National Park Service
U.S. Department of the Interior

Cuyahoga Valley National Park

WETLAND STATEMENT OF FINDINGS
For
EXECUTIVE ORDER 11990
And
NATIONAL PARK SERVICE DIRECTOR'S ORDER 77-1:
WETLAND PROTECTION

Stabilize Riverbank at Towpath Station Road South along the Cuyahoga River (PEPC # 116064)

Prepared by
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Certified for Technical Accuracy and Service wide Consistency by:

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Approved by:

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Director, Interior Regions 3, 4, 5 Date

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INTRODUCTION

The National Park Service (NPS) has prepared this Wetland Statement of Findings (WSOF) in accordance with NPS *Director's Order #77-1: Wetland Protection* for a project that will place rock riprap along the east bank of the Cuyahoga River south of the Station Road Parking Lot at Cuyahoga Valley National Park (park). *Director's Order #77-1* establishes NPS policies, requirements, and standards for implementing Presidential *Executive Order 11990, Protection of Wetlands*.

This WSOF describes (1) the proposed project and project alternatives; (2) effects of the proposed project on wetlands, as defined in NPS *Procedural Manual #77-1: Wetland Protection*; (3) mitigation measures that avoid, reduce, or compensate for adverse effects of the project on wetlands, and (4) how the project and mitigations ensure "no net loss" of wetland functions or values, and (5) the cumulative effects of eight additional armoring projects proposed for construction on the lowland reach of the Cuyahoga.

PURPOSE AND NEED FOR THE PROPOSED ACTION

The NPS is proposing to place approximately 600-linear feet of rock riprap on the east bank of the Cuyahoga River approximately 1,500 feet south of the Station Road Bridge near the confluence of Chippewa Creek and the Cuyahoga River in the City of Brecksville, Cuyahoga County, Ohio (Figure 1).

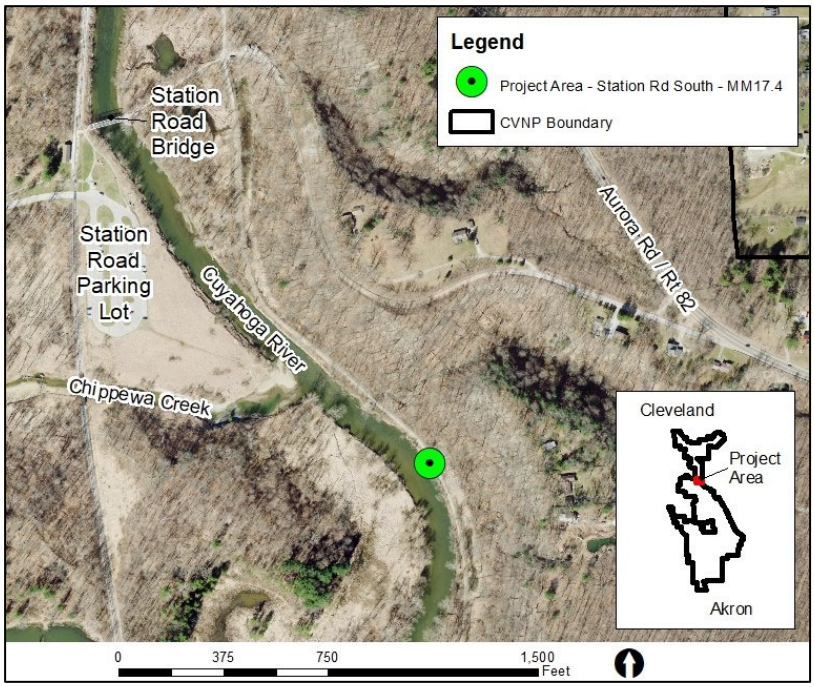

Figure 1. Map of local project area indicating proximity of project site to nearby landmarks.

The purpose of the project is to stabilize an eroding section of riverbank that is damaging the historic Ohio and Erie Canal Towpath Trail and creating a hazard for park visitors and staff. The park receives more than two-million visitors each year with many of those visitors hiking, biking, or running on the Towpath Trail. The trail in the project area is located a few feet east of the Cuyahoga River and currently is separated from the river by a narrow, steep bank with orange construction fencing placed to keep bicyclists and others from falling into the river (Figure 2). The proposed project is needed to protect park visitors in the project area, reduce erosion in the Cuyahoga River, and preserve the historic trail.

Figure 2. Station Road South project site viewed from the south.

Background

The park was established as a National Recreation Area in 1974 and was re-designated as a National Park in 2000. The Station Road area – located about one-third mile north of the project site – is extremely popular with park visitors and serves as a primary access point to the Towpath Trail in the northern part of the park. The park also maintains a river-access point south of the parking lot at Station Road at the confluence of Chippewa Creek and the Cuyahoga River. The river-access point is popular with kayakers and canoers and used extensively from spring through fall. The Station Road Parking Lot can fill beyond capacity with park visitors and their cars on busy weekends and summer days.

The Ohio and Erie Canal and associated Towpath Trail is listed as a National Historic Landmark and the Cuyahoga Valley Scenic Railway is listed as a National Historic District on the National Register of Historic Places. In addition, the section of Cuyahoga River running through the park was designated an official State Water Trail in 2019.

PROPOSED ACTION

Project Area

The project site is located about two miles east-southeast of downtown Brecksville and about one-third mile south of the Station Road Parking Lot (Figures 1, 2, and 3). The site is located on NPS property immediately east of the Cuyahoga River about 300-feet south of the confluence of Chippewa Creek with the river.

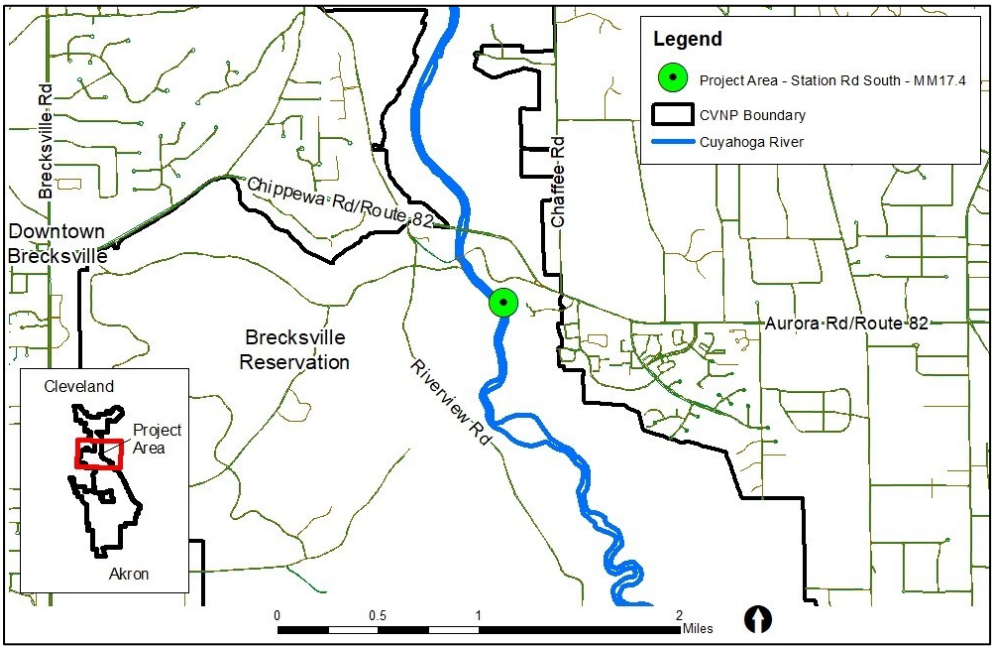

Figure 3. Vicinity map of project area indicating proximity of project site to nearby roads and landmarks.

Proposed Action

The NPS is proposing to stabilize the riverbank adjacent to the Towpath Trail south of Station Road along the Cuyahoga River (Figure 3). The proposed action will disturb the shoreline and place rock riprap at a 2:1 slope (two feet horizontal for every one foot vertical) that will extend approximately 40 feet out into the river from the top of the bank along approximately 600 linear feet of the

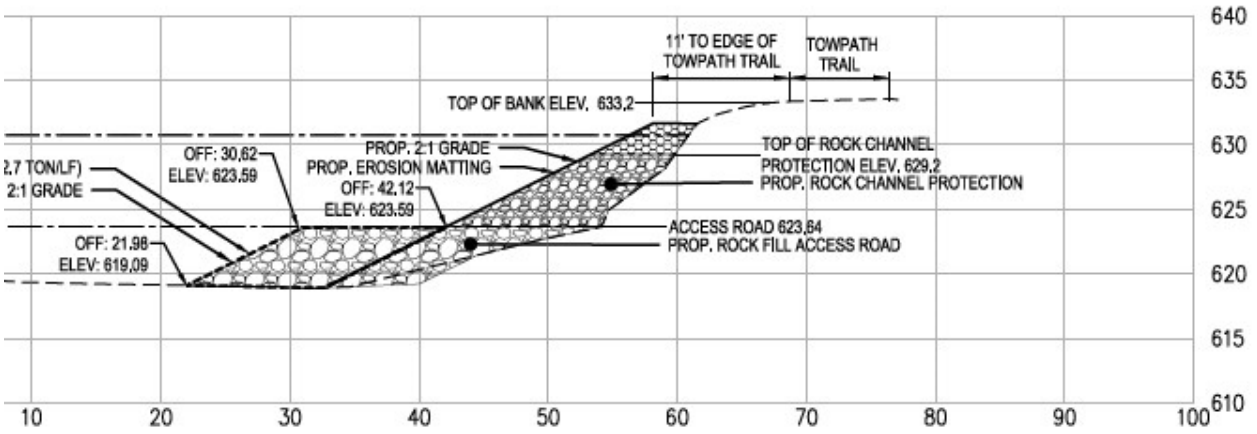

Figure 4. Selected alternative, typical construction-drawing section of the proposed armoring treatment. Note that 8 feet of fill surface area, above the top of the rock channel protection elevation 629, will be planted and is considered the bioengineering section of the armoring. The armoring extends 40 feet from the top-of-bank out into the river.

riverbank (Figures 4 and 5). A rock toe approximately 20-feet wide will be constructed at the base of the riprapped bank into the river at the height of ordinary-base flow. A seed mix of native plants

will be sown along the face of the rock riprap and a native mix of meadow plants will be seeded above the rock fill for the access road to the top of the channel protection rock fill (Figure 4).

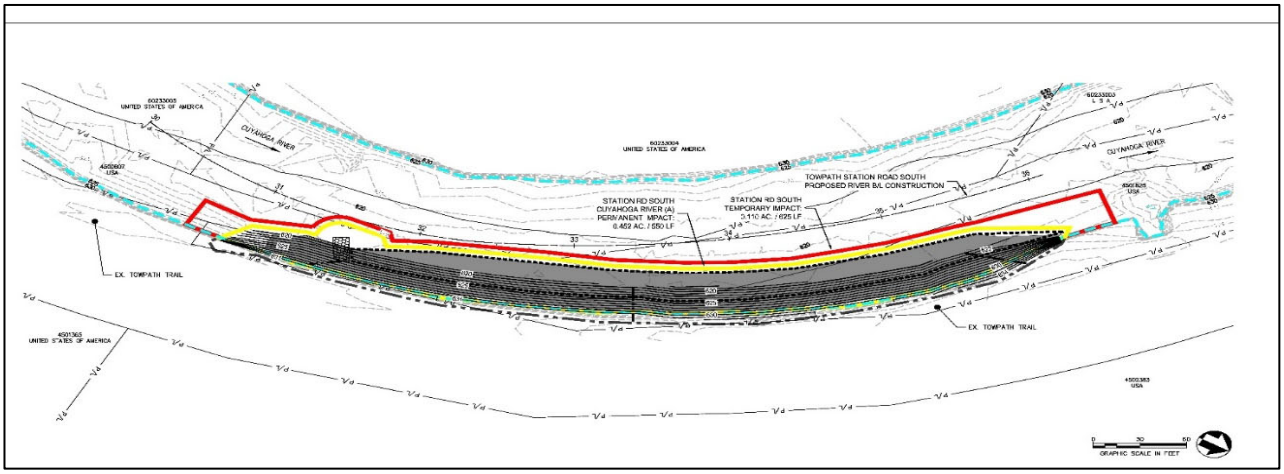

Figure 5. Project area indicating the limits of permanent impacts (yellow polygon) and temporary impacts (red polygon) to the riverine wetland.

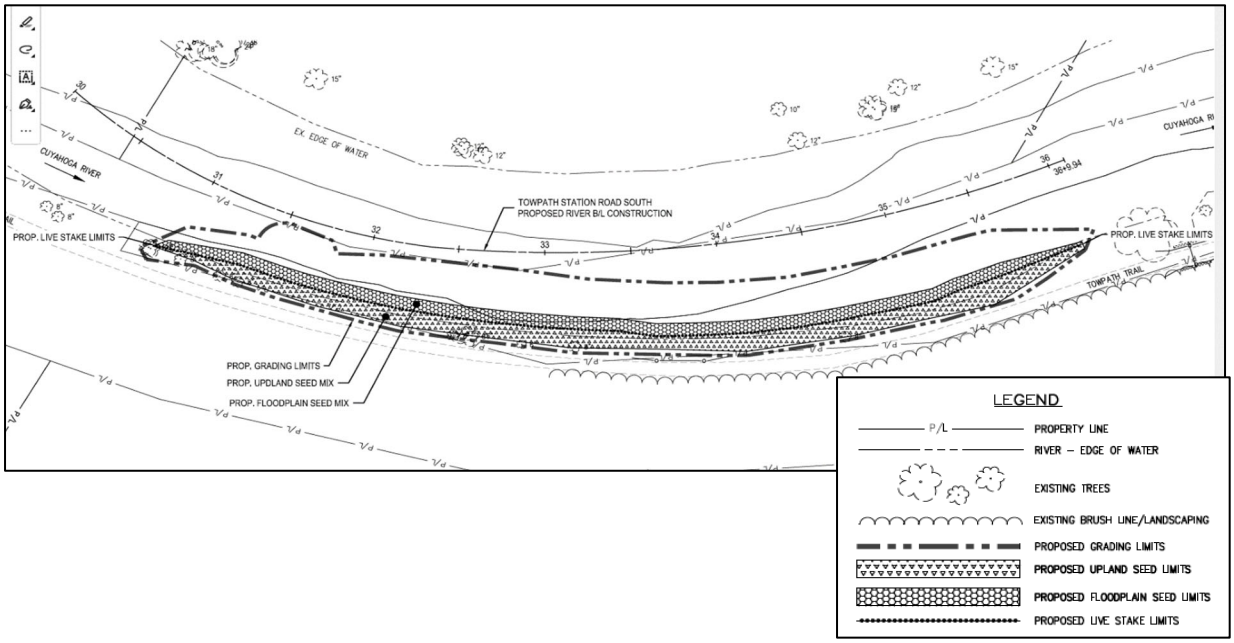

Figure 6. Planting plan indicating the location of live stakes and native seed mix.

The stabilization project also includes implementation of a rock bendway weir feature (20-foot-wide and 3-foot-high) at the upstream extent of the stabilization zones within the project reach with

intention to prevent flanking behind the stabilization area (Figure 7). It will extend into the river approximately 20 feet out, at an upstream angle of about 30 degrees into the flow of the river. Bendway weirs will reduce scour and erosion along the streambank by training the river thalweg to adjust further from the riverbank. The proposed bendway lengths (Figure 7) are elongated sufficiently beyond the rock toe material to deflect energy towards the middle of the river but are short enough to minimize shifting of river energies too far and creating problems on the opposite bank. Spaces immediately downstream of the bendway weirs normally become sediment traps, which will further protect the bank but reduce the transport of bedload sediment that would otherwise contribute to the creation of natural, geomorphological channel features such as riffles and point bars.

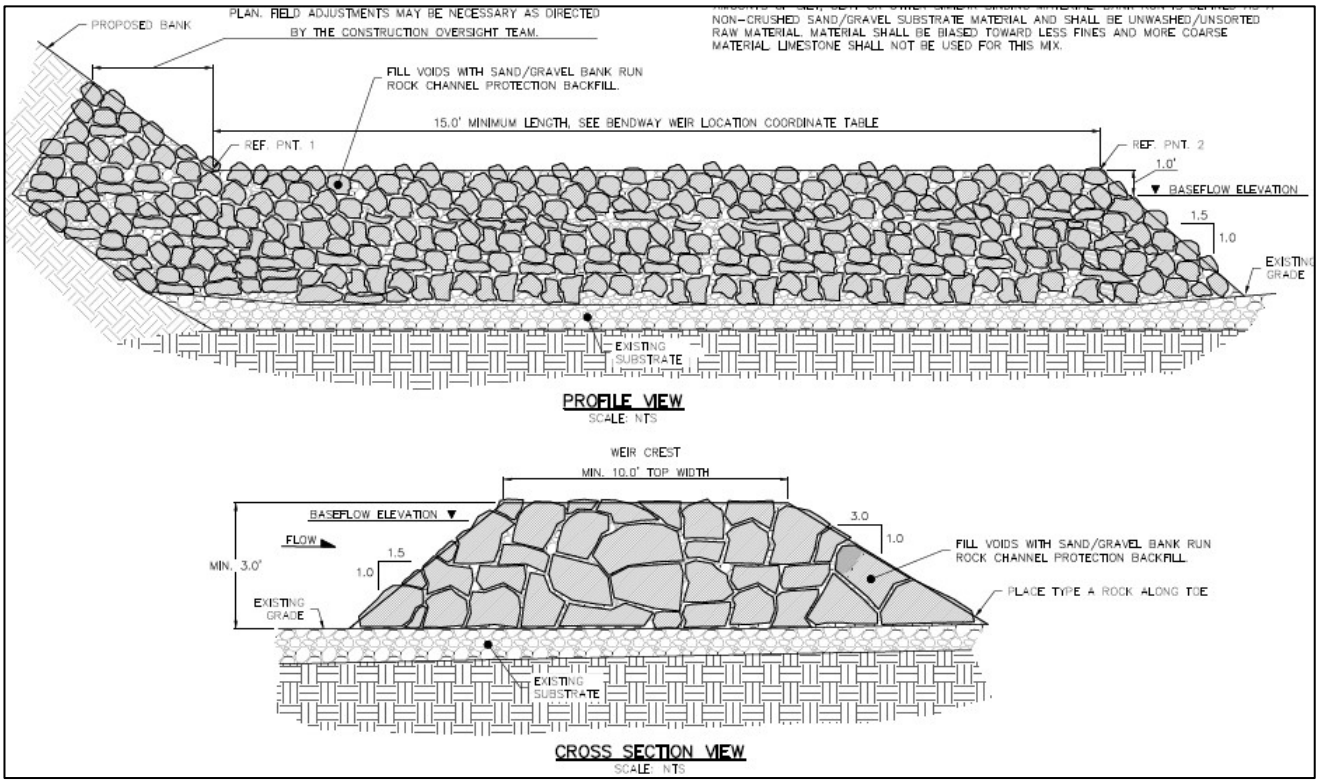

Figure 7. Bendway Structure Details. The structure is 3 feet high, 20 feet wide, and will extend more than 15 feet out into the river.

Three trench keys (7-foot-wide sections of the shoreline armoring comprised of larger stone that extend to the top of the bank) are designed into the armored reach.

Sandstone riprap will be installed using a four-phase approach. The first phase will include constructing a stone access road 15- to 20-feet wide by two-feet thick by about 600-feet long along the base of the riverbank in the project area. The access road will remain in place throughout construction and form the base of the new-bank protection. Next, rock riprap will be placed adjacent to the access road about ten feet further into the river to protect the toe of the bank, and smaller rock ("bank run") will be placed to fill gaps in the toe rock. The third phase of work will entail

placing rock riprap up the bank of the river to the elevation of the one-year flood. A six-inch lift of soil and small rock placed above the bank riprap will be wrapped in coconut-fiber fabric and planted with native vegetation. The fourth phase of the project will include final grading and seeding disturbed areas with a mix of native grasses and wildflowers. The second, third, and fourth phases will be completed from downstream to upstream with work being done as the construction crew moves out of the site along the stone access road.

Phase I - Access and Staging

The primary staging area will be located under the Route 82 Bridge, and the existing Towpath Trail will be used as the primary access way for transporting materials and equipment from the staging area to the construction site (Figure 8). A secondary staging area to support an office trailer and provide parking may be located near the intersection of trails south of the Route 82 Bridge. Staging areas and access routes avoid wetlands, and the project will reduce stormwater runoff and protect habitat by placing silt and construction fencing around sites to eliminate off-site movement of materials.

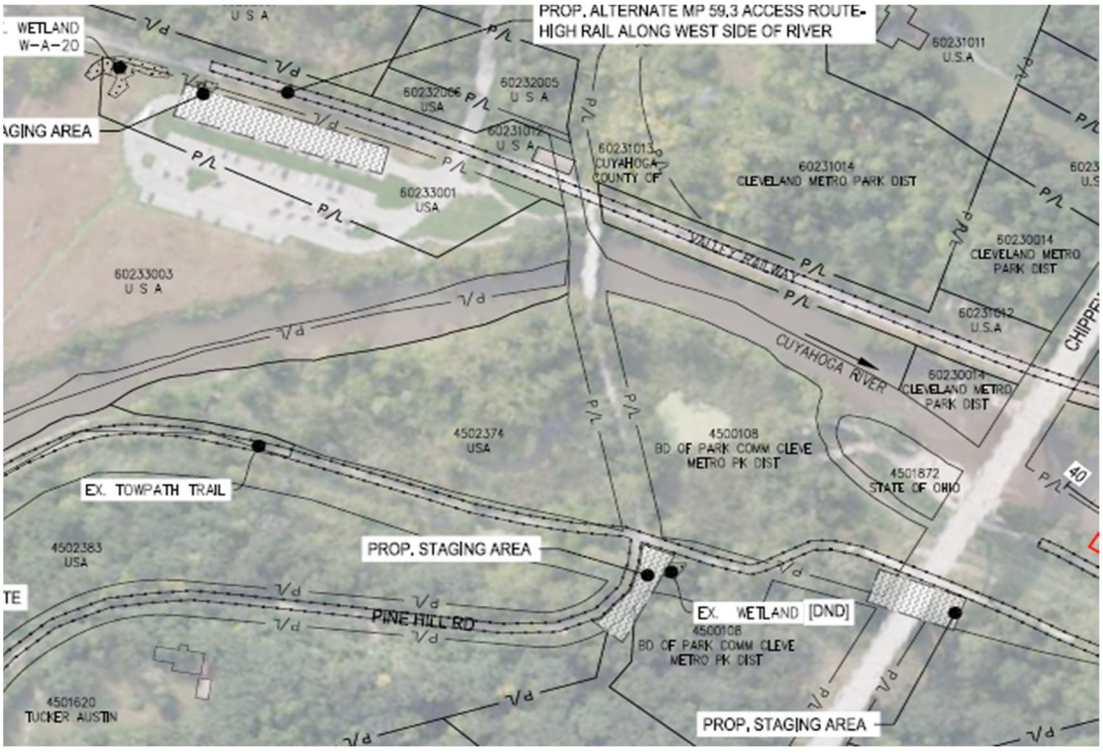

Figure 8. Project area indicating access route, two staging areas, wetlands, and one alternate staging area.

All staging areas avoid wetlands and employ stormwater protection and erosion protection measures, including silt fencing which will be installed to protect wetlands that may be close to staging locations (Figure 8). Mobilization to the site will begin with staging located under the Route 82 bridge south of the Towpath Station project site. The existing trail system will be used as access

for material and equipment. An additional staging for office trailer and parking may be setup at the corner of the maintenance road and trail intersection leading to the proposed primary staging area. Orange 4-foot-high construction fencing will be used to delineate the staging area limits of disturbance that are close to palustrine wetland areas that should not be disturbed.

Access points will be established on the upstream and downstream limits of the Towpath Station project area for access to the toe of streambank. Complete clearing and grubbing will occur to establish access and clear the entire footprint of the armoring structure. Material will be imported to build a work platform at the bottom of the bank stabilization work area to support construction activities. Imported backfill will be placed up to subgrade elevation for the rock bank protection. Site preparation and bank stabilization activities would start at the upstream extents of the project area and continue towards the downstream extents. The existing towpath will be used to haul material and access the site. The source of any material that is imported from outside the park will be from a location that has been tested to be free of any contaminants above state threshold limits and free of any non-native plant parts or seeds.

Phase II – Site Preparation, Phase III – Bank Stabilization, and Phase IV – Site Restoration

Once access and staging has been completed, additional clearing and grubbing of trees/plant material will occur along the project area bank and a rough subgrade will be established to remove any loose or unsuitable material. Imported backfill will be placed up to subgrade elevation for the rock bank protection.

Bank stabilization activities include placing imported sandstone material along the bank and choking (filling gaps between rocks) the area with the material. Imported bank run/fill soil material will be placed in a 6-inch lift above the rock bank protection, with limited use of on-site materials. Bank run/topsoil is to be wrapped in a coir erosion control fabric and planted with native vegetation during Phase IV activities. The balance of any additional longitudinal fill stone toe protection (LFSTP) rock will then be placed along the base as the construction crews proceed to work their way back along the restored bank toward the upstream staging area. The source of any material that is imported from outside the park will be from a location that has been tested to be free of any contaminants above state threshold limits and free of any non-native plant parts or seeds.

The predicted scour depth Hydraulic Modeling is in the range of 3.8’ – 13.5’. However, based on the subsurface investigation, bedrock is estimated at a depth 2- to 5-feet below the bank toe and is considered as the limiting scour depth. Using a predicted 5’ scour depth, the calculated volume of LFSTP required is 1.67-ton per lineal foot. However, to build in some conservatism due to proximity to the towpath asset, the LFSTP volume has been increased by 30%. Therefore, the design includes a 2.2-tons per linear foot of LFSTP measured along the toe for the full project length to counteract potential for up to 7-feet of predicated scour depth for a length of approximately 600 feet. The total length of the scour downstream of this Station Road South armoring project, and the resultant head-cutting scour that will extend above the project limits, has not been determined.

Site restoration activities will include seeding and planting disturbed areas with park-approved native plant species. Live stakes or other planting material will be planted along the restored bank during the seasonally appropriate planting window. The project schedule will provide for revegetation immediately after completion of construction.

OTHER ALTERNATIVES CONSIDERED

Alternative 1 – No Action Alternative

Under the No Action Alternative, the bank adjacent to the Towpath Trail would not be stabilized, and erosion of the riverbank adjacent to the trail would continue. This alternative was dismissed from further consideration because it would not protect the Towpath Trail, park visitors, or staff and would not address the purpose and need for the project.

Alternative 2 – Relocate the Towpath Trail

The NPS considered an alternative to move the section of the Towpath Trail at the project site to the east to provide space for river movement in the area. However, the prism of the historic Ohio & Erie Canal is located immediately east of the existing location of the Towpath Trail, and the canal prism in this area supports a high-quality wetland (a score of 61 per the Ohio Rapid Assessment Method – Mack 2001). So, in this location, moving the Towpath Trail further from the river would impact more wetland acreage of higher value than stabilizing the riverbank in its current location. Accordingly, this alternative was dismissed from further consideration.

Alternative 3 – Use a Brush Mattress instead of Riprap on the Bank

The NPS considered an alternative that would use a "brush mattress" to stabilize the eroding bank in the project area instead of sandstone riprap. This alternative would include placing a layer (or "mattress") of interwoven live branches on the riverbank with a rock toe and a building a bendway weir at the upstream end of the project site (Figure 9). Over time, branches in the brush mattress would root and cover the bank with shrubby vegetation, creating a network of roots to hold soil and vegetation to slow water flow. Although this alternative represents a "greener" technique than rock riprap, project engineers were concerned vegetation alone wouldn't hold the bank together over time and would provide only a short-term fix to the problem (NPS 2021). Accordingly, this alternative was dismissed from further consideration.

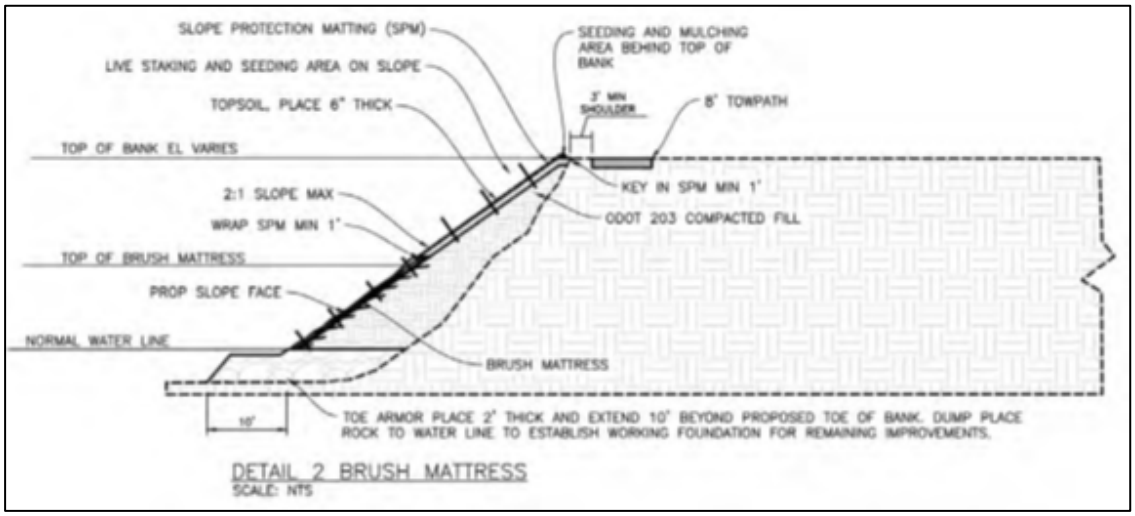

Figure 9. Brush Mattress Alternative

WETLANDS IN THE PROJECT AREA

A wetland delineation was completed in 2021. All wetlands impacted by this project are riverine as defined in the *Classification of Wetlands and Deepwater Habitats of the United States* (Federal Geographic Data Committee, Wetlands Subcommittee. 2013). The boundaries were defined as the ordinary high-water mark (OHWM) along the bank. The wetlands in the study area around the construction zone were delineated using the methods described below. Study area field-survey limits extend 25 feet riverward and 100 feet landward, or to the nearest edge of the Towpath Trail, of the OHWM along each side of the Cuyahoga River from river mile 14 - 29 (Study Area). HDR, an environmental consulting company, completed the field work for the wetland delineation in August and October 2021 (HDR, Inc. 2022). During November and December 2022, EnviroScience, an environmental consulting company, performed a supplemental wetland investigation and delineation within the construction, staging, and access areas (EnviroScience 2023). The staging areas were located in non-wetland areas. The channel below the OHWM is considered riverine wetland under NPS jurisdiction. And a fringe edge of the riverine wetlands was defined as palustrine emergent wetland. The field work was completed by qualified wetland delineators, including two Certified Professional Soil Scientists (CPSS), a botanist, and a biologist. Described below are the wetlands identified in the project site.

Cuyahoga River is a National Wetlands Inventory mapped a perennial waterway located within the Station Road South armoring construction limits. Stream A14 is in the Willow Lake – Cuyahoga River HUC 12 sub-watershed (041100020505). The riverine wetland is comprised of a well-defined channel. Substrate within the project area includes cobble, sand, boulder slabs, boulders, gravel, and silt that comprise naturally-occurring riffles and pools. The riverine habitat is classified as a lower perennial riverine system with an unconsolidated bottom that is permanently flooded (R2UBH).

Wetland Function and Condition Assessment

In an ecological context, riverbanks are an important component of riparian zones. Active unaltered banks create and maintain diverse natural structure and habitat functions. Ecologically functioning riparian zones provide a variety of resources and are vital centers of biodiversity. Channel banks form a significant ecotone between aquatic and terrestrial ecosystems with diverse structure and habitat functions. The main functions of riverine/riparian zones are related to fluvial hydrology and sediment dynamics; retention and cycling of nutrients and pollutants; and maintenance of habitat for fish and wildlife, including invertebrates, amphibians, reptiles, birds, and mammals (Florsheim et al 2008).

- Bank erosion provides a sediment source that creates riparian habitat.
- Active banks create and maintain diverse structure and habitat functions.
- Riparian vegetation promotes bank stability and contributes large woody debris.
- Bank erosion modulates changes in channel morphology and pattern.

Figure 10: Typical condition of riverbank in the project area indicating extensive presence of woody vegetation.

Figure 11: Typical condition of riverbank in the project area indicating extensive presence of mugwort and other woody vegetation with sandstone riprap towards bottom of the slope.

This section of riverbank riparian habitat is vegetated which provides canopy structure for wildlife and some bank stabilization, but the plant species composition suggests that the overall wildlife functions of the riparian edge appear to be in poor condition. The riparian edge in the project area is dominated by woody vegetation including non-native bush honeysuckle (*Lonicera mackii*) and mugwort (*Artemisia vulgaris*) (Figures 10 and 11).

Unaltered riverbanks can modulate floodwater surface elevations and have variable moisture regimes that satisfy the requirements of diverse plant species. Banks provide habitat at different elevation zones needed by flora and associated fauna adapted to flood pulses rising along the bank. Habitats along the bank gradient are exposed to various flood frequencies, durations, and magnitude. Thus, plant communities closest to the channel are colonized by fast-growing, water-adapted sedges, rushes, grasses, herbs, and seedlings of shrubs and trees, whereas terrestrial vegetation is deterred because of frequent flooding (Florsheim, et.al. 2008).

Streamside trees and shrubs that overhang the channel are sources of organic material that provide food and cover for fish. Additionally, organic material from riparian vegetation is a primary food source for invertebrates from all of the primary consumers including filter feeders, shredders, scrapers, and predators. Streamside woody plant species offer shade that modifies aquatic microclimates and maintains more desirable lower water temperatures. Since the EPA defines the Cuyahoga River as a “warmwater habitat,” tree and shrub overhang provides shade and is critical to maintaining cooler water temperatures.

Three federally protected bat species are known to be in the area of the project site, the Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), and the tricolored bat (*Pipistrellus*

subflavus). Critical habitat for the Indiana bat, northern long-eared bat, and tricolored bat is found within the project limits. During a special status species survey conducted on August 23-27 and September 1-3, 2021, no state or federally listed species were observed (HDR 2022b). Bat species feed along river systems on the adult aquatic macroinvertebrates.

The condition of water quality, habitat, and populations of invertebrates and other wildlife continues to improve within the Cuyahoga River aquatic system at the park (Northeast Ohio Sewer District 2022; Ohio EPA 2023). Even though aquatic vegetation is typically associated with large waterways in Ohio and submerged aquatic vegetation exists in some locations along the Cuyahoga River. A survey of aquatic plants completed in 2021 didn't find submerged aquatic vegetation immediately adjacent to the project area bank, although some duckweed was observed along the riverbank (MAD Scientists 2021b). Since 2018 four of the of the ten Beneficial Use Impairments (BUI) listed for the Cuyahoga River have been removed and in 2023 the Cuyahoga River sampling showed that occurrence of fish tumors and other deformities were below threshold values and therefore, the Ohio Environmental Protection Agency announced that the Cuyahoga River now meets conditions for the removal of its BIU for fish tumors and deformities (OEPA, et al 2023).

The Ohio Environmental Protection Agency (Ohio EPA) has established a Qualitative Habitat Evaluation Index (QHEI) as a method for evaluating stream habitat quality. The index provides a measure of habitat that generally corresponds to physical factors that affects fish and other important aquatic life including invertebrates. Using the QHEI (OEPA 2006), A14 scored 70.5 and assessed within the range 'Good' Warmwater Habitat. This is comparable with other studies completed along this stretch of the river by the Ohio EPA and Northeast Ohio Regional Sewer District (NEOSD). In 2017 and 2018, the Ohio EPA sampled the Cuyahoga River and 67 tributaries at 140 sites for chemical, physical, and biological monitoring. Sampling included sites within CUVA, and the Cuyahoga River was deemed in full attainment, with no listed impairments. Park staff came up with a score of <30 (very low-quality score) after applying a rapid QHEI habitat quality assessment to the river reach at the Station Road Project.

An Ohio EPA report (2023) indicates that a stretch of the river near the project area is bad for dissolved oxygen, high risk for nutrient concentrations, lots of DDT, a QHEI score of 59 (fair), and an index of biotic integrity that failed to meet biocriteria. A nearby stretch of the river has a designated aquatic life use of warmwater habitat, an Index of Biological Integrity (IBI) score between 42 to 50 (indicating excellent stream condition), an Invertebrate Community Index (ICI) of 42 to 52 (marginally good to very good), and a QHEI of 75.50 to 82.00 (good to excellent range) (Ohio EPA 2023). In 2021, NEOSD conducted river sampling along the same stretch of the Cuyahoga and yielded similar results. NEOSD also determined full attainment status, with a IBI score of 40, an ICI score around 48, and a QHEI score between 76.00 and 77.50 (NEOSD 2022).

In terms of macroinvertebrate sampling closest to the project area, the most captured aquatic invertebrate species by Ohio EPA were those considered intolerant to moderately intolerant to pollution which includes sediment deposition (Ohio EPA 2023). Invertebrate species that are intolerant of poor water quality are surviving in the river suggests that the water quality (which

includes eroded soil as suspended solids) is good to excellent. Identified species included baetids which are considered pollutant intolerant mayfly species. Other species captured included Rheotanytarsus spp. and Polypedilum midges, and Hydropsychids all of which are considered moderately intolerant to pollution. The 2017-18 survey results from the downstream Gorge Dam (RM 44.5, 25 miles upstream of the project area) to the mouth showed improvement compared to previous surveys conducted in the 1980s. Improvements to industrial facilities along the waterway, and reducing combined sewer overflows (CSO) inputs, has improved the macroinvertebrate community quality in some reaches of the river (Ohio EPA 2023). The 2021 evaluation of macroinvertebrates along RM 20.00 (upstream from the project area) by NEOSD yielded similar results. A total of 60 taxa were collected including 16 Ephemeroptera, Plecoptera, and Trichoptera taxa, 17 sensitive taxa, and two rare and sensitive macroinvertebrates (*Ceraclea sp*. and *Leuchotrichia pictipes*) yielding an "Exceptional" ICI score (NEOSD 2022).

No living mussels were found at the project area during a September 2021 survey. However, several minimally weathered shells were found. These included two large (6" and 7") pink heelsplitters (*Potamilus alatus*), a white heel splitter (*Lasmigona complanata*), and a giant floater (*Pyganodon grandis*), all which had both sides of the shell still connected with wear and discoloration only present on the umbo. One relic shell (identity unknown), living and nonliving invasive zebra mussels (*Dreissena polymorpha*) and Asian clams (*Corbicula sp*.) were also found.

Overall water quality is rated poor. Recent evaluation of water quality in the river at the park – including the project area – continues to indicate degraded conditions with a variety of pollutants present at levels of concern. Through water quality monitoring efforts, Ohio EPA found total dichloro-diphenyl-trichloroethane (DDT) and total polychlorinated biphenyl (PCBs) above the Sediment Quality Guidelines and concentrations above threshold effect, while NEOSD noted over enriched conditions relating to total Kjeldahl nitrogen (TKN), Nitrate-Nitrite, and Total Phosphorus (NEOSD 2022). Within the lower Cuyahoga River, three mainstem locations, including 20.5, Ohio EPA found minimum Dissolved Oxygen exceedances. These results indicate historic contaminant inputs (e.g., DDT, PCB) and ongoing anthropogenic inputs (e.g., nutrients) within the system.

Hydrologic Functions

Hydrologic regimes influence the relationship between upland areas and the river, and artificial changes to the river hydrology created by shoreline armoring can result in geomorphic alterations and structure that may translate to changes in wetland vegetation and degradation of riverine and floodplain habitat.

A general fluvial geomorphology assessment of the entire Cuyahoga River was conducted in 1995 (Biohabitats 1995). The river was classified using the Rosgen Classification System, which quantifies a stream's variables, or morphologic characteristics, in varying levels of resolution from broad characterizations to site specific descriptions. The key variables used in the analysis included channel gradient, bank full width and depth, sinuosity, valley confinement, and particle size of bed materials. Bank full refers to the discharge that fills a stable alluvial channel up to the elevation of the active

floodplain (NPS 2004). These geomorphological features have direct bearing on the hydrologic activity of the Cuyahoga River.

Based on this analysis, the Cuyahoga River was classified as a C5/F5 stream type that has a very high sensitivity to disturbance (including increases to stream flow and timing and/or sediment increases), a fair recovery potential (assumes natural recovery once cause of instability is corrected), a very high sediment supply, high streambank erosion potential, and very high vegetation controlling influence, which are all natural conditions for this class of river.

PROJECT-REACH RIVERINE WETLAND IMPACTS

Figure 5 shows limits of permanent and temporary impacts 50 feet out into the river, perpendicular to and from the top of bank. The bank stabilization will result in impacts to about 660 feet of riparian shoreline considered to have low to moderate functional value. The existing river width in this reach is approximately 120 feet. There will be a permanent and temporary loss of a total of 0.7 acre of riverine aquatic habitat. Permanent impacts will result from direct placement of sandstone riprap on the riverbank. Temporary impacts will result from activities associated with construction, such as driving machinery in the area, moving rocks into permanent place, and increasing in-stream turbidity and sedimentation.

The stabilized bank will have the following adverse effects on the riverine system:

- Along streams where riparian woody vegetation is removed from banks and precluded from being reestablished along erosion control structures, it follows that macroinvertebrate production, essential for aquatic food webs, will be diminished (Florsheim, et al 2008). Please see the existing shoreline habitat conditions in Figures 2, 10, and 11. The armoring will impede the movement of species that use riparian zones for migration corridors, reduce soil structural integrity offered by roots, eliminate reptile (e.g., turtle) nesting areas, and diminish foraging habitat for insects, birds, and bats. The hard armoring structure will also eliminate substrate for micro habitats of plant species that would grow along the bank/water interface.

- Complex riparian plant communities offer a greater variety of food sources and physical habitats than will the proposed bioengineering component proposed for this stabilization project (i.e., live planting and seeding of herbaceous plants along the top eight-foot edge of the armoring will provide limited vegetative cover/biological refugia – Figure 5). Allowing woody plants to grow on or above the armoring could impact the integrity of the armoring. Therefore, the armored portion of the bank will eliminate the possibility of colonization by woody plants that could provide shade that would lower water temperatures and leaf and litter inputs that would support aquatic invertebrates and other wildlife.

- Bats are drawn to riparian vegetation because their prey (mostly aquatic invertebrates as they emerge from the aquatic system) use the woody vegetation canopy for different parts

of their life cycle including reproduction. The project area is critical habitat for three federally protected bat species, the Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), and the tricolored bat (*Pipistrellus subflavus*). Suitable habitat for the Indiana bat, northern long-eared bat, and tricolored bat is found within the project limits. Woody vegetation canopy will be removed, and any remediation plantings will take years to replace, or may never replace, the existing canopy.

- The destruction and smothering of aquatic organisms including invertebrates from rock deposition, stormwater runoff, and an artificially increased turbidity caused by equipment driving in the river, will occur during construction. Upland areas disturbed by construction activities are susceptible to erosion during precipitation events. Silt curtains were not considered for use in the river and will not be used. The short-term impacts on Cuyahoga River due to the potential for increased sediment during construction is anticipated to be moderate and short term.

- Bank erosion modulates changes in channel morphology and pattern. Channel bank armoring will limit the geomorphic processes that transfer sediment through dynamic natural systems and will lead to undesirable secondary effects. For example, completely arresting bank erosion will disrupt the lateral channel-bank sediment exchanges that are necessary to sustain an array of aquatic habitats (Table 1).

- Bank armoring will shift the locus of erosion as the river adjusts to the hardened area that the structure presents. This bank structure will narrow channel width, which will likely lead to higher flow strength and thus initiate a cycle in which the increased energy or shear stress in the center of the new channel – in combination with reduced sediment supply – will lead to channel incision or deepening. The predicted river scour depth Hydraulic Modeling is in the range of 3.8’ – 13.5’. The deepening may in turn increase bank full height and accelerate erosion of unarmored banks downstream (Florsheim et al 2008).

- Channel complexity will be reduced by the changes that the bank armoring produces, including elimination of bank irregularity and channel-width variations, homogenization of near-bank flow velocities, loss of natural bank substrate, and limitation of geomorphic adjustments. Due to changes in hydraulics, it is anticipated that – after construction – most benthic invertebrates and other mobile species will not find suitable conditions to repopulate the channel bottom adjacent to the shoreline stabilization.

- Bank erosion-control structures might fail when flood magnitudes exceed the discharges for which the structures are designed or when processes such as channel migration are prevented. Because hard structures modify the energy flows and impede geomorphic adjustment processes, they can increase erosion locally and in downstream reaches. Nevertheless, bank erosion-control structures can be effective in minimizing land loss over decadal timescales, although some evidence suggests they are ineffective over multidecadal timescales and can have secondary adverse effects (Florsheim et al 2008).

Table 1. Summary of effects on habitat of the Cuyahoga River from construction of channel bank infrastructure to control bank erosion

Geomorphic and ecological attribute	Habitat or ecosystem service influenced	Examples of organisms affected
Loss of sediment source		
Supply	Downstream sandbars that serve as resting habitat for migrating birds	Great blue heron (Ardea herodias)
Grain size	Coarse-grained substrate for attachment and interstitial space for hiding from predators	Macroinvertebrates (e.g., mayflies [*Ephemeroptera*], caddisflies [*Trichoptera*], and stoneflies [*Plecoptera*])
Loss of geomorphic processes		
Migration	Newly scoured or deposited surfaces	Riparian trees (e.g., cottonwood [*Populus*], willow [*Salix*], sycamore [Platanus])
Widening	Adjustment necessary for incised channel to evolve toward equilibrium with floodplain at elevation to support riparian plants	Riparian trees (see above)
Loss of bank substrate		
Unconsolidated sediment	Vertical banks for wildlife burrowing and nesting Filter and retention of nutrients, pollutants, water quality	Bank swallow (*Riparia riparia*) Macroinvertebrates (see above)
Natural biotic and abiotic components of land-water margin	Shoreline microhabitat: soft sediment or burrows, emergent vegetation to cling to; underwater plants, snags, roots protruding from bank	Macro-Invertebrates (see above)
Roughness and irregularity in land-water margin	Variation in near-bank flow velocity, refugia during storm flows	Fish, macroinvertebrates (see above)
Undercut banks	Protection from predators	Crayfish and aquatic insects, juvenile fish (e.g., Smallmouth Bass (*Micropterus dolomieu*))
Loss of woody vegetation		
Stream-side riparian ecosystem, including riparian forests	Complex riparian vegetation, areas for wildlife. Bat habitat, bird breeding, nesting, safety from predators; probing for insects under tree bark; wildlife: food, migration corridor, and/or dispersal route; plants: structure for vines. Natural banks and associated vegetation offer cover for these animals while they move back and forth between water and land.	Bats and birds (e.g., willow flycatcher [*Empidonax traillii extimus*], reptiles (e.g common water snake (*Nerodia sipedon sipedon*), semiaquatic mammals (e.g., river otter [*Lontra canadensis*]), and macroinvertebrates
Overhanging branches, leaves	Shade, organic material, fish food	Fish, macroinvertebrates (nymph and adult stages)
Large woody debris	Reduction in pool complexity and depth, loss of attachment sites	Fish, macroinvertebrates (see above)

CUMULATIVE RIVERINE WETLAND IMPACTS FROM 9 ARMORING PROJECTS

Most of this document focuses on the adverse impacts to the riverine wetland from the Station Road South armoring project. This section discusses the proposed cumulative impacts to physical and biological conditions from all nine armoring projects that are part of one 2024 construction contract. According to the NPS Director's Order #77-1: Wetland Protection Procedural Manual, actions proposed by the NPS that have the potential to have adverse impacts on wetlands are subject to NPS NEPA procedures and supplemented by the wetland protection procedures defined in the Procedural Manual. To comply with the National Environmental Policy Act, the park completed a Categorical Exclusion for this project. Therefore, no Environmental Assessments or Environmental Impacts Statements were completed for this or any of the other 8 individual armoring projects. Accordingly, there has not been any analysis of cumulative effects of these projects on sediment transport, channel erosion, hydraulics, or loss of aquatic habitat from the proposed armoring projects to span 1.7 miles of riverbank at the park.

According to the Programmatic Environmental Assessment for Riverbank Management of the Cuyahoga River (NPS 2004, Table 4-8), prior to 2004 a total of 2.7 miles of shoreline had been armored within the park. By 2017, more than 6.5 miles of riverbank at the park were armored with riprap or other material, an increase of nearly 250 percent since 2004 (NPS 2017). Over time, the existing armoring and the Towpath Station Road South project will be joined by eight more shoreline armoring structures. It is estimated that the nine projects will armor an additional 9,000 feet (1.7 miles) of the riverbank in the 25-mile reach of the Cuyahoga River within the park (please see Figure 12). Some of the new armoring will replace old armoring.

The total cubic yards of fill for the 9 projects have not been calculated and therefore the cumulative effects of the 9 projects on ecological functions, floodway processes, and floodplain carrying capacity has not been analyzed. Suspended solids contributed to the natural bedload transport system will be eliminated at these nine locations, and significantly reduced along the 25-mile reach within park boundaries once all nine armoring projects are in place. Based on the Rosgen channel assessment performed as part of the 2004 Programmatic Environmental Assessment, the Cuyahoga River generally has very high sediment supply. The cumulative reduction of the naturally occurring sediment load will likely have long-term adverse impacts to the river sediment bedload contribution and transport and the width to depth ratio, which will likely adversely increase the hydraulic energies throughout the system and downstream.

The 9,000 feet of bank structures will narrow channel widths. In addition, the stabilization projects include rock bendway weir features (20-foot-wide and 3-foot-high) that will extend into the river approximately 20 feet angled upstream to the riverbank. Bendway weirs will reduce scour and erosion along the streambank by training the river thalweg to adjust further from the riverbank. The proposed bendway lengths are elongated sufficiently beyond the rock toe material to deflect energy to the middle of the river. They are short enough to minimize shifting of river energies too far and creating problems on the opposite bank. The structures are designed to shift the locus of erosion, which will likely lead to higher flow strength and thus initiate a cycle in which the increased energy

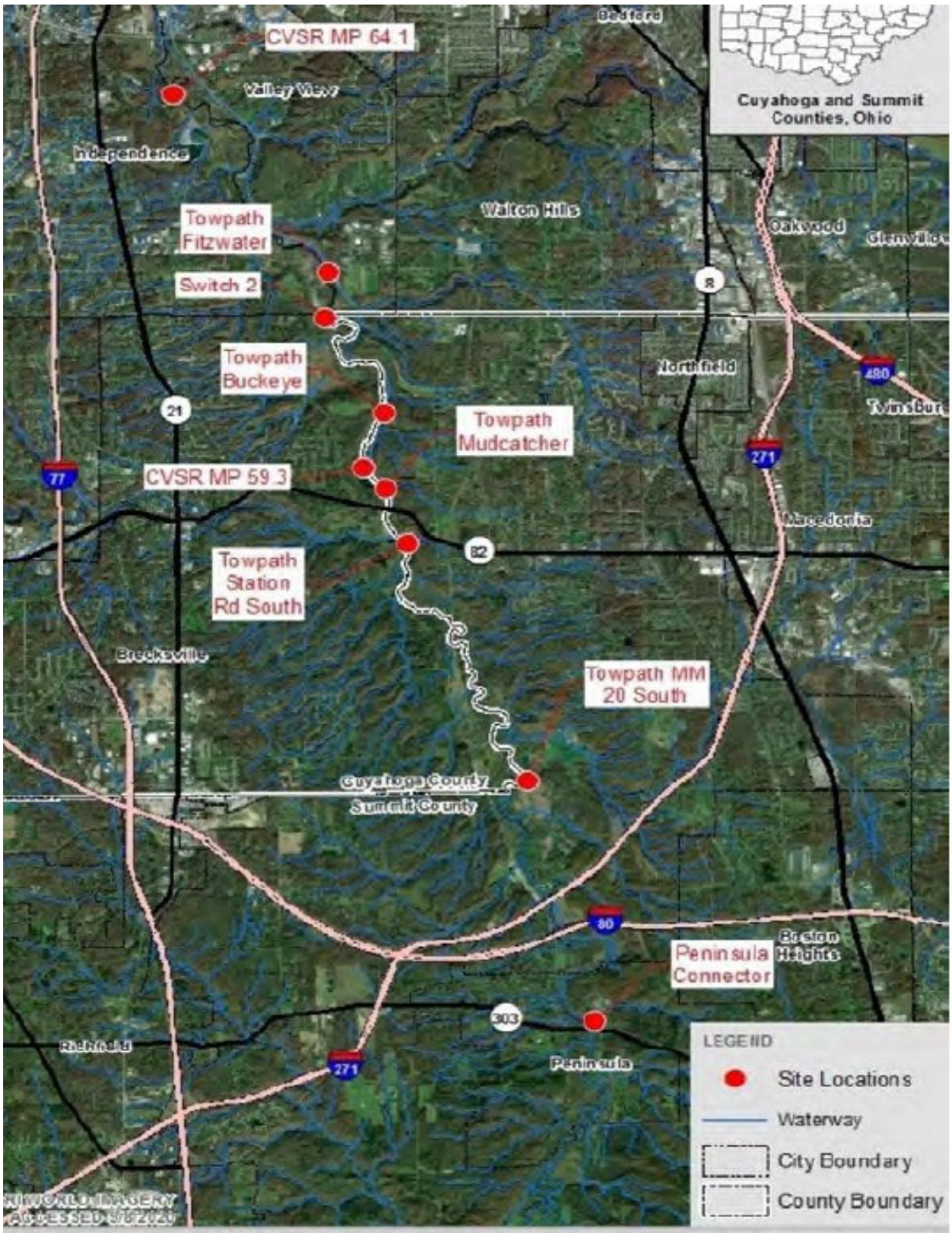

Figure 12. All nine shoreline project locations along the Cuyahoga River including the Station Road South armoring.

or shear stress will shift to the center of the new channel which will likely increase incision and essentially maintain narrower channel widths.

As each new structure interacts with geomorphic processes, bank erosion energy will shift to a new location, creating a chain reaction as each new section of eroded bank is armored with new erosion control structures. The armoring structures, in combination with reduced sediment supply, will likely lead to channel incision or deepening. Hydraulic Modeling predicted river scour depth will be in the range of 3.8' – 13.5'. The deepening may in turn increase bankfull height and accelerate erosion of remaining unarmored banks (Florsheim, et.al. 2008). The total length of the scour adjacent to and downstream of all nine armorings, as well as the extent of head-cutting scour that will extend above the projects, has not been determined.

Consequences of multiple channel bank armorings, that will have long-term effects (beyond the design life of the structure), are that the series of structures may: 1) preclude future river restoration attempts (designed to incorporate nature-based, self-design, and self-sustaining habitats), 2) interfere with the potential for future river restoration initiatives, and 3) interfere with the natural river adjustments needed to maintain equilibrium. If cumulative, long-term effects are ignored, the result will be progressive construction of channel bank infrastructure that, although intended to limit local bank erosion, will likely result in significant channel incision in the lowland Cuyahoga River system (Florsheim, et.al. 2008)

MITIGATION

Best Management Practices

The park will implement and incorporate the following measures into project specifications and drawings to minimize impacts of the project on riverine wetlands:

- Use temporary seeding, permanent seeding, silt fencing, and erosion-control matting to reduce erosion.
- Stabilize construction accessways, place temporary, orange, four-foot-high construction fencing around construction and staging areas, and designate waste disposal, material handling, and equipment fueling areas to protect habitat.
- Delineate wetland boundaries near construction and staging areas with orange, four-foot-high construction fencing.
- Inspect sites weekly and after rainfall events exceeding 0.5-inch and immediately correct any identified deficiencies. All necessary repairs will be implemented immediately after such inspections.
- Remove or cut trees and other woody vegetation only between October 1 and March 30 to avoid impacts to protected bats and migratory birds.
- Ensure that any material that is imported from outside the park is free of any contaminants, and free of any non-native plant parts or seeds.

- Gain approval from the park's Plant Ecologist for any live stakes and seed mixes to be used on the project.
- Remove woody vegetation and trees between October 1 and March 30 to avoid impacts to protected bats and birds protected under the Migratory Bird Treaty Act [16 USC 703].
- No equipment will disturb wetland areas beyond the limits of disturbance identified in Figure 5. Park staff will visit the site regularly during construction to ensure wetlands beyond the limits of disturbance aren't disturbed and compliance with these BMP's is maintained.

Compensatory Mitigation

Construction of the proposed project will impact 0.7 acre of riverine wetlands, including temporary and permanent impacts (Figure 5).

In accordance with NPS guidelines to compensate for wetland impacts, the NPS will create approximately 2.1 acres of forested riverine wetland adjacent to and within the ordinary high-water mark of the Cuyahoga River on NPS property (Figures 13 and 14). This work will result in a compensation ratio of 3:1, creating three acres of habitat for each acre of wetland impact. The compensation area will be located near the southern boundary of the park immediately north of Bath Road and between Riverview Road and Akron-Peninsula Road.

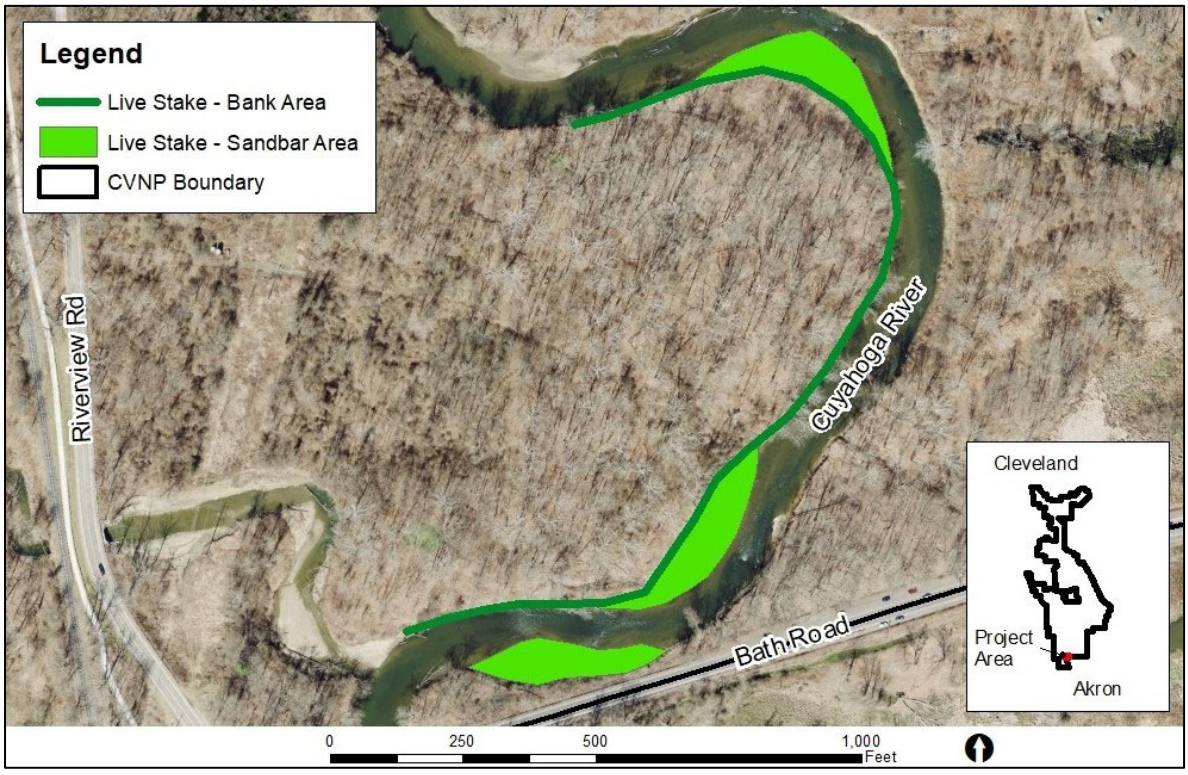

Figure 13: Proposed compensation area and plan to offset project impacts to 0.7 acre of riverine wetland.

Figure 14: Typical bank and river conditions in the compensation area.

Compensation will focus on reforestation of approximately 2,000-linear feet of riverbank and 1.6 acres of sandbar. Existing riverbank conditions in the compensation area are similar to conditions in the project area with poorly vegetated banks dominated by non-native, invasive plants. Plants of particular concern in the compensation area are bush honeysuckle and Japanese knotweed (*Reynoutria japonica*).

Park staff and volunteers have been managing invasive plants and reforesting disturbed uplands east of the compensation area since 2012. Trees initially planted in the area are now nearly 30-feet tall with trunks nearly a foot in diameter. The proposed compensation to add trees and shrubs along the riverbank and within the river channel will improve local ecology further.

NPS staff and volunteers will manage invasive plants in the compensation area intensively for at least three years beginning in 2024, focusing primarily on Japanese knotweed and bush honeysuckle. Initial and follow-up treatments will include foliar spray of Japanese knotweed and cut-stump treatment of bush honeysuckle using a wetland approved herbicide, such as AquaNeat.

Following initial treatment of invasive plants, park staff will begin placing live stakes along riverbank at a density of approximately three stakes per linear foot of bank and one stake per four-square feet of sandbar. Live stakes likely would be purchased from a local source, although some material may be collected locally at the park. Live stakes on sandbars will be dominated by sandbar willow (*Salix exigua*) but will include scattered stakes of sycamore (*Platanus occidentalis*), ninebark (*Physocarpus opulifolius*), and dogwood (*Cornus* sp.). Riverbanks will be planted with similar species but will include more trees. After planting, park staff will incorporate the compensation area into their on-going annual work plan to monitor, continue to manage invasive plants, and re-stake areas that need additional vegetation.

CONCLUSION

The NPS is proposing to use rock riprap to stabilize approximately 600-linear feet of riverbank and channel south of the Station Road Parking Lot to protect the historic Towpath Trail and provide a safe environment for park visitors and staff. The proposed project will impact 0.7 acre of disturbed, low-quality riverine wetland in the project area. To offset these impacts, the NPS will improve the function and value of 2.1 acres of degraded riverine wetlands at the park by transitioning the compensation area from unvegetated riverbank to a diverse assemblage of woody vegetation. This transition will be accomplished by reducing cover of invasive, non-native plants in the area and using live stakes to replace them with native trees and shrubs. After enhancing the site, NPS staff will incorporate the compensation area into their annual work plan and manage the site appropriately to support high-value wetlands in perpetuity in accordance with NPS *Director's Order #77-1: Wetland Protection* and Presidential *Executive Order 11990, Protection of Wetlands*.

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