

51 Harborview NOI Review Summary

Conservation Commission Meeting

1/30/2024



Outline:











Coastal Bank Serving as a Sediment Source and a Vertical Buffer

Coastal Bank Serving as a Vertical Buffer



Photograph 2.14. Coastal bank serving as a sediment source and a vertical buffer. This eroding coastal bank acts as a sediment source to the adjacent beach. This bank also functions as a vertical buffer due to its significant height.



Photograph 2.15. Coastal bank serving as a vertical buffer. This rocky coastal bank and seawall act as a vertical buffer to protect inland areas. The base flood elevation is below the top of the coastal bank (top of wall) and erosion of materials above the wall (or rocky bank) has not occurred. This bank therefore does not serve as a sediment source due to its inability to erode by wave action and does function as a vertical buffer withstanding erosion from waves, wind, and rain.

CZM Coastal Manual

FEMA's National Flood Hazard Layer (NFHL) Viewer

with Web AppBuilder for ArcGIS



MassGIS Aerial Imagery



https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html













Timeline







20+00 20+25 20+50 20+75 20+75	21+56 21+56 21+75 22+00	22+25	PRELIMINARY
S	and the part	Harborview Rd. Shoreline Hull, MA	DWG. NO. P-01
			SHEET NO. 01 of 02
		GEI 2019 Drawing P-0	1 (figure w/ nearmap)



Figures 1 & 2 – Extensive erosion of the coastal bank located seaward of the existing dwelling (left) has put adjacent residential infrastructure at risk (right). Woods Hole Group, November 2019

Timeline















Figure 8: Schematic Profile of Existing Conditions (as of June 2023)

Existing Enforcement Orders (EO)

i) MassDEP WPA Form 9 dated September 16, 2014: the as-built deck encroaches onto the existing coastal bank and is in violation of the approved plans; existing coastal bank vegetation was removed due to construction; a (stormwater) drain was causing erosion of the coastal bank.

The issues listed in this EO were partially addressed by the property owner. no change was made to the constructed deck (i.e., inconsistent with the approved plans).

i) MassDEP WPA Form 9 dated May 17, 2022 (amended October 2023): the November 2019 OOC was not followed; pre-construction meeting with the town was not held; geotechnical analysis report(s) were not provided for review; removal of 10 feet of patio on top of the coastal bank was not performed.

During the fall of 2023, the owner took interim mitigating measures over the existing patio/deck area to reduce stormwater infiltration and runoff onto the coastal bank.

DEP File #: SE35-1516 (Order of Conditions)

HULL Special Conditions

Pursuant to the Authority of the Massachusetts Wetland Protection M.G.L. c. 131, §40, the Hull Conservation Commission has reviewed your Notice of Intent and plans, and has determined that the area which is the subject of the permit application is significant to the interests of the Act. The said Commission has determined that your application is approved. The approved work consists of: **coastal bank stabilization consisting of installation of coastal bank retention system and native coastal bank plantings**. The work shall be in accordance to the work shown on the plan and as described during the public hearing. The homeowner is responsible for ensuring the below Plan/s of Record are followed. If any further work or changes are proposed, they must be approved by the Conservation Commission.

Special Conditions for SE35-1516 if any:

- Top of bank (TOB) will be graded so that it gently slopes towards two drywells (approximately 15 ft landward from the TOB) as indicated on Plan (1). The drywells shall be maintained in good working order in perpetuity. This condition is ongoing and will not expire at the end of three years.
- 2) Patio is to be partially removed so that it resides no closer than 12 ft from the TOB
- 3) 3/4 inch nylon to be used instead of tie rods in the construction of the soil support structure
- The bank stabilization following the prescription in (3) is permitted to include the whole coastal bank contained within the property boundaries.



MassDEP WPA Form 3 – Notice of Intent

For the major portion of the eroded slope that requires stabilization, CEC is proposing to utilize a soil nailing technique that has been used extensively throughout the country for problematic soil conditions. Soil nails are reinforcing elements that are drilled and grouted at approximate 10 to 15 degree angles in the ground to support the unstable slope. For this site, construction of soil nails would contribute to the global stability of the existing slope and would be designed to achieve a permanent factor of safety of at least 1.5. The 1.5 factor of safety is the minimum factor of safety for permanent slope conditions as recommended by the Federal Highway Administration and is commonly used in engineering practice for slope stability projects.

For most projects of this type, soil nails are constructed in 5 foot vertical lifts. For this project, the soil nails would be installed directly into the exposed slope below the soldier piles and timber wall. The soil nail elements and construction sequence are as follows:

- 1. Drilling of nail holes: The holes are advanced with specialized drilling equipment which are generally the size of a small excavator;
- Nail installation: The steel tendon is placed into the drill hole. It is anticipated that a selfdrilled tendon will be used for this project which simplifies the process by combining steps 1, 2, and 3 of this outline into a single step;
- Grout Placement: Grout is placed by gravity or low pressure into the drill hole and around the steel tendon. As noted above, the grout will be added directly through the hollow tendon self-drilled tendon we anticipate utilizing;
- 4. Strip Drain: A strip drain is placed between the soil nails to relieve the final wall of hydrostatic pressure that may develop;
- 5. Initial shotcrete facing: Welded wire fabric is installed across the soil face and the first shotcrete facing is applied to the soil surface. Horizontal and vertical rebar is placed around the nail heads, and, as the shotcrete begins to cure, a steel bearing plate is placed over the protruding tendon. Hex nuts and washers are installed on the tendons to secure the plates. At this stage, some of the soil nails are proof-tested with a hydraulic jack to verify their capacity;
- Final Facing: After the nails have been installed and tested, the final concrete facing is placed.

12.1.22 Date



Option 1 using Gabion Baskets



Option 2 using Riprap with No Gabion Baskets



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Selected bullet items per GZA's review (for further discussion / evaluation) (red – concern):

- Two different slope repair options : 1) with gabion baskets (within property bounds); and 2) with riprap and no gabion baskets;
- Elimination of the deck loads from the first (northern most) row of deck columns;
- Groundwater effects were evaluated per CEC's sensitivity analysis. The assumed groundwater table intersected with the slope failure plane in the back analysis. The groundwater table did not intersect with the failure block in the soil nail wall design analysis;
- Back analysis of the adjacent slope to the west (49 Harborview) indicates that the natural slopes are marginally stable with a factor of safety of 1.17 (i.e., calculated factor of safety values greater than 1.0 but not significantly higher);
- The proposed wall is able to achieve a factor of safety of 1.67 for a rotational type of slope failure, along the selected representative section;
- The gabion basket section did not meet the minimum factor of safety requirements (1.5) in all directions. The design did not provide details;
- The proposed project does not restore the site to the pre-2019 conditions including the granite block wall at the toe;
- The proposed design should incorporate a method to limit seepage migrating to the proposed wall within the previously installed anchor trenches below the patio and capture runoff from the patio area and divert away from the new wall;
- Perched groundwater table (i.e., wetting front) due to heavy rain infiltration below the patio area as a sensitivity check; and
- Specify service life of the soil nail wall in the design package.





Mechanism of rainfall-induced slope failure (after Rahardjo et al., 2007) |...

Bigger-picture Issues

• Constructability;



https://www.geotech.net.au/capabilities/basement-construction/soil-nail-walls.html



Image: GeoDrilling International



Image: Subsurface Construction





Image: Subsurface Construction

Bigger-picture Issues

- Constructability;
- Long-term effects
 - Abutters
 - Force Main
 - Overall stability
 - Coastal ecology





Bigger-picture Issues

- Constructability;
- Long-term effects
- Regulatory compliance (WPA performance standards)
 - ...
 - The applicant demonstrates that no method of protecting the building other than the proposed coastal engineering structure is feasible (310CMR 10.30(3));
 - Any project on a coastal bank or within 100 feet landward of the top of a coastal bank, other than a structure permitted by 310 CMR 10.30(3), shall not have an adverse effect due to wave action on the movement of sediment from the coastal bank to coastal beaches or land subject to tidal action (310 CMR 10.30(4)).
 - Any project on such a coastal bank or within 100 feet landward of the top of such coastal bank shall have <u>no adverse effects</u> on the stability of the coastal bank (310 CMR 10.30(6)).

Coastal Bank (with Riprap) Serving as a Sediment Source and a Vertical Buffer

