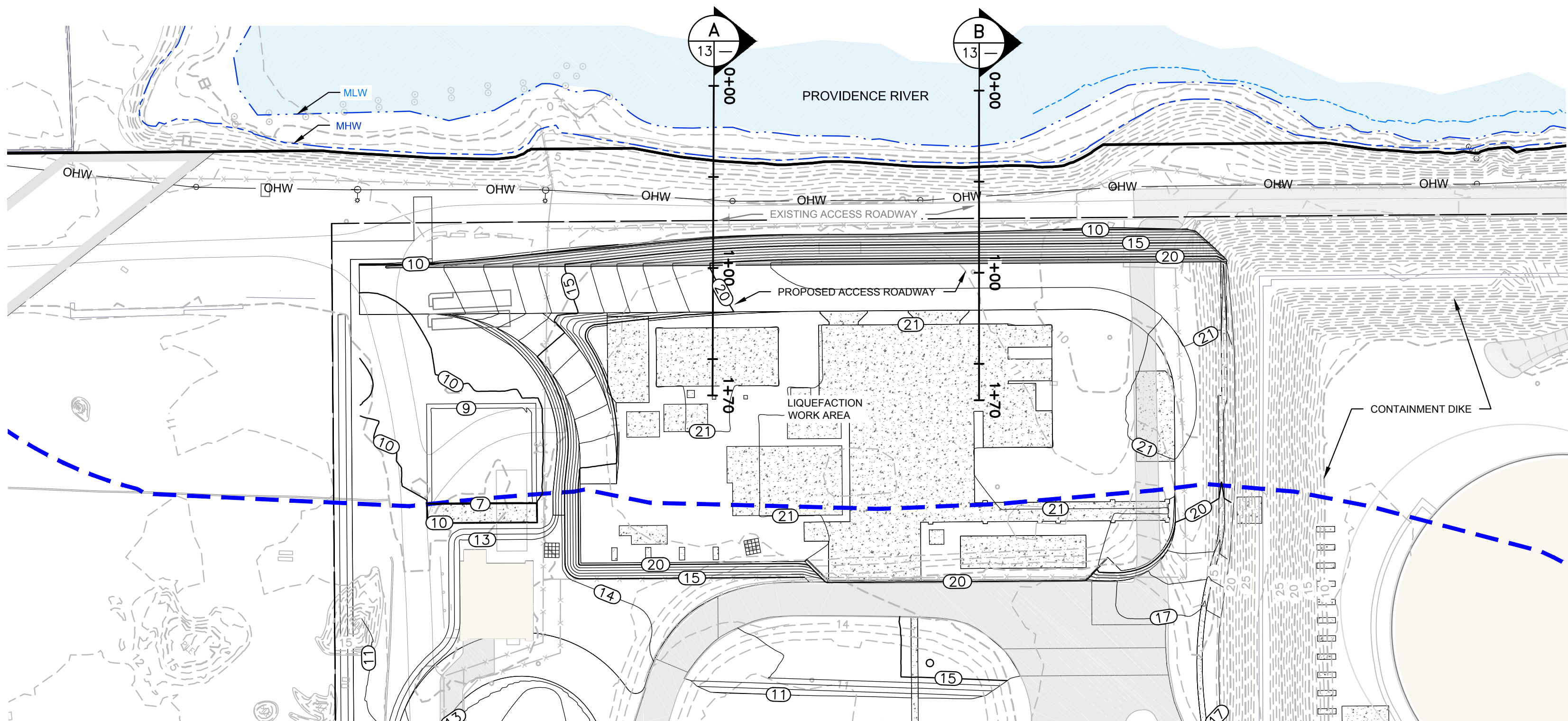
DATE: OCTOBER 2016

PROJECT NO. 33554.60

REVISION NO. 0

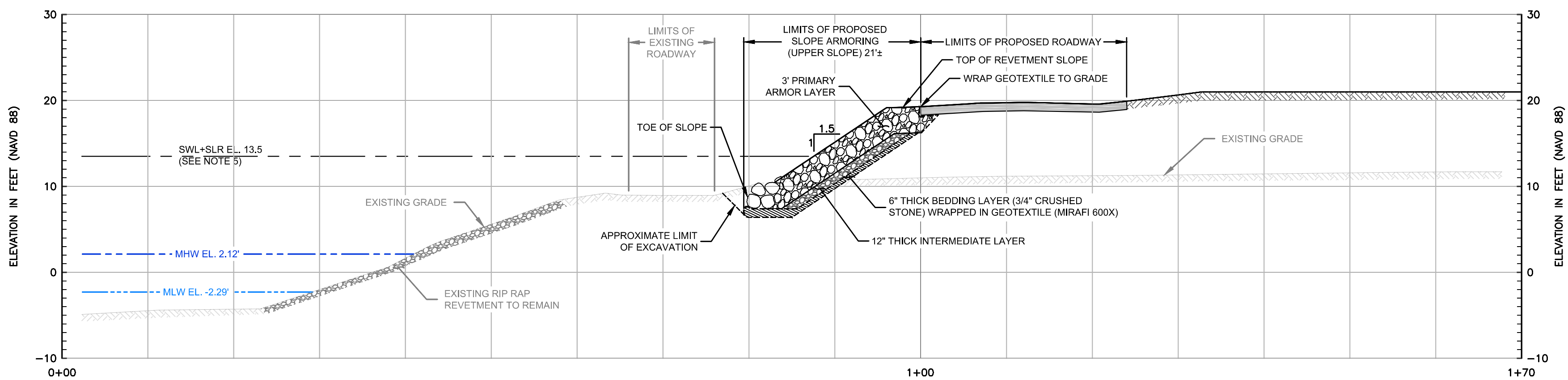
SHEET NO.

1 OF 2



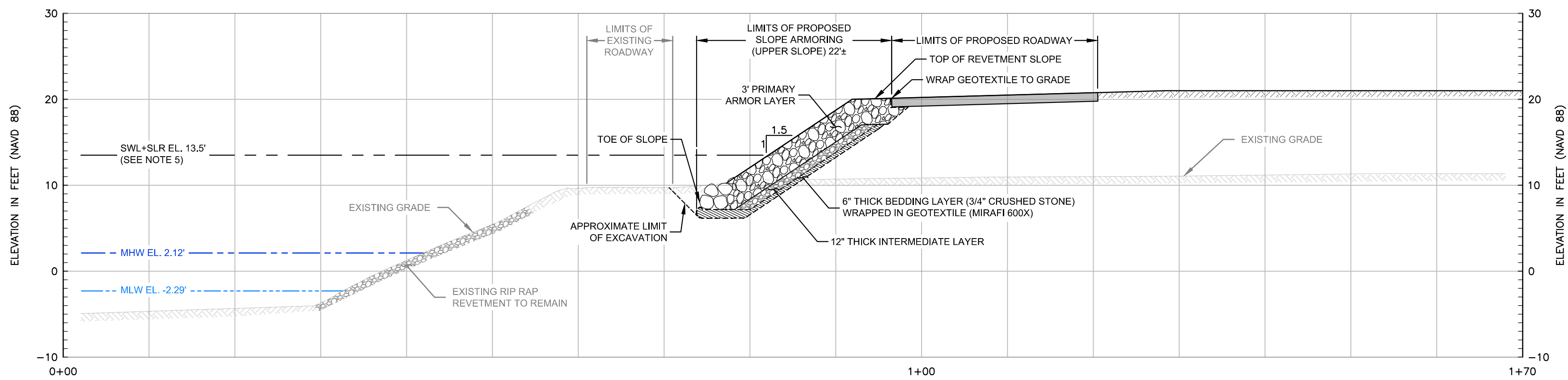
PLAN VIEW OF PROPOSED REVETMENT AND REVETMENT IMPROVEMENTS

SCALE: 1"=50'



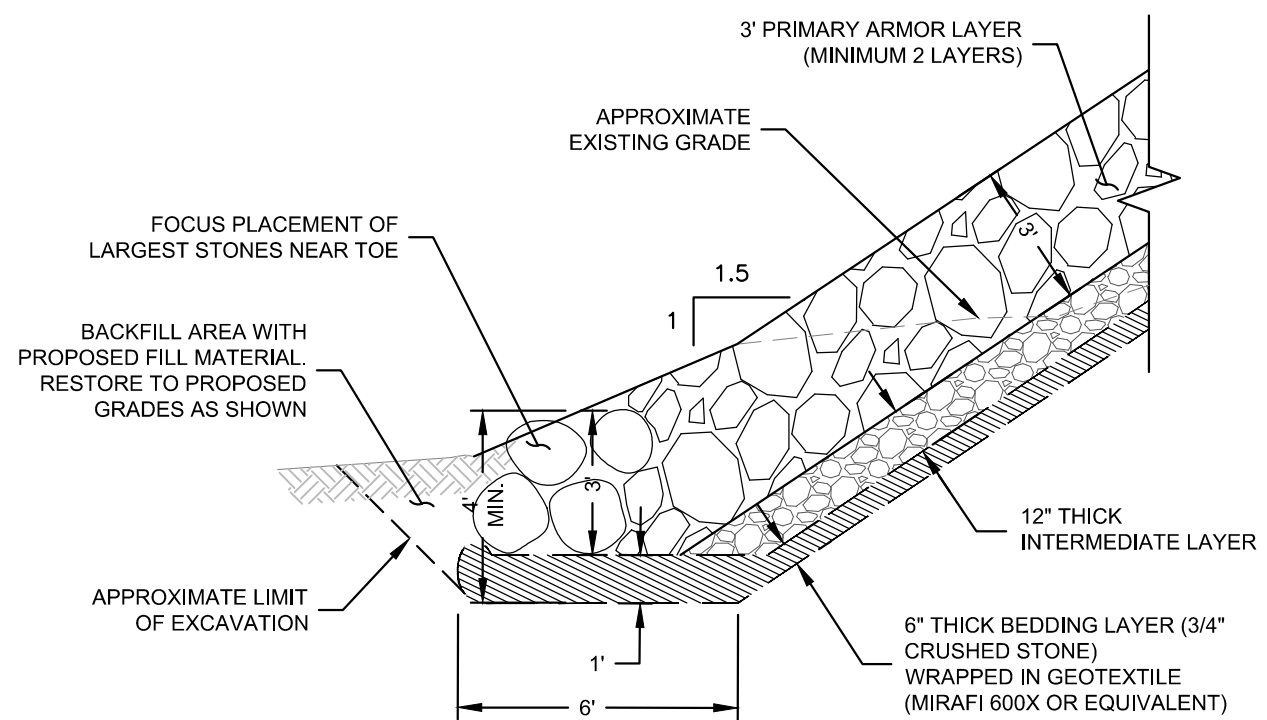
TYPICAL REVETMENT SECTION A

SCALE: 1"=10'



TYPICAL REVETMENT SECTION B

SCALE: 1"=10'



PROPOSED REVETMENT (UPPER SLOPE) (TYP.)

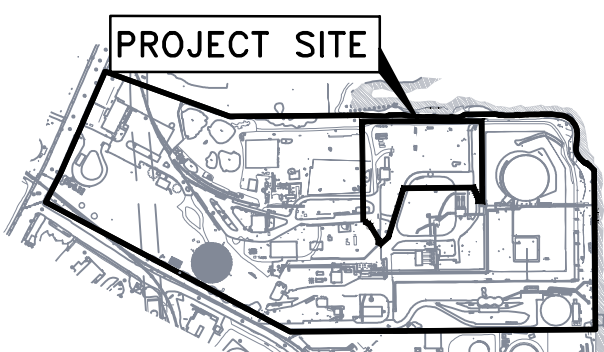
SCALE: 1"=4'

RIP RAP GRADATION REQUIREMENTS			
PRIMARY ARMOR LAYER		INTERMEDIATE LAYER	
RIDOT R-6		RIDOT R-2	
% LESS THAN	STONE SIZE (IN.)	% LESS THAN	STONE SIZE (IN.)
0-15%	8	0-15%	1
0-50%	13	0-50%	2
100%	26	100%	4

3/4" CRUSHED STONE GRADATION REQUIREMENTS	
% LESS THAN	SIEVE SIZE
100	3/4 INCH
90-100	1/2 INCH
30-60	3/8 INCH
0-15	No. 4
0-5	No. 8

LEGEND:

- 200-FOOT CRMC JURISDICTIONAL LIMIT
- MHW
- MLW
- SWL+SLR
- EXISTING OVERHEAD WIRE
- LIMIT OF PROPOSED REVETMENT (UPPER SLOPE)



KEY PLAN:
SCALE: 1"=800'

GENERAL NOTES:

- BASE MAP DEVELOPED FROM THE FOLLOWING:

- ELECTRONIC CAD FILE "ACAD-7257PL.DWG" PROVIDED BY VANASSE HANGEN BRUSTLIN (VHB) ENTITLED "EXISTING CONDITIONS PLAN," PROJECT TITLE "NATIONAL GRID LNG TERMINAL ROAD LNG FACILITY" DATED MARCH 10, 2014, ORIGINAL SCALE 1"=50', DRAWING NO. SV-1 THROUGH SV-3 AND AERIAL MAPPING BY WSP TRANSPORTATION AND INFRASTRUCTURE DATED JANUARY 15, 2014 PREPARED FOR NATIONAL GRID LAND SURVEYING DEPARTMENT, WALTHAM, MASSACHUSETTS AND CAD FILE NO. 09303023.052-1.DWG. PLANS PROVIDED BY NATIONAL GRID.
- ELECTRONIC CAD FILE 14-152_SU1_REV2.DWG, TITLED "TOPOGRAPHIC SURVEY PLAN, PORTION OF A.P. 56 LOT 5" DATED OCTOBER 27, 2014 AND PROVIDED BY NATIONAL GRID.

- HORIZONTAL DATUM IS BASED ON NAD 1983.

- ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM (NAVD) 1988.

NOTES:

- THE CONTRACTOR SHALL MONITOR AND ADJUST OPERATIONS AS NECESSARY TO AVOID VIBRATIONS WHICH COULD DAMAGE ADJACENT PROPERTIES AND STRUCTURES. THE CONTRACTOR IS RESPONSIBLE FOR DAMAGES TO EXISTING STRUCTURES WHICH RESULT FROM HIS OPERATIONS.
- THE CONTRACTOR IS RESPONSIBLE FOR THE SAFE AND PROPER DISPOSAL OF ALL MATERIALS AND SHALL OBTAIN ALL NECESSARY LICENSES AND PERMITS FOR DISPOSAL.
- ALL CONSTRUCTION MATERIALS AND STOCKPILES SHALL BE PLACED UPLAND OF THE COASTAL FEATURE.
- NO DISTURBANCE, EXCAVATION, OR PLACEMENT OF MATERIALS SHALL BE PERFORMED BEYOND THE LIMITS SHOWN ON THE DRAWINGS.
- 1% ANNUAL CHANCE (100-YEAR) FLOOD CONSIDERED TO BE 1% CHANCE STILL WATER LEVEL (SWL) FROM "FEMA FLOOD INSURANCE STUDY (FIS) 44007CV001G FOR PROVIDENCE COUNTY, RHODE ISLAND," DATED OCTOBER 2, 2015, PLUS A PREDICTED SEA LEVEL RISE (SLR) OF 1.5 FEET FOR A 25-YEAR DESIGN LIFE BASED ON SECTION 145 - CLIMATE CHANGE AND SEA LEVEL RISE OF THE "RHODE ISLAND COASTAL RESOURCES MANAGEMENT PROGRAM," DATED FEBRUARY 22, 2016.

TIDAL DATUM

NOTE:

- TO CONVERT FROM NAVD88 TO MLW ADD 2.29 FT.
- TIDAL DATUM BASED UPON NOAA STATION 8454000.

NAVD 88

+2.37' (MHHW)
+2.12' (MHW)

MLW

+4.66' (MHHW)
+4.41' (MHW)
0.0' (NAVD 88)
-2.29' (MLW)
-2.47' (MLLW)

0 2' 4' 8' 12'
SCALE IN FEET 1"=4'

0 5' 10' 20' 30'
SCALE IN FEET 1"=10'

0 25' 50' 100' 150'
SCALE IN FEET 1"=50'

THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

LIQUEFACTION FACILITY
642 ALLENS AVENUE
PROVIDENCE, RHODE ISLAND

LIQUEFACTION WORK AREA - PROPOSED REVETMENT
AND CROSS SECTIONS

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
nationalgrid

PROJ MGR: MSK
DESIGNED BY: SMF
DATE: OCTOBER, 2016

REVIEWED BY: MJP
DRAWN BY: LDT
PROJECT NO. 33554.60

CHECKED BY: MJP
SCALE: AS NOTED
REVISION NO. 0

FIGURE
2
SHEET NO. 2 OF 2



APPENDIX A

LIMITATIONS

LIMITATIONS

1. This Rip Rap Revetment Design Memorandum report has been prepared on behalf of and for the exclusive use of National Grid (National Grid), solely for the Liquefaction Facility in Providence, Rhode Island ("Site"). This report and the findings contained herein shall not, in whole or in part, be disseminated or conveyed to any other party, nor used by any other party in whole or in part, without the prior written consent of GZA GeoEnvironmental of Providence, Rhode Island, or National Grid.
2. GZA's work was performed in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same geographical area, and GZA observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. GZA's findings and conclusions must be considered not as scientific certainties, but rather as our professional opinion concerning the significance of the limited data gathered during the course of the study. No other warranty, express or implied is made. Specifically, GZA does not and cannot represent that the Site contains no hazardous material, oil, or other latent condition beyond that observed by GZA during the work described herein.
3. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation
4. The observations described in this report were made under the conditions stated therein. The conclusions presented in the report were based upon services performed and observations made by GZA.
5. In the event that National Grid or others authorized to use this report obtain information on environmental or hazardous waste issues at the Site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this report.
6. The conclusions and recommendations contained in this report are based in part upon the data obtained from samples obtained from relatively widely spread subsurface explorations. The nature and extent of variations between these explorations may not become evident until further exploration. If variations or other latent conditions then appear evident, it will be necessary to reevaluate the conclusions and recommendations of this report.
7. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.



APPENDIX B

REFERENCES

REFERENCES

1. FEMA Flood Insurance Study (FIS) No. 44007CV001C for Providence County, Rhode Island.
2. Technical Report “National Grid LNG Facility Coastal and Hydraulic Modeling Analysis” prepared by Vanasse Hangen Brustlin, Inc. dated October 2013.
3. Section 145 – Climate Change and Sea Level Rise of The State of Rhode Island Coastal Resources Management Program, As Amended, dated February 22, 2016.
4. Coastal Engineering Manual (CEM), Part VI – Design of Coastal Project Elements, dated April 30, 2002, amended September 28, 2011.
5. Section M.10.03.2 - Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction.



APPENDIX C

WATER QAULTY VOLUME CALCULATIONS

Water Quality Volume for liquefaction plant

Redevelopment Areas (treat 50% of stormwater)	
Liquefaction plant ¹ (impervious over existing impervious)	8,219 ft ²
Total	8,219 ft ²
WQ_v	343 ft³

New Impervious Areas (treat 100% of stormwater)	
Liquefaction Plant	54,454 ft ²
Total	54,454 ft ²
WQ_v	4,538 ft³

Total WQ_v = 4,881 ft³

Sediment Forebay (25% WQ _v)	
Volume Required	1220.25 ft ³
Depth	3.25 ft
Area	376 ft ²
Inner Dimensions	11 ft x 60 ft
Outer Dimensions	12 ft x 61 ft
Volume provided	2145 ft³

Sand Filter (50% WQ _v)	
Volume Required	2,440.5 ft ³
Depths	
Ponding	0.75 ft
Topsoil/vegetation	0.5 ft
sand	1 ft
drainage	1 ft
Effective Depth	1.575 ft
Area	1,550 ft ²
Inner Dimension	49.5ft x 51 ft
Outer Dimension	54 ft x 60 ft
Volume Provided	3,976 ft³

¹ Areas provided by Kiewit on 8/01/2016



GZA GeoEnvironmental, Inc.



Proactive by Design

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION
MANAGEMENT

530 Broadway
Providence, RI 02909
T: 401.421.4140
F: 401.751.8613
www.gza.com



November 23, 2016
File No. 03.0033554.60

Mr. Grover Fugate
Executive Director
Coastal Resources Management Council
Stedman Government Center – Suite 3
4808 Tower Hill Road
Wakefield, Rhode Island 02879

Re: Response to CRMC's comments in an email dated November 3, 2016
National Grid Liquefaction Facility – Federal Consistency Review
121 Terminal Road
Providence, Rhode Island

Dear Mr. Fugate;

GZA GeoEnvironmental Inc. (GZA) is pleased to provide you with this response to comments that were submitted by your staff regarding the recent (October 31, 2016) Federal Consistency Review (FCR) application for the proposed National Grid Liquefaction Facility located at 121 Terminal Road, Providence, Rhode Island. Our response comments are intended to supplement the information already provided in the initial FCR application submittal.

To facilitate your review, CRMC's comments are presented in italics and our responses follow in plain text.

Comment 1

Section 3.2 proposes a design life of 25 years and in the very next Section 3.3 it is stated that the facility has been operated for 40 years. This call out of 25 years does not seem to match past practice and needs to be explained and why 25 years is appropriate.

Response to Comment 1

The design life of the liquefaction facility (25 years) is based on the predicted lifespan of the rotating equipment, which include the nitrogen compressor and feed gas booster compressor. Stationary equipment, such as the existing LNG tank and associated infrastructure generally have longer design lives.

Comment 2

After further review of Section 2.0 Project Description in your October 31 filing, it has been noted that a more detailed description of the liquefaction facility needs to be included in the filing. Currently Section 2.0 is quite brief on what the liquefaction facility will entail. Can you please provide some more details on the facility itself?



Response to Comment 2

The existing LNG storage facility does not have liquefaction capability and only receives LNG by truck. The stored LNG is then vaporized for redelivery to customers via pipeline, although there is the capability to redeliver to the customers' trucks. The storage facility is physically connected to the natural gas distribution system in Providence, RI. The proposed liquefaction facility will allow customers the ability to deliver natural gas for storage in vapor form as an alternative to delivering LNG to the storage tank by tanker truck. Customers would also have the ability to receive their LNG via tanker truck.

The project will consist of one new 20 million standard cubic feet per day (MMscfd) gas pretreatment and liquefaction system to convert natural gas delivered by the existing pipeline into LNG by cooling it to -260 degrees Fahrenheit where it takes liquid form. Converting natural gas to LNG reduces its volume, making it more convenient to store and transport. There are no harmful chemicals used in the liquefaction process. The only substance involved is nitrogen, a safe element that makes up approximately 80 percent of the air we breathe. The LNG will then be stored in the existing LNG tank with a connection to the existing tank fill lines associated with the existing truck unloading station. Currently the LNG tank is filled by tanker trucks through this tank fill line. Constructing the liquefaction facility will allow the existing tank to be filled without the need to truck LNG to the facility for storage.

The feed gas provided by the liquefaction customers will be transported to the project via the connection to the existing 12-inch pipeline that is located adjacent to the northern border of the site. After metering and before entering the liquefaction heat exchanger, the gas pressure will be raised by an electric driven booster compressor and the gas will be pre-treated to remove constituents that have lower freezing points than natural gas such as trace water and CO₂. The existing storage capacity will remain unchanged. There will be no change to the existing LNG storage tank and no relocation of the existing cryogenic piping or vaporization equipment.

The liquefaction system will deploy an electric motor driven, closed loop, nitrogen refrigeration cycle process to convert the natural gas into a liquefied state. The cycle was chosen due to its simplicity of operation, safety considerations, and the lack of environmental impact resulting from the use of an inert gas as the refrigerant. The design of the proposed facilities and the layout of the equipment will be within the boundaries of the existing plant property and will not require the relocation of the existing cryogenic piping, storage, or vaporization equipment.

Major Components:

- Feed Gas Metering Package
- Feed Gas Pretreatment
- Molecular Sieve Beds
- Feed Gas Booster Compressor
- Nitrogen Compressor
- Nitrogen Compenders
- Cold Box
- Hot Oil Heater
- Air Cooled Heat Exchangers
- Warm and Cold Drain Tanks



- Instrument Air Compressors with Driers
- Nitrogen Tanks and Vaporizers
- Fire Water Booster Pump
- Emergency Generator
- Variable Frequency Drive
- Motor Control Center
- Transformers
- Electrical Switchgear
- Distributed Control System

While the liquefaction process unit will be an independent operation, it will be necessary to provide some integration with the existing systems, utilities, and auxiliaries. The project will not alter or replace any of the existing LNG systems or equipment in use.

Adding the liquefaction facility will improve the stability of the LNG supply to customers during high demand winter months. LNG storage provides needed capacity in gas supply during times of peak use from heating loads of residential and commercial customers. The demand for natural gas worldwide has increased, which has led to more volatility in LNG prices. Adding liquefaction equipment to the existing LNG facility will help to stabilize these prices and costs for National Grid's customers in the New England area.

Comment 3

In Section 3.0 it states that the location was chosen to limit the piping and potential land disturbance. This does not seem to agree with the variance criteria and the need to avoid first. They need to show some alternatives and why they need to be here only if it's a matter of existing pipes. There are no alternatives detailed.

Response to Comment 3

While all structural features of the liquefaction facility itself are landward of the required 50-foot setback from the coastal feature, the stormwater outfall and portions of the slope armoring and access roadway must extend into the setback despite attempts to avoid any encroachment.

The LNG plant does not have any other open space suitable for the placement of the liquefaction facility. The location of the liquefaction facility is limited based on the property lines of the LNG plant, the location of the existing adjacent storage tank, access to the gas feed lines, and access to the take-away gas lines. The selected location on the Site for the liquefaction facility has all three of these critical, necessary requirements in the closest proximity possible. The Site is also located in close proximity to the interstate highway system. Relocating the stormwater outfall farther inland would require additional earthwork/land disturbance and would reduce the efficiency of the stormwater conveyance system.

NGLNG did consider several alternatives to the proposed project. First was a no action alternative, which would not have provided the customers of NGLNG a way to convert their natural gas vapor to LNG. While alternative sources were reviewed, no unsubscribed capacity of liquefaction services are available within New England currently. NGLNG considered using a mixed refrigerant cooling system and turbines as prime movers for the rotating equipment, and



both would have increased the efficiency of the process but required a larger footprint of the liquefaction plant and resulted in increased air emissions. NGLNG also considered transporting high pressure gas from the Manchester Street Gate station, approximately 1.2 miles to the north of the liquefier project, to increase efficiency of the plant and alleviate the need for a pressure boosting compressor. However, this additional construction within the public right of way would have significantly impacted the adjacent communities.

We trust this response summary adequately addresses CRMC's comments. If you need any additional information, please feel free to contact Igor at (401) 421-4140 or by email at igor.runge@gza.com.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

A handwritten signature in blue ink, appearing to read 'S. Haupt'.

Sara Haupt
Project Engineer

A handwritten signature in blue ink, appearing to read 'Igor Runge'.

Igor Runge, Ph.D., P.H.
Consultant/Reviewer

A handwritten signature in blue ink, appearing to read 'M. Kilpatrick'.

Margaret S. Kilpatrick, P.E.
Associate Principal

Cc: William Howard, National Grid

J:\ENV\33554.60.msk\Work\CRMC permitting\33554.60 Response to Comments Letter.docx