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MEMORANDUM

Date: May 4, 2012
To: Council Members
From: Grover J. Fugate, Executive Director
Subject: Matunuck Erosion Solution Recommendations

As has been noted, the Matunuck Erosion issue is the proverbial tip of the iceberg. The Rhode Island shoreline is facing significant erosion issues and more needs to be done in analyzing, communicating the issues, and proposing management measures to deal with this growing dilemma. For example, the Council has had to issue an Assent for a Special Exception toe repair activity for Corn Neck Road on Block Island, but this entire strip of road still remains threatened. If the road breaks through, it will segment the island.

Preliminarily therefore, I would recommend a four-pronged approach to deal with the issues at Matunuck and further take a much more comprehensive look at this issue statewide.

- (1) As a stop gap approach to shore-up the road at Matunuck, allow the town to install the 200 foot segment of sheet pile. Even if the town were to agree on some of the alternatives suggested at the hearings and in the staff reports, there is an implementation lag of 18-36 months. The road is already in a compromised state and one good coastal storm could significantly damage it. This road is the sole access to 250 homes and the water supply for 1600 homes which feeds the fire suppression system for these 1600 homes. There is clearly a public health and safety purpose to protecting, in the short term, this limited section of road until a more comprehensive look is taken and other alternatives seriously explored.
- (2) Designate the area that the town requested becomes reclassified as a "manmade shoreline" between the two revetments as an experimental area, as well as a segment in the Atlantic Avenue area in Westerly. A separate Salt Pond SAMP amendment would be necessary to do this with attendant regulations outlining what would be allowed as experimental with monitoring guidelines and bonding for removal. This, however, would allow us to try some techniques such as geo-mattresses that slow or abate the erosion but do not have as damaging impacts as full-out sea walls. The council staff has monitored a number of these systems throughout the world and is familiar with many of the suggested techniques the property owners are putting forth. Unfortunately, in reflective headlands with this wave climate and little sediment load for collection most of these will not work. This does not

mean, however, that there aren't systems worth trying, such as geo-mattresses. The second area is suggested in Westerly because it represents another area that is problematic but has characteristic beach faces with lower profiles and may need different solutions.

- (3) To perform the analysis and work on a strategy that will address our entire shoreline will require a SAMP approach much like the Ocean SAMP. We will need to have all the stakeholders participating as well as an aggressive public education component as part of this. I am suggesting a phased approach where we first deal with the south shore of Rhode Island and Block Island and then move on to the rest of the state. The SAMP will need the scientific resources of URI, the various municipal governments' commitment and backing, as well as the participation of NGO's, trade groups, and the public. I have had URI, CRC/Sea Grant prepare a budget, (see proposal) to assist the Council in this endeavor.
- (4) Enforcement needs to be followed up in the Matunuck area once the experimental designation goes in place. Without proper enforcement, we risk public health and safety issues emanating from improperly designed and placed structures.

This approach addresses the alternatives analysis as well as the majority of concerns expressed at the last meeting regarding our current course of action. I am open to the Town, Save the Bay, CLF and the property owners' suggestions, but this is what I see as a preliminary course of action.

EROSION AND INUNDATION SPECIAL AREA MANAGEMENT PLAN FOR THE RHODE ISLAND SHORELINE

Scope of Work

Aug 1, 2012 – July 30, 2015

Year 1: total cost - \$497,112

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Introduction

The objective of the Erosion and Inundation Special Area Management Plan (SAMP) is to understand how coastal processes, specifically frontal erosion and inundation by storm surge and sea level rise, affect the shoreline and adjacent areas for the entire state of Rhode Island. These processes, coupled with a 'line in the sand' mentality induced by the presence of infrastructure and properties along the coast, present unique and challenging management problems in the near future. With continued (perhaps increased) storminess and the potential for accelerated sea level rise, planning needs to begin now to address future impacts to public and private properties, infrastructure and public access along the shoreline.

The SAMP process, using the best available science and stakeholder involvement will provide a holistic approach to evaluating future planning and development of the Rhode Island shoreline. Both organizations involved in this proposal have a history of working on improving the science of the shoreline and coastal management in Rhode Island. The Coastal Resource Center (CRC) at the University of Rhode Island assisted the RI CRMC with the creation of the Salt Pond SAMP over 20 years ago, and CRC has continued to work with communities on coastal issues in the interim. The principal investigators from the Department of Geosciences assisted in the creation of the original CRMC regulations (aka the 'Red Book') and Salt Pond SAMP (Boothroyd) and more recently the Greenwich Bay and Ocean SAMP's (Oakley and Boothroyd). Both investigators have extensive experience mapping the Rhode Island shoreface and measuring coastal change at a variety of spatial and temporal scales.

Areas of critical concern, where public and private properties and infrastructure are at risk, based on historic shoreline change rates and inundation models created using 2011 LiDAR digital elevation models will be identified. The role of shoreface depositional platform will be examined in concert with observed shoreline change, to better understand the available sediment budget along the shoreline.

This project will consist of three phases, beginning with the Rhode Island South Shore (Napatree Point to Point Judith and Block Island) in year 1. Phase 2 will focus on the east facing shoreline of Narragansett and south facing shorelines of Aquidneck Island and Little Compton. Phase 3 will focus on areas of Narragansett Bay, where the elevation and materials comprising the shoreline cause them to be susceptible to frontal erosion and inundation. Each phase will consist of both a technical and a public outreach component. This proposal presents objectives, deliverables and a budget for Phase 1 (August 1, 2012 – July 31, 2013) of this effort.

Department of Geosciences tasks

1. Identify of areas of critical concern along the Rhode Island shoreline (Including Block Island):

Areas of critical concern are those with existing infrastructure, state/town/private properties and public access that are: susceptible to frontal erosion based on historic rates of shoreline change (updated to include 2011 RIDEM digital orthophotographs). Critical areas are also those inundated by both sea-level rise projected to 2050 (1.5 ft) and 2100 (5 ft) (Figure 1) and areas inundated by storm surge from a significant hurricane (3.1 m above MHHW).

2. Establish the link between the shoreface and shoreline change:

This task will involve high-resolution side-scan sonar mapping (coupled with surface sediment sampling and underwater-video imagery) of the shoreface, focusing on areas of critical concern. Mapping will cover from the intertidal beach out to at least the offshore extent of the depositional platform (or more ideally to a water depth of 12 m) following the protocol used in previous surveys of estuarine and shoreface environments (Boothroyd and Oakley, 2006, 2009; Oakley et al., 2012).

3. Develop and begin monitoring of areas of critical concern:

Sites will be established, and protocol will be developed and tested to monitor the impact of storms on areas of critical concern. Possible techniques used will include:

- a. Establish beach profiles in selected areas to complement existing beach profiles collected by the Department of Geosciences and Graduate School of Oceanography at the University of Rhode Island. Profiles would be obtained using the modified emery method (Emery, 1961), coupled with RTK-GPS.
- b. Low-cost "On-demand" aerial photography can be explored as well (Griffith and Young, 2012). Monitoring would continue and expand in phases two and three.
- c. Collection and analysis of additional shorelines (wet-dry lines) using RTK-GPS.

Coastal Resource Center tasks

1. *Public and stakeholder engagement:* CRC will foster and engage a well-informed and well-represented constituency that understands the South Shore erosion and inundation issues and is involved in the creation of the South Shore SAMP.

- d. Identify and prioritize stakeholder and client issues.
 - i. Organize at least three events (e.g. Block Island, Little Compton, and Charlestown) to present the existing conditions, explain the need for the SAMP, and identify the public's issues and concerns.
 - ii. Meet individually with key stakeholders to both identify issues of concern and opportunity, and determine their preferred mechanisms for involvement. Key stakeholders to be involved are likely to include federal and state government agencies, municipalities, local environmental organizations, historical societies, and chambers of commerce. These issues and level of understanding of the issue will serve as one of the foundations for the outreach strategy.
- e. Develop a communication strategy that responds to the needs and issues of the stakeholders.
 - i. Based on feedback from stakeholders, establish vehicles for stakeholders to engage. It is likely that periodic stakeholder meetings, library lecture series, site visits with stakeholders to key shore sites, and presentations at local civic events will take place to share existing research as well as encourage discussion of some of the priority issues. Communication/outreach products including a fact sheet and web page will be developed. The Rhode Island Sea Grant College Program will use its existing communication products, including 41 Degrees North Magazine, list serves, and Project Note Cards to communicate information and events about this project.
 - ii. Develop a legal analysis on related south shore issues, including an inventory and analysis of existing statutes and regulations. In coordination with project team, identify legal and policy challenges and develop recommendations to resolve these challenges. Core team will engage the Rhode Island Sea Grant Law Program located at Roger Williams University to complete this task.
 - iii. At the end of year one, organize a public event that presents the research developed to date, summarize the legal findings, and identify additional research needs and next steps for the SAMP.

Expected Deliverables

URI Geosciences

Phase 1: August 2012-July 2013 - Napatree Point to Point Judith and Block Island

1. Updated shoreline change maps for Rhode Island shoreline (Including Block Island) using 2011 RIDEM orthophotographs.
2. Identify areas of critical concern (susceptible to frontal erosion and inundation) for the Rhode Island south shore.
3. Establish sites and test a monitoring protocol for areas of critical concern. Begin monitoring selected areas, particularly before and after storm events.
4. Begin shoreface mapping of areas of critical concern interest to RI CRMC Staff (i.e. Matunuck, Misquamicut).

Phase 2: August 2013-July 2014 – East facing shoreline of Narragansett, south facing shoreline of Aquidneck Island and Little Compton

1. Complete depositional environment maps of Rhode Island south shore offshore of Phase 1 areas of critical concern (Figure 2). Work on establishing the link between shoreline change, the width of the depositional platform and location of cross-shore swaths.
2. Identify areas of critical concern (susceptible to frontal erosion and inundation) along the east facing shoreline of Narragansett, south facing shoreline of Aquidneck Island and Little Compton and begin shoreface mapping in Phase 2 region.
3. Establish monitoring sites for areas of critical concern in phase 2 region
4. Continue monitoring areas of critical concern identified in phase 1.

Phase 3: August 2014-July 2015: Selected areas of Narragansett Bay

1. Complete depositional environment maps of mapped portions of the phase 2 areas of critical concern. Work on establishing the link between shoreline change, the width of the depositional platform and location of cross-shore swaths.
2. Identify areas of critical concern and begin shoreface mapping of areas identified as phase three (Areas of Narragansett Bay susceptible to erosion and inundation).
3. Establish monitoring sites for areas of critical concern in phase 2 region
4. Continue monitoring areas of critical concern identified in phases 1 and 2.

Phase 4: August 2015 - ????: Continued monitoring of areas of critical concern and wrap up shoreface mapping in Narragansett Bay

URI/CRC Deliverables (July 2012 – June 2013):

Phase 1 Deliverables:

1. Document that summarizes stakeholder issues
2. Summary Reports from the 3 workshops and other stakeholder meetings.
3. Communication products including but not limited to project web site and fact sheet
4. Legal analysis for Erosion and Inundation SAMP
5. Summary report from final event

Phase 2 and 3 Deliverables:

1. Continued outreach efforts
2. Development of Chapters as determined by CRMC

URI Geosciences Year 1 Budget

Salary/Fringe: \$132,836 will cover Oakley as a full-time research assistant professor (calendar year) in the Dept. of Geosciences/Rhode Island Geological Survey and allow Boothroyd part-time salary, as well hiring graduate or undergraduate students as summer and part-time field and lab assistants.

Equipment/Operating costs by task

Identification of areas of critical concern:

1. Desktop computer designated for use on shoreline change and inundation models, various storage media, paper/ink for large format plotters (\$4,500)

Shoreface mapping

1. Digital side-scan sonar (Klein 3900, 445 / 900 kHz dual frequency system) (Side-scan system to be used to assist RI CRMC on other projects). (\$50,000)
2. New outboard engine/overhaul of the Geosciences owned 24ft r/v G.K. Gilbert (\$25,000)
3. Desktop computer designated for processing side-scan sonar data and creating interpretive maps, software maintenance agreements and hardware maintenance (\$7,000)
4. Field costs (Fuel, boat and equipment overhead, maintenance etc.) (\$2,000)

Monitoring protocol

1. Real-time kinematic (RTK) GPS (\$50,000)
2. Field supplies for beach profile monitoring (Dry suits, field equipment, travel, etc.) (\$4,000)

Indirect costs (Overhead (25%) \$37,584

URI Geosciences total cost for year 1: \$312,920

Total costs for years 2 and 3 are *estimates*, and are subject to change based on initial results of phase 1.

(Estimates of years 2 and 3 includes salary, overhead and field operating costs)

URI Geosciences total cost for Phase 2 (Year 2): \$195,000

URI Geosciences total cost for Phase 3 (Year 3): \$195,000

URI CRC Year 1 Budget

Salary/Fringe: \$132,661 will cover J. McCann (Program Manager), P. Rubinoff (Technical), T. Crean (Community Planner/Outreach Coordinator), C. Damon (GIS), and S. Kennedy (Communications) to complete described tasks. In addition, this will cover the involvement of the Roger Williams University Law Program to assist with the legal analysis.

Operating

Travel: travel to stakeholder meetings in Rhode Island (\$2,500).

Web designer: project web page development (\$5,000).

Materials and Outreach Products: production of fact sheets, printing of large maps, and other materials for meetings (\$7,193).

Indirect costs (Overhead (25%): \$36,838

CRC total cost for year 1: \$184,192

Total costs for years 2 and 3 are *estimates*, and are subject to change based on initial results of phase 1.

URI CRC total cost for Phase 2 (Year 2): \$185,000

URI CRC total cost for Phase 3 (Year 3): \$185,000

(Estimates of years 2 and 3 includes salary, overhead and outreach products and activities)

Year 1: Total budget = \$497,112

References

- Boothroyd, J.C., and Oakley, B.A., 2006, Benthic geologic habitats of the Green Hill - Matunuck shoreface, Rhode Island, Technical report to the U.S. Army Corps of Engineers. includes 1:5,000 scale maps and accompanying figures.
- , 2009, Benthic geologic habitats of the Watch Hill - Misquamicut shoreface, Rhode Island, Technical report to the U.S. Army Corps of Engineers. includes 1:10,000 scale maps and accompanying figures.
- Emery, K.O., 1961, A simple method of measuring beach profiles: *Limnology and Oceanography*, v. 6, p. 90-93.
- Griffith, A., and Young, R., 2012, Observations of coastal systems using low-cost, high-resolution, balloon and kite-based aerial imagery: *Geophysical Research Abstracts* EGU General Assembly 2012, Volume 14: Vienna, Austria.
- Oakley, B.A., Alvarez, J.D., and Boothroyd, J.C., 2012, Benthic geologic habitats of shallow estuarine environments: Greenwich Bay and Wickford Harbor, Narragansett Bay, Rhode Island, USA: *Journal of Coastal Research*, v. In press.



Figure 1: Projected inundation of the Ninigret-Green Hill Lagoons and adjacent areas at mean higher high water with 5 feet of sea level rise and 200 feet of migration of the East Beach and Charlestown-Green Hill barriers. Roads (RI-E-911, 2012) with at least some portion inundated are shown in red.



Figure 2. Benthic geologic habitats: Watch Hill - Misquamicut shoreface. Modified from Boothroyd and Oakley, (2009)