Wetlands and Coastal Dune Board

Continuation Meeting Agenda

August 25, 2016

Cape Charles Civic Center – 500 Tazewell Avenue

6:00 P.M.

1. **Call to Order; Roll Call**

2. **JPA 16-0860 3 Bay Vistas Way – 184 linear feet of revetment stone and beach access steps**
    - **Overview of application**
    - **Applicant's presentation**
    - **Public comments**
    - **Board discussion\deliberation**
    - **Decision**

3. **Adjourn**

Wetlands and Dune Board Staff Report

From: Larry DiRe

Date: August 25, 2016

Item: 2A- JPA 16-0860 3 Bay Vistas Way

Attachments: August 16th VIMS report

Background

The Cape Charles Wetlands and Dune Board held a public hearing and meeting on July 25, 2016 to consider an application to install a riprap revetment stone structure, and beach access steps. The revetment structure is proposed to be 184 linear feet of Class 1+ stone. The Board began discussion of the application. During that discussion questions arose which could not be answered by the materials submitted by the Virginia Institute for Marine Science (VIMS). A supplemental VIMS report was requested, and so the Board moved to continue the meeting until a time after the VIMS report was submitted. The report states *"For typical Bay wave conditions and low- to mid- level storm events we foresee the combination of WADs and beach nourishment working effectively to control shoreline erosion. The continuing and significant erosion along the Calder shoreline is evidence that the WAD units and beach nourishment are not providing sufficient erosion control during larger storm events."* (page 2). That report, dated August 16th, is attached to this staff report.

Item Specifics

According to the supplemental VIMS report the applicant's request for stone revetment is reasonable alternative to additional beach nourishment for several reasons including:

- There are no coastal primary dunes on the applicant's property.
- Revetment would have minimal impact on shoreline natural processes.
- In their current configuration the WAD units not expected to trap sand that may move sand offshore or along the shoreline.
- Structures north and south of the applicant's property will continue to alter longshore sand transport.

The report concludes with a series of recommended modifications to the proposed revetment project, and presents suggestions to modify the existing wave attenuation devices (WAD) units that "would increase their effectiveness against storm events."

Recommendation

Review the application materials, photos and public comment received for the July 27th public hearing and Board meeting, and the August 16th VIMS report. After discussion, determine whether issuance of the permit would be appropriate. It should be noted that approval by this Board is valid only for the local Wetlands Board, and authorization from all other necessary agencies is required prior to any work being done.

August 16, 2016

Mr. Hank Badger
Environmental Engineer, Sr.
Habitat Management Division
Virginia Marine Resources Commission
2600 Washington Avenue
Newport News, VA 23607

Dear Mr. Badger:

The Virginia Institute of Marine Science has completed the requested assessment of a proposed riprap revetment along a sandy Bay shoreline within the Town of Cape Charles (John Calder, VMRC #16-0860). Personnel from the Office of Research and Advisory Services and the Department of Physical Sciences Shoreline Studies Program contributed to this review. Our assessment involved a site visit, review of past shoreline stabilization projects at the Calder property and along this shoreline reach, analyses of natural and man-influenced historical shoreline dynamics, and analyses of appropriate alternative approaches to current and future shoreline stabilization.

The Calder property is located in a geological transition zone. Coastal primary sand dunes are located along the northern section of this shoreline, with a transition to sandy clay-based uplands at, and near, the Calder shoreline. The Calder shoreline was sprigged with American beachgrass (*Ammophila breviligulata*) after sand nourishment, which created a vegetated berm channelward of the upland scarp that functioned to control shoreline erosion (in conjunction with the offshore sill) that resulted mostly from storm waves and high water events. This feature was compromised by recent storms that contributed high amounts of wave energy and/or tidal inundation to Bay shorelines (these include three hurricanes (Irene of 2011, Sandy of 2012, and Joaquin of 2015), two tropical storms (Lee of 2011 and Andrea of 2013), and six other events of significant high waves and surge). A portion of the original American beachgrass plantings remain along the upland scarp, but appear stressed and are likely not contributing significantly to shoreline stabilization. The optimum environment for American beachgrass is semi-consolidated sand and therefore the sandy clay substrate under the thin layer of sand fill upon the scarp may be inhibiting growth and spreading.

The current local shoreline situation includes nourished breakwater fields north and south of the Calder property, an adjacent riprap revetment and concrete block bulkhead, and a sill constructed of WAD (Wave Attenuation Devices) units directly channelward of the Calder shoreline. These structures have influenced the shoreline and nearshore dynamics of this entire reach. Prior to the placement of most of these structures the Calder shoreline was consistently stable, containing small marsh headlands (similar to other sections of the shoreline north of the Calders) and a generally stable upland margin until at least late 2008. The eleven storms since then have contributed to the erosion of the upland scarp and (based on nearshore surveys) has deflated the shoreline and depleted the nearshore sand supply.

We understand that the WAD units were placed in their permitted location and configuration a few weeks prior to hurricane Sandy. Therefore, these offshore structures were in-place for six of the eleven storm events of significance since 2008. Hurricane Joaquin and winter storm Jonas were the only two storm events that occurred post-beach nourishment. Evidence provided by the applicant and the agent shows significant upland erosion occurring post-construction of the WAD units and also after the beach was nourished.

For typical Bay wave conditions and low- to mid- level storm events we foresee the combination of WADs and beach nourishment working effectively to control shoreline erosion. The continuing and significant erosion along the Calder shoreline is evidence that the WAD units and beach nourishment are not providing sufficient erosion control during larger storm events. Although it is not reasonable to expect any residential-level erosion control approach situated on the Chesapeake Bay mainstem to fully abate all levels of marine storm energy without consequence, a large proportion of the limitations of the current approach can be attributed to the low elevation of the WAD units coupled with their distance offshore. The ability for a substrate (sand, concrete, rock) to attenuate wave energy is primarily based on the elevation of the substrate in relation to the height of the storm tide and also the width of the substrate at the effective height. Most of the recent storm events that have affected this shoreline reach produced tide levels between five and seven feet above mean lower low water, significantly higher than the mean tidal range for Cape Charles of approximately two feet.

Based on the current shoreline situation and recent events, a revetment is a reasonable alternative to additional beach nourishment. Since there are no coastal primary dunes on the Calder property, a revetment would have minimal impact to natural shoreline processes. We do not expect the WADs (in their current configuration) to effectively trap sand that may move onshore or along the shoreline. Additionally, the structures north and south of the Calder property will continue to alter longshore sand transport to the degree that they greatly limit or exhaust any significant natural sand supply to the area landward of the WADs.

The current lack of beach sand due to losses of the nourishment material resulting from storm events is problematic even if a revetment is constructed due to the proposed design of the riprap toe. Cross-section plans show the tow above the elevation of mean high water, which creates a situation promoting the likelihood of toe scour and revetment failure during high water and wave events. If a revetment is deemed appropriate, we recommend the following modifications for consideration to improve function and reduce potential environmental impacts:

(1) The stability of the revetment would be enhanced by significantly increasing the depth of the toe. It is common to place the toe below the mean low water elevation. If a clay substrate is located above mean low water, the toe can be situated a reasonable depth below the clay surface. For this shoreline situation, with a four- to five- foot scarp, a depth of at least one foot into a clay layer is recommended.

(2) The revetment is proposed to be constructed of Class I stone at a 1.5:1 slope. For open Bay exposures we recommend either using Class II stone at the proposed slope and/or increasing the slope to 2:1.

(3) To reduce the loss of beach habitat we recommend placing the toe of the revetment landward of the beach.

(4) Each of the above recommendations will result in a further encroachment into and upon the upland scarp and thus the planted American beachgrass community. However, since this community appears to be contributing little to the stability of the scarp we do not consider impacts to this area to be detrimental from a marine environmental perspective.

(5) The northeast end of the proposed revetment, which adjoin a neighboring property, may create conditions during high water and wave events that affect the stability of the neighboring shoreline adjacent to the revetment. The likely effects to the adjacent shoreline cannot be reasonably anticipated and are heavily dependent upon the nature of the storm event(s). There are limited remedial design and construction approaches, beyond those proposed, that can address the potential effects that a hardened shoreline may have on an adjacent natural shoreline.

Alternatively, the applicant's may wish to consider modifications to the WAD units that would increase their effectiveness against storm events. Shoreline protection would be enhanced by moving the WAD sills closer to the shoreline, reworking them into shorter features of higher elevation, and placing enough sand of appropriate grain size landward of the structures so that they (1) have the robust elevation necessary to absorb storm waves and (2) form a functional connection with the beach and upland.

Please contact me if you have questions or require additional information.

Sincerely,

Lyle Varnell
Associate Director for Advisory Services