FINDING OF NO SIGNIFICANT IMPACT

POTOMAC SUBMERGED CHANNEL INTAKE

Washington Suburban Sanitary Commission (WSSC) proposes to construct a new offshore submerged channel intake for water supply at its Potomac Water Filtration Plant (WFP). The WFP is located along River Road near Potomac, Maryland. The Chesapeake and Ohio Canal National Historical Park (C&O Canal NHP or the park) is located parallel to the Potomac River and passes between the existing water intake structure and the remaining facilities of the WFP. The project will involve construction activities and the location of permanent WFP structures within the C&O Canal NHP. The inflows from Watts Branch and Seneca Creek, two tributaries on the north bank of the Potomac River immediately upstream of the WFP intake, have been identified as having a major impact on raw water quality and treatment plant operation. In response to the U.S. Environmental Protection Agency's 1996 Safe Drinking Water Act Amendments, the Maryland Department of the Environment and WSSC undertook a formal Source Water Assessment (SWA), which was completed in 2002. Based on the impact of the input from Watts Branch, the SWA recommended that consideration be given to an upgraded intake structure with the ability to withdraw water from a submerged mid-channel location.

The project is needed by WSSC to provide a consistently higher quality raw water source than can be achieved using the existing onshore intake. The proposed submerged channel intake will not increase water withdrawals from the river, but will provide higher quality source water from an alternate location. The current shoreline intake has a greater withdrawal capacity than that for which WSSC is permitted. Likewise, the proposed submerged channel intake will have the capacity for greater withdrawals than the current permit allows. The construction of the submerged intake will be a major undertaking, and the intake has been designed for long-term use. A larger intake accommodates future requirements, reducing the likelihood of future construction in the river.

The federal action being carried forward by the NPS is to allow for the actions outlined as proposed by WSSC, while considering the purpose and resources of C&O Canal NHP, as expressed in statute, regulation, policy, and the NPS objectives in taking action. The actions to be carried out by the NPS include the issuance of a special use permit for the construction of the WTP and the transfer of property rights or conveyance of an easement through a land exchange or other action pursuant to existing legal authorities. The federal action by the NPS is needed because the applicant has submitted a permit application and preliminary plans to construct a submerged intake and supporting features in and adjacent to C&O Canal NHP. The NPS understands WSSC's need for the project. WSSC and NPS prepared an Environmental Assessment (EA) to examine alternative actions and environmental impacts associated with the proposed action to construct a new offshore submerged channel intake within the C&O Canal NHP.

The EA was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), the regulations of the Council on Environmental Quality (CEQ) for implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508), and NPS Director's Order 12 (DO) 12, *Conservation Planning, Environmental Impact Analysis and Decision-making*, and accompanying Handbook.

SELECTED ALTERNATIVE

Based on close collaboration with the WSSC and professional judgement informed by the analysis presented in the EA, the NPS has agreed with the findings and will allow alternative 2 (Tunneling to Onshore Shaft - West of Existing Intake [page 26 in the EA]) to be carried forward. The Selected Alternative will construct a new intake in the Potomac River by tunneling underground west of the exiting intake. The intake structure within the river will be connected to three corresponding separate intake conduits, constructed within intake shafts and tunnels. The intake shaft will be used to construct the river intakes and connect them to the tunneled intake conduits. A temporary cofferdam will be constructed in the river around the intake location to provide a "dry" working area. A new onshore shaft will be constructed west of the existing intake facility. When tunneling operations are completed, a permanent junction vault structure will then be constructed within the shaft. Three intake tunnels will head north from the new intake to the onshore shaft, and then head east before connecting into the intake conduits on the downstream side of the existing intake facility.

In addition, a boat ramp, parking area, and permanent access road will be constructed west of the existing intake facility. The permanent access road will be located off of the existing intake facility access road to provide access to the new boat ramp and parking area. This road will also provide access for maintenance of the junction vault. A temporary access road will be constructed to allow access from WFP property to construction areas. The road will provide construction access to the intake shaft on the west end of Unnamed Island and to the existing raw water conduits to allow construction vehicles to cross and traverse over the western portion of Unnamed Island and to continue back onshore. An embankment will be constructed across the C&O Canal NHP for the temporary access road because the types of construction equipment required for the project will exceed the rated loading capacity (20 tons) of the existing bridge crossing. A second embankment will be constructed across the channel between the unnamed island and the shoreline just east of the existing intake to support the construction access road. The proposed connection to the existing WTP facilities is through the existing raw water conduits between the existing intake and towpath. This connection will be made by constructing small shafts above each connection point.

The construction area limit or the limit of disturbance for the Selected Alternative will be approximately 8.7 acres. Of this, approximately 2.8 acres will be on C&O Canal NHP, which include deciduous woodlands, forested wetlands, and riverine wetlands. The land is previously disturbed and contains a number of nonnative species; however, the mature forest provides habitat for a variety of plant and wildlife, including special-status species. The construction area limit will also include approximately 5.6 acres (land and water) that are managed by the State of Maryland and 0.3 acre of land managed by WSSC. The project will implement a number of resource protection measures to minimize the degree and/or severity of adverse effects on natural resources, cultural resources, public health and safety, and the visitor experience (see Appendix D of the EA; Attachment B of this FONSI)).

NPS will convey an easement to WSSC, pursuant to applicable legal authorities for the existing and proposed intake facilities. The specifics of the conveyance will be determined in an agreement between NPS and WSSC signed prior to the issuance by NPS of the special use permit for construction.

RATIONALE FOR DECISION

This EA provided an overview of the proposed project and analyzed a no-action alternative and three other action alternatives and their impacts on the environment. The Selected Alternative provides for improved raw water quality, improved reliability, and provides the most protection for the park and other resources. The no action alternative will protect park resources, but the tributary runoff on the north bank of the Potomac River will continue to have an impact on the raw water quality and treatment plant

operations. Alternative 3 (Trenching/Tunneling to Onshore Shaft – West of Existing Intake) will result in more significant impacts due to the use of both open-trench and tunneling construction methods. Trenching the river bottom will cause much greater impact on resources and visitor experience than the tunneling proposed for the Selected Alternative. Alternative 4 (Tunneling to Onshore Shaft – East of Existing Intake) will locate the onshore shaft east of the existing intake. This will require the temporary relocation of the towpath during construction, which will increase the impacts on visitor experience. The Selected Alternative has the smallest construction footprint (limits of disturbance) of the action alternatives. Alternative 3 has the next smallest footprint, but construction will be accomplished by trenching the bottom of the river, resulting in more impacts to river resources than the Selected Alternative, which uses tunneling to construct the intake tunnels. Alternative 4 will require the temporary relocation of the towpath during construction, but the Selected Alternative avoids these impacts on this important park resource. Since the Selected Alternative has the smallest footprint in the river, it lessens impacts on submerged aquatic vegetation, mussels, and general river bottom habitat. During impact analysis, WSSC adjusted the design for the Selected Alternative in consultation with NPS and other resource agencies to further avoid and minimize impacts. For example, the boat ramp was moved to avoid as much of an archeological site as possible. Construction methods for the temporary access road were adjusted to avoid ground disturbance to avoid a second archeological site. The mitigation measures included as part of the Selected Alternative and described below, further reduce impacts on resources and provide for the restoration of affected areas. For these reasons, alternative 2 was selected for implementation.

MITIGATION MEASURES

A variety of mitigation measures will be instituted as the actions are taken to implement the Selected Alternative. The NPS will conduct an appropriate level of monitoring throughout the construction process to help ensure that protective measures are being properly implemented and are achieving their intended results.

Mitigation measures for natural resources will be described in detail in the construction permits (e.g., NPS Special Use Permits; Section 404 Permit for Discharge of Dredged or Fill Material into Waters of the U.S.; Waterways Construction Permit; and Sediment Control Permit) and plans (e.g., Erosion and Sediment Control Plan and Stormwater Management Plan) that will be prepared after the detailed design has been completed, obtained before construction initiation, and approved by the relevant agencies. In addition, a Habitat Restoration Plan (Appendix D of the EA; Attachment B of this FONSI) has been completed that includes mitigation for forestland, submerged aquatic vegetation (SAV), freshwater mussels, special-status species, and nonnative species. Mitigation for wetlands and floodplains can be found in the Statement of Findings (SOF) (Appendix E of the EA; Attachment C of this FONSI). Stipulations that outline appropriate treatment measures to minimize or mitigate adverse effects to cultural resources can be found in the Memorandum of Agreement (MOA) (Attachment D of this FONSI). Additional mitigation measures identified in the EA are documented in Attachment E of this FONSI.

MITIGATION IMPACT FUND

The WSSC will contribute to a mitigation fund for impacts associated with the proposed construction of this project; this fund is separate from the land exchange described above. The funds will be used for appropriate compensatory mitigation projects to minimize or offset the unavoidable impacts of this project on ecological resources and visitor use within the C&O Canal NHP. During construction, the experience for visitors walking or cycling through the project area will be degraded, due to the loss of trees and construction activities, when compared with current conditions; this degradation of a visitor experience cannot be avoided under the action alternatives and an economic value can be estimated for this loss.

NPS and WSSC have prepared an analysis of impacts on visitor experience and ecological resources that will be used by both parties to determine a fair and equitable mitigation for these impacts. The mitigation will be

used to enhance visitor experience and ecological resources within the C&O Canal NHP.

The analysis was conducted to assist WSSC and the NPS to formulate mitigation in monetary terms associated with alternative 2, the preferred alternative. The objectives of the analysis were to:

1. Estimate the approximate monetized value of incremental adverse impacts on use of visitor use, as identified in the EA; and,

2. Estimate the approximate scale and cost of restoration projects appropriate to offset incremental impacts on ecological resources, as identified in the EA.

For impacts on visitor use, the analysis estimates that an average of 370,000 visitors to the C&O Canal NHP will be affected each year. We estimate that visitor impacts will be $1.6 million per year and, discounted for present value, will total approximately $5.7 million, assuming a 4-year construction period.

For impacts on natural resources, the analysis estimates a total of approximately 53 discounted service acre-years of ecological service loss as a result of construction and vegetation clearing across all habitat types and sources of service losses in the project area for the period 2018 through 2096 (time required for the forest to restore to original conditions). Applying proposed ecological restoration project costs, we estimate the total restoration costs required to offset ecological impacts on wetlands and upland forests to be approximately $151,300; the estimated cost to offset impacts on upland forests only is approximately $136,700.

The economic analysis presented above was completed using information available from the conceptual design of the preferred alternative, alternative 2. As WSSC moves forward with detailed design and planning for this project, they will work with NPS to further reduce impacts on ecological resources and visitor use at the C&O Canal NHP. Additional design has the potential to reduce visitor and resource impacts by the footprint of the project and the duration of construction, which is currently estimated at 4 years. The design of the preferred alternative, alternative 2, for this environmental assessment is conceptual and represents the maximum impact from the project to make certain all reasonably foreseeable impacts are addressed.

Once detailed design reaches the seventy percent stage, WSSC and the NPS will re-evaluate the initial analysis to determine if it needs to be modified to reflect actual mitigation and visitor impacts. If a modified analysis is needed, it will be done in a manner consistent with the previous analysis and will be based on the most recent visitor use statistics that reflect actual visitation. The revised analysis will also consider impacts to the Canal Quarters program. NPS and WSSC will use the updated analysis to determine the mitigation for impacts from the proposed construction of the preferred alternative, alternative 2. Prior to the issuance of the Special Use Permit for construction by NPS, WSSC and NPS will execute a task agreement for the Mitigation Fund, with a qualified third party, which will specify the nature of the impacts being mitigated, the amount of compensation, and the type or nature of the compensating mitigation projects for which the funds are intended.

FINDING OF NO SIGNIFICANT IMPACT

As documented in the EA, the Selected Alternative has the potential for adverse impacts on geology and soils/sediment, water resources, wetlands, floodplains, vegetation, wildlife, special-status plant species, cultural resources, scenic resources, and visitor use and experience as a result of construction and operation activities. Even though terrestrial habitat areas will be revegetated following construction, these areas will not succeed to the deciduous woodlands currently present at the project site within the scope of this analysis; therefore construction impacts for vegetation, terrestrial wildlife, scenic resources, and visitor use and experience are considered long term. However, the NPS has determined that the Selected Alternative can be implemented without significant adverse impacts, as defined in 40 CFR 1508.27.

Construction-related activities will adversely affect geology, soils and river sediment. Construction of the cofferdams and embankments will disturb river sediments and soils along the shoreline. Operation of the

intake may cause impacts on river material and sediments from localized sculpting of the river bottom and scouring of the riverbed around the intake. Tunneling for the shafts and tunnels will remove rock from the area permanently. Soils will be disturbed due to clearing, staging and construction activities; however, soils at the site are largely fill from previous disturbances. The placement of new permanent structures will cause adverse impacts to soil, but the features are small and stormwater control practices will reduce impact.

Wetlands and floodplains will be impacted by construction activities and the presence of new permanent facilities. Approximately 0.2 acres of NPS wetlands will be impacted by the construction and operation of this project, these wetlands include riverine wetlands and a small wetland within the project area. A wetland mitigation site within the park has been identified and about 0.75 acres of wetlands will be enhanced, resulting in a mitigation ratio of nearly 4:1. Approximately 6 acres of floodplains will be impacted during construction due to cofferdams and embankments (1.7 acres), vegetation clearing (4.7 acres) and access roads (0.6 acres). Approximately 0.53 acres of floodplains will be permanently impacted due to new permanent structures located in the floodplain (boat ramp facilities including access road and parking area, a junction vault, and the intake structure). These new features represent a small adverse impact on floodplain function.

Construction activities will affect both terrestrial (approximately 4.7 acres) and aquatic vegetation (approximately 4 acres); permanent features will impact approximately 0.31 acres of terrestrial vegetation and 0.17 acres of aquatic habitat. The construction activities include clearing of the construction area, placement of the cofferdams, embankments, and access roads. The Habitat Restoration Plan (Appendix D of the EA) includes full restoration of the construction site, but impacts will persist until the area returns to a mature forest. Permanent features include the new boat ramp, access road, parking area and the junction vault, which will cause a slight impact on both terrestrial and aquatic vegetation.

Several special-status species exist in the project area – northern long-eared bat, floating paspalum, halberd-leaved hibiscus (*Hibiscus laevis*), and rough avens (*Geum laciniatum*). Vegetation clearing is restricted to avoid impacts on the northern long-eared bat, a federally protected species, causing a finding of not likely to adversely affect this species. Adverse impacts on the three plants, state-listed species, will result from vegetation clearing, but these impacts will be offset by restoration of the project area and time of year restrictions.

Construction activities will have adverse impacts on archeological resources, cultural landscapes and historic structures. Impacts on archeological resources will occur during construction of the boat ramp. An MOA was developed to address requirements to mitigate these impacts. Impacts on cultural landscapes will result from the vegetation clearing at the site. The restoration plan will restore the landscape, but impacts will persist until the area returns to a mature forest and the current landscape. The placement of the embankments across the towpath and canal prism will cause adverse impacts during construction. Measures to protect these resources are addressed in the MOA and include the use of steel plates and protective fabric barriers to prevent damage to these resources.

The vegetation clearing needed for construction will impact the scenic resources and visitor experience, altering the landscape for the duration of construction and after, as the area is restored. During construction, the area will be an active construction site adjacent to the towpath. This will include the presence of a fence around the construction site, obscuring views of the river, construction traffic, and, periodic closures of the towpath during blasting operations, to protect visitors. After construction, the area will be restored over time, but visitor experience and scenic resources will be impacted as the forest grows and returns to a mature forest.

AGENCY CONSULTATION

Agency consultation was conducted with the US Army Corps of Engineers (USACE), US Fish & Wildlife Service (USFWS), and Maryland Department of Natural Resources (MD DNR). Communication with these agencies began in early spring of 2013 concerning the need to conduct natural resource surveys in the project area. The agencies recommended and agreed that surveys should be completed for freshwater mussels, SAV,

wetlands, forest stands, and rare plants. The agencies reviewed and approved study plans for the proposed surveys. A survey for floating paspalum (state-endangered plant species) was also conducted for the species to better understand the context of the potential impacts and the opportunity for recolonization of the species following construction.

In accordance with federal and state requirements for special-status species, consultation letters were mailed to state and federal agencies including the USFWS Chesapeake Bay Field Office and the MDNR Wildlife and Heritage Service. The USFWS stated in a response letter that no federally proposed or listed endangered or threatened species are known to exist within the project impact area and thus no Biological Assessment or further Section 7 Consultation with the USFWS is required. Consultation was again conducted with the USFWS on the recently federally listed northern long-eared bat and the USFWS responded in a letter that the proposed submerged channel intake project is "not likely to adversely affect" the northern long-eared bat given that vegetation clearing will not occur between April 15 and August 30. The MD DNR responded in a comment on the EA that they are supportive of the analysis in the EA of the natural resources. Consultation with MD DNR is ongoing.

Compliance with Section 106 of the National Historic Preservation Act is being handled separately through ongoing consultation with the Maryland Historical Trust (MHT). An MOA was prepared to guide the Section 106 process. The provisions of the MOA will guide the implementation of this project and will stipulate appropriate treatment measures to minimize or mitigate any adverse effects to the potentially eligible sites from the proposed action. Consultation with MHT is ongoing.

CONCLUSION

As described above, the decision of NPS to allow the implementation of the Selected Alternative does not constitute an action meeting the criteria that normally requires preparation of an environmental impact statement (EIS). The Selected Alternative will not have a significant effect on the human environment in accordance with Section 102(2)(c) of NEPA.

Based on the foregoing, it has been determined that an EIS is not required for this project and, thus, will not be prepared.

Recommended: Kevin O. Brandt 1/11/2018

Kevin D. Brandt
Superintendent
Chesapeake and Ohio Canal National Historical Park
National Capital Region

Date

Approved: Robert A. Vogel

Robert A. Vogel
Regional Director
National Capital Region

Date

ATTACHMENT A: NON-IMPAIRMENT DETERMINATION

WHY IS A NON-IMPAIRMENT DETERMINATION REQUIRED?

Section 1.4.7 of *Management Policies 2006* states that:

> [b]efore approving a proposed action that could lead to an impairment of park resources and values, an NPS decision-maker must consider the impacts of the proposed action and determine, in writing, that the activity will not lead to an impairment of park resources and values.

Actions that require preparation of Environmental Assessments (EAs) and Environmental Impact Statements (EISs) constitute actions that may have the potential to impair park resources or values. Therefore, a non-impairment determination must be made for any action selected in a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) that could impact park resources and values and to which the NPS is a signatory. The non-impairment determination is completed only for the selected action.

WHAT IS IMPAIRMENT?

Sections 1.4.5 and 1.4.6 of *Management Policies 2006* provide an explanation of impairment. Section 1.4.5 defines impairment as:

> an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values.

Section 1.4.5 goes on to state that:

> [a]n impact to any park resource or value may, but does not necessarily, constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:
>
> - Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park
> - Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
> - Identified as a goal in the park's general management plan or other relevant NPS planning documents as being of significance.
>
> An impact would be less likely to constitute an impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values and it cannot be further mitigated.

Section 1.4.6 of *Management Policies 2006* identifies the park resources and values that are subject to the non-impairment standard.

> The "park resources and values" that are subject to the non-impairment standard include:
>
> - the park's scenery, natural and historic objects, and wildlife, and the processes and condition that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural

visibility, both in daytime and at night; natural landscapes; natural soundscapes an smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structure, and objects; museum collections; and native plants and animals;

- appropriate opportunities to experience enjoyment of the above resources, to the extent that can be done without impairing them;
- the park's role in contributing to the national dignity, the high public value and integrity, and the superlative environmental quality of the national park system, and the benefit and inspiration provided to the American people by the national park system; and
- any additional attributes encompassed by the specific values and purposes for which the park was established.

HOW IS A NON-IMPAIRMENT DETERMINATION MADE?

Section 1.4.7 of *Management Policies 2006* states that

> "[I]n making a determination of whether there would be an impairment, an NPS decision maker must use his or her professional judgment. This means that the decision-maker must consider any environmental assessments or environmental impact statements required by the National Environmental Policy Act of 1969 (NEPA); consultations required under Section 106 of the National Historic Preservation Act (NHPA); relevant scientific and scholarly studies; advice or insights offered by subject matter experts and others who have relevant knowledge or experience; and the results of civic engagement and public involvement activities relating to the decision."

Management Policies 2006 further define "professional judgment" as

> "a decision or opinion that is shaped by study and analysis and full consideration of all the relevant facts, and that takes into account the decision-maker's education, training, and experience; advice or insights offered by subject matter experts and others who have relevant knowledge and experience; good science and scholarship; and, whenever appropriate, the results of civic engagement and public involvement activities relation to the decision."

HOW IS A WRITTEN NON-IMPAIRMENT DETERMINATION PREPARED?

This determination on impairment has been prepared for the Selected Alternative, as described in the EA. Topics from the EA that were evaluated for potential impairment due to implementation of the Selected Alternative include: geology and soils, water resources, wetlands, floodplains, aquatic and terrestrial vegetation, aquatic and terrestrial wildlife, special-status species, scenic resources, and cultural resources. Impairment determinations are not made for human health and safety, visitor use and experience, and land use as these topics do not constitute impacts to park resources and values subject to the non-impairment standard by the Organic Act.

RESOURCES OF CHESAPEAKE AND OHIO CANAL NATIONAL HISTORICAL PARK

The C&O Canal NHP is the last towpath that remains fully intact from the mule-drawn barge transportation era in the United States. The C&O Canal NHP, established in 1971, is located along 184.5 miles of the Potomac River shoreline in Maryland. The C&O Canal NHP is historically significant primarily because it embodies nineteenth-century engineering and architectural technology. Today, the canal's remaining historical structures tell the story of the canal's important role in many aspects of American history, including transportation, engineering achievement, and commerce. The park's mission

is to preserve and protect the natural, cultural, and historic resources of the park. The park provides recreational activities including hiking, biking, camping, canoeing, fishing, and boating to visitors in addition to allowing them to experience the rich history, wildlife, and geologic resources of the canal.

The purpose of the park is to provide visitors the opportunity to understand the canal's purpose and benefits during its time of operation; to appreciate the setting and the natural and human history of the canal; and to enjoy the recreational use of the canal, the parklands, and the adjacent Potomac River (NPS 1976). The natural and cultural resources are integral to fulfilling the purpose of the park. These goals were considered during the impairment determination process for the Selected Alternative.

GEOLOGY AND SOILS

The Selected Alternative will result in adverse impacts to geologic resources, soils, and sediments of the C&O Canal NHP; however, the Selected Alternative also includes measures to reduce impacts on these resources. Construction of the new intake tunnels will involve excavating a tunnel beneath the Potomac River to connect the new intake to the existing raw water conduits, thus affecting bedrock material. Bedrock removal will be permanent; however, the excavations will be carried out in a manner that will maintain stability of the surrounding geology. The installation and removal of temporary cofferdams for the construction of the new intake, intake shaft, and boat ramp and the construction of the embankments in the C&O Canal NHP and channel of the Potomac River will disturb canal and riverbed material (sediments) potentially resulting in the release of fine sediment into the canal and river. Silt curtains will be used during installation and removal of the cofferdams to reduce suspended sediments in the water column. Upland construction activities including the construction of the boat ramp access road, parking area, junction vault, construction access road, and associated staging areas will impact soils at the site. Vegetation will be cleared and soils subsequently graded resulting in soil disturbance and compaction. Following construction, the site will be restored and revegetated to stabilize soils in the long term. There will be a small loss of soils from permanent features; however, most will be constructed of paving materials that will allow rainwater to pass through the material into the soil below and then back to the ground water supply, thereby stabilizing the soils at the site and minimizing impacts on soil functionality. Additionally, best management practices (BMPs), such as stormwater control practices, will be used.

Although adverse effects on geology and soils will occur under the Selected Alternative, mitigation measures included in the Selected Alternative will help avoid and minimize impacts, as described above. Permanent removal of soil in some areas will be mitigated by using permeable materials that allow absorption of rainwater. The soils and geology within the park will continue to exist in a condition similar to its current state. Current and future generations of visitors will have similar opportunities to experience these resources; therefore, implementation of the selected action will not result in impairment to geology and soils.

WATER RESOURCES

The water resources, including the water quality of the Potomac River and C&O Canal NHP, will be adversely affected during construction of the project. It is anticipated that turbidity will temporarily increase locally from the construction and removal of the cofferdams and embankments and potential sediment runoff from the upland construction areas. However, WSSC will use applicable BMPs and follow Maryland and Montgomery County regulations for sediment and erosion control during construction to ensure proper drainage onsite and to minimize impacts on stormwater. BMPs will be used to minimize disturbance within the river as well as onshore. Impacts on water quality from the construction of onshore structures at the site are expected to be short-term minor and adverse; however, in the long term, impacts from the permanent onshore structures will be negligible due to the small area of new impervious surfaces created at the site and the use of stormwater control BMPs. The operation of the

submerged intake will result in long-term minor and adverse impacts on the flow velocity of the Potomac River, but these impacts will be localized to the project site.

Although adverse effects on water resources will occur under the Selected Alternative, mitigation measures included in the Selected Alternative will help avoid and minimize impacts, as described above. Under the Selected Alternative, the C&O Canal NHP and the Potomac River will continue to exist in a condition similar to their current conditions after completion of the project. Current and future generations of visitors will have similar opportunities to experience these water resources. Therefore, implementation of the selected action will not result in impairment to water resources.

WETLANDS

Riverine systems and wetlands will be adversely affected during construction and operation of the Selected Alternative. Construction and removal of the cofferdams, culverts, and embankments will cause short-term impacts from dewatering of a portion of the Potomac River and direct loss of SAV and increased turbidity in the Potomac River and C&O Canal NHP riverine systems. These impacts will be reduced through time of year restrictions and the use of silt curtains. A forested wetland (wetland A) will also be temporarily impacted by the project. The construction of a temporary access road will affect 0.02 acre through removal of vegetation and reduction of functions and values. BMPs will be employed to minimize impacts on hydrology, water quality, and special-status species to comply with *PM #77-1: Wetland Protection.* Installation of permanent features will also affect wetlands in the project area; however, only a small fraction of riverine wetlands will be permanently affected on NPS property from the portion of the boat ramp that extends into the Potomac River. Overall, approximately 0.19 acre of forested and riverine wetlands on NPS property will be affected, and approximately 0.002 acre of riverine wetland will be permanently affected. Wetland impacts will be further mitigated through enhancement of an existing wetland within C&O Canal NHP in order to provide the same functional benefits of the 0.19 acre of wetlands that will be impacted at the WSSC Potomac WFP. The wetland mitigation site is approximately 1.7 acres in size, and approximately 0.75 acre of this will be enhanced, making the mitigation ratio nearly 4:1.

Adverse effects on wetlands will occur under the Selected Alternative; however, mitigation and enhancement measures included in the Selected Alternative, as described above, will help reduce temporary impacts and create overall beneficial effects on wetlands at the park. Therefore, wetlands within the park will continue to exist in a condition similar to or better than its current state. Current and future generations of visitors will have similar opportunities to experience these habitats. Implementation of the selected action will not result in impairment to wetlands.

FLOODPLAINS

Under alternative 2, the 100-year floodplain will be affected during construction and operation of the project. It is anticipated that short-term adverse impacts will result from construction and removal of the cofferdams and embankments. During construction activities, appropriate stormwater management techniques will be used to avoid indirect impact to floodplains to comply with Procedural Manual 77-2: *Floodplain Management.* Long-term adverse impacts will result from the clearing of forest trees and for the operation of the permanent structures within the floodplain, as floodplain functions will change as a result of tree loss, including the ability to convey floodwaters. However, this will be site-specific and will only affect a small portion of the floodplain. In addition, the design of structures within the floodplain will incorporate methods for minimizing flood damage, as contained in the National Flood Insurance Program "*Floodplain Management Criteria for Flood-Prone Areas*" (CFR 44, 60.3) and in accordance with any state or county requirements for flood-prone areas.

Adverse effects on floodplains will occur under the Selected Alternative; however, these impacts will be reduced through mitigation measures, as described above. The floodplain within the park will continue to exist in a condition similar to its current state. Therefore, implementation of the selected action will not result in impairment to floodplains.

AQUATIC AND TERRESTRIAL VEGETATION

Aquatic and terrestrial vegetation will be affected by construction of the submerged intake structure, boat ramp, parking area, boat ramp access road, and junction vault. Existing terrestrial vegetation will be removed or destroyed from placement of temporary construction features. Following construction, the terrestrial habitat will be revegetated using native vegetation and will be monitored and managed to prevent colonization by nonnative invasive species, as presented in the Habitat Restoration Plan; however, the impacts on vegetation will be long-term and adverse, as the area will not be restored to current conditions within the period of analysis. The available habitat for both aquatic and terrestrial vegetation will be reduced from construction of permanent features (e.g., intake structure, parking area), but the affected area will be small. Adverse impacts will also occur from operation of the intake as areas of riverbed downstream of the intake and between the intake and Unnamed Island are subject to scouring and sedimentation, respectfully, and submerged aquatic vegetation growth in these areas could be affected.

Adverse effects on aquatic and terrestrial vegetation will occur under the Selected Alternative, though the impacts will be reduced slightly due to the plan to revegetate with native species and monitor for nonnative invasive species. Although the project area will not return to mature forest within the analysis period of this project, the measures in the Habitat Restoration Plan will eventually create a viable forest with a goal of fewer nonnative species. Overall, aquatic and terrestrial vegetation communities within the park will continue to exist in a condition similar to its current state. Current and future generations of visitors will have similar opportunities to experience these habitats and the species that use them. Therefore, implementation of the selected action will not result in impairment to aquatic and terrestrial vegetation.

AQUATIC AND TERRESTRIAL WILDLIFE

The Selected Alternative will result in a permanent loss of both terrestrial and aquatic habitats at the project site, but the loss of permanent habitat will be small and localized. Construction activities will result in the disturbance of terrestrial and aquatic habitat. Removal of vegetation and disturbance of substrate in these areas will affect wildlife through direct mortality or displacement. After construction, the temporary features will be removed and the project area will be restored. Following construction, aquatic species are expected to return to the disturbed areas as natural processes build up the streambed and SAV is established again. The composition of aquatic wildlife may differ from current conditions, as conditions will be similar but not exactly the same. Adverse impacts on aquatic wildlife species from operation of the submerged intake are expected to be long-term from scouring of the substrate and possible impingement/entrainment.

Terrestrial habitat areas will be revegetated following construction, but will not succeed to the mature deciduous woodlands currently present at the project site within the scope of this analysis. Wildlife will begin to use the area after construction activities are complete and the area replanted with vegetation. Complete restoration will take many years and will extend beyond the scope of this assessment. As the area grows and succeeds toward mature forest, the structure of the habitat will change, supporting different species of wildlife. The terrestrial wildlife species that currently inhabit the project area may not repopulate the area within the scope of this analysis; therefore, impacts are expected to be long-term and

adverse. Although the habitat, and therefore wildlife, composition will not be restored to the current conditions following construction, the area will be available to wildlife following construction.

Although adverse effects on terrestrial and aquatic wildlife will occur under the Selected Alternative, mitigation measures outlined in the Habitat Restoration Plan will reduce these impacts somewhat. Under this plan, mussels will be relocated outside of the construction area limits prior to initiation of the project and terrestrial areas will be revegetated with native species and monitored for nonnative invasive species. The terrestrial and aquatic wildlife communities within the park will continue to exist in a condition similar to its current state. Current and future generations of visitors will have similar opportunities to experience these species. Therefore, implementation of the selected action will not result in impairment to terrestrial and aquatic wildlife.

SPECIAL-STATUS SPECIES

The Selected Alternative will impact four special-status species plants and potentially impact one federally-listed wildlife species. The southern water nymph (*Najas guadalupensis*), an aquatic species, will be affected through changes in water quality; however, these impacts are expected to be temporary, as they will only occur during construction activities. Construction of temporary and permanent construction features will impact terrestrial plants by direct mortality. Impacts on terrestrial special-status species will affect entire populations of the plants in the project area. The impacts on floating paspalum (*Paspalum fluitans*), halberd-leaved hibiscus (*Hibiscus laevis*), and rough avens (*Geum laciniatum*) will be offset by mitigation measures including complete restoration of the project area, expected reestablishment for special-status plant species, and time-of-year restrictions. Removal of vegetation at the site could potentially affect the northern long-eared bat (*Myotis septentrionalis*), a federally threatened species. When time-of-year restrictions are considered for the northern long-eared bat, it has been determined through consultation with USFWS that the proposed project will "*not likely to adversely affect*" the bat. Operation of the submerged channel intake will not have an effect on special-status plants or wildlife.

Although adverse effects on special-status species will occur under the Selected Alternative, mitigation measures included in the Selected Alternative will help avoid and minimize impacts, as described above. The special-status species within the park will continue to exist in a condition similar to its current state. Current and future generations of visitors will have similar opportunities to experience these species. Therefore, implementation of the selected action will not result in impairment to special-status species.

SCENIC RESOURCES

Scenic resources will be adversely affected by the Selected Alternative, but the impacts will not result in impairment. Prior to construction, a fence will be constructed, obscuring most of the construction on both sides of the towpath from visitors' views. Boaters on the Potomac River will be able to see all aspects of construction except for those that impact the canal. The impacts from construction equipment and features will be temporary. Following construction, which will last approximately 4 years, all park visitors and river users will be able to see the change in vegetation, which will result in long-term adverse impacts. The new permanent terrestrial features (i.e., junction vault, boat ramp, parking area, boat ramp access road, and security fencing) will be visible for both towpath and river users; boaters will also see a change in the river at and downstream of the submerged intake. Although the project site will be revegetated following construction, impacts on visual resources from operation of the proposed submerged intake will be long-term, as the mature deciduous woodland will not be fully restored during the period of analysis.

Although adverse impacts on scenic resources will occur, these impacts will be somewhat reduced by a fence that will block the view of construction activities from visitors on the towpath. The scenic resource

at the park will continue to exist in a condition similar to the current state. Current and future generations of visitors will have similar opportunities to experience the many scenic resources at the park. Therefore, implementation of the selected action will not result in impairment to scenic resource.

CULTURAL RESOURCES

Historic Structures, Buildings, Objects, and Districts. Construction and operation of the submerged channel intake under the Selected Alternative could affect the canal prism and towpath, both of which are historic structures in the area of potential affect. Additionally, a Memorandum of Agreement (MOA) was prepared with stipulations that outline appropriate treatment measures to minimize or mitigate adverse effects to cultural resources. The MOA stipulates requirements to protect historic structures, such as the towpath and canal. All work that will impact historic structures (canal prism and towpath) will be designed and constructed to meet the Secretary of the Interior's Standards for Historic Preservation (36 CFR 68 as amended by the NPS). The construction and installation of the temporary embankment for the construction access road will be completed without ground disturbance, and a protective barrier will be installed to protect the canal prism and towpath from the installation of the embankment and temporary ramps will be used to carry the towpath over the construction access road. The construction of the embankment will have temporary adverse impacts on the canal prism and the towpath; however, once construction is complete, the embankment will be removed and this section of the canal prism and the towpath will be restored.

Although temporary adverse impacts on historic structure, buildings, objects, and districts will occur under the Selected Alternative, long-term impacts will be avoided through the measures detailed in the MOA. The historic structures at the park will continue to exist in a condition similar to the current state. Current and future generations of visitors will have similar opportunities to experience the historic structures at the park. Therefore, implementation of the selected action will not result in impairment to historic structure, buildings, objects, and districts.

Archeological Sites. The project footprint was designed to avoid archeology sites as much as possible; however, the eastern portion of one site, 18MO633, could not be avoided and will be affected by the construction of the temporary and permanent features. A Phase II evaluation recommended that archeological site 18M0633 is eligible for listing on the National Register of Historic Places (Klein et al. 2015). The Selected Alternative has the potential to have long-term adverse impacts on archeological site 18MO633 due to construction associated with the permanent access road and parking area associated with the new boat ramp; however, an MOA will be prepared with stipulations outlining appropriate treatment measures to minimize or mitigate these adverse effects. The MOA stipulates that, prior to any ground disturbing activities within the project site, data recovery excavations within the portion of the site to be impacted by construction be undertaken. To avoid impacts to site 18MO719, there will be no ground disturbing activities associated with construction of the temporary access road at this site. Site preparation, such as tree removal prior to placement of the barrier, will also be completed without ground disturbance. To minimize the traffic load on the archeological deposits, steel plates will be placed across the archeological site at the location of the temporary construction road. Placement of these weight-bearing buffers on top of the site will disperse the force of the weight of the construction vehicles and prevent compaction to the deeply buried deposits

Although adverse impacts on archeological sites will occur under the Selected Alternative, an MOA was be prepared that will help avoid and reduce impacts and recover data using excavations prior to ground disturbing activities, as described above. The archeological resources at the park will continue to exist in a condition similar to the current state. Current and future generations of visitors will have similar opportunities to know that archeological resources exist at the park. Therefore, implementation of the selected action will not result in impairment to archeological resources.

Cultural Landscapes. Impacts on cultural landscapes under the Selected Alternative will be a combination of temporary and long-term adverse impacts; however, these impacts will not result in the impairment of cultural landscapes. Short-term impacts will occur due to the introduction of temporary embankments, construction access road, fencing, and construction equipment within the historic landscape. Long-term impacts will occur as a result of the clearing of vegetation at the site and the addition of new features (e.g., boat ramp, parking lot, and access road) to the landscape. Impacts will be reduced by planting approved native trees and shrubs, as directed by the Habitat Restoration Plan, which will eventually provide a buffer between the towpath and the new features (e.g., boat ramp, parking lot).

Although adverse impacts on cultural landscapes will occur under the Selected Alternative, long-term impacts will be reduced through the mitigation measures detailed above and in the Habitat Restoration Plan. Overall, the cultural landscapes at the park will continue to exist in a condition similar to the current state. Current and future generations of visitors will have similar opportunities to experience the cultural landscapes at the park. Therefore, implementation of the selected action will not result in impairment to cultural landscapes.

SUMMARY

As described above, adverse effects and environmental impacts anticipated as a result of implementing the Selected Alternative will not rise to levels that will constitute impairment of park values and resources in the C&O Canal NHP National Historical Park.

ATTACHMENT B: HABITAT RESTORATION PLAN

Washington Suburban Sanitary Commission

Potomac River Submerged Intake Project
Montgomery County, Maryland

Habitat Restoration Plan

July 2016

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ACRONYMS AND ABBREVIATIONS

COMAR	Code of Maryland Regulations
EAEST	EA Engineering, Science, and Technology, Inc.
FCA	Forest Conservation Act
GPS	Global Positioning System
MDA	Maryland Department of Agriculture
NNI	Nonnative Invasive
NPS	National Park Service
O.C.	On Center
SAV	Submerged Aquatic Vegetation
SOF	Statement of Findings
USEPA	Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WFP	Water Filtration Plant
WSSC	Washington Suburban Sanitary Commission

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HABITAT RESTORATION PLAN

INTRODUCTION

This Habitat Restoration Plan is part of the environmental assessment prepared by the National Park Service (NPS). The purpose of this plan is to provide guidelines for habitat and resource restoration and mitigation necessary to reduce the impacts associated with the construction and operation of the new offshore intake structure for the Washington Suburban Sanitary Commission's (WSSC) Potomac Water Filtration Plant (WFP). This plan includes mitigation activities associated with freshwater mussels and reforestation of the project area. Mitigation associated with wetlands can be found in the Statement of Findings (SOF) (Appendix E). This Habitat Restoration Plan also includes monitoring activities associated with submerged aquatic vegetation (SAV), floating paspalum (*Paspalum fluitans*), species planted for reforestation and wetland mitigation, nonnative invasive (NNI) species, and freshwater mussels. Monitoring for vernal amphibians, halberd-leaved hibiscus (*Hibiscus laevis*), and rough avens (*Geum laciniatum*) would be done along with reforestation monitoring activities. Since monitoring may indicate the need to alter or adjust mitigation measures to ensure their success, an adaptive management plan for the project site is also included herein.

PROJECT BACKGROUND

WSSC is proposing to construct a new offshore intake structure for their Potomac WFP. The Potomac WFP is located along River Road on the north side of the Potomac River, in Montgomery County, Maryland (figure 1). The WFP is located at 39° 02' 24.28" north, 77° 15' 14.45" west, respectively. The proposed project would include the construction of an intake for water supply in the Potomac River channel, a tunnel, or trench conduit system to connect the new intake to the existing onshore WFP, and a new boat ramp to provide access to the new intake for maintenance and emergency rescue activities.

MITIGATION

Mitigation measures will be implemented to restore the integrity of natural resources at the project site. These resources include freshwater mussels, forested land, and herbaceous plant communities. The following sections contain the proposed mitigation plans for each resource. The SOF (Appendix E) includes detailed information on wetland mitigation, as required by NPS. That information is incorporated by reference into this plan.

FRESHWATER MUSSEL RELOCATION

Mussel Survey and Relocation

Prior to construction, a mussel survey will be conducted within the construction area limits for the project and include an upstream (100 m) and downstream (200 m) buffer zone for mussel relocation. The survey methods for the future survey will follow the methods described in the 2013 Freshwater Mussel Study Plan (EAEST 2013a). Figure 2 presents the results of the 2013 mussel survey.

The construction area limits will be surveyed for live freshwater mussels immediately prior to any instream construction related to the proposed project. The survey will be conducted during the Summer Index Period where snorkeling will be the primary method of collection, followed by underwater viewers in the shallow areas. Timed searches will be recorded as divers survey specific areas within the construction area limits (e.g., intake structure location). Additionally, if any threatened or endangered species are collected during the survey, state or federal authorities will be contacted within 24 hours for further guidance.

All live mussels collected during the relocation will be identified to species and photographed. Species, abundance, diversity, and estimated community density will be recorded on datasheets. Shell condition of live individuals will be noted if there are predation marks, umbo erosion, or other notable marks on shells. Relic shells found within the project area will not be relocated but will be photo documented and a few will be retained for identification purposes only. Any federally listed species (live or relic) that is encountered will not be retained for identification. All relocated mussels will be placed in burrows to avoid rapid predation by muskrats and other resident carnivores known to be present. No voucher specimens of any live unionids will be preserved for this project.

Relocation activities can place additional stress on mussels and therefore extra care will be taken to minimize these stresses. Mussels collected within the project area will be transferred to a designated relocation area the same day to minimize the stress they may experience from being removed from their original burrows. During the short holding time, mussels will be held in containers that allow flow-through of Potomac River water. If needed, battery-powered aerators will be used to ensure that dissolved oxygen in the water column remains near saturation.

Substrate characterization will also be visually estimated to determine the range of particle sizes within the project site and the proposed relocation site (Wentworth 1922).

Relocation Area

Mussels collected from within the construction area limits will be transferred upstream [about 2,000 feet (600 m)] to a relocation area and out of any physical disturbance occurring in the Potomac River. A relocation area will be identified prior to movement of collected mussels. The relocation area should include suitable substrate, water depth, and the space to accommodate all live mussels collected during the downstream survey. Relocated mussels will be placed in burrows to avoid rapid predation by resident carnivores known to be present. The upstream and downstream boundaries of the relocation area will be marked using a Trimble® Global Positioning System (GPS).

Data Analysis

A written report that summarizes the methodology and technical findings (mussel species, abundance, and substrate characterization) will be prepared following relocation. Data collected from the relocation will be summarized as the total abundance, species composition, and associated age determinations of mussels collected from the project area. Statistical evaluations of the data will not be conducted; however, estimated community density will be calculated so that during placement at the relocation site, similar density patterns can be replicated. Data summarizing substrate composition and water quality as well as a photolog will be included in the report.

Summary of 2013 Mussel Survey

A total of 88 live individuals, comprising two species, were collected from seven stations within the project footprint of the Potomac River. The Eastern elliptio *(Elliptio complanata*) dominated the collection with 99% of the individuals collected from all seven stations. The highest numbers of Eastern elliptio were found at station 1 (n=23), along the southern shoreline of Unnamed Island, and station 6 (n=27), directly upstream of the proposed project footprint. The plain pocketbook mussel (*Lampsilis cardium*) was the only other species collected during the survey and is considered nonnative to the State of Maryland. Only one plain pocketbook mussel was collected at station 4. Figure 2 presents the locations of the survey stations and the number of mussels found at each station.

REFORESTATION OF PROJECT AREA

The following reforestation plan addresses the forested project area that will be cleared for construction under the preferred alternative. It is meant to address the requirements of the environmental assessment. Further forest mitigation may be required by Montgomery County during the site plan and forest conservation plan review process once the actual alternative is selected and the construction area limit is finalized prior to construction.

The Forest Conservation Act (FCA) was enacted in 1991 to minimize the loss of Maryland's forest resources during land development by making the identification and protection of forests and other sensitive areas an integral part of the site planning process. The FCA is implemented on a local level and includes the approval of a Forest Stand Delineation Plan. A Forest Stand Delineation Plan was prepared and provided details on the forest types and notable trees found throughout the project area (EAEST 2013b). Any additional forest conservation and mitigation actions beyond what is proposed within this plan will comply with Maryland's FCA, the Code of Maryland Regulations (COMAR) 08.19.01 through 08.19.06.

The forest mitigation proposed within this reforestation plan is designed to mitigate the impacts to forest resources cleared during the proposed construction. The restoration goal for forest mitigation would be to revegetate the project area in such a way that it would succeed into the current habitat type, deciduous woodlands.

Reforestation Plan

The reforestation plan includes the replanting of native vegetation associated with the clearing of forested area for construction purposes. Approximately 4.7 acres of forest vegetation will be removed from the limits of construction (figure 3) during the construction activities associated with the project and are proposed to be replaced in a phased planting plan with native species of trees, shrubs, and understory species that are common to the surrounding area. A detailed planting plan will be prepared in cooperation with NPS staff at the park and regional level and will be approved by the NPS prior to construction. Native vegetation species that were found onsite during the forest stand delineation have been selected for reforestation of the project area. Overall tree and shrub spacing proposed will have a spacing average of 8 feet on center (O.C.) with a greater quantity of trees than shrubs. Trees will cover 70% of the replanting area, and shrubs will cover 30% of the area. The detailed planting plan will address phased planting - trees would be planted first and once a tree canopy has been established, the understory plants (e.g., shrubs, understory trees) would be planted to promote a higher success of the understory plantings. The higher percentage of trees has been proposed in order to better outcompete any nonnative species that may be inadvertently introduced into the reforestation area.

Trees and shrubs that are planted in the reforestation area will be planted in a 1:1 ratio to compensate for the vegetation removed during construction. The trees and shrubs will not be planted in a gridlike pattern, rather they will follow a random planting scheme where all plants are installed following the overall average spacing, however the spacing of trees may vary from two to three feet above or below the average 8-feet spacing. Since the reforestation area is approximately 4.7 acres and trees and shrubs are being placed at an 8-feet O.C. spacing, then 3,213 trees will be needed to replace the removed trees at a 1:1 ratio. Approximately 2,250 total trees and 963 shrubs will be needed for the reforestation.

Herbaceous plant species will be planted intermittently between shrubs and trees as necessary to provide adequate cover and planted approximately 2-feet O.C. Since the reforestation area is approximately 4.7 acres and herbaceous plants are being placed at a 2-feet O.C. spacing, 51,402 herbaceous plants will be needed. Approximately 17,134 plants of each species will be needed.

The plant material selected is representative of the existing species composition of the project. However, final selection of plant stock will be determined to some extent by availability. Efforts will be made to acquire all plants from local sources. The selected tree species will consist of 1-3 gallon containerized and/or bare root stock protected by tree shelters. The tree shelters will provide protection from wildlife depredation, wind, or other damaging influences. Table 1 presents the species that are proposed for reforestation as well as spacing specifications and sizes.

Table 1. Reforestation Species and Planting Specifications

Common Name	Scientific Name	Quantity	Overall Average Spacing	Classification	Size
Total reforestation area is approximately 4.8 acres					
Pin oak	*Quercus palustris*	450	8' O.C.	Canopy	1.5 - 2" caliper
Sycamore	*Platanus occidentalis*	450	8' O.C.	Canopy	1.5 - 2" caliper
Red maple	*Acer rubrum*	400	8' O.C.	Canopy	1.5 - 2" caliper
Silver maple	*Acer saccharinum*	400	8' O.C.	Canopy	1.5 - 2" caliper
American hornbeam	*Carpinus caroliniana*	275	8' O.C.	Understory Tree	1 - 1.5" caliper
Red osier dogwood	*Cornus sericea*	275	8' O.C.	Understory Tree	1 - 1.5" caliper
Spicebush	*Lindera benzoin*	321	8' O.C.	Shrub	1 gallon container
Highbush blueberry	*Vaccinium corymbosum*	321	8' O.C.	Shrub	1 gallon container
Sweet pepperbush	*Clethra alnifolia*	321	8' O.C.	Shrub	1 gallon container
Cinnamon fern	*Osmunda cinnamomea*	12,851	2' O.C.	Herbaceous	1 quart
Switch fern	*Panicum virgatum*	12,851	2' O.C.	Herbaceous	1 quart
New York fern	*Thelypteris noveboracensis*	12,851	2' O.C.	Herbaceous	1 quart
Rough avens	*Geum laciniatum*	12,851	2' O.C.	Herbaceous	1 quart

O.C. = on center

Nonnative Invasive Species

A higher percentage of trees than shrubs have been proposed for the replanting area. The higher percentage of trees has been proposed in order to better outcompete any NNI species that may be inadvertently introduced into the reforestation area, such as Japanese honeysuckle (*Lonicera japonica*), Japanese stiltgrass (*Microstegium vimineum*), Chinese bushclover (*Lespedeza cuneata*), and ground ivy (*Glechoma hederacea*), all of which have been found in forested areas in previous site visits.

The reforestation area will be monitored for NNI species seasonally (once every 3 months) for 5 years following the reforestation effort. The monitoring will be conducted through a species inventory of the area that documents the location and population size of nonnative species that is found along with recommended treatment actions. Thresholds for NNI species control will be determined during the permitting phase of this project. Actions to eradicate nonnative plant populations will be taken if necessary.

MONITORING

Following the completion of construction activities, monitoring will be performed by WSSC to ensure that natural resources at the project site have re-established. Resources to be monitored include SAV, floating paspalum, species planted for forest mitigation, and nonnative plants. Freshwater mussels will be

monitored during construction since they will be relocated prior to construction. The following sections contain monitoring plans for each resource.

SUBMERGED AQUATIC VEGETATION

Following construction activities, monitoring will be conducted in the Potomac River to document the recovery of SAV in the project area. SAV monitoring activities will include surveys of SAV to document its presence or absence in the project area as well as surveys of SAV in upstream habitats used as reference locations. A report summarizing the methodology used for the monitoring of SAV as well as the technical findings will be produced after each survey. The monitoring methodology will be approved before the surveys are conducted.

This section includes the results of the 2013 SAV survey (EAEST 2013c), monitoring protocols, a discussion of the SAV survey methodology, and data analysis.

Results of the 2013 SAV Survey

A total of five species of true SAV were observed during the July and September 2013 surveys: common waterweed (*Elodea canadensis*), water star grass (*Heteranthera dubia*), southern water nymph (*Najas guadalupensis*), sago pondweed (*Stuckenia pectinata*), and wild celery (*Vallisneria americana*). All five species of SAV observed during the surveys are considered native to the Chesapeake Bay and not nuisance species. In addition to SAV species, one species of a multi-cellular algae, muskgrass species (*Chara* species), was observed during the surveys. Muskgrass is considered a native algal species which rarely creates a nuisance. Figure 4 presents results of both the July and September 2013 SAV surveys.

Monitoring

Monitoring for SAV will be conducted by WSSC annually each summer for a 5-year monitoring period. Year 1 of the monitoring effort will be conducted during the summer of the same year of completion of the construction, unless the construction is completed after April 1st. If the construction is not completed prior to April 1, the first year monitoring event will be performed the following year. Each monitoring event will be followed by an annual monitoring report which will be submitted before December 31st of each monitoring year. The monitoring report will summarize the technical findings of the survey. Details on the survey methodology are presented in the following section "Survey Methods."

Due to the transient nature of yearly SAV presence in this portion of the Potomac River, an SAV reference area within the vicinity of the project area was identified during the 2013 field survey and was marked using a Trimble® GPS. The moderately dense SAV populations that were found upstream of the SAV populations in the project area are visible in figure 4. These reference populations will provide reseeding of the impacted populations as well as a baseline to determine whether a low SAV population in the project area is due to construction or is due to poor temporal conditions that inhibit SAV growth.

The mitigation goal for SAV would be that the project area would succeed into the current SAV habitat type. Following the 5-year monitoring period, a determination will be made by NPS as to whether the project achieved the final mitigation goal or whether additional efforts are required. If additional efforts are required, monitoring will continue until the project has achieved final mitigation goals.

Survey Methods

Survey methods will follow the methods described in the 2013 SAV work plan for the proposed project.

The SAV survey will be conducted within the project area of the Potomac River as defined in the 2013 work plan. The project area was divided into 122 grids, each 100 feet by 100 feet (figure 4). A center

point (X and Y coordinates) was determined for each grid. Forty-three grids fell on top of the various alternatives for the new intake. Thirty additional center points were selected, at random, for inclusion in the SAV survey. Approximately 60% of the grids within the project area will be surveyed directly. The survey area will be confined by the left bank of the mainstem and the shoreline of Watkins Island (approximately 800 feet "bank to bank"), and the area from the mouth of Watts Branch to the upstream side of the existing intake weir (approximately 1,700 feet) (figure 4).

The survey will be conducted from an open work boat. A Trimble® GPS with submeter accuracy will be used to navigate to station locations. The X and Y coordinates determined in the office for the center points of each grid will be uploaded to the GPS unit prior to starting the field survey.

Vegetation will be identified to species level. A modified iron garden rake will be used as a collection device if needed. The density for each rake throw will be recorded on field datasheets. Measurements of density will be recorded as 0 through 4, based upon methods developed by United States Fish and Wildlife Service (USFWS). For the density classification of collected SAV, a "0" corresponded to a lack of SAV, "1" corresponded to a very sparse density class, "2" corresponded to a sparse density class, "3" corresponded to a moderate density class, and "4" corresponded to a dense density class (USFWS 2002).

Data Analysis

Data collected from this qualitative survey will be summarized as the presence/absence, species composition, and density of SAV present within the project area at the time of the survey. River stage, weather conditions, water clarity, and the time of day, will be noted as these variables can substantially affect the visibility of SAV beds. Text, summary tables, and a figure will be created to present the observations and results of the survey. Statistical evaluations of the data will not be conducted, which is consistent with this type of qualitative survey. A written report that summarizes the methodology and technical findings will be prepared following the survey.

FLOATING PASPALUM MONITORING

Following construction activities, monitoring will be conducted to document the recovery of floating paspalum (*Paspalum fluitans*) in the project area. Floating paspalum is a state endangered grass species that was found in the project area along the muddy shorelines of the Potomac River. Floating paspalum monitoring activities will include surveys of floating paspalum to document its presence or absence in the project area as well as surveys of floating paspalum in upstream habitats used as reference locations. A report summarizing the technical findings will be produced after each survey.

This section includes the results of the 2013 and 2014 floating paspalum surveys (EAEST 2014), monitoring protocols, a discussion of the survey methodology, and data analysis.

Results of 2013 and 2014 Surveys

During the fall 2013 rare, threatened, and endangered plant survey, floating paspalum was found in the project area along the muddy shorelines of the Potomac River in both habitat stations 1 and 2. Approximately 76 plants of floating paspalum were found at habitat station 1 and approximately 395 plants were found at habitat station 2. Floating paspalum plants were also observed outside of the survey area for habitat station 2.

The 2014 floating paspalum survey documented that floating paspalum was in the same locations where it was found in 2013. Approximately 2,000 plants were located along the shoreline during this survey. In addition, this survey documented large (thousands of stems) populations of floating paspalum in areas

immediately upstream and continuing several miles above the project site. Figure 5 presents the locations where floating paspalum was found during the 2014 survey.

Monitoring

Monitoring for floating paspalum will be conducted annually by WSSC each summer for a 5-year monitoring period. Year 1 of the monitoring effort will be conducted during the summer of the same year of completion of the construction, unless the construction is completed after April 1st. If the construction is not completed prior to April 1, the first year monitoring event will be performed the following year. Each monitoring event will be followed by an annual monitoring report which will be submitted before December 31st of each monitoring year. The monitoring report will summarize the technical findings of the survey. Details on the survey methodology are presented in the following section.

A reference area for floating paspalum within the vicinity of the project area will need to be identified during the survey and marked using a Trimble® GPS.

The mitigation goal for floating paspalum would be that the project area would succeed into the current floating paspalum extent. Following the 5-year monitoring period, a determination by NPS will be made as to whether the project achieved the final mitigation goal or whether additional efforts are required. If additional efforts are required, monitoring will continue until the project has achieved final mitigation goals.

Survey Methods

The project area will be surveyed for floating paspalum, including locations (stations) where floating paspalum was documented in 2013 and 2014 (figure 4 and 5) using a GPS unit. The number of plants found will be counted and recorded, as well as notes regarding floating paspalum presence/absence. Associated plant species that were observed along the shoreline with floating paspalum and notes to describe the habitat at the stations that support floating paspalum will be recorded to further document the distribution of this listed plant species.

Data Analysis

A written report that summarizes the methodology and technical findings will be prepared following the survey. The report will include text, summary tables, and a figure will be created to present the observations and results of the survey. Statistical evaluations of the data will not be conducted, which is consistent with this type of qualitative survey.

Forest Mitigation Monitoring

Following construction activities, monitoring will be conducted by WSSC in the project area to document the survival of plants that were planted for reforestation. Forest plant monitoring activities will include surveys of plants to document survival and reports summarizing the survey methodology and findings. Monitoring for vernal amphibians, halberd-leaved hibiscus, and rough avens would be done during the reforestation monitoring. This section includes a discussion of the forest plant survey methodology, data analysis, and monitoring protocols.

The SOF (Appendix E) includes detailed information on wetland mitigation, as required by NPS. Monitoring for the enhancement of the Lock 13 wetland mitigation site would also follow the methods described below.

Post Construction Survey Methods

Annual monitoring reports will be prepared for a period of five consecutive years from the completion of construction. The first monitoring report is due the year the mitigation planting occurs, unless planting occurs after April 15, in which case the first monitoring report will not be due until the end of the next year. For each monitoring report, at least one monitoring visit shall be conducted during the growing season for the vegetative monitoring. These site visits should preferably be during a period with normal precipitation and groundwater levels. Monitoring for vernal amphibians would be done along with wetland plant species monitoring.

For each monitoring year, the estimate of the percent cover by dominant plant species (including volunteer plants) and any invasive plant species will be documented. The percent cover by plants will be estimated with a wetland indicator status of FAC or wetter. The percent survival of woody planted material and number of native trees/shrubs per acre (including volunteer woody species taller than ten inches) will be estimated. Sites where the woody species density is inconsistent throughout the site may not meet the Project Standards (e.g., a site where some portions have high densities of woody species but other portions have low densities).

Measurements of vegetation should be based upon performance standard criteria and methods used to assess the vegetative success of the mitigation site.

For years when vegetative plots are assessed, the results from the vegetation plot study will be summarized, including the density of trees/shrubs and percent cover of wetland species present in order of dominance and for each vegetative stratum. Raw plot data will not be included in the monitoring report.

Recommended Vegetation Density Measurement Technique

The following method for measuring the success of the vegetative colonization should be conducted once between May and September of the second, third, and fifth growing seasons subsequent to the completion of the construction of the mitigation project, unless an alternate schedule is agreed upon by MDE.

Vegetation sample plots will be located on a stratified random basis over the site in order to sample all areas of restored/constructed wetlands at locations adjacent to each photo location marker. The following minimum numbers of samples will be required:

- If the site is < 5 acres, then a minimum of 3 plots/acre is necessary.
- If the site is > 5 acres but less than 20 acres, then a minimum of 3 plots/acre is required for the first 5 acres, then 2 plots/acre is required for the remaining acreage.
- If the site is > 20 acres, then a minimum of 2 plots/acre is required for the first 20 acres, then 1 plot/acre is required for the remaining acreage.
- All cells, fields, or blocks shall be sampled. A targeted vegetation monitoring approach that correlates monitoring stations with vegetative signatures on aerial photography may be useful for larger mitigation sites.

Each plot shall be of a size no less than 400 square feet for woody plants and 9 square feet for herbaceous plants (or circular with approximately the same surface area). The vegetation data shall be collected during the growing season and shall include:

- Dominant vegetation species identification
- Percent ground cover assessment

- Number of woody plant stems greater than 10 inches in height (total and number/acre)
- The percentage of dominant species FAC or wetter
- Percent survival by planted species
- An invasive/noxious species assessment including percent cover

Evaluation of Success

If success criteria have been satisfied at the completion of the 5-year monitoring program, a request for release from monitoring will be made. Additional monitoring may be required as a special condition of the issued permits or after reviewing the success of the mitigation sites during the initial monitoring period.

Appropriate measures to address deficiencies identified during monitoring will be developed in consultation with NPS, WSSC, and the appropriate agency. These appropriate measures will be part of the adaptive management plan, and will ensure that the modification of the mitigation project provides ecological resource functions comparable to the project objectives. Extended monitoring of the site for a longer period than proposed may be required. Additional monitoring may be required as a special condition of the issued permits or after reviewing the success of the site during the initial monitoring period.

NONNATIVE INVASIVE SPECIES MONITORING

Background

Nonnative invasive species are generally defined as plants which quickly invade, out-compete, and replace native species that are indigenous, occur naturally within an ecosystem, and which existed prior to significant human impacts and alterations to the landscape of a region or particular habitat. The spread of NNI species disrupts newly reforested areas in addition to established forest ecosystems or other habitat types, and often results in negative impacts on the overall biodiversity of an ecosystem, especially if the NNI species becomes a monoculture or significantly dominates the vegetation within a plant community. NNI species found at the project site during rare plant surveys are listed in table 2.

Table 2. Nonnative Invasive Species Identified at the Project Site

Common Name	Scientific Name
Grass Species	
Nepalese browntop	*Microstegium vimineum*
Herbaceous Species	
Wild garlic	*Allium vineale*
Spotted knapweed	*Centaurea stoebe micranthos*
Bull thistle	*Cirsium vulgare*
Beefsteak plant	*Perilla frutescens*
Garlic mustard	*Alliaria petiolata*

Common Name	Scientific Name
Vine Species	
Japanese honeysuckle	*Lonicera japonica*
Tatarian honeysuckle	*Lonicera tatarica*
Mile-a-minute	*Persicaria perfoliata*
Japanese hops	*Humulus japonicus*
English ivy	*Hedera helix*
Oriental bittersweet	*Celastrus orbiculatus*
Shrub Species	
Common mugwort	*Artemisia vulgaris*
Amur honeysuckle	*Lonicera maackii*
Morrow's honeysuckle	*Lonicera morrowii*
Japanese barberry	*Berberis thunbergii*
Autumn olive	*Elaeagnus umbellata*
Multiflora rose	*Rosa multiflora*
Tree Species	
Norway maple	*Acer platanoides*
Tree-of-heaven	*Ailanthus altissima*

Objective

During the construction of the new submerged intake, NNI species will be managed at the project site based upon practices detailed in this plan. Following completion of construction, monitoring of revegetated and disturbed areas within the construction area limits will be conducted for a minimum of two years. Revegetation will be considered successful if upon visual survey, the density and cover of NNI species are similar in density and cover to adjacent undisturbed lands.

During Construction Management

The period of NNI species management defined as during construction will start coincident with earth disturbance activities and cease upon final permanent stabilization of the project area. NNI species plant material will require removal and disposal from the designated treatment areas. Field verification of proper NNI species removal and management shall be conducted immediately after completion of the construction activities to determine success of the controls during construction or to determine if any additional controls are necessary. Thresholds for NNI species control will be determined during the permitting phase of this project.

Post-Construction Management

The period of NNI species management defined as post-construction will commence upon the final permanent stabilization and continue for a period of 5 years beyond this time. During the 5-year monitoring period, areas that contain a predominance of NNI species which will require additional control will be identified. The requirements detailed in the methodology section below will be followed for post-construction management of NNI species.

Monitoring for the enhancement of the Lock 13 wetland mitigation site would include the monitoring of the invasive reed canarygrass (*Phalaris arundinaecea)* that is proposed to be removed from the mitigation site.

Methodology

Management practices of NNI species are variable and for the purposes of this plan, prevention, mechanical control, and chemical control will be the primary methods recommended for use. Control of NNI species will require manual removal and/or herbicide application, depending on the time of year and species specific protocol. The NPS will pre-approve all pesticide use on an annual basis. All necessary permits prior to initiating herbicide application will be obtained, and all work will follow the best management practices established by the USFWS, U.S. Department of Agriculture-Natural Resource Conservation Service, Maryland Department of Agriculture's (MDA's) Pesticide Regulations, and conditions and practices that may be established in the non-tidal wetlands permit. Herbicide labeling will be incorporated into these best management practices, accounting for species, application concentration, application time of year, and materials safety as compliant with applicable permits.

Prevention

Prevention of NNI species is the most effective and least expensive method of managing NNI species. Due to the disturbance of the site during construction activities, the potential for previously absent NNI species to become established is of concern. Field efforts during post-construction activities will allow for observations and accurate identification of on-site vegetation throughout the growing season which will identify if NNI species management is necessary. Upon identification of a previously absent NNI species, the extent of coverage shall be determined to identify whether mechanical or chemical control is necessary.

Additionally, equipment used for construction will be washed and inspected prior to entering the project site to prevent the introduction of NNI species from outside the project boundaries, when appropriate based on the potential for off-site NNI species to be present on the equipment. Any imported fill, mulch, or other materials should be free of NNI materials (certified weedfree mulch would be used), and seed mixes utilized in the stabilization of the site would meet the erosion and sediment control standards as specified in the Erosion and Sediment Control Plans for the project site. In addition, an NPS-approved annual and permanent grass seed mix would be used.

Mechanical Control

Although mechanical control is an alternative for all NNI species, some NNI species may require mechanical control as the only effective management practice. The mechanical control of NNI species requires effective removal of the root system and timely implementation, specifically prior to the seed set. In addition, proper disposal of plant material is necessary to prevent regeneration or further spread of NNI species through discarded material. Seed from NNI species have potential to remain in the soil seedbank; therefore, mechanical control methods are most effective if they are implemented annually for up to 2 years.

Mechanical control options include several methods and are generally practical for smaller areas of targeted control. The options are hand-pulling, using hand and power tools to cut, girdling plants to kill them prior to removal, mowing and/or roto-tilling. Seedlings and small or shallow-rooted plants can be pulled when soil is moist. Larger plants should be dug out to remove as much of the root system as possible. The removal of seed heads prior to ripening and dispersal is an option, particularly for annual NNI species. Mechanical control of perennial NNI species such as mowing or cutting back NNI species requires a minimum of three times per growing season to be effective and may require additional mowing efforts annually. This will be determined based on field observations early in the growing season and subsequent field visits, as necessary.

Equipment shall include, but is not limited to hand tools: lever-based tools, machetes, power pruners/trimmers, chainsaws, metal blade brush cutters, brush axes/hooks, shovels, spading forks, loppers, hedge shears and associated safety equipment. Limited use of wood chippers, forestry mowers, and conventional rotary mowers may be applicable. Depending on the species specific protocol (type, size, density) and existing on-site conditions, mechanical/ manual removal of NNI species may or may not require a follow-up herbicidal application component. Some areas of NNI species may only require manual removal treatments; however, subsequent herbicide application may be necessary to control and ultimately avoid re-emergence of the species.

Chemical Control

Herbicides can offer an effective and cost-efficient way to control NNI species in areas where manual control is not practical, such as areas with large infestations of NNI species. In addition, some NNI species are ineffectively managed using mechanical controls. Herbicides should be selected based on targeted NNI species and site constraints, such as proximity to aquatic resources. In addition, the use of chemical control should be sensitive to adjacent property vegetation and usage that may be adversely impacted by the potential for drifting chemicals, and adjacent property owner sensitivity to the chemicals being used. Depending on species-specific protocol (type, size, and density), specific area of the site, and the spatial extent of the particular NNI vegetation, three different treatments may be utilized two times annually:

- Cut-Stem Treatment
  - Cut stump/stem
  - Hack and Squirt
- Basal Bark Treatment
- Foliar Treatment

Equipment shall include, but is not limited to: backpack sprayers, spray bottles, wick-applicators, squirt bottles, injection gun, paint brush, or other equivalents as approved by the responsible party. All herbicide applications shall be selective low volume treatments. Broadcast high volume applications and equipment mounted spray operations shall not be used due to the potential for off-target drift. Herbicides approved for use by the U.S. Environmental Protection Agency (USEPA) include the following items listed in table 3; however, there are no pre-approved herbicides for use in national parks. Therefore, NPS will pre-approve all pesticide use on a case-by-case and chemical-by-chemical basis annually.

Table 3. USEPA Approved Herbicides

Active Ingredient	Examples of Approved Trade Name Products
Aquatic glyphosate	Aqua Neat
Aquatic non-ionic wetting agent	Alenza 90
Glyphosate	Roundup Pro Concentrate Rodeo Herbicide Pathfinder II (marker dye shall be added)
Triclopyr	Garlon 3A, Garlon 4
Imazapyr	Arsenal, Chopper, Stalker, Habitat

Materials shall include the herbicides, wetting agents, basal oil, marking dye, and any other incidental materials needed to successfully eradicate NNI species. All herbicides shall be USEPA-registered chemicals and MDA approved chemicals that are approved for use in forested areas and/or adjacent to waterways to control and prevent regrowth of undesirable vegetation. Manufacturer recommended

wetting agents, basal oils (when appropriate), and marking dye or equivalents, would be used as approved. (NOTE: Not all of the herbicides listed in table 3 are approved for use in and/or directly adjacent to waterways/wetlands; only herbicides approved for use in proximity of aquatic resources may be utilized for such applications). Herbicides other than those listed above must be approved by the responsible agency with written approval prior to use. Manufacturer's specification sheets (labels) and Safety Data Sheets for herbicides, wetting agents, basal oils, and dyes shall be provided to and approved by NPS, and maintained on-site throughout any application of the materials.

All herbicide applications shall be as specified in the MDA's *Regulations Manual for Maryland Highways* (October 2003), and in conformance with the manufacturer's recommendations as shown on the product label. Marking dye shall be from a commercial source, shall be herbicide compatible, and shall be water soluble. Marking dye shall be mixed with all herbicide prior to application at rates necessary to be readily visible in the field for at least three days after application.

Implementation of Recommended Methods

Personnel who will perform and/or supervise chemical control on the project site are recommended to have the following qualifications:

- Maryland Pesticide Applicator's License in appropriate categories (II, IIIA, V, and/or VI)
- Maryland Tree Expert License

During construction and post construction periods of the project, inspections of the project site would be conducted every two months during each growing season (April – November), for a total of four times to identify the areas of invasive species that require implementation of control methods.

During the management of NNI species in the construction and post-construction periods, NNI species control may occur at any point during the project based on monitoring results. Control may require manual removal or herbicide treatment, or both, depending on conditions, and should occur regardless of schedule or work load. Delays to other components of the construction project shall not be granted or allowed due to NNI species control and management. Execution of the NNI species control and management requires that all aspects of NNI species control work be executed concurrently with the construction project, whenever necessary. Manual control should be conducted a minimum of three times annually and chemical control should be conducted a minimum of two times annually.

A pre-construction meeting shall be scheduled prior to commencement of any NNI species control operations. The areas planned for treatment shall be clearly flagged in the field and reviewed by NPS and WSSC prior to commencement of treatment activities. Native plant species shall be protected and preserved from impacts associated with NNI species eradication. WSSC will be responsible for replacing and/or pruning any native plant material killed or damaged through any act of negligence during NNI species management. Due to the nature of the treatment area and the density of NNI species, some damage to desired vegetation may occur. Extreme caution shall be used when spraying adjacent to non-target, non-invasive vegetation. Areas of concern in the proximity of rare, threatened, or endangered species shall be given special priority and all applications in these areas will be coordinated with the Maryland Department of Natural Resources, prior to execution. Herbicide application will only be conducted during appropriate weather conditions as indicated on the product label (e.g., spraying during high winds, rain, high humidity, and/or high temperatures may result in uptake by off-target vegetation due to the volatility of certain herbicides). Use of herbicide must be pre-approved by the park Integrated Pest Manager.

Field verification of herbicide application success will be conducted after completion of the work and within six weeks following application. Additional applications of herbicide treatments may be required if the initial application is determined to be unsuccessful. The management of NNI species will be

considered successful if, upon visual survey, the density and cover of NNI species are similar in density and cover to adjacent undisturbed lands after a two-year period.

FRESHWATER MUSSEL MONITORING

Monitoring of freshwater mussels will begin one year following relocation to ensure that mussels relocated from the project area are still surviving. A general survey of the relocation area will occur and will follow the methods described in the 2013 Freshwater Mussel Study Plan for the proposed project (EAEST 2013a). Mussel relocation monitoring will continue for at least 5 years. The mitigation monitoring effort will include the collection of specific data for reporting:

- The presence or absence of the relocated mussel species.
- The abundance of the relocated mussel species.
- The density of the relocated mussel species.

ADAPTIVE MANAGEMENT

Mitigation efforts described for reforestation, wetlands, SAV, mussels, and floating paspalum may require modification in order to be successful, due to the unpredictable nature of environmental conditions and their result on the survival of wildlife and vegetation. An adaptive management and monitoring plan is recommended for use at this site. Adaptive management will take into account conditions that affect habitat restoration which were not predicted or accounted for during this initial habitat restoration plan.

The performance standards outlined in the previous sections of this report can be revised through adaptive management procedure to take into account appropriate measures implemented to address deficiencies, such as unsuccessful regeneration of vegetation or unsuccessful reestablishment of mussels. The performance standards may also be modified to reflect changes in management strategies and objectives as long as the modifications lead to ecological benefits comparable to or superior to the approved compensatory mitigation project. For example, the tree protection used onsite as part of reforestation efforts may not prevent deer browsing on the new plants, preventing the vegetation from establishing. Adaptive management to replace the plants using a new method to reduce grazing may be utilized. Adaptive management procedures can be implemented under any circumstances in which the function of the impacted vegetation, wetlands, or wildlife is not being performed by the mitigation project and secondary impacts are not being prevented.

REFERENCES

EA Engineering, Science, and Technology (EAEST). 2013a. *Freshwater Mussel Study Plan: Potomac River Mainstem Near WSSC Diversion Channel.* Prepared for Maryland Department of Natural Resources, Annapolis, MD. 8 pages.

EA Engineering, Science, and Technology (EAEST). 2013b. *Forest Stand Delineation Report: Washington Suburban Sanitary Commission, Potomac Water Filtration Plant.* Prepared for Washington Suburban Sanitary Commission, Laurel, MD. 11 pages.

EA Engineering, Science, and Technology (EAEST). 2013c. *Submerged Aquatic Vegetation (SAV) Survey of the Potomac River, Montgomery County, Maryland.* Prepared for Washington Suburban Sanitary Commission, Laurel, MD. 29 pages.

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U.S. Fish and Wildlife Service (USFWS). 2002. *Adaptation of Braun-Blanquet Scale to Rate SAV Density through Rake Throws*. Adapted from Virginia Institute of Marine Science (VIMS) website. June 2004.

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Figures

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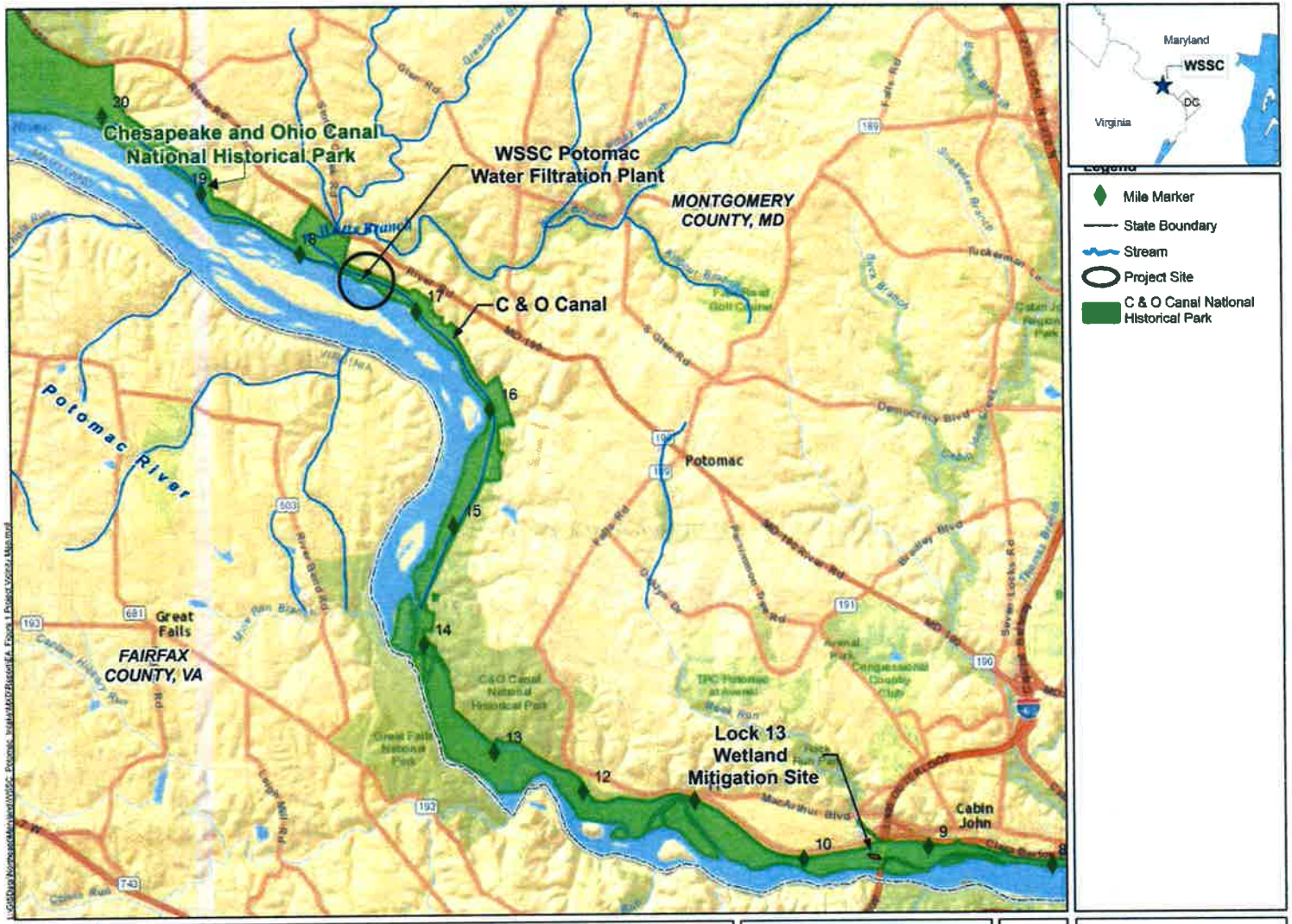

Figure 1
Project Location Map

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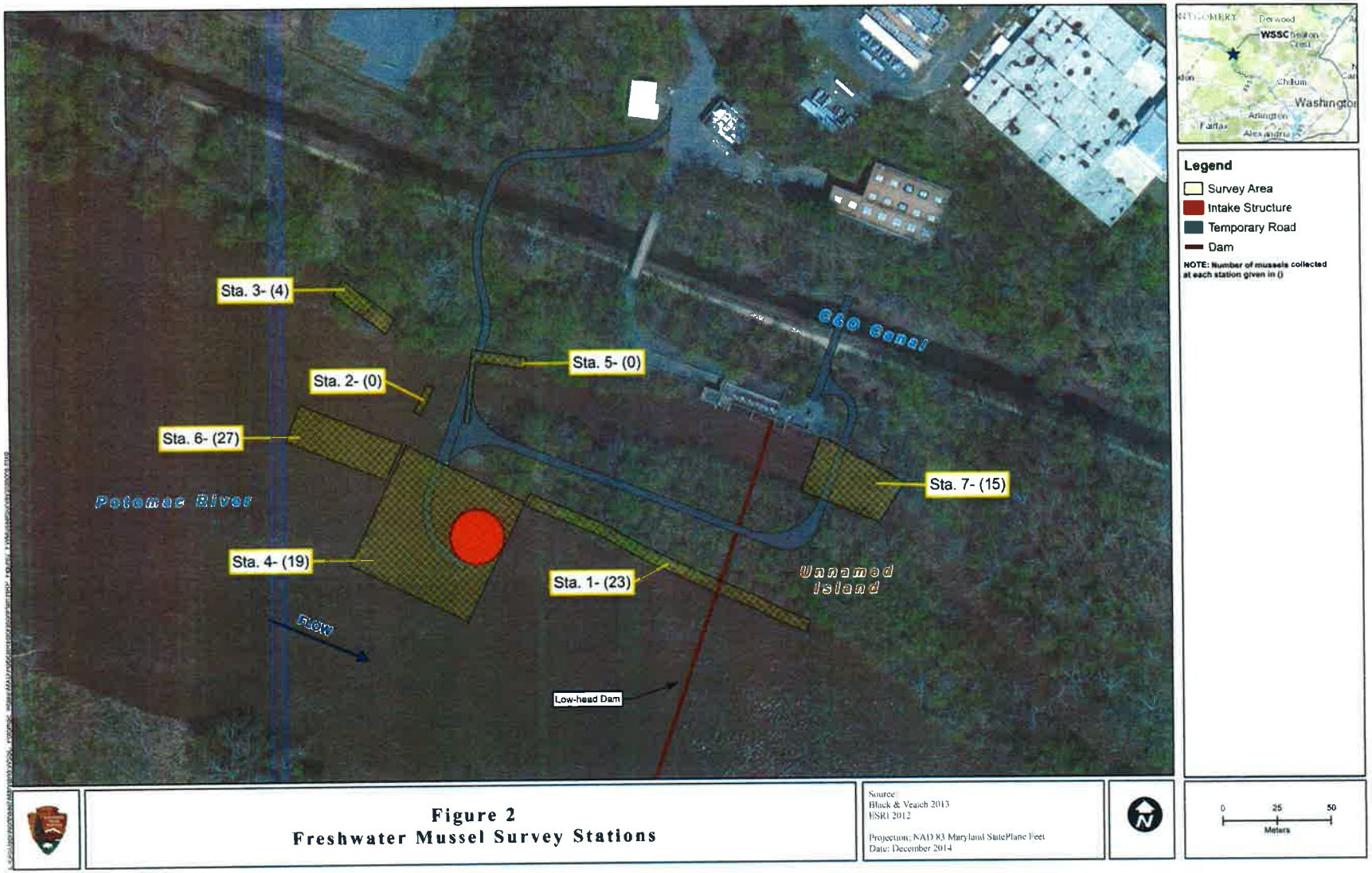

Figure 2
Freshwater Mussel Survey Stations

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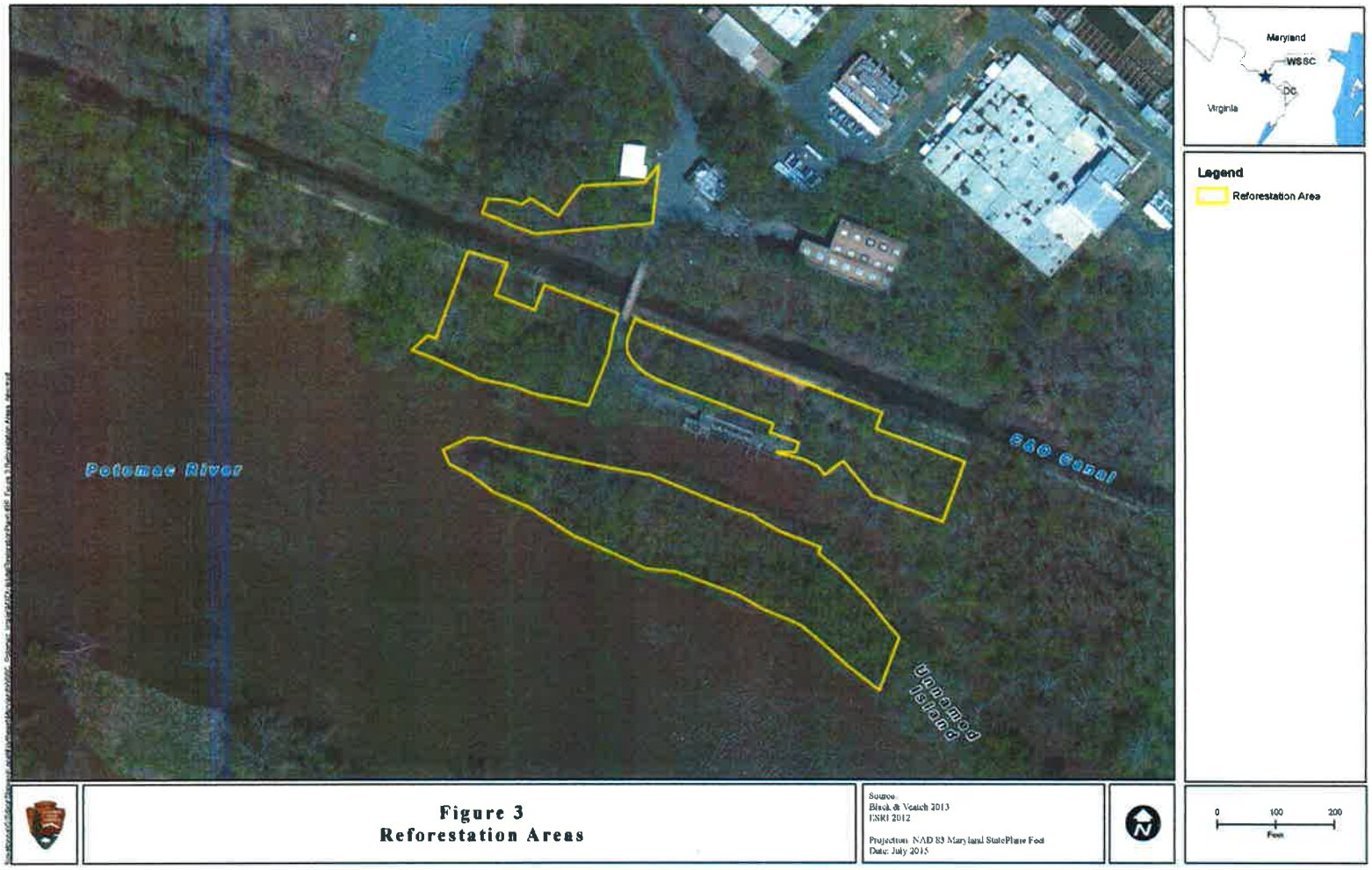

Figure 3
Reforestation Areas

Source:
Black & Veatch 2013
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: July 2015

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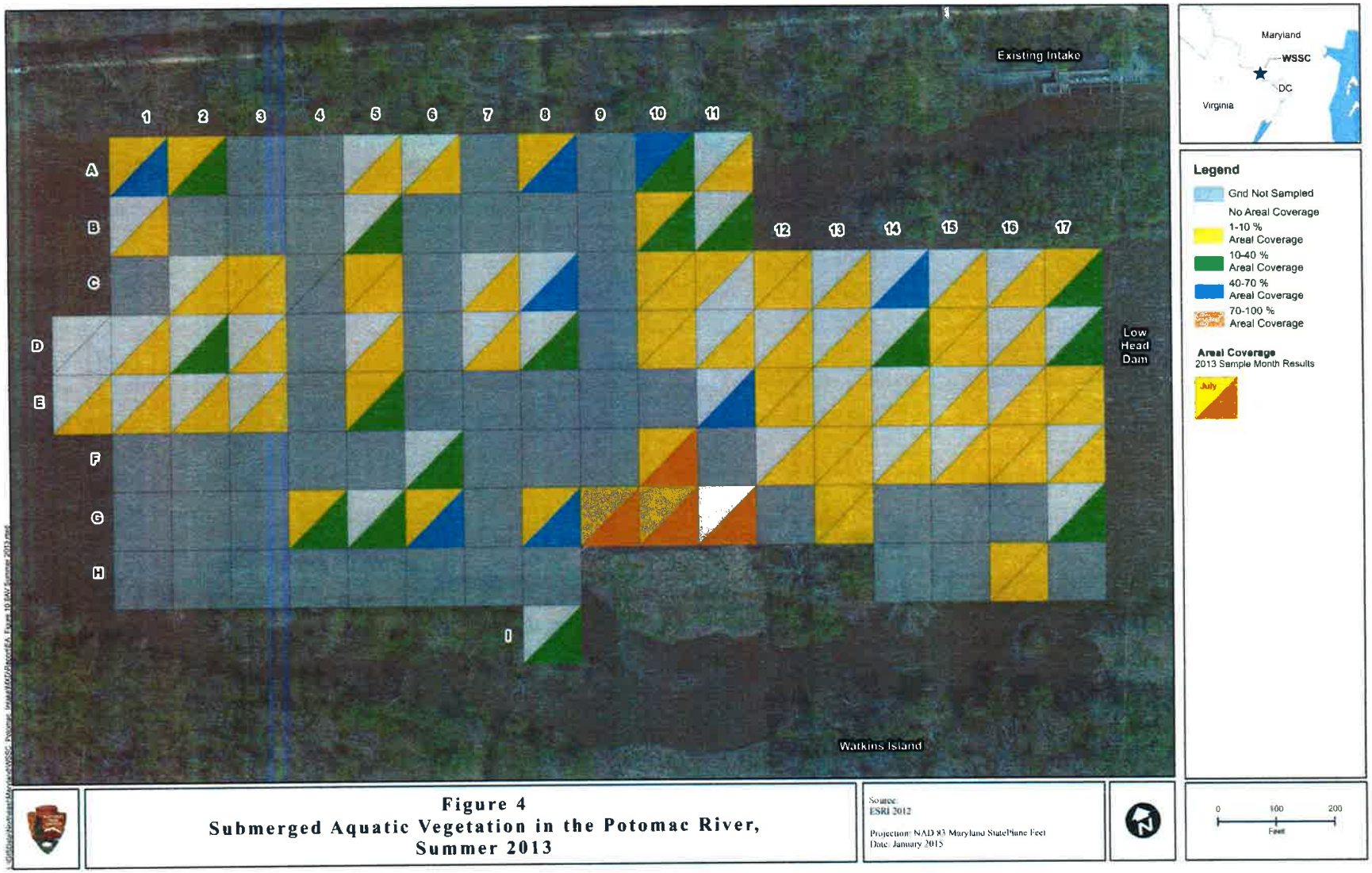

Figure 4
Submerged Aquatic Vegetation in the Potomac River, Summer 2013

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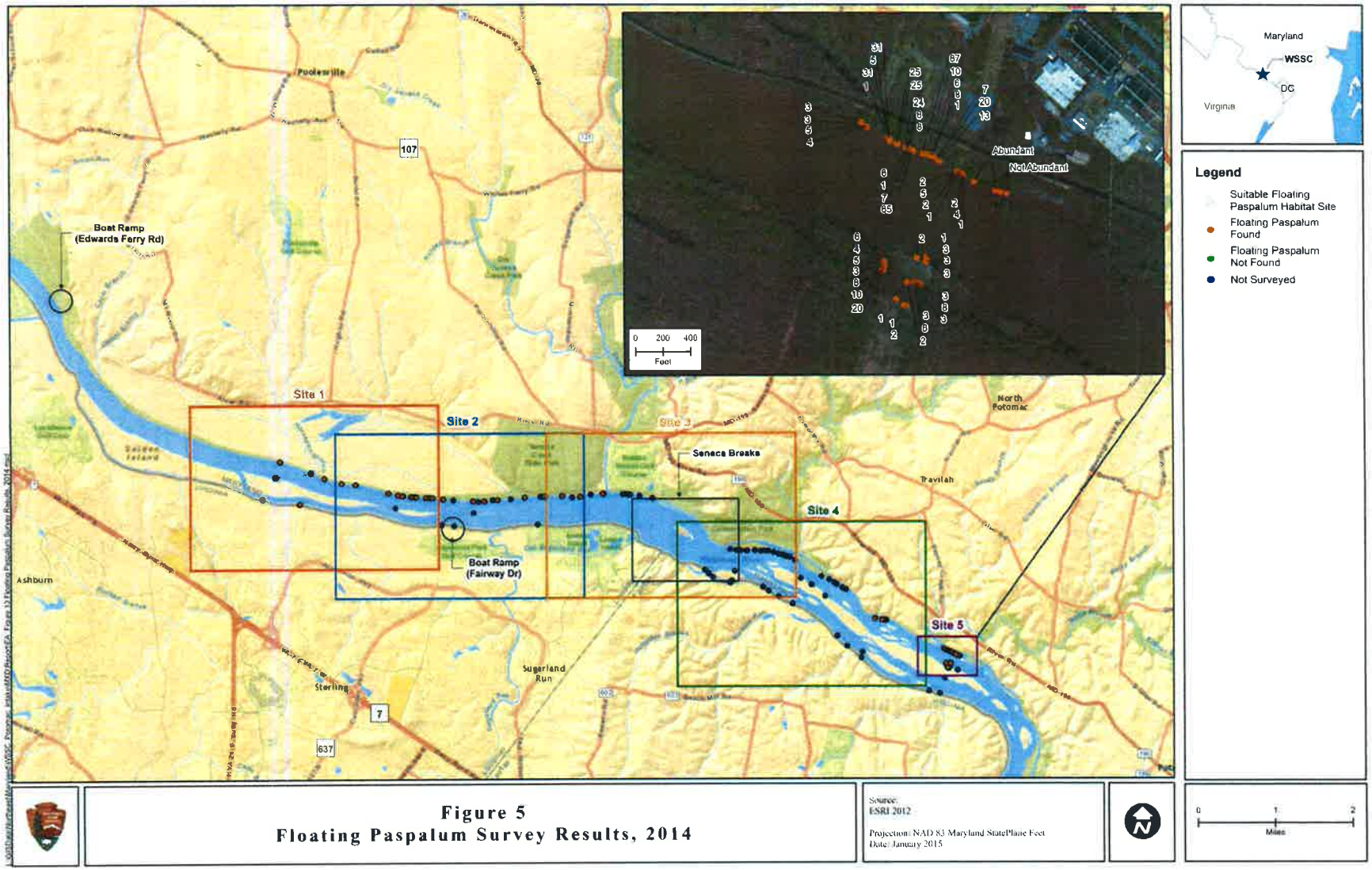

Figure 5
Floating Paspalum Survey Results, 2014

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Statement of Findings for Executive Order 11990, "Protection of Wetlands" and Executive Order 11988, "Floodplain Management"

Chesapeake & Ohio Canal National Historical Park

Potomac Submerged Channel Intake

Montgomery County, Maryland

Recommended:

Superintendent, Chesapeake & Ohio Canal National Historical Park — Date: 10/23/17

Certification of Technical Adequacy and Servicewide Consistency:

Chief, Water Resources Division — Date: 10/27/2017

Approved:

Regional Director, National Capitol Region — Date: 1/29/2018

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Acronyms and Abbreviations

BMP	Best Management Practices
C&O Canal NHP	Chesapeake and Ohio Canal National Historical Park
EA	Environmental Assessment
FEMA	Federal Emergency Management Agency
GPS	Global Positioning System
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
NEPA	National Environmental Policy Act
NPS	National Park Service
NWI	National Wetlands Inventory
OHWM	Ordinary High Water Mark
PFO1B	Palustrine, Forested, Broad-Leaved Deciduous, Saturated
R2UBH	Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded
R2UBHx	Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded, Excavated
RPW	Relatively Permanent Water
SAV	Submerged Aquatic Vegetation
SOF	Statement of Findings
TNW	Traditional Navigable Waters
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WFP	Water Filtration Plant
WSSC	Washington Suburban Sanitary Commission

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STATEMENT OF FINDINGS

INTRODUCTION

WETLANDS

Executive Order 11990, "Protection of Wetlands," issued May 24, 1977, directs all federal agencies, to avoid to the maximum extent possible, the long- and short-term adverse impacts associated with the occupancy, destruction, or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. In the absence of such alternatives, parks must modify actions to preserve and enhance wetland values and minimize degradation.

To comply with Executive Order 11990 within the context of the agency's mission, the National Park Service (NPS) has developed a set of policies and procedures found in Director's Order 77-1: *Wetland Protection* (NPS 2002) and Procedural Manual 77-1: *Wetland Protection* (NPS 2012). These policies and procedures emphasize: 1) exploring all practical alternatives to building on, or otherwise adversely affecting, wetlands; 2) reducing impacts to wetlands whenever possible; and 3) providing direct compensation for any unavoidable wetland impacts by restoring degraded or destroyed wetlands on other NPS properties. If a preferred alternative would have adverse impacts on wetlands, a Statement of Findings (SOF) must be prepared that documents the above steps and presents the rationale for choosing an alternative that would have adverse impacts on wetlands.

FLOODPLAINS

Pursuant to Executive Order 11988, "Floodplain Management," and Director's Order 77-2: *Floodplain Management*, flooding hazards have been evaluated related to the proposed alternatives for the project. The evaluation considers impacts to human life and safety, capital investment, and floodplain values and functions. The area of the floodplain affected by the proposed project is relatively small in consideration of the size of the Potomac River and its floodplain. The project will not impact the floodplain function with respect to human life and safety; therefore, this topic is not analyzed in this statement. The project includes construction in the river, as required for the water intake. Elements of the project in the river and the floodplain will be designed to function in these environments and to withstand impacts associated with river and floodplain functions. Impacts to federal capital investments are not analyzed, as no investments will be altered by this project. This SOF describes the proposed project and alternatives, project site, floodplain determination, use of floodplain, investigation of alternatives, flood risks, and mitigation for the continued use of facilities within the floodplain.

PROJECT AREA

The NPS prepared an environmental assessment (EA) to consider the environmental consequences related to the potential construction of a new offshore submerged channel intake for water supply at the Washington Suburban Sanitary Commission's (WSSC) Potomac Water Filtration Plant (WFP). The Potomac WFP is located along River Road near Potomac, Montgomery County, Maryland, on the north side of the Potomac River (figure 1). The Chesapeake and Ohio Canal National Historical Park (C&O Canal NHP or the park) is located parallel to the Potomac River and passes between the existing water intake structure and the remaining facilities of the WFP. The C&O Canal NHP extends for 184.5 miles from Washington, DC to Cumberland, Maryland. The project area is located near mile marker 17.5 of the C&O Canal NHP. The project would involve construction activities in and adjacent to the C&O Canal NHP.

There are three landowners within the project area: NPS, WSSC, and the State of Maryland (figure 2). For the purposes of this SOF, the mitigation of wetlands within NPS property is addressed.

ALTERNATIVES CONSIDERED

The purpose of the federal action is to respond to WSSC's proposal considering the purpose and resources of C&O Canal NHP, as expressed in statute, regulation, policy, and the NPS objectives in taking action Figure 2 depicts the project area and existing riverine systems and wetland features. The project is necessary because the applicant has submitted an application and preliminary plans to construct a submerged intake and supporting features in and adjacent to C&O Canal NHP. The park's enabling legislation recognizes the potential need for utility projects to cross the park and provides the Secretary authority to permit crossings "if such crossings are not in conflict with the purposes of the park and are in accord with any requirements found necessary to preserve park values." Public Law 91-644, Section 5 (b), 1971. The applicant requests NPS permission to construct a new submerged channel intake in the Potomac River, as well as an onshore intake shaft, a boat ramp, a parking area, and a permanent access road. Construction would include temporary cofferdams in the Potomac River for the submerged intake and boat ramp and a temporary construction access road including embankments across the Potomac River and C&O Canal.

ALTERNATIVE 1: NO-ACTION ALTERNATIVE

The no-action alternative is required under National Environmental Policy Act (NEPA) to compare feasible alternatives to existing conditions. Under the no-action alternative, the existing operations at the Potomac WFP would continue, and no alterations would be made to the Potomac WFP, the C&O Canal NHP structures, or the Potomac River.

The Potomac WFP draws water directly from the Potomac River and can treat up to 285 million gallons of water each day. The main facilities that support the Potomac WFP include the existing intake, diversion weir, two raw water pumping stations, and six raw water intake conduits. The existing intake is located along the shoreline of the Potomac River opposite the Unnamed Island. The diversion weir is located at the eastern end of the structure and creates a pond from which the intake draws. Water flows through the existing intake by gravity through six conduits under the C&O Canal to the raw water pumping stations. Current average and maximum day production rates are approximately 130 and 200 million gallons of water per day, respectively; however, the existing intake structure has a maximum capacity of 400 million gallons per day.

An access road to the existing intake extends from the south gate of the Potomac WFP and across the C&O Canal at the west side of the intake. The road divides into the upper access road that follows a retaining wall and the intake access road that parallels the Potomac River and terminates at the WSSC monument. The intake access road is connected to the towpath via a foot path.

The C&O Canal, operated by the NPS, runs between the intake and the pumping stations. The C&O Canal is a historic man-made structure that is the focus of the C&O Canal NHP. This is generally a linear park that occupies the north bank of the Potomac River and extends from Cumberland, MD downstream into the District of Columbia. The towpath along the canal is a popular area for hiking and the canal itself can be navigated by small nonmotorized recreational watercraft. Within the Potomac WFP site, the canal itself is a dish or trapezoidal shaped section approximately 5 feet deep at the center and approximately 60 feet wide. An approximately 10 feet wide towpath is located on the south bank of the canal. The towpath is connected to the intake access road at the WSSC interpretive monument at the east end of the intake. The canal property extends from approximately 20 feet north of the northern canal bank to the river and includes the property on which the intake is constructed.

Because the existing intake structure would remain in the same location, the tributary runoff on the north bank of the Potomac River would continue to have an impact on the raw water quality and treatment plant operations. The raw water entering the water treatment process following storm or high flow events would continue to contain increased levels of solids, chemicals, and pathogens and require higher quantities of chemicals to treat raw water during these high flow events.

ELEMENTS COMMON TO ALL ACTION ALTERNATIVES

The construction of a new submerged channel intake is proposed under all the action alternatives. An offshore intake would improve the quality of the raw water for the Potomac WFP; however, the quality of the water supplied to the public would not change. The proposed project would not increase water withdrawals from the river, but would provide higher quality source water from an alternate location. The current shoreline intake has a greater withdrawal capacity than that for which WSSC is permitted. Likewise, the proposed submerged channel intake would have the capacity for greater withdrawals than the current permit allows. Water consumption has been static over the last 30 years, and WSSC has no reason to expect this to change. Current average and maximum day production rates are approximately 130 and 200 million gallons of water per day, respectively; the submerged intake was designed for an ultimate or future peak flow capacity of 400 million gallons per day. The construction of the submerged intake would be a major undertaking, and the intake has been designed for long-term use. A larger intake accommodates future requirements, reducing the likelihood of future construction in the river. A new permit would be required before WSSC could increase water withdrawals from the Potomac River. The project would include the following elements, regardless of the action alternative chosen.

Construction Area Limits (Limits of Disturbance)

While the actual construction area limits vary slightly among the alternatives (8.7 – 9.1 acres), the treatment remains the same. For impact analysis, it is assumed that all areas within the depicted construction area limits could be impacted by construction. The individual elements (e.g., temporary and permanent roads, cofferdams, embankments) would essentially be as depicted for each alternative. Location and exact dimensions may shift slightly as design progresses, but all construction activity would occur within the construction area limits, and significant changes in location or dimension are not anticipated. The construction area limits for the project were designed to avoid and minimize impacts to natural resources. One of the goals of construction is to leave the existing habitat as close to natural and undisturbed as possible by constructing the project in the smallest footprint feasible.

Intake Shaft (Underground)

- River intakes and the intake shaft would be constructed southwest of the existing intake facility. River intakes would be comprised of three separate structures in a side-by-side configuration at the top of the intake shaft and above the river bottom, sized for a water inflow velocity of 0.5 feet per second. Intake structures would be connected to three corresponding separate 96-inch-diameter intake conduits, constructed within the intake shafts and tunnels/trench. Construction of the intake shaft would be done using the drill and blast method.
- The intake shaft would be used to construct the river intakes and connect them to either tunneled or trenched intake conduits.
- The location of the intake shaft would be approximately 100-feet offshore of the west end of Unnamed Island.
- The intake shaft is estimated to be 80 feet in diameter and approximately 50-feet deep in partially excavated rock for the tunneling alternatives and 40-feet deep in the trenching option.

- For all alternatives, three small shafts – one down to each of the connections between a new 8-foot intake conduit and two existing 6-foot intake conduits with 6 x 8 foot diameter steel pipe tee fittings – will be constructed.

Onshore Shaft/Junction Vault

- A new onshore shaft would be constructed west of the existing intake facility.
- The onshore shaft would be used as the main access point during tunneling operations. When tunneling operations are completed, a permanent junction vault structure would then be constructed within the shaft. The gate structure would include sluice gates used to control flow to the existing piping connections and provide operational flexibility for the Potomac WFP. The junction vault will be located primarily underground with a 16 x 52 foot at grade rectangular structure containing three 12 x 12 foot chambers with at grade, removable slabs for maintenance access to the sluice gates. Each chamber will have an above grade sluice gate operator protruding approximately 3 feet above grade.

Cofferdam (Intake Shaft)

- A temporary cofferdam would be constructed to provide a "dry" working area for construction of the intake shaft and possibly to sculpt the river bottom upstream of the intake to provide optimal flow conditions to the intake. The need for and extent of this sculpting will be determined in detailed design through additional hydraulic modeling, geotechnical investigations, and bathymetry. The cofferdam would extend approximately 150 feet into the river and 200 feet across in an oval shape.
- Each side of the cofferdam cross section would include a dam-type backfill area using select material placed at 2:1 side slopes from a bottom elevation of 152 feet (corresponding approximately to river bottom) to a top of dam elevation of 175 feet. The dimensions of each side of the dam would be 23 feet high and 104 feet wide at the base. The top section would be 12 feet wide, and would serve as a temporary road for construction access. The two sides of the dam would be separated by approximately 230 feet from each other's toe to provide sufficient area to lay back trenches or to work on the intake shaft at the River. The overall width of the dams plus the piping would be approximately 400 feet.

Boat Ramp and Permanent Access Road

- A new permanent access road, boat ramp and parking area would be constructed west of the existing intake facility.
- A temporary cofferdam would be constructed around the boat ramp location to provide a "dry" working area.
- The parking area would be sized to accommodate a truck and trailer and up to three additional parking spaces for other vehicles. It would accommodate parking and maneuvering of the vehicles, as well as other equipment necessary to maintain the offshore intake. None of the equipment would be stored on the parking area. Maintenance of the offshore intake could include launching of a small barge to collect debris and deposits around the intake. The barge-hauling truck and trailer would park in the parking area while debris collection is made. The parking area could also hold a dump truck during cleaning operations to remove the debris/deposits from the site. Cleaning/Maintenance is estimated to be needed every two years or more. Between maintenance, no vehicle use, besides emergency vehicles, is anticipated at the boat ramp/parking area.

- Pervious materials would be used for the surface of the parking area and the portion of the boat ramp that is upland and not subject to frequent inundation.
- A permanent road would be located off of the existing intake facility access road to the location of the new boat ramp and parking area. This road will also provide access for maintenance of the junction vault. A locked security gate would be constructed restricting access from the existing intake access road to the permanent access road that leads to the junction vault and boat ramp.

Temporary Access Road and Embankment

- A temporary access road would be constructed to allow access from Potomac WFP property to construction areas. The road would provide construction access to the intake shaft on the west end of Unnamed Island and to the existing raw water conduits. The temporary access road follows the same route from the Potomac WFP property in the north to just east of the existing intake for all three alternatives. The remaining route that differs amongst the alternatives is described under each alternative. One embankment would be constructed across the C&O Canal for the temporary access road. The embankment is needed to cross the C&O Canal because the types of construction equipment required for the project would likely exceed the rated loading capacity (20 tons) of the existing bridge crossing.
- A second embankment would be constructed across the channel between Unnamed Island and the shoreline just east of the existing intake to support the construction access road.
- A protective landscape fabric barrier would be installed between the towpath and the fill and between the canal prism and the fill to protect the structural integrity of these resources where the road crosses.
- Visitor use of the towpath would be accommodated by constructing ramps on either side of the access road. The ramps would allow walkers, cyclists, strollers and wheelchair users to cross the access road as they traverse the towpath.
- Safety personnel and signs would be used to protect visitors.

Public Protection Controls

- Visitors would be excluded from all construction areas by the use of construction fencing around the perimeter of the project, and if appropriate, by the use of guards. Flag people would control towpath traffic during blasting and drilling and when construction vehicles cross the towpath.
- During construction of the embankment, temporary access roads, and the cofferdams, the C&O Canal, towpath, and portions of the Potomac River would be temporarily closed to visitors; however, detours would be provided to avoid having visitors within close proximity to the construction zone.
- Signage would be installed to inform the visitors to the towpath of closures and detours. Signage would be present for the duration of the construction phase of the project. Lighting would not be installed, as construction activities would not occur at night and the park is only open during daylight hours.

Canal Operations

- For the temporary access road, temporary culverts would be installed through the embankment to maintain flow in the canal. A protective landscape fabric barrier would be installed between the fill and the canal prism to protect the structural integrity of the canal prism.

Connection to Existing Facilities

- The proposed connection to the existing facilities for all alternatives is through the existing raw water conduits between the existing intake and towpath. This connection will be made by constructing small shafts above each connection point.

Land Exchange

- A land exchange between the NPS and WSSC would occur. WSSC is planning to purchase and provide land, identified by NPS, to the NPS in exchange for a perpetual easement for the existing and proposed intake facilities. The land for which an easement is needed has been surveyed and mapped. Lands to be purchased and provided by WSSC to NPS in exchange for the easement will be identified and the agreement between NPS and WSSC signed prior to the issuance by NPS of the special use permit (SUP) for construction. A SUP is a document issued by the superintendent to allow special park uses that do not have their own permitting instrument.

Land Ownership

- The project site involves three parcels of land under separate ownership (WSSC, NPS, and the state of Maryland). A small portion of the project (northern portion of the construction access road) is within the boundaries of the existing Potomac WFP facility owned by WSSC. The boat ramp, parking area, access road, junction vault, and onshore intake tunnels would be located on NPS property. The majority of the construction access road, the intake shaft, and in-river intake tunnel would be located on both land and riverbed that is owned by the State of Maryland.
- Unnamed Island is a small island in the Potomac River located just offshore of WSSC's existing raw water intake. The ownership of Unnamed Island was investigated by WSSC since environmental impacts are expected to the island by construction activities related to the proposed new offshore submerged channel intake. Through extensive research on the ownership of the island, it was determined vacant and a title search revealed that Unnamed Island lacks ownership (Miles and Stockbridge 2014). Any unpatented land in the Potomac River is "owned" by the state; therefore, the state of Maryland owns the island.

Wetland Mitigation Site

Since implementation of the proposed project would involve impacting wetland areas, a wetland mitigation site was identified on park property within the area of Lock 13. The Lock 13 wetland mitigation site is a 1.7-acre wetland between the Potomac River and C&O Canal, near the I-495 overpass. Figure 3 shows the location of the wetland mitigation area.

Required Permits, Approvals, and Plans for Proposed Action

- Permits for construction of the Potomac Submerged Channel Intake Project are anticipated to be required from the following agencies:
    - NPS
    - U.S. Army Corps of Engineers (USACE)
    - Maryland Department of the Environment (MDE)
    - Montgomery County

- A general summary of the anticipated permits and approvals required for the proposed project are summarized in table 1, and a general summary of the anticipated plans required for the proposed project are summarized in the following paragraphs. In addition to required permits and plans, WSSC is planning to purchase land which it would provide to the NPS in exchange for a perpetual easement for the existing and proposed intake facilities.

Table 4. General Summary of Required Permits and Approvals

Permit/Approval Name	Agency	Description of Permit/Approval
Federal Issued Permits		
Section 404 Permit for Discharge of Dredged or Fill Material into Waters of the US	USACE	Permit required for any activity that involves filling Waters of the U.S., including wetlands. Authorizes only necessary and unavoidable impacts.
Section 10 of the Rivers and Harbors Act Permit	USACE	Permit required for any work in the Potomac River, including construction, excavation, or deposition of materials in, over, or under navigable waters, or any work that would affect the course, location, condition, or capacity of those waters.
Special Use Permit	NPS	Permit required for a short-term special park use that is issued by the superintendent such as an activity that provides a benefit to an individual, group, or organization rather than the public at large; requires written authorization and some degree of management control from the NPS in order to protect park resources and the public interest; and is neither initiated, sponsored, nor conducted by the NPS.
Perpetual Easement	NPS	WSSC is planning to purchase land which it would provide to the NPS in exchange for a perpetual easement for the existing and proposed intake facilities.
State Issued Permits		
Section 401 Water Quality Certification	MDE	Permit required for wetlands and waterways construction to prevent violation of water quality standards.
Nontidal Wetlands and Waterways Permit	MDE	Permit required for any activity that alters nontidal wetland or its 25-foot buffer.
Waterways Construction Permit	MDE	Permit required for construction in river and 100-year floodplain to prevent increased flooding and impacts on river channel, wetlands, floodplains, and impacts on fish and wildlife.
General Discharge Permit for Stormwater Associated with Construction Activities	MDE	Permit required in areas of disturbance >1 acre to control stormwater runoff during construction.
Water and Sewerage Construction Permit	MDE	Permit required for major modifications of public water systems.

Permit/Approval Name	Agency	Description of Permit/Approval
Memorandum of Agreement	SHPO	A Memorandum of Agreement will be prepared with stipulations that outline appropriate treatment measures to minimize or mitigate adverse effects to cultural resources.
County Issued Permits		
Sediment Control Permit	Montgomery County	Permit required for work in the Potomac River. Permit requires applicant to install booms and filter fencing in water column to reduce the quantity of solids released during construction activities.
Floodplain District Permit	Montgomery County	Permit required for any land disturbing activities within the floodplain district and for temporary or permanent construction involving the placement of a structure, regardless of the size of the disturbed area.

Erosion and Sediment Control Plan – After the detailed design has been completed, an agency approved erosion and sediment control plan would be prepared and obtained before construction begins. This plan is required by MDE to control soil erosion and sediment runoff from construction sites. It is required for projects that involve land clearing, land disturbance or grading where more than 5,000 square feet are disturbed within the limits of the project area. MDE and its Water Management Administration oversee the approval of erosion/sediment control and stormwater management plans and documentation, as well as the issuance of permits and state regulatory standards. Stormwater runoff (discharge) from Maryland construction sites are regulated under section 402 of the Clean Water Act. Section 402 outlines the National Pollutant Discharge Elimination System permitting program. MDE and Montgomery County would review and approve this plan prior to construction.

The plan typically includes:

- Environmental site design to be utilized throughout all stages of the construction project.
- Best Management Practices (BMPs) to minimize total land disturbances caused by construction activities.
- Control of vehicles and construction equipment entering and exiting the site.
- Evaluations and Inspection records throughout the duration of construction.
- Identification of disturbed or high risk locations within the construction site.
- Final and temporary stabilization methods to remedy all environmental site disturbances.
- Protective measures to ensure all discharges into the Chesapeake Bay and other Maryland water bodies are in accordance with an established Total Maximum Daily Load.

Erosion and sediment controls, which include both stabilization and structural control measures, prevent or reduce erosion, and redirect stormwater flow during construction activities. Examples of construction stabilization include:

- Temporary seeding: Vegetation such as grass that grows quickly to hold the soil in place preventing erosion due to wind currents or stormwater. An NPS-approved annual grass seed mix would be used.

- Permanent seeding: Vegetation is used during construction to prevent soil erosion and remains as part of the final landscaping. An NPS-approved permanent grass seed mix would be used.
- Mulching: Material such as hay, grass, wood chips, gravel, or straw is placed on top of the soil to prevent erosion and only certified weed-free mulch would be used.

Structural control measures prevent pollutants from leaving the construction site, limit the amount of water flow, or change the direction it travels. Examples include:

- Silt fences: A trapping device captures sediment on one side of the fence while allowing water to flow through.
- Sediment traps: Sediment settles out in a specified area such as an empty pond.
- Sediment basins: Sediment basins allow sediment to settle out in a specified area but require a controlled release of the water flow.

Stormwater Management Plan – After the detailed design has been completed, an agency approved stormwater management plan would be prepared and required permits obtained before construction initiation. The plan is required by regulation if more than 5,000 square feet are disturbed to prevent stream bank erosion by controlling the rate of stormwater runoff from newly developed areas. Examples of stormwater management controls include:

- Retention Ponds: Stormwater runoff is retained in a pond and may be removed through evaporation, infiltration, or emergency bypass.
- Detention Ponds: Water is held then slowly released, allowing sediments to settle.
- Infiltration: Measures can include infiltration trenches, basins, and dry wells that allow water to percolate from the surface into the soil below.
- Vegetated Swales and Natural Depressions: Vegetation, usually grass, lines the swale and removes sediments from runoff, allowing it to better infiltrate into subsurface soil.

This plan would include sufficient information, drawings, computations, and notes to describe how soil erosion and off-site sedimentation would be minimized. The plan would serve as the basis for all subsequent grading and stabilization that would take place on the construction site. Coordination and approval with MDE is required based on how much impervious surface remains onsite after construction.

Construction Safety Plan – Prior to construction, a construction safety plan would be prepared that addresses appropriate elements to provide for visitor, worker, and park staff safety. A construction safety plan is important for several reasons. First, it helps protect workers and the public from injury or harm. Second, it is often required by land owners or developers to help limit their liability during construction. A construction safety plan typically includes the following topics: scope of project work, project risks and methods of control such as unauthorized public access to the site and exposure to construction site hazards and worker exposure to general site hazards, site inspections, public protection controls such as erecting fences or barricades and displaying signs "Construction Site - Do Not Enter Authorized Personnel Only," project site rules, and emergency preparedness. These fences or barriers would also act as a visual barrier to reduce the visual impacts from vegetation removal and construction activities.

Habitat Restoration Plan – A Habitat Restoration Plan was developed through consultation with NPS, USACE, U.S. Fish and Wildlife Service (USFWS), and Maryland Department of Natural Resources (MDNR). This comprehensive plan provides guidelines for habitat and resource restoration and mitigation associated with the construction and operation of the new offshore intake structure. This plan

includes mitigation activities associated with freshwater mussels and reforestation of the project area. This plan also includes monitoring activities associated with submerged aquatic vegetation, floating paspalum (*Paspalum fluitans*), species planted for reforestation, nonnative invasive species, and freshwater mussels. Adaptive management was also included since mitigation efforts may require more advanced management and modification in order to be viable.

ALTERNATIVE 2: TUNNELING TO ONSHORE SHAFT -WEST OF EXISTING INTAKE (PREFERRED ALTERNATIVE)

Figure 4 depicts the location of the project elements for alternative 2, which is the preferred alternative for this project. In addition to elements common to all action alternatives, alternative 2 would include the following elements:

Construction Method

- Alternative 2 would utilize tunneling for the installation of all new piping.
- The tunneling for each of three 8-foot-diameter intake conduits (pipes) requires a 10-foot-diameter tunnel with a horseshoe-shaped cross section. The three tunnels are separated 10 feet from each other's side walls. The tunnels are 30-feet deep from the tunnel invert to the river bottom. There is a 5-foot separation at each side of the overall piping section to the boundary of the impact area.

Construction Schedule

- Phase 1 - construction (mainly onshore) before installation of the intake cofferdam: site preparation, clear and grub site (4.7 acres), install stormwater management, temporary construction laydown areas, site security, install access road embankments and culverts, and install temporary access road. This phase would take approximately 17 months. All vegetation within the construction area limit would be removed during Phase 1.
- Phase 2 - installation of intake cofferdam and associated construction within the cofferdam: install intake cofferdam, install intake shaft, install onshore shaft and construct junction vault (note: this is onshore construction), install tunnels from onshore shaft to intake shaft, install conduits in tunnel, grout around conduits in tunnels, fill and cover intake shaft and onshore shaft, and remove intake cofferdam. This phase would take approximately 2 years.
- Phase 3 - construction (mainly onshore) after removal of intake tunnel cofferdam: construct boat ramp, parking area, and permanent access road; remove temporary embankments and temporary access road; and conduct site restoration of approximately 4.4 acres. This phase would take approximately 6 months.

Onshore Shaft

- A new onshore shaft would be constructed west of the existing intake facility.

Intake Tunnels

- The three intake tunnels would head north from the new intakes to the onshore shaft, and then head east before connecting into the six existing 6-foot-diameter intake conduits on the downstream side of the existing intake facility.

Temporary Access Road

- The eastern portion of the temporary access road ends northeast of the existing intake.

Embankment

- An additional temporary road embankment would be constructed across the Potomac River channel to allow construction vehicles to cross and traverse over the western portion of Unnamed Island and to continue back onshore. This would allow access to construction areas needed to construct the intakes and intake shaft and perform the pipeline connections. Culverts would be provided in the embankments (see "Common to All Action Alternatives" section for the eastern embankment) to maintain flow in the channel.

ALTERNATIVE 3: TRENCHING/TUNNELING TO ONSHORE SHAFT - WEST OF EXISTING INTAKE

Alternative 3 is similar to alternative 2 with respect to the locations of the new intakes, onshore shaft/junction vault, horizontal alignment of the new conduits, and the connections to the existing 6-foot intake conduits. However, the installation of the new piping would be completed using both open-trench and tunneling construction. The intake conduits between the intake shaft and the onshore shaft would be installed in a trench and the intake conduits between the onshore shaft and connection to existing conduits would be installed in tunnels. Some of the same design features for alternative 2 also apply to alternative 3; however, those that most significantly differ include the following:

Construction Method

- Alternative 3 would utilize open-trench construction in lieu of tunneling for the installation of new piping between the intake shaft and the onshore shaft. Tunneling construction would be used to install the piping under the existing access road, adjacent to the existing bridge abutments, to minimize risk and impacts associated with open trenching and also to keep the intake road open during construction.
- The trench section for the 8-foot-diameter piping requires a 12-foot-high and 10-foot-wide backfill trench section, including pipe bedding. The trenches are 17-feet deep from trench invert to the river bottom. A 5-foot-high concrete slab extending from the river bottom down to the top of the trench would be installed to prevent flotation or scouring of pipes. The three trenches are separated 10 feet from each other's side walls. There is a 5-foot separation at each side of the piping section to the boundary of the permanent impact area. There is also a 20-foot separation from both sides of the piping section to the edge of the cofferdam toe fill sections. The 60-foot-wide section is considered the permanent impact area.
- The intake shaft is estimated to be 80-feet (diameter) wide and slightly shallower at approximately 40-feet deep within partially excavated rock.

Construction Schedule

- Phase 1 - construction (mainly onshore) before installation of the intake tunnel cofferdam: construction during this phase would be the same as alternative 2 except that there would be an additional cofferdam in the existing intake channel to provide access to Unnamed Island and there would be an additional step of installing a temporary water supply channel across Unnamed Island. This phase would take approximately 19 months. All vegetation within the construction area limit (3.7 acres) would be removed during Phase 1.

- Phase 2 – installation of intake cofferdam and associated construction within the cofferdam: construction during this phase would be the same as alternative 2 except that a trench instead of a tunnel would be excavated within the cofferdam from the intake shaft to the onshore shaft. Conduits would then be installed in the trench. This phase would take approximately 1.8 years.
- Phase 3 - construction (mainly onshore) after removal of intake cofferdam: construct boat ramp, parking area, and permanent access road; remove temporary embankments and temporary access road; and conduct site restoration of approximately 3.4 acres. This phase would take approximately 6 months.

Trenched Conduits

- Where the sections of new conduits are placed in the channel and river, a concrete cap or cover would be installed above the conduits for pipe protection. The top of the concrete cover would match the existing channel or river bottom elevation.

Cofferdam (Intake Shaft and Trenched Conduits)

- Since this alternative utilizes open-trench construction, a larger, more extensive cofferdam is required in the river and across Unnamed Island to install new conduits from the new intake. The cofferdam across the existing intake channel would serve as the channel crossing for the temporary construction road in lieu of the western embankment in alternatives 2 and 4.

Embankment

- Since the cofferdam construction would block off flow from the existing supply channel to the existing intake facility, a temporary supply channel would recreate this flow through and across Unnamed Island. An embankment with culverts that maintain supply flow is needed across the temporary supply channel to provide construction vehicle access to the east connection to existing conduits.

ALTERNATIVE 4: TUNNELING TO ONSHORE SHAFT - EAST OF EXISTING INTAKE

For alternative 4, the method of constructing the three intake tunnels and many of the design features are similar to what is described under alternative 2; however, the horizontal alignment of the tunnels/conduits and the location of the onshore shaft/junction vault are different. Some of the same design features for alternative 2 also apply to alternative 4; however, those that most significantly differ include the following:

Construction Schedule

- Phase 1 - construction (mainly onshore) before installation of the intake cofferdam: construction during this phase would be the same as alternative 2. This phase would take approximately 17 months. All vegetation within the construction area limit (4.4 acres) would be removed during Phase 1.
- Phase 2 – installation of intake cofferdam and associated construction within the cofferdam: construction during this phase would be the same as alternative 2. This phase would take approximately 2 years.
- Phase 3 - construction (mainly onshore) after removal of intake cofferdam: construct boat ramp, parking area, and permanent access road; remove temporary embankments and temporary access

road; and conduct site restoration of approximately 4.1 acres. This phase would take approximately 6 months.

Onshore Shaft and Tunnels

- The onshore shaft would be located east of the existing intake facility, whereas in alternatives 2 and 3 it was located to the west of the existing intake facility. The tunneled conduits would run from the intake shaft approximately 700-feet southwest to the new river intakes located 100-feet offshore of Unnamed Island.
- Three tunneled conduits would also run to the west from the onshore shaft to connect into the six existing intake pipelines that are located downstream of the existing intake facility.

Embankment

- Similar to alternative 2 but different than alternative 3, an additional temporary road embankment would be constructed across the Potomac River channel to allow construction vehicles to cross and traverse over the western portion of Unnamed Island and to continue back onshore. This would allow access to construction areas needed to construct the intakes and intake shaft and perform the existing pipeline connections. Culverts would be provided between the embankments (see "common to all action alternatives" section for the eastern embankment) to maintain flow in the channel.

Canal Operations

- If required for construction safety and maintaining access for visitor and park staff use, temporary relocation of the towpath would be provided on the north side (left bank) of the canal. The need for temporary towpath relocation would be determined during detailed design.

DESCRIPTION OF WETLANDS AND FLOODPLAINS IN THE PROJECT AREA

WETLANDS

For the NPS, any area that is classified as a *wetland* according to the USFWS "Classification of Wetlands and Deepwater Habitats of the United States" (Cowardin et al. 1979) is subject to NPS Director's Order 77-1: *Wetland Protection* (NPS 2002). Deepwater habitats are not subject to Director's Order 77-1. Under the Cowardin definition, a wetland must have one or more of the following three attributes:

1. At least periodically, the land supports predominantly hydrophytes (wetland vegetation).
2. The substrate is predominantly undrained hydric soil.
3. The substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.

In addition, under the Cowardin definition, wetland deepwater habitat boundaries are described as a depth of up to 6.6 feet (2 meters) at low water for riverine systems. Areas containing SAV would be characterized as riverine systems. The Cowardin wetland definition encompasses more aquatic habitat types than the definition and delineation manual used by the USACE for identifying wetlands subject to Section 404 of the Clean Water Act. The 1987 *Corps of Engineers Wetlands Delineation Manual* requires that *all three* of the parameters listed above (hydrophytic vegetation, hydric soil, wetland hydrology) be present in order for an area to be considered a wetland (USACE 1987). The Cowardin wetland definition includes such wetlands, but also adds some areas that, though lacking vegetation and/or soils *due to*

natural physical or chemical factors such as wave action or high salinity, are still saturated or shallow inundated environments that support aquatic life (e.g., unvegetated stream shallows, mudflats, rocky shores).

The National Resources Conservation Service web soil survey for Montgomery County, Maryland depicted one soil type within the project area: Lindside Silt Loam (0-3% slopes and occasionally flooded). This soil type does not have hydric status (i.e., soils that form under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions), although some hydric indicators can be found in the lower positions of this landform (PEER 2013).

The National Wetlands Inventory (NWI) of the USFWS produces information on the characteristics, extent, and status of the nation's wetlands and deepwater habitats. The USFWS definition of wetlands is similar to the NPS definition of wetlands in that only one of three parameters (hydric soils, hydrophytic vegetation, and hydrology) is required to characterize an area as a wetland, based upon the Cowardin Classification of Wetlands (Cowardin et al. 1979). The USFWS objective of mapping wetlands and deepwater habitats is to produce "reconnaissance-level information on the location, type and size of these resources" (USFWS/NWI 2014). NWI maps are prepared by the USFWS from the analysis of high altitude imagery and wetlands are identified based on vegetation, visible hydrology and geography. The NWI online maps identify three systems within the project area: a freshwater pond (classification code PUBHX) adjacent to the existing bridge over the C&O Canal, a freshwater forested/shrub wetland (classification code PFO1A) located on the eastern portion of unnamed island, and a riverine system (classification code R2UBH), which is the Potomac River (USFWS/NWI 2014). NWI maps are not always consistent with the exact wetland type or accurate when ground-truthing of the site is conducted. Therefore, a wetland delineation of the site was conducted to determine exact locations and current Cowardin Classification of wetlands in the project area; results are discussed below.

WETLAND FUNCTIONS AND VALUES

Wetlands serve a wide range of ecological functions. They are valuable as holding areas for rising floodwaters. Wetland vegetation reduces floodwater velocity and depletes its destructive energy, thereby protecting mainland and upland areas. Wetland vegetation also forms buffers against erosion by absorbing current and storm energy, stabilizing substrates, and trapping sediments. Filtration of sediments, nutrients, pollutants, and toxic substances has the added advantage of improving water quality. Wetland functions are physical, chemical, and biological processes or attributes of wetlands that are vital to the integrity of a wetland system, while wetland values are attributes not necessarily important to the integrity of a wetland system but perceived as valuable to society. A brief description of the common function and values is provided below:

- **Groundwater recharge/discharge** — The potential for the wetland to contribute water to an aquifer or potential for the wetland to serve as an area where groundwater can be discharged to the surface.
- **Floodflow alteration (storage and desynchronization)** — Effectiveness of the wetland in reducing flood damage by attenuation of floodwaters for prolonged periods following precipitation events.
- **Fish and shellfish habitat** — Effectiveness of seasonal or permanent water bodies associated with the wetland in question for fish and shellfish habitat.
- **Sediment/toxicant/pathogen retention** — Prevents degradation of water quality relating to the effectiveness of the wetland as a trap for sediments, toxicants, or pathogens.

- **Nutrient removal/retention/transformation** — Ability for the wetland to prevent adverse effects of excess nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers, or estuaries.
- **Production export (Nutrient)** — Wetlands ability to produce food or usable products for humans or other living organisms.
- **Sediment/shoreline stabilization** — Effectiveness of a wetland to stabilize stream banks and shorelines against erosion.
- **Wildlife habitat** — The wetlands ability to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species must be considered.
- **Recreation (Consumptive and Non-Consumptive)** — Ability for the wetland and associated watercourses to provide recreational opportunities such as canoeing, boating, fishing, hunting, and other active or passive recreational activities. Consumptive activities consume or diminish the plants, animals, or other resources that are intrinsic to the wetland, whereas non-consumptive activities do not.
- **Educational/scientific value** — Value of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.
- **Uniqueness/heritage** — Ability for the wetland or its associated water bodies to produce certain special values. Special values may include such things as archaeological sites, unusual aesthetic quality, historical events, or unique plants, animals, or geologic features.
- **Visual quality/aesthetics** — The presence of visual and aesthetic qualities of the wetland for society.

WETLAND DELINEATION AND FUNCTION/VALUE ASSESSMENT

In addition to the desktop analysis, a wetland delineation was conducted within the project area. In November 2013, natural and artificial wetlands in the project area were delineated according to the guidance in NPS Director's Order 77-1. PEER Consultants, P.C. conducted the wetland delineation. Wetlands were identified in accordance with the 1987 *Corps of Engineers Wetland Delineation Manual* (USACE 1987) and in conjunction with USFWS's *Classification of Wetlands and Deepwater Habitats of the United States* (Report FWS/OBS-79/31); (Cowardin et al. 1979). A total of two wetland areas (wetland A and wetland B) and two riverine systems (Potomac River and C&O Canal) were identified and flagged during the survey. In general, the wetlands at the site are located along the floodplain of the Potomac River. According to the wetland delineation, the mapped riverine systems did not have associated wetlands beyond the channels above the ordinary high water mark (OHWM). Wetlands A and B are described briefly in the paragraphs that follow and in table 2. Wetlands shown on figure 2 meet the NPS definition of a wetland described above.

Table 2. Riverine Systems and Wetland Areas Delineated in the Project Area

Delineated Feature	Cowardin Classification*	Dimensions within the Project Area (acres)	Dimensions within the Project Area (square feet)
Wetland A	PFO1B	0.020	871.2
Potomac River	R2UBH	0.032	1393.9
C&O Canal	R2UBHx	0.137	5967.7
Total Wetlands Mapped in Project Area		**0.020**	**871.2**
Total Riverine Systems Mapped in Project Area		**0.169**	**7361.6**
Total Impacts		**0.189**	**8232.8**

Note: Above data is approximate and is applicable to wetlands and riverine systems on NPS property only. Dimensions in acres have been rounded for brevity; as a result, dimension values in square feet may appear not to be a direct conversion from the acreage value.
Wetland Definitions:
PFO1B = palustrine, forested, broad-leaved deciduous, saturated wetland
R2UBH = Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded
R2UBHx= Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded, Excavated

In addition to the standard wetland delineation methods, PEER Consultants personnel performed a Function and Value Assessment of the wetlands delineated within the project area. The functional wetland assessment was conducted in accordance with the Wetlands Functions and Values: A Descriptive Approach described in the September 1999 supplement to *The Highway Methodology Workbook (Supplement)* by the New England Division of the USACE (USACE 1999). This methodology uses a descriptive approach to characterize functions and values of wetlands.

DESCRIPTION OF WETLANDS IN THE PROJECT AREA

Wetland Descriptions

Wetland A - Wetland A is characterized as a palustrine, forested, broad-leaved deciduous, saturated wetland (PFO1B) wetland, located in the northwest corner of the proposed construction area limit (limit of disturbance). The portion of wetland that lies within NPS property in the project area totals 0.020 acre; however, the wetland extends outside of the project area to the north and west. Wetland A is located on the right bank of the C&O Canal and extends beyond an existing fence line, which is located outside of the project area. The three parameters (soils, hydrology, and vegetation) were met at this site. Change in vegetation and surrounding slopes were the used to define the limits of wetland A. Wetland A has 75% canopy cover and is dominated by red maple (*Acer rubrum*), sycamore (*Platanus occidentalis*), and box elder (*Acer negundo*). The understory is dominated by a shrub layer composed of American hornbeam (*Carpinus caroliniana*) and the herbaceous plant Nepalese browntop (*Microstegium vimineum*). This wetland is adjacent to the C&O Canal and contributes to its hydrology and water quality. Therefore, under the USACE Jurisdictional Determination requirements, wetland A would be classified as a relatively permanent water (RPW) or wetland directly abutting RPWs that flow directly or indirectly into traditional navigable waters (TNWs). During flood events, and heavy rains, there is a direct overland connection from wetland A to the C&O Canal.

As a wetland adjacent to a TNW, wetland A performs several functions, and has its own intrinsic value. Table 3 provides details on the functions and values of the wetland areas identified within the project area. The primary function of wetland A includes *Groundwater Recharge/Discharge.* Wetland A acts to help recharge the groundwater, by storing overland flow and keeping it from joining the C&O Canal. This

runoff retention also provides *Nutrient Removal* which would otherwise run into the canal, as well as, provide an area where sediments can settle out of the stormwater runoff, thus providing *Sediment/ Toxicant Retention*. Wetland A also provides the value *Wildlife Habitat*; although no wildlife was noted during the field investigation, wetland A could provide habitat for small amphibians, birds and insects.

Table 3. Function and Values of the Wetland and Riverine Systems Delineated

Function and Values	Wetland Systems	Riverine Systems	
	Wetland A (PFO1B)	Potomac River (R2UBH)	C&O Canal (R2UBHx)
Groundwater recharge/discharge	✓		
Flood attenuation/alteration		✓	
Fish/shellfish habitat		✓	✓
Sediment/toxicant retention	✓		
Nutrient removal	✓		
Production export			
Sediment/shoreline stabilization		✓	
Wildlife habitat	✓	✓	✓
Recreation and tourism		✓	
Education/scientific		✓	
Uniqueness/heritage		✓	✓
Visual quality/aesthetic		✓	
Endangered species habitat		✓	

Wetland Definitions:
PFO1B = palustrine, forested, broad-leaved deciduous, saturated wetland
R2UBH = Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded
R2UBHx= Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded, Excavated

Riverine Systems Descriptions

As previously mentioned, there were two riverine systems noted during the field investigation. These were delineated by global positioning system (GPS) and field survey locations of the OHWM perimeters of these systems within and just beyond the project area identified. Under the Cowardin Classification system, the Potomac River is classified as riverine, lower perennial, unconsolidated bottom, permanently flooded (R2UBH) system and consists of 0.032 acre within NPS property in the construction area limits. The C&O Canal is similar in nature, but has the excavated component and is considered a riverine, lower perennial, unconsolidated bottom, permanently flooded, excavated (R2UBHx) system and consists of 0.137 acre within NPS property in the construction area limits.

As part of evaluating the feasibility of constructing a new offshore intake structure, a survey of SAV within the vicinity of the proposed project area in the Potomac River was conducted in July and September 2013 (EAEST 2013a). The purpose of the SAV survey was to investigate and document the presence/absence of SAV within the footprint or area of disturbance of the project. During the survey, five native species of SAV were collected and recorded in the project area, including common waterweed (*Elodea canadensis*), water star grass (*Heteranthera dubia*), southern water nymph (*Najas guadalupensis*), sago pondweed (*Stuckenia pectinata*), and wild celery (*Vallisneria americana*). One species, southern water nymph, is ranked as a G5S3 species (MDNR 2010). The G5S3 species are

considered globally secure, but could be rare in parts of its range. In the state of Maryland, southern water nymph is a watch list species, meaning that it is rare to uncommon in its range. Watch list species are not officially listed as threatened or endangered by the State of Maryland, nor are they considered rare enough in Maryland to currently warrant reporting and tracking by the Maryland Natural Heritage Program database. They are, however, considered uncommon species in Maryland and are often significant on a local level (MDNR 2010). The timing of the surveys was planned to capture warmer water species like wild celery and water stargrass, as well as horned pondweed (*Zannichellia palustris*), a target species identified by the MDNR; however, no horned pondweed was observed during the survey. In the canal, hydrilla (*Hydrilla verticillata*) was observed covering most of the water surface (EAEST 2013a). Hydrilla is a nonnative species that is often considered a nuisance species because of its tendency to form dense impenetrable beds that impede recreational uses of waterways. Hydrilla has lower light requirements than other SAV species and is able to grow in more turbid water (MDNR 2010).

In 2013, seasonal rare plant surveys were conducted within the project area during June, August, and September. Within wetland areas discussed in this SOF and in addition to the southern water nymph, one watch list species, halberd-leaved hibiscus (*Hibiscus laevis*) was observed (EAEST 2013b). Additionally, a state endangered plant, floating paspalum (*Paspalum fluitans*), was observed along the muddy shorelines of the Potomac River within the project area and the mosquito fern (*Azolla caroliniana*), a "Maryland Established Plant" was observed floating in the Potomac River (EAEST 2013b). Established species, such as the mosquito fern, are those that are not native to Maryland, but may be native elsewhere in North America. Mosquito fern has not been tracked since 2009 after it was determined that it was being spread by waterfowl to different parts of the state. Mosquito fern has been spread to man-made ponds and ditches and there is a general belief or concern within the region that this species is an ephemeral, nonnative cultivar that is spreading by way of waterfowl and milder winters (Stango 2013).

The Potomac River shoreline riverine system also supports pockets of emergent wetlands as well as SAV species in the submerged areas. Small pockets of herbaceous wetland areas exist along the Potomac River where suitable substrate accumulates, thus supporting hydrophytic vegetation such as water willow (*Justicia americana*) and in some locations floating paspalum. The primary function of the Potomac River appeared to be *Sediment/Shoreline Stabilization* due to some narrow areas of vegetation protection along shoreline, although some steep adjacent slopes occur immediately inland (table 3). Secondary functions included: *Floodflow Alteration* (due to location within the floodplain of the Potomac River), *Fish and Shellfish Habitat* (due to proximity to the Potomac River shoreline, particularly in areas inhabited by SAV species where snails and crayfish were observed), and secondary values included: *Wildlife Habitat* (the riverine portion of Potomac River provides excellent wildlife value, particularly for fish and aquatic bird species) and *Endangered Species Habitat* (due to observations of *Paspalum fluitans* and southern water nymph). This wetland also had the following values, generally due to its location within a National Historical Park: *Educational/Scientific Value*, *Uniqueness/Heritage*, and *Visual Quality/Aesthetics*. The C&O Canal is watered in the section located within the project area, but is largely stagnant due to low flow and no natural connection to other water sources. The primary function of the C&O Canal is to provide *Fish Habitat* and the secondary values provide *Wildlife Habitat* and *Uniqueness/Heritage*, due to proximity within a park setting.

FLOODPLAINS

Executive Order 11988, "Floodplain Management" requires federal agencies to develop policies for the minimization of impacts to floodplains, loss due to flooding, and the restoration and preservation of natural and beneficial values of floodplains. This executive order defines floodplains as "the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum, that area subject to a one percent greater chance of flooding in any given year."

The area with a one percent chance of flooding every year is referred to as the 100-year floodplain. Flooding in the 100-year zone is expected to occur once every 100 years, on average.

Director's Order 77-2 presents the NPS policy on floodplain management in compliance with Executive Order 11988. Specifically, NPS policies state that floodplain management will provide for the protection and preservation of floodplain functions and natural resources, and will avoid environmental effects (both long-term and short-term) of use and alteration of floodplains, including development that could adversely affect the functions and/or resources of floodplains and increase the risk of flooding. In addition, NPS policy recommends restoration of affected natural floodplain functions where possible.

All federal agencies are required to avoid building in a 100-year floodplain unless no other practical alternative exists. NPS has adopted guidelines pursuant to Executive Order 11998 stating that NPS policy is to restore and preserve natural floodplain values and avoid environmental impacts associated with the occupation and modification of floodplains. The guidelines also require that, where practicable alternatives exist, Class I actions be avoided within a 100-year floodplain. Class I actions include the location or construction of administration, residential, warehouse, and maintenance buildings, non-excepted parking lots, or other man-made features that by their nature entice or require individuals to occupy the site.

According to the Federal Emergency Management Agency (FEMA) Digital Flood Insurance Rate Maps (Map ID 24031C0320D, dated September 2006), the entire low-lying riparian corridor located along the Potomac River and the C&O Canal NHP within the preferred alternative 2 project area are within the 100-year floodplain (figure 5). This area is described as Zone A, where base flow elevations and flood hazard factors have not been determined (FEMA 2006). Basically, the entire preferred alternative 2 project area, except for a small (0.07 acre) portion of the northwest corner of the construction access road, is within the 100-year floodplain, including the construction area limits for the project. The Potomac River's floodplain contains vegetation that provides stability to the riverbank and acts as a travel route for migrating and resident wildlife. Riparian areas reduce erosion and trap sediments from runoff, replenishing the soils of the riparian corridor. By slowing the velocities of floodwaters, these natural corridors reduce potential damage to downstream areas.

The floodplain along the Potomac River is comprised of deciduous woods dominated by box elder, sycamore, slippery elm, and silver maple (*Acer saccharinum*). The canopy trees are approximately 4 to 8 inches in diameter at breast height and approximately 60 to 75 feet tall, with some very large specimen trees of sycamore and tulip poplar (*Liriodendron tulipifera*) scattered throughout the site. The sapling/shrub stratum is dominated by paw paw (*Asimina triloba*). Herbaceous species that dominate the understory include Virginia wildrye (*Elymus virginicus*), beefsteak plant, and Nepalese browntop. Poison ivy (*Toxicodendron radicans*), wingstem (*Actinomeris alternifolia*), paw paw (*Asimina triloba*), spicebush (*Lindera benzoin*), Japanese honeysuckle (*Lonicera japonica*), among other species, are also present. Along portions of the Potomac River shoreline that are not steep, a narrow fringe of emergent wetland is present within the floodplain as previously described. Other portions of the shoreline are steep and rocky with historically placed riprap.

USE OF THE WETLANDS AND FLOODPLAINS

CHESAPEAKE AND OHIO CANAL

During the late 1790s and early 1800s, more than 3,000 miles of canals were built throughout the United States to transport goods and supplies from coastal to inland areas and to aid in the migration of people heading west to settle beyond the original thirteen colonies. Construction of the C&O Canal began in 1828 when President John Quincy Adams broke ground for a canal that would stretch from Georgetown,

Maryland to Pittsburgh, Pennsylvania to connect the Chesapeake Bay and the Ohio River. Irish, Dutch, and English immigrants worked long hours for little pay using primitive tools to dig the canal. Masons, stonecutters, carpenters, and blacksmiths were employed to create the engineering marvels along the canal. After 22 years of construction and $13 million to build, the canal was completed in 1850, but only extended to Cumberland, Maryland.

The C&O Canal remained in operation for 96 years, from 1828 to 1924. Mules pulled boats along a 12-foot wide towpath. The boats floated several tons of cargo including hay, coal, hydraulic cement, fertilizer, and virtually any product that could be placed on a boat. Seven feeder dams were built on the Potomac River to supply water for the canal. To control the water, 74 lift locks were placed in the canal, which were typically 90-feet long and 15-feet wide. The locks raised and lowered boats 8 feet, allowing them to travel both downstream and upstream. Most boats were approximately 95-feet long and 14.5-feet wide and traveled at a speed of no more than 4 miles per hour. Flooding in 1924 finally led to the permanent closure of the canal.

PROPOSED USE OF THE PARK

NPS prepared an EA to consider the environmental consequences related to the potential construction of a new offshore submerged channel intake for water supply at the WSSC's Potomac WFP. As part of the project, a land exchange between the NPS and WSSC would occur since some of the existing and proposed submerged channel intake facilities reside on NPS property as part of the C&O Canal NHP. WSSC is planning to purchase and provide land to the NPS in exchange for a perpetual easement for the existing intake facilities and proposed facilities.

The C&O Canal includes historical structures that capture the story of the canal's important role in many aspects of American history, including transportation, engineering achievement, and commerce. The park also provides a place to recreate and enjoy nature. The purpose of the park is to provide visitors the opportunity:

- to understand the canal's reason for being, its construction, its role in transportation, economic development and westward expansion, the way of life which evolved upon it, the history of the region through which it passes and to gain an insight into the era of canal building in the country;
- to appreciate the setting in which it lies and the natural and human history that can be studied along its way; and
- to enjoy the recreational use of the canal, the parklands and the adjacent Potomac River (NPS 1976).

The park's mission is to preserve and protect the natural, cultural, and historic resources of the park. The park provides hiking, biking, camping, canoeing, fishing, and boating to visitors in addition to allowing them to experience the rich history, wildlife, and geologic resources of the canal.

INVESTIGATION OF ALTERNATIVES

During the planning process, two alternatives were considered, but dismissed. These include:

- Construction of an onshore tunneling shaft located south of the C&O Canal between the existing intake and the C&O Canal. This alternative used trenched conduits to connect the onshore shaft to the existing raw water transmission pipelines south of the C&O Canal towpath and tunneled pipelines to connect the onshore shaft to the new intake structure. This alternative was eliminated

because it was determined that there was not adequate space to construct the onshore shaft between the existing pipelines contained in that area.

- A combination of some of the same design elements as alternatives 2 and 3, whereby the gate structure is located to the east of the existing intake facility, but open-trench pipe construction across Unnamed Island from the river intake is proposed. However, this alternative was dismissed from further consideration due to a higher risk of impacts to the structural integrity of the weir from the close proximity of a temporary drainage channel; and the complex construction sequencing from using the open-excavation method.

For this project, a no-action alternative (alternative 1), a preferred alternative (alternative 2), and two additional action alternatives (alternatives 3 and 4) were considered and investigated in the EA. Alternatives 3 and 4 were described previously in Section 3 and summarized below:

- Alternative 3 is similar to the preferred alternative 2 with respect to the locations of the new intakes, onshore shaft/junction vault, horizontal alignment of the new conduits, and the connections to the existing 6 feet intake conduits; however, the installation of the new piping would be completed using both open-trench and tunneling construction. The intake conduits between the intake shaft and the onshore shaft would be installed in a trench and the intake conduits between the onshore shaft and connection to existing conduits would be installed in tunnels followed by open cut at the existing conduits.
- For alternative 4, the method of constructing the three intake tunnels and many of the design features are similar to what is described under the preferred alternative 2; however, the horizontal alignment of the tunnels/conduits and the location of the onshore shaft/junction vault are different.

PROPOSED IMPACTS TO WETLANDS AND FLOODPLAINS IN THE PROJECT AREA

Impact analysis and the conclusions for possible impacts to wetlands were based on the wetland delineation and SAV survey that was conducted at the site. The locations of floodplains were overlain with the proposed actions to determine impacts to this resource. As a result of the wetlands impacted by the proposed project, a Joint Federal/State Application for the Alteration of any Floodplain, Waterway, Tidal or Nontidal Wetland in Maryland would be submitted as well as applicable permits obtained from the MDE and the USACE prior to initiating any construction activities. All regulated activities within riverine systems, jurisdictional wetland areas, and 100-year floodplain, would be conducted in accordance with permit conditions and *Maryland's Waterway Construction Guidelines* (MDE 2000).

PREFERRED ALTERNATIVE 2 WETLAND IMPACTS

Project components specific to alternative 2 would adversely affect vegetated terrestrial wetlands and include the construction of the parking area and construction access road. Project components that would adversely affect vegetated (rooted), submerged riverine systems include the installation of cofferdams, embankments, construction access road, boat ramp, and the shaft/junction vault. Total impacts associated with the activities described above are detailed in table 4. Figure 4 depicts the riverine systems and wetlands affected by the preferred alternative 2 project components.

Table 4. Preferred Alternative 2 Riverine System and Wetland Impacts on NPS Property

Delineated Feature	Cowardin Classification*	Impact (acres)	Impact (square feet)
Wetland A	PFO1B	0.020	871.2
Potomac River	R2UBH	0.032	1393.9
C&O Canal	R2UBHx	0.137	5967.7
	Total (Wetlands)	**0.020**	**871.2**
	Total (Riverine)	**0.169**	**7361.6**
	Total Impacts	**0.189**	**8232.8**

Note: Measurements in this table are approximate
Note: Dimensions in acres have been rounded for brevity; as a result, dimension values in square feet may appear not to be a direct conversion from the acreage value.

Impacts – A total of 0.189 acre of wetlands (wetland A [PFO1B], Potomac River [R2UBH], and C&O Canal [R2UBHx]) would be impacted by project components associated with alternative 2 (table 4). The installation and removal of temporary cofferdams associated with the intake, intake shaft, intake conduits, and boat ramp would impact the riverine system (Potomac River) as a result of dewatering a portion of the Potomac River and disturbance of riverbed material during cofferdam placement. The riverine systems would also be impacted by construction of the embankments and placement of culverts in the C&O Canal and Potomac River. Installation of the temporary cofferdams and embankments would require the placement of rock with clay layer/liner and geotextile that would serve as the water barrier. The rock would impact SAV in the footprint of the cofferdam and embankment, resulting in a direct loss of those plants. Indirect impacts on SAV would occur from the release of fine sediment into the river from construction activities. Construction of the embankments will allow a temporary construction access road that would cross the Potomac River channel and C&O Canal. Culverts would be installed to maintain flow in the river and canal past the construction areas. In addition to impacts on existing SAV populations], a state endangered wetland plant (floating paspalum) and a state watch list wetland plant (halberd-leaved hibiscus) are located along the shoreline of Unnamed Island, which is characterized as part of the Potomac River riverine system. The entire shoreline of Unnamed Island and most of the shoreline west of the existing intake would be impacted during construction. Vegetation would be removed along the Potomac River shoreline for temporary construction features and staging of construction materials. Construction impacts on the wetland plants floating paspalum and halberd-leaved hibiscus would be adverse and are discussed in more detail in the EA for this project. The in-water construction phase of the proposed project is expected to take approximately 2 years.

Overall, there would be short-term adverse impacts on the riverine systems (Potomac River and C&O Canal) and wetland A from the installation and removal of the cofferdams, embankments, and construction access road. Areas affected by temporary features of alternative 2 would be restored to pre-existing conditions once the project is completed. Within the Potomac River and C&O Canal, SAV would be expected to recolonize in the area within a few years following removal of the temporary structures built during construction (cofferdam and embankment) since dense SAV exists within both riverine systems in adjacent areas that would not be disturbed by this project.

Impacts as a result of permanent construction features are associated with the construction of the boat ramp, intake structure, access road, and parking area. Similar to the discussion above, floating paspalum and halberd-leaved hibiscus were observed along the shoreline of the Potomac River in the area of the proposed boat ramp. These plant species would be adversely affected as a result of excavation and removal during construction of the boat ramp. It is unlikely that impacts to the mosquito fern, a

"Maryland Established Plant," would occur due to the floating nature of this plant and the fact that it is possibly a nonnative cultivar that is well established and no longer tracked by MDNR.

Computational fluid dynamics modeling was completed to determine the sizing, configuration and hydraulic characteristics of the proposed intake system alternatives (Black and Veatch 2013). Results of the preliminary model indicted that the intake structure, regardless of the alternative, would increase local flow velocities upstream of the structure and vortices (a whirling mass of water, especially one in which a force of suction operates, such as a whirlpool) may form downstream, potentially leading to scour of the structure and the surrounding riverbed. Between the intake and Unnamed Island downstream of the structure, the velocity would be slower and there is the potential for sedimentation. Impacts to the Potomac River bottom and removal of existing SAV would occur from the intake structure. Additionally, the computational fluid dynamics modeling has predicted that a small area of scour surrounding the intake structure is likely possible that would also affect existing SAV. One of the co-dominant species of SAV in the area proposed for the intake structure includes southern water nymph. This species is listed as a watch list species by MDNR. Watch list species are not officially listed as threatened or endangered by the State of Maryland, nor are they considered rare enough in Maryland to currently warrant reporting and tracking by the Maryland Natural Heritage Program database. They are however, considered uncommon species in Maryland and are often significant on a local level (MDNR 2010). During the SAV survey, southern water nymph was one of the co-dominant species that occurred in high densities in the Potomac River both within and beyond the boundaries of the project area. This SAV species is therefore not unique in the vicinity of the project. It is expected that SAV species in the areas beyond the intake structure and area of scouring would not be affected in the long-term, but would repopulate areas with adjacent SAV rooted plant stock when project disturbance has ceased.

A total of 0.020 acre of wetland A (PFO1B) would be impacted by project components associated with alternative 2. The construction access road would requre vegetation clearing and grading within wetland A, resulting in a loss of trees at this forested wetland. Wetland functions and values that would change as a result of tree loss include groundwater recharge/discharge, wildlife productivity and habitat, vegetation, water quality, and hydrology. Tree removal within forested wetland A would change functions and values by reducing the vegetation canopy over these wetlands, which would reduce the biomass and change the species composition of the wetland (Cutlip 1986). The reduction in biomass would potentially alter the vegetation and wildlife species that use that wetland. This shift in the vegetation type could lessen available resources for wildlife species that depend on the conditions currently found in the wetland. Therefore, measurable adverse changes to the abundance and diversity of wetland vegetation would occur.

The construction of the construction access road both adjacent to and through Wetland A would remove portions of or fragment the wetlands, resulting in changes to hydrology and impeding water movement, ground-level wildlife movement, and the seed distribution of wetland plants. The access road would also reduce the ability of wetlands to perform functions such as groundwater discharge/recharge, sediment/toxicant retention, and nutrient removal may be temporarily decreased due to disturbance adjacent to the wetland. The access road would also cause the wetland's stormwater/nutrient assimilative capacity to be lost and construction vehicles along the roads could introduce toxic substances (oil and grease). During construction activities, siltation/runoff into wetland areas could occur but will be contained with approved BMPs as discussed under mitigation.

Following construction, all cleared areas within the construction area limit, including the construction access road, would be re-graded and re-planted to resemble the existing vegetation. Wetland A would be re-planted with wetland plants and monitored for invasive species; however, the clearing would be considered permanent impact, as northern forested wetlands may take 50 years to reach maturity (Kusler

2006) and trees within wetland A would not recover during the life of the project (15 years) to become a fully functioning forested wetland.

Overall, 0.169 acre of riverine system (Potomac River [R2UBH] and C&O Canal [R2UBHx]) and 0.020 acre of wetland A (PFO1B) would be adversely impacted by project components associated with alternative 2.

PREFERRED ALTERNATIVE 2 FLOODPLAIN IMPACTS

Under alternative 2, the 100-year floodplain would be affected during construction of the project. It is anticipated that short-term adverse impacts would result from the construction and removal of the cofferdams and embankments. Long-term adverse impacts on the 100-year floodplain are anticipated from terrestrial vegetation clearing within the construction area limit (table 5) and for the construction and operation of permanent structures (table 6).

Table 5. Preferred Alternative 2 Floodplain Impacts – Temporary

Project Components	100-Year Floodplain (acres)
Cofferdams and Embankments	1.7
Terrestrial Vegetation Clearing	4.7
Construction Access Road[(a)]	0.61
TOTAL	**7.0**

Note: measurements in this table are approximate.
(a) Composed of pervious materials

Table 6. Preferred Alternative 2 Floodplain Impacts – Permanent

Project Components	100-Year Floodplain (acres)
Boat Ramp	0.030
Junction Vault	0.12
Intake Structure	0.14
Parking Area (and boat ramp road)[(a)]	0.24
TOTAL	**0.53**

Note: measurements in this table are approximate.
(a) Composed of pervious materials

Temporary Impacts – A total of 1.7 acres within the floodplain would be affected by temporary in-water construction project components (table 5). The installation and removal of temporary cofferdams for the construction of the intake, intake shaft, river embankments, and boat ramp would potentially result in changes to the hydrologial regime of the river as it may alter the natural flow regimes. The temporary cofferdams may alter the capacity of the channel to convey water and increase the height of surface water. Upstream flooding may increase due to narrowing the width of the channel and increasing the channel's resistence to flow, resulting in a higher stage as it flows past the obstruction. This impact is also expected from the construction of the embankments and placement of the culvert pipes into the channel of the Potomac River. One embankment needed within the C&O Canal for the construction access road to cross the canal is located within the 100-year floodplain. Within the embankments, culverts would be installed to maintain flow in the river and canal past the construction areas. Overall, there would be short-term,

adverse impacts to the 100-year floodplain from the installation and removal of the cofferdams and embankments. The in-water construction phase of the proposed project is expected to take approximately 2 years.

Upland construction activities are expected to have long-term adverse impacts on the 100-year floodplain as a result of vegetation clearing from temporary project components. Construction of project components would possibly require a maximum of 4.7 acres of vegetation to be cleared from the construction area limit within the floodplain resulting in a loss of trees. Approximately 0.61 acre within the floodplain would be for the temporary construction access road which is composed of pervious materials. All cleared areas within the construction area limit, including the construction access road would be re-graded and re-planted to resemble the existing vegetation after construction is complete; however, because northern forests may take 50 years to reach maturity (Kusler 2006) and because trees within the floodplain would not recover during the duration of this EA to become a fully functioning floodplain, a long-term impact would result. Floodplain functions and values would change as a result of tree loss including the ability to convey floodwaters, but this would be a localized event within the project area. In summary, the upland construction activities would result in short- and long-term adverse impacts on the 100-year floodplain. Even though the upland construction phase of the proposed project is expected to take approximately 4 years, long-term impacts to the floodplain would result from the removal of forest trees.

Permanent Impacts – A total of 0.53 acre within the floodplain would be adversely affected by permanent project components (table 6). Permanent structures including the boat ramp, parking area, boat ramp access road, and junction vault have the potential to impact the 100-year floodplain in the long-term since the proposed location of these structures is currently vegetated and would require conversion to either pervious or impervious cover. The parking area and assocated access road would be located within the floodplain (0.24 acre) but constructed of pervious paving to allow percolation or infiltration of rainwater and stormwater. The pervious materials are designed to be porous-permeable paving that allows rainwater to pass through the cross section and back to the groundwater supply. New impervious areas within the floodplain are associated with the boat ramp (0.030 acre) and junction vault (0.12 acre). As a result of these permanent structures, these previously vegetated areas would have less capacity to store rainfall; the replacement of those areas with impervious surfaces may result in a reduction of water storage, a reduction of infiltration of water into the ground, and the acceleration of runoff to ditches and streams. The intake is another permanent feature located within the floodplain (0.14 acre). Although these impacts are mostly to the riverbed, the placement of the intake may alter the capacity of the channel to convey water, increasing the height of the water surface and the chance of flooding. The impacts of the operation of the intake and associated conduits are expected to be long-term. The tunneled conduits would be located within the floodplain, but would be placed underground within the bedrock and would not affect hydrologic patterns at the surface.

Under alternative 2, the use of the Potomac WFP would remain the same; however, the operation of a submerged channel intake would require structures to be placed within the 100-year floodplain. The addition of new structures within the floodplain would create long-term adverse impacts on flooding characteristics such as conveyance of flood flows and flooding potential. In addition, the removal of soils and vegetation would result in long-term impacts on floodplain values. The long-term impacts would be site specific and would only affect a small portion of the floodplain. The design of the structures within the floodplain would incorporate methods for minimizing flood damage, as described in the National Flood Insurance Program "Floodplain Management Criteria for Flood-Prone Areas" (CFR 44 60.3) and in accordance with state and/or county requirements for flood-prone areas. Overall, operation of the permanent structures would result in long-term adverse impacts on the 100-year floodplain.

MITIGATION MEASURES

WETLAND MITIGATION

Implementation of the preferred alternative would involve impacting wetland areas. During the construction activities for the preferred alternative, BMPs would be employed to minimize impacts to hydrology, water quality, threatened and endangered species, and cultural resources as described in detail in the "Alternatives" chapter of the EA to comply with Procedural Manual 77-1: *Wetland Protection* and Procedural Manual 77-2: *Floodplain Management*. A sediment and erosion control plan would be prepared prior to construction and submitted to appropriate local and state agencies. Mitigation measures would be employed during construction, when appropriate, to minimize impacts on riverine systems and wetland areas, including the use of silt curtains that would be placed in the Potomac River and C&O Canal to prevent impacts on the aquatic environment from silt and sediment that may be stirred up during construction. Guidelines for waterway construction, published by the MDE (*Maryland's Waterway Construction Guidelines*, MDE 2000) would also be followed. The limits of the area disturbed by project components associated with preferred alternative 2 would be kept to as minimal as possible. Whenever feasible, construction activities, including heavy equipment use and stockpiling of materials, would be conducted outside of wetland areas.

For the purposes of implementing Executive Order 11990, the NPS has determined that any area classified as wetland habitat according to the USFWS *Classification of Wetlands and Deepwater Habitats of the United States* is subject to Director's Order 77-1: *Wetland Protection* and the implementation procedures outlined in the Procedural Manual77-1: *Wetland Protection*. Director's Order 77-1 states that for new actions where impacts to wetlands cannot be avoided, proposals must include plans for compensatory mitigation that restores wetlands on NPS lands at a minimum acreage ratio of 1 to 1. For this project, the estimated impact to NPS wetlands is 0.169 acre of the riverine systems (Potomac River, R2UBH and C&O Canal, R2UBHx) and 0.020 acre of wetland A (PFO1B), which totals 0.189 acre of impacts to wetland and riverine systems. The wetland impacts discussed in this document represent the most current approximations at this time; however, this impact and compensation acreage may increase or decrease after final design. The wetland mitigation plan in this SOF addresses impacts to wetlands on NPS property only. Impacts to wetlands on adjacent properties will be addressed during the permit application process. Additional mitigation measures, such as silt fencing and construction methods for waterways would be used, and the location and extent of any additional mitigation would be determined when permitting is completed.

In November 2014, NPS staff visited various areas on park property to determine wetland mitigation potential. During this effort one potential mitigation site was identified within the area of Lock 13 located at 38° 58' 16.14" north, 77° 10' 48.92" west, respectively. This Lock 13 site was chosen for wetland mitigation actions and is located within C&O Canal NHP, approximately 6 miles southeast of the project site. It is a 1.7 acre wetland between the Potomac River and C&O Canal, near the I-495 overpass. Figure 3 shows the wetland mitigation area and its proximity to the I-495 overpass.

A wetland delineation of the Lock 13 mitigation site was completed in December 2014. The site contains an emergent wetland dominated by the invasive reed canarygrass (*Phalaris arundinacea*) with several standing dead American sycamore trees. The presence of the dense coverage of reed canarygrass appears to prevent the establishment of sycamore saplings or new tree species. Several wetland hydrology indicators as well as hydric soil indicators were observed at the site. Two perennial stream channels were identified within the vicinity of the mitigation site, which were identified to the east and west of the mitigation area and convey flow to the Potomac River. Therefore, the Lock 13 wetland mitigation site is bound by three large perennial stream channels to the south, east, and west.

Since the proposed Lock 13 mitigation site consists of an existing wetland and no new wetlands are proposed to be created, the proposed wetland mitigation is considered to be enhancement. Enhancement at the Lock 13 wetland to improve the quality of the wetland would include removing the invasive reed canarygrass and planting native species before the reed canarygrass can re-establish itself. The wetland would be upgraded from an emergent wetland dominated by invasive species to a scrub-shrub/forested wetland composed of native species. Several tree, shrub, and herbaceous species have been selected for planting based on their hydrophytic status and shade tolerance (table 7). Trees would compose 70% of the re-planted vegetation and shrubs would compose 30% of the re-planted vegetation in order to outcompete invasive species. Herbaceous plants would serve as groundcover beneath the trees and shrubs.

Due to these natural sources of hydrology and the concave structure of the wetland, no grading would be required during the proposed mitigation actions. The site has been examined by NPS staff, and it has been determined that there are no archeological resources present there that would prevent wetland mitigation from occurring. Enhancement efforts would have beneficial impacts to other wetlands within the Lock 13 area. The Lock 13 wetland mitigation site is 1.7 acres in size, and approximately 0.75 acre would be enhanced for mitigation. Only 0.189 acre of wetlands will be impacted as a result of construction activities at the Potomac WFP site. Therefore, wetland compensation for this project would occur at a ratio of nearly 4:1.

The loss of wetlands within the project site will lead to a loss of a variety of wetland functions, including sediment and toxicant retention, water quality function, and floodflow alteration. The enhancement of the Lock 13 site could provide functions that would be similar to those lost at the impact site. Therefore, the Lock 13 site compensation effort would be considered in-kind with the wetland functions being lost at the impact site. NPS would be required to obtain a Joint Permit for the Alteration of any Floodplain, Waterway, Tidal or Nontidal Wetland. Procedural Manual77-1: *Wetland Protection* states that compensating for the loss of wetlands using restored wetlands is appropriate but may require more than one acre of restoration for one acre of impact (NPS 2012). The regulatory agency may also require more compensation per acre of impact to satisfy their regulatory and permitting needs. The exact ratio would be determined by the regulatory agency and based on the results of a function and value assessment applied to the impact and compensation site.

Table 7. Wetland Enhancement Species and Planting Specifications

Common Name	Scientific Name	Quantity	Overall Average Spacing	Classification	Size
Total mitigation area is approximately 0.75 acres.					
American sycamore	*Platanus occidentalis*	89	8' O.C.	Canopy	1.5 - 2" caliper
Red maple	*Acer rubrum*	89	8' O.C.	Canopy	1.5 - 2" caliper
Silver maple	*Acer saccharinum*	89	8' O.C.	Canopy	1.5 - 2" caliper
Muscle wood	*Carpinus caroliniana*	89	8' O.C.	Understory Tree	1 - 1.5" caliper
Highbush blueberry	*Vaccinium corymbosum*	51	8' O.C.	Shrub	1 gallon container
Coastal sweet pepperbush	*Clethra alnifolia*	51	8' O.C.	Shrub	1 gallon container
Spicebush	*Lindera benzoin*	51	8' O.C.	Shrub	1 gallon container
Ernst seed mix #137[(a)]		15 lbs of seeds	N/A	Herbaceous	N/A

(a) Ernst seed mix #137 from Ernst Conservation Seeds, Inc. contains specialized herbaceous species for shaded wetlands. The seed mix is mostly comprised of Virginia wildrye (*Elymus virginicus*), fox sedge (*Carex vulpinoidea*), redtop panicgrass (*Panicum rigidulum*), and lurid sedge (*Carex lurida*), among other shade-tolerant wetland species.
O.C. = on center

FLOODPLAIN MITIGATION

Implementation of the preferred alternative would involve permanently impacting floodplain areas. During the construction activities for the preferred alternative, BMPs would be employed to minimize impacts to water quality, threatened and endangered species, and cultural resources to comply with Procedural Manual77-2: *Floodplain Management*. In addition, the design of structures within the floodplain would incorporate methods for minimizing flood damage, as contained in the National Flood Insurance Program "*Floodplain Management Criteria for Flood-Prone Areas*" (CFR 44, 60.3) and in accordance with any state or county requirements for flood-prone areas.

Activities associated with the preferred alternative would cause permanent alterations to 0.53 acre of the floodplain as a result of impervious construction associated with the boat ramp and parking area, the junction vault, and the intake and associated conduits. Appropriate stormwater management techniques, including approved BMPs, would be required to avoid indirect impacts to floodplains during construction of the access road. Areas adjacent to the permanent floodplain impacts would be revegetated with appropriate native vegetation within the floodplain after construction activities are completed. Facilities that are water-dependent structures, including the boat ramp and onshore shaft were placed in the floodplain because no other viable alternative was available.

SUMMARY

NPS prepared an EA to consider the environmental consequences related to the potential construction of a new offshore submerged channel intake and associated project components for water supply at the WSSC's Potomac WFP. The project is needed because the current Potomac River raw water intake structure is adversely affected by its location along the Potomac River shoreline.

A wetland delineation was conducted within the project area in accordance to the guidance in NPS Director's Order 77-1 and the 1987 *Corps of Engineers Wetland Delineation Manual* and in conjunction with USFWS's *Classification of Wetlands and Deepwater Habitats of the United States* (Report FWS/OBS-79/31). A total of two wetlands (wetland A and wetland B) and two riverine systems (Potomac River and C&O Canal) were identified during the survey. In general, the wetlands at the site are located along the floodplain of the Potomac River. In addition to the standard wetland delineation methods, PEER Consultants personnel performed a Function and Value Assessment of the wetlands delineated within the project area. The following long-term permanent adverse impacts are expected from preferred alternative 2:

- Riverine systems and wetland impacts – 0.189 acre
- Floodplain impacts – 0.53 acre

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MEMORANDUM OF AGREEMENT AMONG
THE NATIONAL PARK SERVICE,
THE WASHINGTON SUBURBAN SANITARY COMMISSION
AND THE MARYLAND STATE HISTORIC PRESERVATION OFFICER
PURSUANT TO 36 CFR 800 REGARDING
CONSTRUCTION OF POTOMAC SUBMERGED CHANNEL INTAKE FOR
THE POTOMAC WATER FILTRATION PLANT
MONTGOMERY COUNTY, MARYLAND

WHEREAS the Washington Suburban Sanitary Commission (WSSC) proposes to construct a new offshore submerged channel intake for water supply at the Potomac Water Filtration Plant (WFP) in Montgomery County (undertaking) pursuant to Public Law 91-664, which established the Chesapeake and Ohio Canal National Historical Park; and

WHEREAS the undertaking consists of the construction of an intake for water supply in the Potomac River Channel, the installation of a tunnel trench conduit system to connect the new intake to the existing onshore WFP, the construction of a new boat ramp to provide access for maintenance and emergency rescue activities, and a land exchange between the National Park Service (NPS) and WSSC; and

WHEREAS, the NPS and WSSC have defined the undertaking's area of potential effect (APE) as illustrated in Attachment 1 and much of the work will be taking place within the Chesapeake & Ohio Canal National Historical Park, which is a unit of the National Park System and is listed in the National Register of Historic Places; and

WHEREAS, WSSC has consulted with the NPS on the design of the undertaking and incorporated measures to ensure the protection of the Chesapeake & Ohio Canal National Historical Park from construction impacts; and

WHEREAS, the NPS has determined that the undertaking will have an adverse effect on archeological site 18MO633, which is individually eligible for listing in the National Register of Historic Places, and has consulted with the Maryland State Historic Preservation Officer (MD SHPO) pursuant to 36 C.F.R. part 800, of the regulations implementing Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108); and

WHEREAS, the NPS shall serve as the lead Agency Official pursuant to 36 CFR 800.2(a)(2) and shall act in cooperation with WSSC in order to fulfill their respective responsibilities under the requirements of Section 106 of the National Historic Preservation Act of 1966 for the undertaking; and

WHEREAS, the NPS and WSSC have notified the public through news releases (19JUL2013 and 30JUN2016), public scoping meetings (1AUG2013 and 14JUL2016)), and public review periods (19JUL2013-19AUG2013 and 30JUN2016-14AUG2016); and

WHEREAS, in accordance with 36 C.F.R. § 800.6(a)(1), the NPS has notified the Advisory Council on Historic Preservation (ACHP) of its adverse effect determination with

specified documentation and the ACHP has chosen not to participate in the consultation pursuant to 36 CFR § 800.6(a)(1)(iii); and

NOW, THEREFORE, the NPS, the WSSC and the MD SHPO agree that the undertaking shall be implemented in accordance with the following stipulations evidencing that the signatories have taken into account the effect of the undertaking on historic properties.

STIPULATIONS

NPS and WSSC shall ensure that the following measures are carried out:

I. PROTECTION OF CHESAPEAKE & OHIO CANAL NATIONAL HISTORICAL PARK

WSSC shall use all practicable measures to minimize disturbances to, and provide appropriate treatment of, the Chesapeake & Ohio Canal National Historical Park and to all elements that contribute to the National Register historic district during the construction of the project. The WSSC shall provide the NPS with construction plans prior to implementation of the project. The WSSC will take all comments into consideration and make any necessary revisions to address these comments.

II. ARCHEOLOGICAL SITE 18MO633

A. Archeological Treatment Plan

WSSC shall prepare a Treatment Plan for the recovery and interpretation of data from site 18MO633 – a prehistoric encampment site that was occupied repeatedly over millennia and exhibits stratigraphically discrete occupations ranging in age from the Terminal Archaic or Early Woodland through the Late Woodland Periods. The Treatment Plan shall include appropriate provisions for fieldwork, analyses, reporting, curation of recovered materials and records, public interpretation, unanticipated discoveries during construction, performance standards, and ongoing consultation with the signatory parties to this MOA. WSSC shall provide a copy of the draft Treatment Plan to the NPS and the MD SHPO for a thirty (30) calendar day review period. Upon receipt of written concurrence from the MD SHPO and the NPS, WSSC may proceed with the data recovery.

B. Archeological Resource Protection Act (ARPA) Permit

In accordance with the provisions of ARPA, and prior to the implementation of the Treatment Plan or the commencement of ground disturbing activities on lands administered by the NPS, WSSC shall apply for and obtain an ARPA Permit so that archeological work may be undertaken.

C. Data Recovery

WSSC shall implement the Treatment Plan for the recovery of data from site 18MO633 prior to the start of ground disturbing activities within or immediately adjacent to the site area. WSSC shall afford the MD SHPO and the NPS an opportunity to meet on-site to evaluate the success of the fieldwork phase of the data recovery program. WSSC shall submit a management summary to the MD SHPO and the NPS documenting the completion of fieldwork for a fifteen (15) calendar day review period. Upon receipt of written concurrence from the MD SHPO and the NPS, WSSC may proceed with construction within the site area concurrently with the completion of the remaining laboratory, analysis, reporting, and public interpretation phases of the data recovery work.

III. COORDINATION WITH THE MARYLAND HISTORICAL TRUST ACT OF 1985

The MD SHPO agrees that the fulfillment of the terms of this MOA will satisfy the responsibilities of any Maryland state agency under the requirements of the Maryland Historical Trust Act of 1985, as amended, State Finance and Procurement Article 5A-325 and 5A-326 of the Annotated Code of Maryland, for those components of the Project which require licensing, permitting and/or funding actions from Maryland agencies.

IV. COORDINATION WITH OTHER FEDERAL AGENCIES

In the event that another federal agency not initially a party to or subject to this MOA receives an application for funding/licensing/permitting the undertaking as described in this MOA, that agency may fulfill its Section 106 responsibilities by stating in writing that it concurs with the terms of this MOA and notifying the NPS, WSSC and MD SHPO that it intends to do so.

V. POST-REVIEW DISCOVERIES

If historic properties are discovered or unanticipated effects on historic properties are found after the undertaking is implemented, the WSSC shall ensure that reasonable efforts are made to avoid, minimize, or mitigate adverse effects to such properties, and shall consult with the NPS and the MD SHPO and other relevant consulting parties to resolve any adverse effects pursuant to 36 CFR 800.13(b). WSSC shall ensure that any resulting cultural resources work is accomplished in accordance with the relevant performance standards in Stipulation VI.

VI. PERFORMANCE STANDARDS

A. Professional Qualifications

The NPS shall ensure that all archeological work carried out pursuant to this MOA is conducted by or under the direct supervision of a person or persons meeting at a minimum the *Secretary of the Interior's Professional Qualifications Standards (48 FR 44738-9 and 36 CFR Part 61) for Archeologists.*

B. Standards and Guidelines

All cultural resource work carried out pursuant to this MOA shall be conducted in a manner consistent with the principals and standards contained in the documents (and subsequent revisions thereof) listed below:

- *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716-44742);
- *Standards and Guidelines for Archeological Investigations in Maryland* (Shaffer and Cole 1994);
- *Advisory Council on Historic Preservation – Section 106 Archaeology Guidance* (ACHP 2007);
- *Recommended Approach for Consultation on Recovery of Significant Information from Archaeological Sites* (ACHP 1999);

C. Curation

WSSC and the NPS shall ensure that all artifacts, specimens, samples, materials, and records generated by archeological work for this project, including but not limited to recovered artifacts, field notes and forms, photographs, maps, and reports, are the property of the NPS and will be documented, curated, and conserved, as necessary, according to the standards found in 36 CFR Part 79, Curation of Federally-Owned and Administered Archaeological Collections; the National Park Service Museum Handbook, Part 1; and the requirements of the NPS's Regional Archaeology Program for the storage of objects at the NPS National Capital Region Museum Resource Center in Landover, Maryland in accordance with 36 CFR Part 79 and the Archeology Laboratory Manual of the NPS Regional Archeology Program, National Capital Region. The artifacts, specimens, samples, materials, and records will be turned over to the NPS upon completion of any archeological analysis performed as part of this MOA.

VII. MONITORING AND REPORTING

Each year following the execution of this MOA until it expires or is terminated, WSSC shall provide all parties to this MOA a summary report detailing work undertaken pursuant to its terms. Such report shall include any scheduling changes proposed, any problems encountered, and any disputes and objections received in WSSC's efforts to carry out the terms of this MOA.

VIII. DISPUTE RESOLUTION

Should any signatory to this MOA object in writing to the NPS regarding any actions carried out or proposed with respect to the undertaking or implementation of this MOA, the NPS shall consult with such party to resolve the objection. If the NPS determines that such objection cannot be resolved through consultation, the NPS will:

A. Forward all documentation relevant to the dispute, including the NPS's proposed

resolution, to the ACHP. The ACHP shall provide the NPS with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the NPS shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP and signatories, and provide them with a copy of this written response. The NPS will then proceed according to its final decision.

B. If the ACHP does not provide its advice regarding the dispute within the thirty (30) day time period, the NPS may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the NPS shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories to the MOA, and provide them and the ACHP with a copy of such written response.

C. The NPS's responsibility to carry out all other actions subject to the terms of this MOA that are not the subject of the dispute remain unchanged.

IX. RESOLUTION OF OBJECTIONS BY THE PUBLIC

At any time during implementation of the measures stipulated in this MOA, should any objections pertaining to any such measure or its manner of implementation be raised by a member of the public who can display a vested interest in the resources, the NPS shall notify the parties in this MOA and take the objection into account, consulting with the objector and, should the objector so request, with any of the parties to this MOA to resolve the objection.

X. AMENDMENTS

Should any party to this MOA request an amendment, the requesting party shall notify all other parties in writing. The written notification shall include a statement of the purpose of the required modification and the proposed wording to amend the MOA. All parties shall review the proposed amendment and, if necessary, shall consult among themselves to discuss the amendment. If after consultation it is agreed that the amendment is necessary or desirable, all parties to this original MOA shall sign the amended MOA. If necessary, dispute resolution shall follow Stipulation VIII.

XI. NOTICES

Any notices required to be sent in accordance with this MOA shall be mailed to the parties by first class mail, postage prepaid. Notice shall be sent to the parties as follows:

National Park Service
C&O Canal NHP
1850 Dual Highway, Suite 100
Hagerstown, MD 21740
Attn: Kevin Brandt, Superintendent

Maryland State Historic Preservation Officer
100 Community Place
Crownsville, MD 21032
Attn: Elizabeth Hughes, Director/SHPO

Washington Suburban Sanitary Commission
14501 Sweitzer Lane
Laurel, MD 20707
Attn: Gary Gumm, Chief Engineer

XII. TERMINATION

If any signatory to this MOA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other parties to attempt to develop an amendment per Stipulation X, above. If within thirty (30) days (or another time period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate the MOA upon written notification to the other signatories.

Once the MOA is terminated, and prior to work continuing on the undertaking, the NPS must either (a) execute an MOA pursuant to 36 CFR § 800.6 or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. The NPS shall notify the signatories as to the course of action it will pursue.

XIII. DURATION

This MOA will expire if its terms are not carried out within five (5) years from the date of its execution. Prior to such time, the signatories may consult and agree in writing to an extension for carrying out the terms of the MOA in accordance with Stipulation X above.

Execution of this MOA by the NPS, WSSC and the MD SHPO and implementation of its terms evidence that NPS and WSSC have taken into account the effects of this undertaking on historic properties and afforded the ACHP an opportunity to comment.

SIGNATORIES:

NATIONAL PARK SERVICE

_____ Date: 10/12/16
Kevin Brandt, Superintendent, C&O Canal NHP

MARYLAND STATE HISTORIC PRESERVATION OFFICER

_____ Date: 10·18·16
Elizabeth Hughes, State Historic Preservation Officer

WASHINGTON SUBURBAN SANITARY COMMISSION

_____ Date: 11/1/16
Gary J. Gumm, P.E., Chief Engineer

ATTACHMENT 1 – WSSC POTOMAC SUBMERGED CHANNEL INTAKE SITE PLAN