

## Application for Section 401 Water Quality Certification

Project: Shoreline Improvements at 33850 Lake Road, Avon Lake, Ohio  
Applicant: Richard Hausrod & Brooke Hohn  
Site Address: 33850 Lake Road, Avon Lake, Ohio 44012  
KS Project No: 14156

### Item 5

#### Proposed Project Antidegradation Analysis

##### 1. Project Description

- a. Preferred Design Alternative: The proposed project includes the construction of 70 linear feet of new armor stone revetment and an 80-foot long by 10-foot wide steel crib pier connected to shore with a 20-foot long by 10-foot wide steel crib pier and two 25-foot long open span steel bridges. The armor stone revetment is to be constructed with 2 to 4-ton armor stone at a 1.5 horizontal to 1 vertical slope to a crest elevation of 582.0 feet IGLD 1985. The toe of the structure will be supported with 3 to 5-ton armor stone at a minimum elevation of 566.9 feet IGLD 1985. The steel cribs will be anchored with W6x25 steel piles driven through 8-inch x 8-inch by 5/16-inch thick steel square tubes a minimum of 1-foot into shale bedrock. The cribs will be framed with 6-inch by 6-inch by 5/16-inch thick steel tubes and C8x11.5 cribbing. The cribs will be filled with ODOT Type "B" stone and capped with a 12" thick concrete slab reinforced with #5 bars at 12 inches on center in both directions. The steel bridges will be constructed with W8x35 steel beams at 21 inches on center and will be decked with 1 inch thick steel grating. The bridges will be sloped at 7.7 horizontal to 1 vertical to reduce the elevation from 582.0 at the revetment crest to 579.25 at the landward crib to 576.0 at the lakeward crib. The revetment crest will be capped with a new 12-inch thick concrete slab reinforced with #5 bars at 12 inches on center in both directions and supported by new W8x35 piles driven a minimum of 1-foot into shale bedrock. A 12-foot wide by 15-foot deep boat house will also be constructed landward of the concrete cap on the new armor stone revetment. The project also includes the placement of 140 cubic yards of sand as pre-fill.

This alternative meets the design objectives by providing a stable structure to access the waters of Lake Erie as well as providing erosion protection in the area of the structure. The armor stone revetment will provide protection to the eroding shale bluff in the area proposed access to the crib pier. The revetment will also dissipate wave energy (rather than reflecting it) in the area where boats will be launched, berthed and docked along the pier. This will increase the overall safety of the pier for lake access.

The dimensions of the steel crib pier were also selected to provide adequate options for transient dockage in a variety of wind and wave conditions. The proposed pier is similar in sizes and shape to the existing T-shaped pier at 33826 and 33834 Lake Road, although the proposed pier and revetment will cover a smaller footprint and require less fill than the existing structures located about 200 feet east of the project site. The proposed structures also have the advantages of significantly greater space along the open span bridges to allow the sediment transport and will be constructed with cribbing and armor stone that reduces wave reflection in the nearshore (rather than the concrete blocks used to construct the structures at 33826 and 33834 Lake Road).

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Fill Materials: 432.0 cubic yards below Ordinary High Water including 149.6 cubic yards of armor stone (limestone), 75.0 cubic yards of concrete rubble and 207.4 cubic yards of ODOT Type "B" stone for crib fill. The project also includes the placement of 140 cubic yards of sand as pre-fill.

- b. Minimum Degradation Alternative: The proposed project includes the construction of approximately 70 linear feet of new armor stone revetment and an L-shaped steel crib pier. The proposed pier consists of a 33.5-foot long by 10-foot wide shore perpendicular section and a 47-foot long by 10-foot wide shore-parallel section. The pier will be connected to shore with a 40-foot long by 10-foot wide steel bridge framed with W8x35 steel beams at spaced at 21-inches on center covered with 1-inch thick steel grating. The cribs will be anchored with W6x25 steel piles driven through 8-inch x 8-inch by 5/16-inch thick steel square tubes a minimum of 1-foot into shale bedrock. The cribs will be framed with 6-inch by 6-inch by 5/16-inch thick steel tubes and C8x11.5 cribbing. The crib will be filled with ODOT Type "B" stone and capped with a 12-inch thick concrete slab reinforced with #5 bars at 12 inches on center in both directions at an elevation of 576.0 feet IGLD 1985. The armor stone revetment is to be constructed with 2 to 4-ton armor stone at a 1.5 horizontal to 1 vertical slope to a crest elevation of 582.0 feet IGLD 1986. The toe of the structure will be supported with 3 to 5-ton armor stone at a minimum elevation of 566.9 feet IGLD 1985. The revetment crest will be capped with a new 12-inch thick concrete slab reinforced with #5 bars at 12 inches on center in both directions and supported by new W8x35 piles driven a minimum of 1-foot into shale bedrock. A 12-foot wide by 15-foot deep boat house will also be constructed landward of the concrete cap on the new armor stone revetment. The project also includes the placement of 140 cubic yards of sand as pre-fill.

This alternative meets the design objectives by providing protection to the eroding shale bluff in the area of the proposed steel access stairs and providing safe access to the waters of Lake Erie with a stable steel crib pier. The armor stone revetment is similar to the structure proposed in the preferred alternative because it is the minimum structure required to protect the bluff in the area of the proposed project from wave based erosion. The revetment does not span the entire width of the property and will only be constructed in the area where it is required. The 1.5 horizontal to 1 vertical slope of the revetment is also the minimum customarily allowed based on structural stability.

The dimensions of the steel crib pier proposed in the minimal degradation alternative are also considerably smaller than the pier proposed in the preferred alternative. The eastern extension of the proposed T-shaped pier in the preferred alternative was completely removed in the minimal degradation alternative. The western extension was also rotated approximately 20-degrees lakeward to more closely follow the 568.0 foot isocurve and provide more consistent water depths for transient dockage along the pier. The amount of fill required for the crib pier was reduced by about 79.2 cubic yards (about 42.2 cubic yards below OHW). The steel crib pier proposed in the minimum degradation alternative has been designed with the minimal overall dimensions and

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weight required to provide a stable structure with an acceptable factor of safety in both sliding and overturning (for a recreational structure at a private residence).

Fill Materials: 389.8 cubic yards below Ordinary High Water including 149.6 cubic yards of armor stone, 75.0 cubic yards of concrete rubble and 165.2 cubic yards of ODOT Type "B" stone crib fill. The project also includes the placement of 140 cubic yards of sand as pre-fill.

- c. Non-Degradation Alternative: The project would not be constructed leaving the existing shale bluff face vulnerable to erosion and preventing the property owners from accessing the waters of Lake Erie.

It is not practicable to construct a project to provide access to the waters of Lake Erie in a site with nearly vertical shale bluffs and to protect the bluffs from erosion without placing fill.

Fill Materials: 0 cubic yards below Ordinary High Water.

## 2. Avoidance

The design objectives of providing protection to the eroding shale bluff from wave based erosion and providing access to the waters of Lake Erie could not be achieved without a minimal effect on water resources. There is no feasible design alternative available for a re-design that will meet the project objectives and the project size has already been minimized to provide protection to the minimum length of the shore necessary at the project site. No other sites were considered for this project as the project includes the installation of erosion protection on a specific property. Also, no other geographical areas were searched for alternative sites and no other non-wetland sites are available for proposed project.

The consequences of not constructing the project are that the shale bluff face would remain vulnerable to erosion and property owners would be prevented from accessing the waters of Lake Erie. The existing concrete steps at the project site are also in poor condition and would continue to deteriorate if not replaced with the proposed structures.

There are logistical concerns to consider in the construction of shore improvements at the site. Although some materials may be able to be transported to the site by barge, it is expected that most construction materials and equipment will likely be transported to the site over the upland. Nearshore water depths lakeward of the project site are relatively shallow so barge access will be limited and loads will need to be decreased to limit draft. Any limitations or logistical concerns in construction will be similar for both the preferred and minimum degradation alternatives

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### 3. Minimization

The armor stone revetment was also designed to be the minimum structure to meet the required function. The length of the revetment was minimized to protect only the actively eroding areas of the bluff face, the slope of the revetment is the minimum customarily allowed considering structural stability and the crest elevation was set below the total expected wave run-up elevation to minimize the footprint of the structure.

The steel crib pier was designed to be the minimum structure to allow safe transient dockage for a recreational watercraft up to 40 feet in length. The distance the structure extends offshore is the minimum to reach water depths acceptable considering the draft of the boats expected to access the pier. The shore-parallel portion of the pier in the minimum degradation alternative was also rotated approximately 20 degrees lakeward (as compared with the preferred alternative) to more closely follow the 568.0 isocurve so that water depths will be more consistent along the length of the pier. This reduced the need to extend the pier farther offshore.

### 4. Magnitude of the Proposed Lowering of Water Quality

There is no known medium or long term lowering of water quality due to the placement of the proposed materials into the waters of Lake Erie. There will be a temporary, short term, increase in turbidity levels during construction. There will also be an increase in fish habitat in the steel crib proposed in both the Proposed and Minimum Degradation Alternatives.

### 5. Technical Feasibility and Cost Effectiveness

All three alternatives have been designed to be technically feasible and construction materials are readily available. However, the Non-Degradation Alternative would not produce the benefits of the project including: erosion protection, lake access, increased property values and tax revenues and Submerged Lands Lease fees.

Construction costs are estimated to be greatest for the Preferred Alternative and slightly reduced for the Minimum Degradation Alternative due to the reduction of materials needed for construction. The costs of the armor stone revetment and steel bridges will be similar for each alternative. Accurate construction costs will not be available until contractor bids are received.

### 6. Economic Considerations

Construction of the Preferred or Minimal Degradation Alternatives will likely employ 4 to 6 workers for a period of about 3 months. This will provide a benefit to the local and regional economy. The local economy is in a state of recession recovery and would benefit from the proposed project. The completed project will also increase the value of the project site and property tax revenue for the City of Avon Lake. The Submerged Lands Lease fees will also provide funding to be shared by the ODNR Office of Coastal Management and the City of Avon Lake. The Non-Degradation Alternative

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will result in no change.

### **7. Cumulative Impact**

Both the Preferred and Minimal Degradation Alternatives include the construction of an armor stone revetment to provide erosion protection along approximately 70 linear feet of shore. Because the project site is fronted with nearly vertical shale bluffs the construction of shore protection at the project site is not expected to have any impact on sand resources in Lake Erie. If the shale bluffs were left to erode no additional sand would be provided to the lake. Therefore, the construction of erosion protection is not preventing any sand from entering the lake or contributing any cumulative impacts in terms of sand resources. The project also includes the placement of 140 cubic yards of sand in the littoral system as pre-fill (as required by the U.S. Army Corps of Engineers).

Both the Preferred and Minimal Degradation Alternatives have been designed to be held back from the property lines and littoral rights partition lines to prevent any impacts on adjacent properties.

The construction of an armor stone revetment and steel crib pier will provide benefits in terms of fish habitat in an area with predominantly vertical shale bluffs and very little nearshore variations to provide quality fish habitat.

The Non-Degradation Alternative will result in no change.

### **8. Indirect Impacts**

The Preferred and Minimal Degradation Alternatives are not expected to create a barrier to the movement of aquatic organisms, cause changes to drainage patterns, impact downstream water bodies, or cause measurable changes to the lakebed slope, cross section area or vegetation/surfacing. Indirect impacts of the project are expected to be minimal. The Non-Degradation Alternative will result in no change.

### **9. Construction Storm Water Management Plans**

No water pollution controls are planned for either the Preferred or Minimal Degradation Alternatives since the fill materials do not pollute the water resource. Storm Water Pollution Prevention Plans are not required because of the small size of the project. The Non-Degradation Alternative will result in no change.

### **10. Post-Construction Storm Water Management Plans**

The existing 12" steel storm water pipe in the area of the existing concrete stairs will be extended through the proposed armor stone revetment. No other post-construction storm water impacts are expected. There will be no change in the Non-Degradation Alternative.