PROGRAM OF REQUIREMENTS (POR)

STABILIZE RIVERBANK ALONG TOWPATH TRAIL NEAR MM 20 South

CUVA 224822

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A. Project Summary

The Cuyahoga Valley is an important asset to the National Park Service in the Park, south of the Cleveland metropolitan area. The Park includes an historic railroad, known as the Valley Railway, which runs primarily along the left (west) bank of the Cuyahoga River. Along the right (east) bank of the river is another historic asset – the Ohio & Erie Canal and Towpath Trail which was built in the early 1800s to connect Lake Erie to the Ohio River. The Park is very popular with the public, and the National Register Towpath Trail and Scenic Railroad are heavily used by Park visitors daily.

The MM 20 site along the Towpath Trail is a high-priority site that is at risk of failure due to riverbank erosion caused by frequent flooding and high-water events. Riverbank failure would significantly damage the cultural resources and make the path unusable for a significant period of time. Loss of the assets would be detrimental to the Park and its programs. At this location, the Cuyahoga riverbank will be repaired, reconstructed, and stabilized to address the erosion problems that threaten extensive damage to the historic resources. The proposed remediation will provide a level of protection for these historic resources.

The ongoing river erosion processes are influenced by both natural and manmade causes. Development influences the volume and timing of runoff to the river and influences the river's planform where embankments, bridges, and other features have been constructed in the river corridor. In the Midwest, the increase in intensity and frequency of rainfall-runoff events has been associated with climate change. These influences coupled with natural geomorphological process have resulted in appreciable meandering at sites such as Towpath MM 20 South.

This project site requires attention due to the over-steepening of banks that introduces safety concerns for Towpath Trail use. The loss of soil material along the bank has resulted in drop-offs within just a few feet from the trail's edge. It has required repeated temporary closures and emergency repairs to address failed trail sections.

Executive Summary

The purpose of Cuyahoga Valley (CUVA) National Park Project 224822 is to stabilize the Cuyahoga riverbank at high priority areas along the Towpath Trail. The project is specific to the Towpath Trail Mile Marker 20 South (MM 20).

The Basis of Design Report supports the Schematic Design of stabilization measures that include natural rock riprap and bioengineering techniques. Where required, structural measures shall be incorporated to address asset protection needs in more challenging hydraulic and geotechnical conditions. The report prepared by HDR addresses the MM20 site and others not part of this work. A geotechnical investigation and analysis were performed for six (6) trail sites, including this site. The soils encountered in these areas contain varying amounts of highly erodible, fine-grained silts and clays. Shale bedrock was encountered at depths of about 13 to 17 feet below grade at four of the six sites. At the exceptions, MM 20, bedrock was not encountered in the borings, which extended 40 to 45 feet below existing grades. Bedrock topography mapping indicates bedrock at depths of about 150 feet below existing grades for the MM 20 site. The geotechnical analyses informed design considerations including shoulder width (between edge of trail and top of bank), riverbank slope, and the need for rock channel protection to provide a stable working platform. Hydraulic analyses were performed to evaluate existing and proposed conditions at the sites. Two hydraulic models from the U.S. Army Corps of Engineers (USACE) Buffalo District provided a basis for the schematic design modeling effort. Flow data was taken from a HEC-RAS 1D model identified as CVNP Eco Restoration Model. Geometry and terrain data were adopted from a HEC-RAS 2D model identified simply as Cuyahoga Valley. Topographic and bathymetric data collected for this CUVA project were incorporated into the hydraulic model, and other refinements were implemented to better predict hydraulic conditions along the river and at the site. The hydraulic analysis focused on velocity, shear stress, and water surface elevation results to evaluate performance under existing and proposed conditions. Based on similar geotechnical and hydraulic conditions, alternatives the MM 20 were evaluated.

Varying conditions within the MM 20 South site required different measures along the Towpath and along the upstream river bend for some alternatives. Alternatives for MM 20 include: A) Hybrid Riprap along the Towpath and Rock Channel Protection and Live Staking along the bend, B) Brush Mattress along the Towpath and Rock Chanel Protection and Brush Mattress along the bend, and C) Durable Riprap along the Towpath and the bend. Preferred alternatives were selected through a Value Analysis Workshop held with NPS staff. This workshop used Choosing by Advantages (CBA) methodology and selection also considered Life Cycle Costing (LCC). Alternative A – Hybrid Riprap and Rock channel protection and Live Staking was selected at that time.

During the Design (See 2023 BODR) of the riverbank stabilization for the MM 20 section, the team completed another round of value analysis in which another alternative called a hybrid riprap along the towpath and rock channel protection and live staking was chosen.

After more design documents were completed and the NPS Water Resource Division reviewed the Wetland Statement of Findings (WSOF) and the Floodplain Statement of Findings (FSOF) they recommended a reevaluation of the design. The NPS decided to stop the work on this section of the project due to the overall combined impacts of time and redesign constraints. The major objections to the design were the reducing of the channel's length and width and that the design could potentially impact this site's Wild and Scenic River designation due to the hardening of the riverbank.

NPS has reevaluated the alternatives previously considered and is revising the preferred alternative for this section of riverbank stabilization be Detail 2 - Brush Mattress as illustrated in the 2021 Schematic Design Documents. This alternative softens the design by keeping a more natural planted look of the riverbank. This detail calls for toe armor (rock) to be placed below normal waterline, Brush mattress to approximately halfway up the slope with live staking and seeding of the remaining portion of the slope and a maximum slope will be 2.5:1 to meet geotechnical design factors of safety. (See Table 5.2, in BODR 2021)

B. Project Analysis

Design objectives were identified in coordination with National Park Service (NPS) staff during the scoping process, including the scoping site visit performed in August 2020. These design objectives are:

- Protect Park assets,
- Provide sustainable, long-term solutions,
- Promote consistent design and constructability,
- Incorporate green infrastructure strategies,
- Limit required maintenance,
- Preserve natural river processes, and
- Consider regulatory compliance ramifications. (Planned work must stay within or be a smaller footprint identified in the CD documents provided. See the 2023 BODR)

Geotechnical and hydraulic design factors shall be evaluated in the development of alternatives. The geotechnical factors considered as a part of the design shall include the project area soil properties and subsurface conditions. The hydraulic factors considered as a part of the schematic design shall include the velocity, water surface elevation (WSEL), and shear stresses along the project reach of the Cuyahoga River.

The Geotechnical Engineer of Record shall perform global stability analyses to evaluate the long-term (drained), short term (undrained), and rapid drawdown stability of the slopes.

As part of the Design Development (DD) phase, the D-B Team shall evaluate several alternatives to:

- Evaluate project extents and tie-in points.
- Evaluate planform geometry of the laterally migrating meander bend and the profile of the river upstream and downstream to recommend a stable configuration.

The Topographic and Bathymetric Survey (2021 for six trail sites and 2018 for two CVSR sites), Basis of Design Reports, and Geotechnical Reports (included as appendices to the Basis of Design Reports) are not contractual and shall be considered "for information only". They are intended to inform the final design by the DB Contractor. The DB Contractor is responsible for their use and for any interpretations or conclusions drawn from these and other data and materials provided by NPS. Due to ongoing riverine erosion processes, the DB Contractor is required to perform and provide topographic and bathymetric surveys to confirm site conditions.

For the Construction Development (CD) phase of design, the D-B Team must finalize the design approach and refined working models, and calculations as described in a basis of design report and be submit a stamped contract set.

C. Program Analysis

This project will stabilize the Cuyahoga riverbank. Stabilization could utilize natural rock rip rap and bioengineering techniques. This project also includes remediation of the construction site and equipment access routes. The river length shall not be adjusted by this project and work will be constrained to the right (east) bank.

Many of the riverbank areas have experienced severe erosion due to recent floods. Along the Towpath Trail, in most locations (but not all) the trail surfaces have not been directly impacted by severe erosion, but temporary fencing has been installed as a safety precaution. This project will address long-term repairs needed to properly protect the resource. The distance between the resource and the bank varies to less than 5'. If these areas are not stabilized and their condition continues to deteriorate, the park will need to close portions of the towpath trail. Experience tells us that the closer the river is to the resource, the more complicated and expensive stabilization projects become. In addition to being significant historic resources, the Towpath Trail is also the most popular recreational resource in the park, used by over 200,000 visitors each year.

C.1 **MM 20 - Riverbank Stabilization*:***

The riverbank stabilization design shall adhere to the hydraulic requirements documented below unless otherwise approved by the Contracting Officer.

- The Contractor is required to analyze the existing and proposed conditions using the 1.5-year, 10-year, and 100-year event peak discharges documented in the Basis of Design Reports and applied to the Schematic Design hydraulic models. Provide treatments that meet the following minimum permissible shear stress values:
    - Riprap (Median Stone Diameter 18 inches): 7.6 lb/ft2
    - Brush Mattress: 6 lb/ft2
    - Live Staking: 2.6 lb/ft2
- The maximum shear stress within the footprint of the proposed bank stabilization improvements shall be used to confirm that the design satisfies the minimum permissible shear stress values.
- Riprap and brush mattress treatments shall extend half the vertical distance between normal water line and top of bank to protect from frequent runoff flows.
- The 100-year event shall be used to evaluate water surface elevation (WSEL) impacts. WSEL increases shall be minimized throughout each affected reach and cannot exceed the values below. WSEL increases shall be measured at the upstream end of each site unless otherwise specified.
    - Towpath MM 20 South: 0.05 ft

The riverbank stabilization design shall adhere to the geotechnical requirements documented below unless otherwise approved by the Contracting Officer.

- The DB Contractor Team shall thoroughly review the Geotechnical Reports (included as appendices to the Basis of Design Reports) and provide additional borings, laboratory testing, and geotechnical analyses as necessary for their final design activities.
- Permissible Slopes
    - The Geotechnical Engineer of Record shall perform global stability analyses to evaluate the long-term (drained), short term (undrained), and rapid drawdown stability of the slopes. The minimum target factors of safety for these conditions are as follows:
    - Short Term and Long Term: 1.3

- Rapid Drawdown: 1.1
- Cut and fill slopes shall be no steeper than 2.5H:1V.
- The crest of any altered slope should be a minimum horizontal distance of 5 feet from the edge of the Towpath Trail.

Historic Preservation requirements:

All work to comply with the Secretary of the Interior's Standards for the Treatment of Historic Properties.

Treatment Specialist Qualifications: The work should be performed by an experienced firm regularly engaged in historic treatments similar in nature, materials, design and extent to the work as outlined and that has a record of successful in-service performance that demonstrates the firm's qualifications to perform this work. Any Archaeologist engaged in the project shall meet the professional qualifications for that role as listed in the Secretary of the Interior's Standards in the Federal Register.

General Requirements:

Landscape:

- Protection of trees – Work should take place outside the critical root zone (CRZ) of trees unless the tree is determined by Park Staff not to be preserved. CRZ is typically 18" for every inch of diameter and breast height (DBH) or the dripline of the canopy, whichever is greater.
- Equipment Access – Mitigation for equipment damage is to be minimized by pre-planning and using portable roads. There will be vegetation repair, but the portable roads should limit the damage to the soil if coupled with a weather plan
- Seeding and Restoration – Seed should be chosen to match surrounding area and match natural resource and maintenance goals. Seed mixture shall be submitted to CO for approval prior to use. Slope and size of area disturbed will drive the hydromulch and tackifier specification. Acceptance to be one year later after one winter cycle to allow settling and revegetation of the open scars to achieve 90% level. Live stakes, brush mattress and native seed will be planted along the restored bank during the seasonally appropriate planting window.

***Archaeological Sites**:*

- Archaeological Protection – Follow Secretary of the Interior's Standards for Archaeology to protect buried resources. All excavations should be monitored unless documented to be previously disturbed areas containing infrastructure less than 50 years old or unless previously surveyed or cleared by a Park.
- Ground Disturbance – Areas identified as archaeologically or culturally sensitive by a qualified Archaeologist will need to be monitored by an Archaeologist meeting the Secretary of the Interior's professional standards.

The Cuyahoga River will remain open to boating including kayaks and canoe traffic.

Permitting requirements:

Compliance CE for this project is complete. DB contractor shall review and conform design to adhere to the requirements in the CE.

Contractor shall complete the Floodplain Statement of Findings (FSOF) and Wetland Statement of Findings (WSOF) for the Superintendent's signature.

All applicable permits must be reviewed and obtained as defined in the Permitting Assessment Form (PAF). A summary of the anticipated permits is below. Responsibility for securing permits required to construct bank stabilization measures is assigned to the Design Build Contractor.

NPS identified but may not be limited to the following permits and approvals:

- United States Coast Guard – Notice to Mariners
- Ohio Environmental Protection Agency – National Pollution Discharge Elimination System General Stormwater Construction Permit
- Section 404 Clean Water Act
- Section 10 Rivers and Harbors Act
- Section 401 Water Quality Certification