GEORGE WASHINGTON MEMORIAL PARKWAY

MARYLAND FEDERAL SMALL MS4 PROGRAM PLAN FOR CLARA BARTON PARKWAY

Prepared in compliance with Maryland General Permit No. 13-SF-5501
October 31, 2019

Prepared by National Park Service staff with assistance from

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wood.

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CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

_____	_____	_____
Name	**Title**	**Date**

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Acronyms

BMP	Best Management Practice
EPA	Environmental Protection Agency
GWMP	George Washington Memorial Parkway
IDDE	Illicit Discharge Detection and Elimination
MCM	Minimum Control Measure
MDE	Maryland Department of the Environment
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
TMDL	Total Maximum Daily Loads

1 Introduction and Background

This MS4 plan documents how the National Park Service (NPS) intends to meet the requirements set forth in the George Washington Memorial Parkway's (GWMP's) Maryland General Permit for Discharges from State and Federal Small Municipal Separate Storm Sewer Systems (MS4s). The GWMP's permit (13-SF-5501) was issued by the Maryland Department of the Environment Water and Science Administration effective October 31, 2018 and will expire October 30, 2023.

The GWMP's MD MS4 permit requires the development and implementation of processes and plans to support the state's overall nutrient and sediment load reductions required to address the Chesapeake Bay TMDL by 2025. The Maryland permit requires that the park commence restoration efforts for 20% of existing impervious lands that have little or no stormwater management. This plan details the strategies and plans the park will undertake to achieve the permit requirements.

1.1 Current Program and Legal Authority

The NPS will participate in the early and candid evaluation of proposals by other governmental or private entities to avoid adverse environmental impacts to NPS park units or other park or recreation resources subject to the provisions of Federal law. This is an essential element of effective NPS stewardship. When participating in the environmental impact analysis processes of other entities, the Associate Director for Natural Resource Stewardship and Science will ensure that the NPS's responsibilities for commenting are clearly defined and that the Service and its personnel work with federal, tribal, state, and local governments in identifying and evaluating potential impacts to resources under NPS jurisdiction or within areas of NPS expertise. Examples include, but are not limited to:

- Consultation under provisions of Section 4(f) of the Department of Transportation Act;
- Evaluation of noise, visual, or other impacts to national park system resources resulting from external activities;
- Hydropower re-licensing projects through Federal Energy Regulatory Commission procedures;
- Impacts of proposed projects on non-NPS areas that have benefited from NPS-administered partnership programs (e.g., Land and Water Conservation Fund, Rivers and Trails, National Natural Landmarks, National Register Properties, etc.);
- Analysis of cumulative ecosystem or other impacts upon the integrity of NPS administered resources; and
- The impacts of any federal activity on other park resources.

It is important to note that currently GWMP currently does not have agreements or policies in place with surrounding counties, nor does it have the authority to enforce local ordinances.

In addition to abiding by pertinent stormwater regulatory requirements, the NPS 2006 Management Policies, specifically Sections 4.6.3 – 4.6.6, provide NPS policies related to the protection of water quality, floodplains, wetlands, and watershed and stream processes. In summary these management polices direct NPS to:

- Protect, maintain and/or restore the quality of surface and groundwaters within the parks, consistent with federal, state, and local laws and regulations;
- Protect, preserve, and restore the natural resources and functions of floodplains;
- Avoid adverse wetland impacts to the extent practicable; and
- Protect watershed and stream features by avoiding impacts on watershed and riparian vegetation and by allowing natural fluvial processes to take place.

Section 4.8.2.4 of the 2006 Management Policies discusses the management of soil resources aimed to prevent unnatural erosion, contamination, and to "prevent or at least minimize adverse, potentially irreversible impacts on soils."

Additionally, the National Park Service is subject to the National Environmental Policy Act of 1969 (NEPA). NEPA is landmark environmental legislation establishing as a goal for Federal decision-making a balance between use and preservation of natural and cultural resources. NEPA requires all Federal agencies to (1) prepare in-depth studies of the impacts of and alternatives to proposed "major Federal actions" prior to making decisions; (2) use the information contained in such studies in deciding whether to proceed with the actions; and (3) diligently attempt to involve the interested and affected public before any decision affecting the environment is made.

1.2 Cultural and Historic Landscapes

A cultural landscape is defined as "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values." There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes.

Historic landscapes include residential gardens and community parks, scenic parkways like George Washington Memorial Parkway, rural communities, institutional grounds, cemeteries, battlefields and zoological gardens. They are composed of a number of character-defining features which, individually or collectively contribute to the landscape's physical appearance as they have evolved over time. In addition to vegetation and topography, cultural landscapes may include water features, such as ponds, streams, and fountains; circulation features, such as roads, paths, steps, and walls; buildings; and furnishings, including fences, benches, lights and sculptural objects.

Prior to undertaking work on a landscape, a treatment plan or similar document is developed. The four primary treatments identified in The Secretary of the Interior's Standards for the

Treatment of Historic Properties, are:

- Preservation is defined as the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project.
- Rehabilitation is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical or cultural values.
- Restoration is defined as the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work to make properties functional is appropriate within a restoration project.
- Reconstruction is defined as the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location.

Stormwater BMPs are implemented to control stormwater runoff and reduce pollutant loads. Many MS4 permit holders implement stormwater BMPs to address pollutant load reduction expectations stemming from TMDLs. These BMPs can include both structural BMPs, which are built structures that are specifically designed to capture and treat stormwater; as well as non-structural BMPs, which typically consist of activities, practices and programs (as opposed to built structures) that help to control stormwater. Examples of structural BMPs include regional stormwater control ponds and small-scale environmental site design practices like bioretention cells or bioswales. Non-structural BMPs include educating the public about stormwater pollution so as to change their behavior and reduce pollution; or pollution prevention programs that help reduce the probability that pollutants will enter the stormwater system.

The GWMP is a historic district listed in the National Register of Historic Places and features many cultural landscapes, including: Arlington House; Arlington Ridge Park; Clara Barton Parkway; Fort Hunt Park; Fort Marcy; GWMP-North; Glen Echo Park/Clara Barton House; Great Falls Park; Lady Bird Johnson Park; Lyndon B. Johnson Memorial Grove; Memorial Avenue Corridor; Mount Vernon Memorial Highway; Patowmack Canal/Matildaville; Spout Run Parkway; Theodore

Roosevelt Island; and US Marine Corps War Memorial. In addition to cultural landscapes, the GWMP also features historic properties (those cultural resources listed in the National Register of Historic Places), historic structures, memorials, and archeological sites. Integrity is the authenticity of a property's historic identity or the extent to which a property evokes its appearance during a particular historic period. The National Register identifies seven aspects of integrity: location, design, setting, materials, workmanship, feeling and association. Retention of these qualities is essential for a property to convey its significance. In order to meet requirements under the MD MS4 permit in the future, the GWMP may require improvements to these areas in the form of structural BMPs. It is important for the Maryland Department of the Environment Water and Science Administration to understand that improvements in the form of structural BMPs to these areas are very difficult because of the historical and cultural aspects of these facilities. Before further modifications are made to the landscape, changes will have to be carefully evaluated for their impact on the character-defining features and for their adherence to the historical and cultural aspects.

2 MS4 Service Area Delineation

The MS4 permit requires the GWMP to define the size and extent of the existing impervious area within the MS4 service area. Areas of the GWMP that sheet flow directly to waters of the state, or otherwise drain to waters of the state through means other than a regulated outfall, are not considered part of the MS4 service area per 40 CFR 122.26(b)(9).

The first step in the analysis utilizing local ArcGIS data and tools and discussions with NPS staff and regulating agencies. Based on this analysis, the estimated land areas draining to the GWMP Maryland MS4 service area are presented in Table 1 and Figure 1 show the size and extent of the impervious land use for the MS4 service area.

Table 1. GWMP MS4 Area Impervious Area

	Sq. Ft.	Acres
Parkway Impervious Area	2,072,861.54	47.59
Managed Impervious Area (BMPs)	-	0.00
Unmanaged Impervious Area	2,072,861.54	47.59
20% of Unmanaged Impervious Area	414,572.31	9.52

Figure 1. GWMP Clara Barton Parkway MS4 Area

3 Maximum Extent Practicable Reduction Strategy

To achieve the required water quality goals, the permit requires the GWMP to control the discharge of pollutants to the maximum extent practicable (MEP) by addressing the following six minimum control measures (MCMs). The six minimum control measures will be used to create stormwater management best management practices (BMPs).

1. Public Education and Outreach on Stormwater Impacts	**4.** Construction Site Stormwater Runoff Control
2. Public Involvement / Participation	**5.** Post-Construction Stormwater Management
3. Illicit Discharge Detection and Elimination	**6.** Pollution Prevention/Good Housekeeping for Municipal Operations

The NPS understands the need for environmental stewardship and the regulatory requirements to address TMDLs stemming from its MS4 permit. Indeed, the NPS is a pre-eminent federal advocate for the preservation of natural places in the United States. But the NPS is also charged with preserving historic cultural landscapes, and, in the case of the GWMP, with operating and maintaining a highly-trafficked roadway, with all of the safety and land-use restrictions that come with that responsibility.

In short, the NPS must balance multiple requirements that sometimes are difficult to achieve. Therefore, the NPS has developed a Maryland MS4 plan that makes use of activities, practices, and programs that are already underway in the GWMP. Many of these are non-structural BMPs that focus on public education and involvement in reducing stormwater loads from GWMP property. Simultaneously, the NPS will look for opportunities to add structural stormwater treatment BMPs while also meeting cultural landscape requirements. Implementation of additional stormwater management – particularly capital projects - will be subject to the NPS budgeting process.

3.1 Employee Training

GWMP understands that education and outreach to its own GWMP employees is just as important as public outreach and education. To this effect, GWMP will train its employees in stormwater pollution prevention, Best Management Practices, stream pollution recognition, prevention, reporting, and cleanup of spills. The park commits to providing additional awareness and education to its employees on ways in which they can eliminate and reduce discharges of pollutants of concern (nitrogen, phosphorus, and sediment). Further, in accordance with park Spill Prevention, Control, and Countermeasure (SPCC) plans, employees have mapped the park's internal drainage system in the maintenance yards and other areas where spills are most likely to occur. Finally, employees are aware of the location of spill kits which are strategically located

near potential sources of spills. For more information about GWMP's specific employee training plan, please refer to section 4.1.

4 Minimum Control Measures

In accordance with the park's MS4 permit, the park will develop and implement processes and procedures to address the six (6) minimum control measures (MCMs) that the state of Maryland has identified as essential elements of a MS4 plan, in accordance with the permit Part IV, A-F. The six MCMs are:

1. Public or personnel education and outreach
2. Public involvement and participation
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post-construction stormwater management for new development and development on prior developed lands
6. Pollution prevention and good housekeeping for facilities owned and operated by the permittee within the MS4 service area

Each of the MCMs and required permit conditions are discussed below.

4.1 MCM #1: Public or Personnel Education and Outreach

In accordance with permit requirements in Part IV, A, GWMP will implement a public or personnel education and outreach program designed to help reduce the discharge or pollutants caused by stormwater runoff through the use of developing materials to educate personnel about the impacts of stormwater discharges on receiving waters, why controlling discharges is important, and what personnel and the public can do to reduce pollutants in stormwater.

With limited park staff and 7,600 acres of park property, it is important to engage the public in the park's stormwater management and MS4 programs to seek their support in identifying and reporting any suspected illicit discharges, improper disposal, or spills, or other complaints within the park's MS4 service area as well as communicate about any stormwater complaints or land disturbing activities. The GWMP website on which the park posts MS4 information will be the primary mechanism by which the public can review pertinent stormwater/MS4 program information as well as locate contact information for GWMP employees who will be identified as the point-of-contact(s) for stormwater issues.

The GWMP website is accessible by the public and is available at:
https://www.nps.gov/gwmp/learn/scienceresearch.htm

The website will be updated in permit year 2019 to provide pertinent park staff email and phone numbers in case a member of the public wants to contact GWMP regarding stormwater issues. The

GWMP Environmental Specialist, Mr. Robert Mocko's phone number (1-703-289-2540) and email address (Robert_Mocko@nps.gov) will be posted on the website as well as the phone numbers for the U.S. Park Police (1-202-610-7500), and the National Response Coordination Center (1-800-246-4335).

GWMP will respond to public comments as each comment is received. Additionally, a log of public comments that have been received and GWMP's response to each will be maintained on the website for the public to review. To protect privacy, comments will be kept anonymous on the log that is posted to the website.

Based on qualitative staff expertise about the various stormwater topics that affect the park's MS4 service area, GWMP has determined that the following issues are the three (3) high-priority stormwater topics that will be focused on in the public and personnel education and outreach program. The issues are:

1) Pet wastes
2) Illicit discharges; and
3) Chesapeake Bay nutrients.

In tackling these three topics, GWMP aims to educate park visitors as to how their own individual actions, as well as the actions of others – either intended or unintended - can negatively affect water quality.

GWMP will use the following strategies for communicating information about these high-priority issues

1) Signage:
    a. Summary: Signage examples include temporary or permanent signage in public places or facilities, or storm drain stenciling.
    b. Intended Audience: The public audience intended with this strategy will focus on park visitors that utilize park facilities and grounds.
2) Media Materials:
    a. Summary: Media material examples include information disseminated through electronic media, radio, television, websites and online sources such as Twitter and Facebook.
    b. Intended Audience: The public audience intended with this strategy will focus on park visitors that "follow" GWMP on the social media sites of Twitter and Facebook. This audience includes both local and non-local members of the public.

GWMP understands that employee training on stormwater related matters is an important part of the park's MS4 program and will help ensure compliance with this plan and permit requirements. A table summarizing the park's training program is provided below:

Training Topic	Audience	Frequency
Recognition and reporting of illicit discharges	Park personnel	Annually

Pollution prevention and good housekeeping associated with maintenance, public works, road, street and parking lot maintenance	Employees performing maintenance, road, street or parking lot maintenance	Annually
Construction site runoff – Maryland Responsible Personnel Certification	Employees overseeing contractors performing construction	As needed
Spill Response	Employees who could cause or respond to petroleum, oils, and lubricants spills	Annual HAZWOPER training for emergency response personnel. Annually for oil-handing employees as part of required facility SPCC Plans at locations outside the MS4 service area.

GWMP will maintain documentation of each training event for a minimum of 3 years, including date, number of attendees, and objective. GWMP will submit example training materials and attendee lists to the state of Maryland in accordance with reporting requirements.

4.2 MCM #2: Public or Personnel Involvement and Participation

GWMP understands it is important to create and foster opportunities for public and/or personnel participation in the MS4 program. As such the park will utilize a variety of public involvement strategies and BMP opportunities each year to encourage public and/or personnel engagement and awareness of stormwater issues affecting the park.

GWMP commits to at least five (5) activities per permit term (e.g., 1 activity per year). The planned activities will focus on Volunteer Cleanups.

a. Summary: The cleanups will include engagement by the public (target audience) to help park staff cleanup waste and litter from a particular park area.
b. BMP Goal: Conduct one to two cleanups each permit year.
c. Metric: The metric used as an indication of success in protecting water quality will be the number of full trash bags collected at the end of each event.

In addition to the cleanups, GWMP will post the annual Progress Reports on the MS4 website (https://www.nps.gov/gwmp/learn/scienceresearch.htm) and consider any comments received about the MS4 plan or any annual Progress Report. Further, GWMP will comply with all state and federal public notice requirements for any regulated activity associated with the permit.

4.3 MCM #3: Illicit Discharge Detection and Elimination (IDDE)

GWMP understands that the development, implementation and enforcement of IDDE procedures is an important component in the overall MS4 program. This program includes but is not limited to identifying sources of illicit discharges, eliminating illegal connections to illicit discharges, and enforcing the program with the support of regulatory authorities such as MDE. The GWMP MS4 IDDE procedures will also address illegal dumping and spills. GWMP prohibits the discharge of unauthorized nonstormwater discharges in accordance with its MS4 permit. GWMP abides by the NPS 2006 Management Policies which state under section 9.1.6.2 Response to Contaminants:

> *"The Service will make every reasonable effort to prevent or minimize the release of contaminants on or that will affect NPS lands or resources, and the Service will take all necessary actions to control or minimize such releases when they occur. For purposes of this section, contaminants include any substance that may pose a risk to NPS resources or is regulated or governed by statutes referenced in this subsection.*

The policy states further:

> *"The Service will identify, assess, and take response actions as promptly as possible to address releases and threatened releases of contaminants into the environment."*

A primary component to this MS4 program is that GWMP has and maintains an MS4 map that includes the following features: stormwater conveyances, outfalls, stormwater BMPs, and waters of the U.S. receiving stormwater discharges.

GWMP will make reasonable efforts to maintain the capability to access the storm sewer system across the entire MS4 service area in order to identify and investigate potential illicit discharges.

The park maintains IDDE written procedures on what is an illicit discharge, and how to use visual observation analysis to help determine if in fact is an illicit discharge, and finally, what are allowed and prohibited discharges to the storm sewer system. These procedures are available in Appendix A of this plan.

The total property size of GWMP in Maryland is approximately 1,600 acres. According to the MS4 permit requirements the park is considered a "medium property" and therefore must screen 50% of its outfalls per year. In Maryland, the GWMP has 18 outfalls that are accessible for park staff to inspect safely. Park staff will inspect a minimum of 9 outfalls annually, prioritizing those in the Carderock area

During the outfall inspection, GWMP will use the form titled "Storm Water Outfall Dry Weather Screening Inspection Form" to log information about each outfall. The form is provided as Appendix C of this plan. Once the form is completed for an outfall, park staff will submit the form to the GWMP Environmental Protection Specialist who will maintain an electronic log of outfalls and the schedule

of inspection.

If during an outfall inspection, or upon other discovery of a potential illicit unauthorized nonstormwater discharge, or illegal dumping, the GWMP Environmental Protection Specialist will initiate and conduct an investigation within 48 hours of notice of the discharge. Priority of investigations will be given to discharges of suspected sanitary sewage and those believed to be a risk to human health and public safety. During the investigation, the Environmental Protection Specialist will coordinate as needed with other park divisions including but not limited to Natural Resources, U.S. Park Police, and the GWMP management team to support the investigation. As needed, GWMP will coordinate with other MS4 operators on adjacent lands.

The IDDE written procedures will be followed as the methodology to identify the source of the illicit discharge. If at the conclusion of the investigation, no later than six (6) months following the discovery of the discharge, the source has not been determined, the GWMP Environmental Protection Specialist will document his/her attempts to identify the source. As appropriate, GWMP will coordinate with MDE for support during an illicit discharge investigation. Results of an investigation will be shared with MDE on a regular basis.

Investigation information will be maintained by park staff in an electronic log and these logs will be made available to MDE upon request. At a minimum, the log tracks the following information:

- Dates when the illicit discharge was initially observed or reported;
- Results of the investigation, including the source, if identified;
- Follow-up as necessary;
- Resolution of the investigation; and
- Date the investigation was closed.

GWMP will utilize MCM #1, Public and Personnel Education and Outreach to inform employees, businesses, and the general public about issues related to illicit discharges, illegal dumping and improper waste disposal. Additionally, GWMP employees receive training on identifying unauthorized nonstormwater discharges (refer to the park's training plan outlined in section 4.1, above).

4.4 MCM #4: Construction Site Stormwater Runoff Control

Generally, GWMP conducts limited construction activities. As a National Park, a historic landscape, in addition to being listed on the National Historic Register, construction on park property is minimal and only conducted when necessary to improve the operations and/or facilities of the park. The park understands, per MD's MS4 permit condition Part IV, D, that construction activity that disturbs 5,000 square feet of land area or 100 cubic yards or more of earth movement must comply with COMAR 26.17.01 and Environment Article, Title 4, Subtitle 1 Annotated Code of Maryland.

GWMP understands that a project which does not disturb over 5,000 square feet of land area is not

required to meet the state's guidance for stormwater management and for a project which does not disturb over 5,000 square feet of land area AND disturb less than 100 cubic yards of earth is not required to meet the state's erosion/sediment control guidelines. If the park undertakes a project which does not meet one of the above criteria, the park will ensure the appropriate erosion and sediment control plan is submitted for review and approval. The park will obtain additional state permits (e.g., Maryland's General Permit for Stormwater Associated with Construction Activity) as required for any construction project disturbing one (1) acre or more, and local sediment and erosion control plan approval.

The park will utilize the MS4 website to list the primary park point-of-contact who will be tasked with receiving and responding to complaints from interested parties related to land disturbing and construction activities within the park. Park staff will respond to the individual(s) making the complaint within 7 days.

The park does not expect to construct a new public roadway, or widen an existing public roadway at any point in the future. However, if needed the park will apply for and track active grading permits and report disturbed areas for all active grading permits to MDE.

Otherwise, all construction projects within park boundaries are administered by the NPS except for permitted utility work which is allowed via special use permits and generally do not have associated land disturbing activities.

The park requires contractors to obtain the appropriate permits and comply with all permit conditions. For example, for construction-related permits and inspections, the contractor is required to perform the weekly site inspections, using the MDE-approved inspection form, as required by the MDE construction permit. GWMP will periodically confirm compliance with the contractor's construction stormwater permit through visual inspection of the land-disturbing activity and/or review of the weekly inspection forms.

Contractors must meet contract requirements and implement appropriate controls to prevent nonstormwater discharges to the MS4. These prohibited discharges include, but are not limited to, wastewater, concrete washout, fuels and oils, and other illicit discharges identified during either the park's or the contractors' inspections. Specific contract language examples related to stormwater management are provided below:

- National Park Service, Special Use Permit, NPS Form 10-114 (Rev. 01/2017)
    - Condition #33: Before commencement of work, Permittee will provide the NPS with copies of any and all documentation utilized in the planning of the work, including diagrams, schematics, pictures, drawings, and/or plans of any kind (e.g., architectural drawings, security plans, storm water management plans, and erosion & sediment control measures). In the event that such documentation changes, Permittee will promptly submit updated copies to the NPS.
    - Condition #34: Before work begins: Permittee will perform a preliminary walk-

through with NPS to define the Limit of Disturbance (LOD) area, document prior existing conditions, review the work-plan with all construction crews and be familiar with the pre-approved staging area(s) and site plans.

- Condition #48: The Permittee shall comply with all Federal, State, and Local regulations pertaining to environmental quality and safety. This includes but is not limited to the Resource Conservation Recovery Act ("RCRA"), the Clean Water Act ("CWA"), the Clean Air Act ("CAA"), the Oil Pollution Act ("OPA"), and OSHA 1910.120 ("Hazwoper"). The Permittee must show proof of licenses if applicable when performing work on NPS property. The Permittee shall show proof that employees are in a medical monitoring program if applicable. If Applicable, the Permittee shall submit written emergency response procedures for NPS review and approval.
- Condition #49: Hazardous Incidents: In the event of any action or occurrence at the site which causes or threatens the environment or public health and welfare, such as hazardous material release or hazardous environmental conditions that constitutes an emergency situation, the Permittee shall immediately take all appropriate action to prevent or abate and mitigate such threat and shall immediately notify the NPS. Such incidents might include, but are not limited to examples such as fire or accidental release of hazardous materials.
- Condition #50. The Permittee shall take responsibility for all vehicles and equipment used during this permitted activity including any and all releases and/or discharges of hazardous substances, petroleum products, and non-hazardous wastes into the environment resulting from project activities. The Permittee will assume responsibility for immediate clean-up for any such releases and discharges.
- Condition #51. Any waste entering on park land shall be removed and the affected property cleaned, stabilized, or restored, to the satisfaction of NPS. This restoration shall take place within the time period directed by NPS.
- Condition #55: No refueling or maintenance of equipment on park property is permitted. The Permittee shall have an approved Spill Response Kit available on-site at all times and personnel shall be trained in the use of the equipment. All spills must be reported to NPS point of contact, or alternate contact, or USPP immediately.
- Condition #56. Flood Plan: Permittee shall submit a flood plan to the NPS outlining the general actions and communication plan of the Permittee and contractors in the event of a prediction of major flooding by the Potomac River.
- Condition #61: 61. The permittee is (or shall require its contractor) to be responsible for the cost and repairs to any structures, facilities, installation, sod, soils, or landscape vegetation on park land damaged by the work authorized

under this permit and shall, at the direction of the NPS, submit detailed plans for the repair, restoration and/or replacement of such. All parkland and structures disturbed by the work authorized by this permit will be restored to the satisfaction of the Superintendent or their designee. Restoration of turf areas shall be according to the NPS Specifications for Turf Restoration.

- Condition #67: Erosion control methods shall be used to prevent silt-laden water from entering the stream and watershed. These may include, but are not limited to, silt fencing, filter fabric, excelsior or fumigated straw filter logs, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas. In order to prevent import of non-native plants, straw bales or non-fumigated products shall not be permitted. This measure is designed to keep fine and course sediments from reaching flowing waters where they can be transported downstream and may affect spawning gravels, substrate embeddedness, pool frequency/quality and the development of large pools. Silt protection structures should be inspected and cleaned out periodically.
- Condition #68. Both during and upon completion of the construction phase of the project, Permittee agrees to take all measures necessary to curtail erosion and sedimentation caused by the excavation, and further to restore and re-vegetate the area to its original condition as agreed to at the preconstruction meeting as described above. Furthermore, Permittee agrees to meet, at a minimum, all state and local erosion and sedimentation regulations.

During the planning of a construction project expected to disturb more than 5,000 square feet of land, park staff ensure that proper erosion and sediment control measures are part of the project planning. Additionally, GWMP must undergo compliance with the federal National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) to ensure protection of the park's natural and cultural resources.

If corrective action for a contractor is required, the park will use contracts between the park and the contractor to enforce compliance.

As needed, park staff will be trained on actions to take to address a potential discharge of pollutants as a result of any construction activity. A training resource may include, but is not limited to, the MDE Responsible Personnel Certification online training available here: http://mderpc.mde.state.md.us/Account/login.aspx.

4.5 MCM #5: Post-Construction Stormwater Management for New Development and Development on Prior Developed Lands

As mentioned previously, construction is rarely conducted on park property. However, if construction

occurs for new development or redevelopment on prior developed lands which is expected to disturb 5,000 square feet or more of land area, GWMP will manage post-construction stormwater in accordance with MS4 permit requirements.

GWMP understands that a project which does not disturb over 5,000 square feet of land area is not required to meet the state's guidance for stormwater management and for a project which does not disturb over 5,000 square feet of land area AND disturb less than 100 cubic yards of earth is not required to meet the state's erosion/sediment control guidelines. If the park undertakes a project which does not meet one of the above criteria, the park will ensure the appropriate erosion and sediment control plan is submitted for review and approval.

For new development and redevelopment projects, the park will Implement the principles, methods, and practices found in the latest version of the 2000 Maryland Stormwater Design Manual, Volumes I & II (Manual), and the latest version of MDE's Maryland Stormwater Management Guidelines for State and Federal Projects. This includes that environmental site design (ESD) be implemented to the maximum extent practicable (MEP).

GWMP will maintain the following information which will be reported in its MS4 Annual Progress Reports.

- Total number of stormwater management plans submitted to MDE for review and approval;
- Total number of as-built plans submitted to MDE and approved;
- Verification that stormwater management BMPs are maintained in accordance with MDE requirements outlined on approved plans.

GWMP understands that in general, post-construction stormwater BMPs refer to a control measure that controls stormwater runoff and changes the characteristics of that runoff including the quantity and quality, the period of release or the velocity of flow. Examples of BMPs include but are not limited to

- Pervious concrete and asphalt;
- Raingardens and bioretention ponds;
- Stormwater pre-treatment chambers;
- Stormceptors.

As needed, GWMP will provide training to park staff responsible for proper BMP design, performance, inspection and routine maintenance. This training information will be reported to MDE to include the number of trainings offered, topics covered, and number of attendees.

Finally, GWMP will maintain and submit an urban BMP database in accordance with the MS4 permit, Appendix B, Tables B1. a-c. The database will be submitted to MDE with each year's Annual Progress Report.

4.6 MCM #6: Pollution Prevention and Good Housekeeping

GWMP implements pollution prevention and good housekeeping practices and includes park staff training to minimize and prevent pollutants from discharging to its MS4. Written procedures, stormwater pollution prevention plans (SWP3), and training are key parts of the park's pollution prevention and good housekeeping program. For more details about the training program at GWMP, refer to section 4.1. In addition to providing training to its own employees, GWMP uses the following mechanisms to ensure contractors working on their behalf, who may have the potential to impact stormwater management implement good housekeeping procedures and pollution prevention procedures:

- Specific contract language (for contract language examples, refer to section 4.4); and
- Compliance with MDE regulations including NPDES stormwater permits.

GWMP maintains and implements written pollution prevention and good housekeeping procedures. The list of good housekeeping procedures is available in Appendix B of this plan. The good housekeeping procedures identify:

- Site activities;
- List of potential pollutants including sources and locations on the site.
- Consideration of stormwater conveyances entering, flowing across, and leaving the site.
- Procedures designed to prevent the discharge or pollutants off site.
- Regular visual inspections.
- Corrective action procedures.
- Documentation of any spills, discharge, leak, release including the date, findings and response actions.

The procedures are part of the annual staff training on stormwater management and include procedures park staff will follow in areas where maintenance of vehicles or heavy equipment is conducted; deicer, anti-icer, fertilizer, pesticide, and road maintenance materials are handled. At this time, GWMP does not handle the materials identified above, nor conduct vehicle or heavy equipment maintenance at any location in Maryland. If that changes in the future, GWMP will submit a Notice of Intent for that location to be covered under a Maryland General Permit for Stormwater Discharges Associated with Industrial Activity, and develop and implement an appropriate Stormwater Pollution Prevention Plan (SWPPP).

Other sources of good housekeeping procedures include but are not limited to:

- Spill prevention, control and countermeasures (SPCC) plans for Glen Echo, which is a location outside of the MS4 service area.

GWMP will quantify and report on its good housekeeping efforts in accordance with the MD MS4 permit. Specifically, the park will monitor and track the following activities:

- Number of miles swept and pounds of material collected from street sweeping and inlet cleaning programs, as applicable;
- Good housekeeping methods for pesticide application such as integrated pest

management plans or alternative techniques;

- Good housekeeping methods for fertilizer application such as chemical storage, landscaping with low maintenance/native species, and application procedures;
- Good housekeeping methods for snow and ice control such as use of pre-treatment, truck calibration and storage, and salt dome storage and containment; and
- Other good housekeeping methods performed by the park not listed above.

5 Chesapeake Bay Restoration and Meeting Total Maximum Daily Loads

In accordance with GWMP's MDE MS4 permit, the park is committed to commencing restoration efforts of 20% of existing developed lands that have little or no stormwater management by the permit end date of 2023.

5.1 Baseline Impervious Area Assessment

For a detailed description of how the impervious areas were determined, please refer to Appendix D.

	Sq. Ft.	Acres
Parkway Impervious Area	2,072,861.54	47.59
Managed Impervious Area	-	0.00
Unmanaged Impervious Area	2,072,861.54	47.59
20% of Unmanaged Impervious Area	414,572.31	**9.52**

5.2 Develop and Implement an Impervious Area Restoration Work Plan

GWMP will use the table below to outline its work plan over the five-year permit term. The work plan describes the activities and milestones that the park will employ to show progress towards the 20% impervious area restoration requirement. This plan below will be submitted on an annual basis with the park's Annual Progress Report. It will be updated as needed.

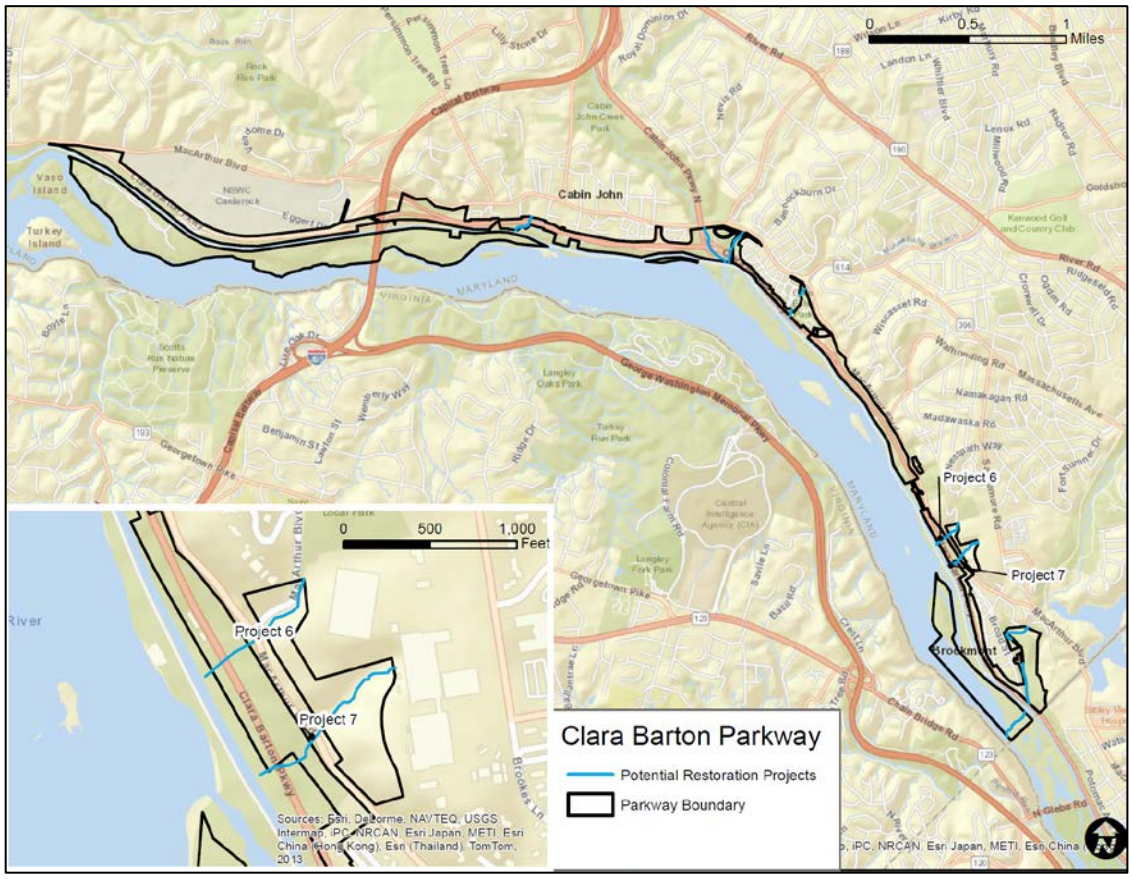
Timeline	Management Strategies and Goals
Year 1 (7/1/2018 - 6/30/2019)	Develop impervious area baseline assessment.
	Develop restoration work plan for MDE review and approval.
	Assess opportunities and timelines for implementing water quality BMPs.
	Assess opportunities to develop partnerships with other MS4 permittees (within or outside of NPS).
	Determine funding needs and develop a long-term budget.
Year 2 (7/1/2019 - 6/30/2020)	Update Work Plan, Restoration Activity Schedule and Urban BMP database as needed.
	Identify and work with partners to evaluate potential water quality improvement opportunities.
	Modify (as needed) list of specific projects to be implemented for restoration and update the Restoration Activity Schedule.
	Evaluate and refine budget needs for project implementation including long term inspection and maintenance costs and development of as-built plans.
Year 3 (7/1/2020 - 6/30/2021)	Update Work Plan, Restoration Activity Schedule and Urban BMP database as needed.
	Identify and apply for grant opportunities and add project to NPS park funding plan.
	Continue to identify opportunities for water quality improvement projects and collaborative partnerships to meet restoration requirements.
	Evaluate and refine budget needs for project implementation including long-term inspection and maintenance costs and development of as-built plans.
Year 4 (7/1/2021 - 6/30/2022)	Update Work Plan, Restoration Activity Schedule and Urban BMP database as needed.
	Continue to evaluate funding options and project opportunities for water quality improvement in coordination with any identified partners.
	Evaluate and refine budget needs for project implementation including long-term inspection and maintenance costs and development of as-built plans.
	Continue project implementation process for identified projects.
Year 5 (7/1/2022 - 6/30/2023)	Update Work Plan, Restoration Activity Schedule and Urban BMP database as needed.
	Continue project implementation process for identified projects and develop complete list of specific projects needed to meet the restoration requirement and include the projected implementation year (no later than 2025) in the Restoration Activity Schedule.
	Update project costs for identified projects to include the cost of long-term inspection and maintenance needs and development of as-built plans for all constructed BMPs.

5.3 Develop a Restoration Activity Schedule

GWMP has developed a general restoration activity schedule that will be updated annually and provided with the park's annual progress report to MDE. The restoration activity schedule is maintained in a separate Microsoft Excel file as requested by MDE.

Phase II MS4 Restoration Activity Schedule									
Impervious Acre Baseline (47.59); 20% Restoration Target (9.52 acres)									
Type of Restoration Project	BMP Code[1]	BMP ID (Optional)	Cost ($K)[2]	Imperv Acres Treated	Imperv Acre Target and Balance	Project Status[3]	Year Complete or Projected Implementation Year (by 2025)	MD Grid Coordinates (Northing/Easting)	
					9.518				
Wapakoneta Channel stream restoration (140 linear feet)	STRE		TBD	4.2	5.318	P	2025	142405.79	389056.45
Midsite Channel stream restoration (178 linear feet)	STRE		TBD	5.34	-0.022	P	2025	142239.12	389170.56

A visual of the stream restoration projects that GWMP will undertake is provided below:



5.4 BMP Database Tracking

GWMP will maintain an electronic BMP inventory which includes all required fields outlined in the MD MDE MS4 permit, Appendix B, Tables B..1.a.b. and c. As BMPs are implemented in the

park, they will be logged into the inventory. Inspection (at least once every 3 years) and maintenance will be performed by park staff. The BMP inventory will be submitted to MDE with the annual progress report.

6 Assessment of Effectiveness

The GWMP will assess the effectiveness of its efforts by reviewing this plan annually as a component of developing the Annual Progress Report submitted to MDE by October 31st of each year, for the previous year reporting year (July 1 – June 30). As the Impervious Area Restoration Work Plan, and the Restoration Activity Schedule changes, this plan will be updated.

7 Appendix A: NPS MS4 Illicit Discharge Procedures

NPS MS4 Illicit Discharge Procedures

July 2019

Introduction

In most urban areas, the flow of water from a storm drain system is not a routine event during dry weather periods and, therefore, can be an indicator of illicit discharges (e.g., illegal dumping and unauthorized connections to a MS4). However, dry weather flows from an MS4 can be from other non-stormwater discharges, that would not be considered an illicit discharge and are a normal event for some MS4 outfalls (depending on location). These non-stormwater discharges could include: groundwater infiltration into the storm sewer system, irrigation return flow, foundation drain discharges, etc.

Using the assumption that dry weather flows are not conclusive indicators of possible illicit discharges in the park, outfall inspections will be conducted focusing on visually conspicuous evidence of possible illicit discharges to the MS4. Water quality sampling and analyses will not be conducted.

Definition of an Illicit Discharge

An illicit discharge is a release to a municipal storm sewer or drainageway that is not composed entirely of stormwater. Illicit discharges can be categorized as either direct or indirect.

- Examples of direct illicit discharges:
  - Sanitary wastewater piping that is directly connected from a home to the storm sewer,
  - Materials (e.g., used motor oil) that have been dumped illegally into a storm drain catch basin,
  - A shop floor drain that is connected to the storm sewer, and
  - A cross-connection between the sanitary sewer and storm sewer systems.
- Examples of indirect illicit discharges:
  - An old and damaged sanitary sewer line that is leaking fluids into a cracked storm sewer line, and
  - A failing septic system that is leaking into a cracked storm sewer line or causing surface discharge into the storm sewer.

Typical illicit surface discharges that may be observed by field personnel include:

- Overflows of sanitary sewerage systems;
- Untreated radiator flushing wastewaters;
- Untreated engine degreasing wastes;
- Over-application of fertilizers, pesticides or herbicides onto landscaping and impervious surfaces;
- Dewatering of construction sites;
- Improper washing of concrete ready-mix trucks;
- Commercial use of soaps and detergents: used in cleaning pavement, vehicles and equipment outside;
- Latex/oil-based paints and solvents disposed of in gutters or inlets;
- Restaurant grease (improperly disposed);
- Private/Public utilities improperly storing chemicals or maintaining equipment;
- Leaking dumpsters;
- Car lots for used and new vehicles dripping fluids on the pavement;
- Fuel spills;
- Hazardous materials dumped along the roadway; and

- Unidentified substances dumped in secluded areas.

Definition of Dry Weather Inspection

A dry weather period is a time interval during which less than 0.1 inch of rain is observed across a minimum of 72 hours. Unlike wet weather sampling, dry weather inspections are not intended to capture a "first flush" of stormwater discharge, rather they are intended to identify any/all discharges from a stormwater outfall during a period without recorded rainfall. The objective of inspections during a dry weather period is to characterize observed discharges and facilitate detection of illicit discharges.

Visual Conditions Analysis

For any visual observation of pollution in a stormwater outfall discharge, an investigation into the pollution source should occur, but the following are often true:

1. Foam: indicator of upstream vehicle washing activities, or an illicit discharge.
2. Oil sheen: result of a leak or spill.
3. Cloudiness: indicator of suspended solids such as dust, ash, powdered chemicals and ground up materials.
4. Color or odor: Indicator of raw materials, chemicals, or sewage.
5. Excessive sediment: indicator or disturbed earth of other unpaved areas lacking adequate erosion control measures.
6. Sanitary waste and optical enhancers (fluorescent dyes added to laundry detergent and some toilet paper): indicators of illicit discharge.
7. Orange staining: indicator of high mineral concentrations.

Many of these observations are indicators of an illicit discharge. Examples of illicit discharges include: cross-connections of sewer services to engineered storm drain systems; leaking septic systems; intentional discharge of pollutants to catch basins; combined sewer overflows; connected floor drains; and sump pumps connected to the system (under some circumstances).

Conditional and Qualitative Considerations

Although many of the parameters listed above are considered to be indicators of illicit discharge, the presence of a parameter is not absolute evidence of an illicit discharge. Some of these indicators may occur naturally. Orange staining may be the result of naturally occurring iron, and therefore unrelated to pollution. Foam can be formed when the physical characteristics of water are altered by the presence of organic materials. Foam is typically found in waters with high organic content such as bog lakes, streams that originate from bog lakes, productive lakes, wetlands, or woody areas. To determine the difference between natural foam and foam cause by pollution, consider the following:

1. Wind direction or turbulence: natural foam occurrences on the beach coincide with onshore winds. Often, foam can be found along a shoreline and/or on open waters during windy days. Natural occurrences in rivers can be found downstream of a turbulent site.
2. Proximity to a potential pollution source: some entities including the textile industry, paper production facilities, oil industries, and firefighting activities work with materials that cause foaming in water. If these materials are released to a water body in large quantities, they can cause foaming. Also, the presence of silt in water, such as from a construction site can cause foam.

3. Feeling: natural foam is typically persistent, light, not slimy to the touch.
4. Presence of decomposing plants or organic material in the water.

Some of the indicators can have multiple causes or sources. For example, both bacteria and petroleum can create a sheen on the water surface. The source of the sheen can be differentiated by disturbing it, such as with a pole. A sheen caused by oil will remain intact and move in a swirl pattern; a sheen caused by bacteria will separate and appear "blocky". Bacterial or naturally occurring sheens are usually silver or relatively dull in color and will break up into a few small patches of sheen. The cause may indicate the presence of iron, decomposition of organic material or presence of certain bacteria. Bacterial sheen is not a pollutant but should be noted.

Optical enhancers at high concentrations are sometimes visible to the naked eye as a bluish-purple haze in the water. However, due to physiological variation of the human eye, not all inspectors may be able to identify the presence of these materials, and quantitative testing is the preferred method to confirm the presence of these compounds. Optical enhancers are typically detected using clean, white cotton pads placed within the discharge for several days, dried, and viewed under a fluorometer. If the cotton pad fluoresces, optical enhancers are assumed to be present. The magnitude of the fluorescence, as measured in fluorescent units, can be used to correlate the concentration of optical enhancers in water to other samples collected locally.

FIELD INSPECTION FORMS

The Dry Weather Screening Inspection Form provides a record of routine screenings during dry weather events. Screenings shall be conducted by field staff on a routine basis.

QUICK SUMMARY

ALLOWED DISCHARGES

NON-STORMWATER DISCHARGES THAT ARE PERMISSIBLE:

• water line flushing	• irrigation return flow
• landscape irrigation	• springs
• diverted stream flows	• water from crawl space pumps
• rising groundwaters	• footing drains
• uncontaminated groundwater infiltration	• lawn watering
• uncontaminated pumped groundwater	• individual residential car washing
• discharges from potable water sources	• flows from riparian habitats and wetlands
• foundation drains	• dechlorinated swimming pool discharges
• air conditioning condensation	• street wash water
• flows from riparian habitats and wetlands	

PROHIBITED MS4 DISCHARGES

The following are considered to be illicit (illegal) discharges to the park (this list is not considered all inclusive):

Sanitary wastewater sources such as:

- Sanitary wastewater (usually untreated) from improper sewerage connections, exfiltration or leakage;
- Effluent from improperly operating or improperly designed septic tanks; and
- Overflows of sanitary sewerage systems.

Automobile maintenance and operation sources such as:

- Untreated (e.g., through a well-maintained oil/water separator) commercial car wash wastewaters;
- Untreated radiator flushing wastewaters;
- Untreated engine degreasing wastes;
- Improper oil, gasoline, and other automotive fluids disposal;
- Leaky underground storage tanks; and
- Untreated leaking of oils, gasoline and other automotive fluids for automobiles.

Landscape irrigation sources such as:

- Direct spraying of fertilizers, pesticides or herbicides onto impervious surfaces; and
- Over-application of fertilizers, pesticides or herbicides onto landscaping.

Other sources such as:

- Laundry wastes;
- Non-contact cooling waters;
- Metal plating baths;
- Dewatering of construction sites;
- Washing of concrete ready-mix trucks;
- Contaminated sump pump discharges;
- Improper disposal of household toxic wastes;
- Spills from roadway and other accidents;
- Chemicals, hazardous materials, garbage, and sanitary sludge landfills and disposal sites;
- Commercial use of soaps and detergents; use in cleaning pavement, vehicles and equipment;
- Sediment from lack of or improper maintenance of erosion and sedimentation controls;
- Latex/oil-based paints & solvents;
- Trash and debris: littering and dumping, household or construction waste; and
- Restaurant grease: Improper disposal.

8. Appendix B. NPS Good Housekeeping Procedures

NPS MS4 Good Housekeeping Procedures: Common Stormwater Pollutants, Sources, and Impacts

July 2019

On its way to creeks, rivers, and lakes, stormwater runoff can accumulate pollutants such as pesticides, pathogens (bacteria), sediment, automotive fluids, and heavy metals. These pollutants can degrade water quality and aquatic habitat, impair ecosystem functions, and harm human health. Understanding the sources of these pollutants and the impacts of each pollutant can help an auditor understand the goals and objectives when managing stormwater. Table 1 summarizes common stormwater pollutants, their sources, and potential impacts. During self-audits, make sure to look for these potential sources of pollution. The remaining pages provide templates of self-inspection check sheets for various park areas.

Table 1: Common Stormwater Pollutants, Sources, and Impacts

Pollutants	Sources	Impacts
Sediment	Construction sites; eroding stream banks and lakeshores; winter sand and salt application; vehicle/boat washing; agricultural sites	Destruction of plant and fish habitat; transportation of attached oils, nutrients, and other pollutants; increased maintenance costs; flooding
Nutrients (phosphorus, nitrogen)	Fertilizers; malfunctioning septic systems; livestock, bird, and pet waste; vehicle/boat washing; gray water; decaying grass and leaves; sewer overflows; leaking trash containers; leaking sewer lines	Increased potential for nuisance or toxic algal blooms; increased potential for hypoxia/anoxia (low levels of dissolved oxygen, which can kill aquatic organisms)
Hydrocarbons (petroleum compounds)	Vehicle and equipment leaks; vehicle and equipment emissions; fuel spills; improper fuel storage and disposal; equipment cleaning; pesticides	Toxic to human and aquatic life at low levels
Heavy metals	Vehicle brake and tire wear; vehicle/equipment exhaust; batteries; galvanized metal; paint and wood preservatives; fuels, pesticides, and cleaners	Toxic at low levels; drinking water contamination
Pathogens (bacteria)	Livestock, bird, and pet waste; malfunctioning septic systems; sewer overflows; damaged sanitary lines	Risk to human health, leading to closure of shellfish areas and swimming areas; drinking water contamination
Toxic chemicals	Pesticides; dioxins; polychlorinated biphenyls (PCBs); spills, illegal discharges, and leaks	Toxic to human and aquatic life at low levels
Debris/litter	Improper waste disposal and storage; fishing gear; leaking trash containers; cigarette butts; littering	Potential risk to human and aquatic life; aesthetically displeasing.

Source: "Guidelines and Standard Operating Procedures: Illicit Discharge Detection and Elimination and Pollution Prevention/Good Housekeeping."

Pollution Prevention

The lists below provide more information on measures that can help prevent pollution or improve surface water quality.

Best Management Practices

- Enclosure/containment of material or potential contamination sources
- Diversion of stormwater away from areas of potential contamination
- Installation of stormwater collection systems followed by storage and reuse where possible
- Provision of oil/water separators, sediment traps, or other treatment devices
- Erosion control using diversions, re-grading, revegetation, and use of rip-rap
- Use of drip pans or dry sweep material under leaking vehicles or equipment

- Use of absorbent devices to contain and reduce releases of liquids
- Moving industrial operations, storage areas, vehicle/equipment maintenance areas, etc., from outdoors to indoors
- Good housekeeping practices (see below for examples)
- Modification/labeling of storm drains or catch basins
- Implementation of a spill prevention and response program
- Employee training program
- Preventative maintenance program
- Covered roll-offs/dumpsters

Good Housekeeping Practices

- Frequent cleaning
- Proper disposal of trash, garbage, and other waste
- Proper storage and transfer of materials
- Frequent walkthroughs or inspections of work areas for potential problems

Problems to Look For

- Uncovered/exposed materials
- Dirty or cluttered surfaces exposed to stormwater
- Oils, grease, or other chemicals on the ground
- Spots, stains, and discoloration
- Leaking equipment
- Poor chemical storage or transfer operations
- Floor drains or other conduits that toxic chemicals are likely to enter
- Suspicious-looking puddles

The remaining pages provide templates of self-inspection check sheets for various park areas.

Master Record of Inspections

Facility	Inspection Date	Inspector	Corrective Action Needed?			Corrective Actions from Previous Inspection Done?		
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA
			☐ Yes	☐ No	☐ NA	☐ Yes	☐ No	☐ NA

Inspector Name				
Inspector Title and Department				
Name and Location of Facility/Site				
Facility/Department Manager				
High-Priority Facility	☐ Yes ☐ No (See the High-Priority Determination checklist.)			
Date				
Inspection Period	☐ Quarterly	☐ Semiannually	☐ Annually	☐ Other:

General

General	Yes	No	NA	Comments
1. Are there appropriate measures in place to control pollutants in stormwater discharge (e.g., silt fencing)?	☐	☐	☐	
2. Are there structural practices (e.g., earth dikes and drainage swales) in place to divert flows or limit runoff and the discharge of pollutants?	☐	☐	☐	
3. Are the appropriate measures in place to control stormwater pollutants related to erosion and sediment?	☐	☐	☐	
4. Has the maintenance of drains/inlets/drainage paths been checked to confirm these are properly functioning?	☐	☐	☐	
5. Do runoff discharges from air compressors, cooling towers, and/or boilers drain to a sanitary sewer?	☐	☐	☐	
6. Have the containment and/or filtering BMP controls been checked to make sure they are in good condition?	☐	☐	☐	
7. If the facility conducts surface or pressure washing, is wastewater collected?	☐	☐	☐	
8. Are there any signs of leaks, spills, or drips in exterior vehicle and equipment areas?	☐	☐	☐	
9. If the facility has storm drains, are any toxic chemicals likely to enter them?	☐	☐	☐	
Additional Notes/Corrective Action Needed:				
Expected Completion Date for Actions:				
Person Responsible for Corrective Actions: **Name:** _____ **Title:** _____ **Signature:**_____				
Signature of Inspector:				

Yard

Bulk Material Storage	**Yes No NA**	**Comments**
1. Are there any bulk materials stored outside, such as sand, gravel, asphalt, or mulch?	☐ ☐ ☐	
2. Are these materials in a containment bay?	☐ ☐ ☐	
3. Is the containment bay covered?	☐ ☐ ☐	
4. Are erosion controls in place around the bulk materials?	☐ ☐ ☐	
Waste Materials	**Yes No NA**	**Comments**
5. Are there any exposed litter, debris, or chemicals?	☐ ☐ ☐	
6. If there are, have they been picked up, stored according to hazard, or disposed of properly?	☐ ☐ ☐	
7. Are all dumpsters or outdoor trash containers covered?	☐ ☐ ☐	
8. Do all dumpsters have their drains plugged to prevent waste from discharging?	☐ ☐ ☐	
Chemicals	**Yes No NA**	**Comments**
9. Are chemicals in labeled containers?	☐ ☐ ☐	
10. Are containers stored outside under cover or inside?	☐ ☐ ☐	
11. Are containers stored on spill pallets?	☐ ☐ ☐	
12. Are chemicals used outside?	☐ ☐ ☐	
Materials Stored Outside in Containers (Drums, Barrels, Tanks, etc.)	**Yes No NA**	**Comments**
13. Are there any materials or wastes stored outside in containers? If so, are the lids secure?	☐ ☐ ☐	
14. Are the containers stored on an impervious surface?	☐ ☐ ☐	
15. If containers are stored on an impervious surface, are they under cover or is there a secondary containment (e.g., berms)?	☐ ☐ ☐	
16. Are containers with dispensers stored properly (e.g., indoors)?	☐ ☐ ☐	
17. Are the containers empty and clean?	☐ ☐ ☐	
18. Are the containers in good condition and not leaking?	☐ ☐ ☐	
Vehicles and Equipment Stored Outside	**Yes No NA**	**Comments**
19. Are vehicles and equipment stored outdoors?	☐ ☐ ☐	
20. Are they stored under cover?	☐ ☐ ☐	
21. Are they stored on a paved/impervious surface?	☐ ☐ ☐	
22. Are there any signs of leaking from vehicles or equipment?	☐ ☐ ☐	
23. Are drip pans placed under leaking vehicles and equipment?	☐ ☐ ☐	
Additional Notes/Corrective Action Needed:		
Expected Completion Date for Actions:		
Person Responsible for Corrective Actions: **Name:** _____		

Title: _____ **Signature:**_____
Signature of Inspector:

Fuel and Fleet Maintenance

Fuel Facility	Yes	No	NA	Comments
1. Is the fuel facility paved?	☐	☐	☐	
2. Is the fuel facility under cover?	☐	☐	☐	
3. Are fuel dispensers locked?	☐	☐	☐	
4. Is an emergency shutoff switch present?	☐	☐	☐	
5. Are written spill cleanup procedures posted and a spill kit readily available?	☐	☐	☐	
6. Is there signage prohibiting "topping off"?	☐	☐	☐	
7. Is a spill containment device and/or spill kit readily available?	☐	☐	☐	
8. Is there evidence of leaked vehicle fluids on the ground?	☐	☐	☐	
9. Does the fuel facility have a Spill Prevention, Control, and Countermeasures (SPCC) Plan (if required)?	☐	☐	☐	
Vehicle Service Bays	**Yes**	**No**	**NA**	**Comments**
10. Are vehicles serviced indoors?	☐	☐	☐	
11. Do spill pallets, fire cabinets, and parts cleaners appear to be used effectively?	☐	☐	☐	
12. Are drip pans placed under leaking vehicles?	☐	☐	☐	
13. Are containers properly labeled and stored, without any signs of fluid leakage?	☐	☐	☐	
14. Are written spill cleanup procedures posted and is there a spill kit readily available?	☐	☐	☐	
15. Is there evidence of leaked vehicle fluids on the ground?	☐	☐	☐	
16. Is used oil disposed of properly?	☐	☐	☐	
17. Does the oil/water separator drain to the sanitary sewer?	☐	☐	☐	
18. Does the facility have up-to-date maintenance records for the oil/water separator?	☐	☐	☐	
Vehicle Washing	**Yes**	**No**	**NA**	**Comments**
19. Are vehicles washed on site?	☐	☐	☐	
20. Is there a designated washing area?	☐	☐	☐	
21. Are there standard operating procedures (SOPs) for vehicle washing to ensure that vehicle wash water does not drain directly to the municipal storm sewer system or a water body? *For example, vehicles are washed indoors, or wash water is redirected to flow to a vegetated area or sent to the sanitary sewer system.*	☐	☐	☐	
22. Are sand trap records maintained?	☐	☐	☐	
Chemicals	**Yes**	**No**	**NA**	**Comments**
23. Are chemicals in labeled containers?	☐	☐	☐	
24. Are containers stored outside under cover or inside?	☐	☐	☐	
25. Are containers stored on spill pallets?	☐	☐	☐	
26. Are chemicals used outside?	☐	☐	☐	

Additional Notes/Corrective Action Needed:
Expected Completion Date for Actions:
Person Responsible for Corrective Actions: **Name:** _____ **Title:** _____ **Signature:**_____
Signature of Inspector:

Spills/Solid Waste

Spills	**Yes No NA**	**Comments**
1. Is staff training on spill response documented?	☐ ☐ ☐	
2. Is there a spill response plan in place?	☐ ☐ ☐	
3. Are spill protocol notices posted?	☐ ☐ ☐	
4. Do employees know where the spill kit is located?	☐ ☐ ☐	
5. Are the spill response plan and spill kits readily available close to where they are needed?	☐ ☐ ☐	
6. Are spill kits labeled on the site plan?	☐ ☐ ☐	
7. Are spill kits stocked? (Also check the level of absorbent material.)	☐ ☐ ☐	
8. Are spills reported as required?	☐ ☐ ☐	
9. Which staff members are responsible for spill response?	Name(s):	
10. Is the contact information for reporting a spill up to date?	☐ ☐ ☐	
11. Is there a disposal plan in place?	☐ ☐ ☐	
12. Are there signs of spill stains? (Suspicious-looking puddles, spots/stains/discoloration, etc.)	☐ ☐ ☐	
Solid Waste	**Yes No NA**	**Comments**
13. Does the facility keep waste manifests for the 3-year minimum requirement?	☐ ☐ ☐	
14. Are outdoor trash receptacles overflowing?	☐ ☐ ☐	

Additional Notes/Corrective Action Needed:

Expected Completion Date for Actions:

Person Responsible for Corrective Actions:
Name: _____
Title: _____
Signature:_____

Signature of Inspector:

Storage Tanks/General Equipment

Storage Tanks/General Equipment	Yes	No	NA	Comments
1. Are drums, barrels, tanks, and other containers in good condition?	☐	☐	☐	
2. Are the containers properly labeled?	☐	☐	☐	
3. Are the containers properly sealed?	☐	☐	☐	
4. Are there visible leaks from the containers?	☐	☐	☐	
5. Is there visible damage to the containers?	☐	☐	☐	
6. Are containers with dispensers stored properly (e.g., indoors)?				
7. Do drums have adequate secondary containment and cover?	☐	☐	☐	
8. Are bulk fluids and wastes double-contained to prevent accidental discharges?	☐	☐	☐	
9. Is there liquid in the secondary containment storage?	☐	☐	☐	
10. Are aboveground storage tanks inspected on a periodic basis for leaks and other hazardous conditions?	☐	☐	☐	
11. Are used batteries protected from contact with stormwater?	☐	☐	☐	
Additional Notes/Corrective Action Needed:				
Expected Completion Date for Actions:				
Person Responsible for Corrective Actions: **Name:** _____ **Title:** _____ **Signature:**_____				
Signature of Inspector:				

Parks and Grounds

Parks and Grounds	Yes	No	NA	Comments
1. Is landscape maintenance debris contained and stored away from drainage paths?	☐	☐	☐	
2. Are irrigation systems regularly maintained to avoid overwatering?	☐	☐	☐	
3. After mowing, are grass clippings left or swept/blown on the grass, or swept/blown into a pile for removal?	☐	☐	☐	
4. Is trash picked up from the grounds in conjunction with mowing?	☐	☐	☐	
5. Are outdoor trash receptacles overflowing?	☐	☐	☐	
6. Is the spraying of pesticides avoided within 50 feet of surface water, creek, etc., or within designated "no-spray" zones?	☐	☐	☐	
7. Is spot spraying the preferred practice for weed and insect control?	☐	☐	☐	
8. Is broadcast spraying avoided?	☐	☐	☐	
9. Are fertilizers and pesticides not applied before rain events?	☐	☐	☐	
10. Is dog waste disposed of properly?	☐	☐	☐	
Chemicals	**Yes**	**No**	**NA**	**Comments**
11. Are chemicals in labeled containers?	☐	☐	☐	
12. Are containers stored outside under cover or inside?	☐	☐	☐	
13. Are containers stored on spill pallets?	☐	☐	☐	
14. Are chemicals used outside?	☐	☐	☐	

Additional Notes/Corrective Action Needed:

Expected Completion Date for Actions:

Person Responsible for Corrective Actions:
Name: _____
Title: _____
Signature:_____

Signature of Inspector:

9. Appendix C: NPS Dry Weather Inspection Form

NPS STORM WATER OUTFALL DRY WEATHER SCREENING INSPECTION FORM

July 2019

Date:_____
Time:_____
Pipe/Outfall Location & Description:_____
Weather: _____
Waterway:_____
Outfall ID: _____

NOTES:

Inspector(s) Name(s): _____
Date of Last Rainfall: _____
Amount of Last Rainfall (in): _____
Is pipe/outfall active? _____
If active, is flow sufficient to sample? _____

FLOW/DISCHARGE ESTIMATE (for active outfalls) CIRCLE ONE

Velocity: slow (<2 ft/s)
Moderate (2-5ft/s)
Fast (> 5ft/s)
Water Level in Pipe/Channel:_____inches.

OUTFALL SCREENING RESULTS

VISUAL OBSERVATIONS (evaluate and add notes as applicable at each item or in the comments section)

Is outfall submerged? _____
Outfall Damaged? _____
Stains/Deposits/Sediment at Outfall? _____
Algae Growth at Outfall? _____
Abnormal Vegetation at Outfall? ___
Unusual Water Color? _____
Unusual Odor? _____

Turbidity?_____

Floatables?_____

Surface Sheen? _____

Detergents? _____

Additional Comments/Observations:

10 Appendix D: Methodology of Impervious Area Assessment

Memorandum

From: LimnoTech

Date: August 2, 2019

Project: NPS-US-P-2019 NCR Enviro Audit, Maryland MS4 Compliance Assistance

To: Dana Davis, Hitachi
Robert Mocko, National Park Service
Diana Bramble, National Park Service
Michael Commisso, National Park Service
David Birney, National Park Service

CC:

SUBJECT: Impervious Area Analysis and Development of Restoration Opportunities for Clara Barton, Baltimore-Washington, and Suitland Parkways

Introduction

The Clara Barton, Baltimore-Washington (BW), and Suitland Parkways, each of which is administered by the National Park Service, are covered individually by the NPDES General Permit for Discharges from State and Federal Small MS4s (General Permit) issued by the Maryland Department of Environment (MDE). Part V. of this permit, Chesapeake Bay Restoration and Meeting Total Maximum Daily Loads, requires each Parkway to restore 20 percent of its uncontrolled impervious area within the current permit cycle. LimnoTech was tasked with providing a baseline impervious area assessment, an Impervious Area Restoration Work Plan, a Restoration Activity Schedule, and stormwater best management practice (BMP) tracking database for each Parkway to address these permit requirements. This memo discusses the impervious area assessment and the development of restoration opportunities which will be incorporated into a Impervious Area Restoration Work Plan and a Restoration Activity Schedule individually for each Parkway based on additional input from NPS.

The baseline impervious area assessment was conducted through a GIS analysis, using data obtained from NPS, Montgomery County, Prince George's County, Anne Arundel County, and the State of Maryland. LimnoTech also requested information on any existing BMPs managing runoff at the three Parkways in order to determine what percentage of impervious area at each Parkway was currently controlled by BMPs. NPS informed LimnoTech that there are no existing NPS-owned structural or non-structural BMPs at any of the Parkways. NPS did alert LimnoTech to one existing BMP at BW Parkway, but this was not NPS-owned. However, this BMP was included in the calculation of controlled impervious surface because it did control some of BW Parkway's impervious area. Once the controlled impervious area was determined for each Parkway, LimnoTech calculated 20 percent of the remaining uncontrolled impervious area at each Parkway to determine the target area for restoration required by the MS4 permit.

The Parkways face a variety of constraints when it comes to BMP implementation, so the potentially feasible implementation options identified after discussions with NPS are limited to stream restoration at all three Parkways and stormwater ponds in highway interchanges at BW and Suitland Parkways. LimnoTech conducted an "opportunity analysis" to identify potential BMP projects that could help NPS meet its requirements. LimnoTech used GIS to conduct the opportunity analysis and identified stream reaches on Parkway land that could potentially be restored, as well as potential sites for installation of new stormwater ponds. Multiple potential projects that could be used to meet the restoration requirement were presented to NPS, along with information about the stream health and watershed condition of the potential stream restoration projects. This latter information can be used by NPS to prioritize potential projects into a specific BMP implementation strategy to meet restoration targets.

Methodology

Data Collection

The following GIS data were used for the impervious area and restoration opportunity analyses, with source and date the data was acquired listed, as applicable:

- Impervious surfaces, Montgomery County. Obtained July, 2018. Data set originally generated in 2014.
- Impervious surfaces, Prince George's County. Obtained November, 2018. Data set originally generated in 2014.
- Impervious surfaces, Anne Arundel County Obtained April, 2019. Data set originally generated in 2017.
- Existing BMPs, obtained from Patrick Callahan, Prince George's County, February 14 2019.
- BMP Drainage Areas, obtained from Patrick Callahan, Prince George's County, June 6 2019.
- Maryland Rivers, State of Maryland. Obtained June, 2019. Data set originally generated in 2014.
- Clara Barton Parkway Boundary, obtained from Robert Mocko, George Washington Memorial Parkway, May 10 2019.
- BW and Suitland Parkway Boundaries, obtained from Joe Kish, National Capital Parks East, February 5 2019.
- Contour Lines (2 ft), Prince George's County. Obtained February, 2019. Data set originally generated in 2014.

The following reports were used to gather information on watershed condition, in order to help NPS prioritize stream restoration candidates:

- Anne Arundel County. 2016. *Little Patuxent Watershed Assessment Comprehensive Summary Report.*
- Montgomery County Stream Condition Index Map, https://www.montgomerycountymd.gov/water/streams/watershed-health.html
- Montgomery County. 2018. *Cabin John Creek Watershed Assessment Summary Document.*
- Prince George's County. 2014. *Watershed Existing Condition Report for the Potomac River Watershed.*
- Prince George's County. 2014. *Watershed Existing Condition Report for the Anacostia River Watershed.*
- Prince George's County. 2014. *Watershed Existing Condition Report for the Upper Patuxent River, Western Branch, and Rocky Gorge Reservoir Watersheds.*

Impervious Area Assessment

The baseline impervious area was assessed for each Parkway using a GIS analysis. For each Parkway, an impervious surface layer was intersected with the Parkway boundary layer to determine the amount of impervious area contained within the Parkway boundary. The impervious layers were obtained from the Counties in which each Parkway was located. The boundary layer for each Parkway was received from NPS. LimnoTech discussed the extent of the boundary and MS4 service area (i.e., the area served by the Parkway's MS4 system, which is subject to MDE's permit requirements) with NPS representatives of each Parkway. Specific evaluations of the boundary data included discussions about whether roadway right-of-way, maintenance areas, parking lots, etc. were included within the boundaries of each Parkway. Thus, the boundaries used in this analysis were verified by NPS.

Once the total impervious area was determined, the "controlled" impervious area was calculated. The controlled impervious area is the area that is already managed by stormwater BMPs. NPS does not currently own or operate any stormwater BMPs on Parkway land for any of these three Parkways. However, there is a stormwater pond identified adjacent to BW Parkway (at the interchange with Laurel-Bowie Rd) that receives runoff from a portion of the Parkway's impervious area. This area was determined using GIS by intersecting the impervious layer with the pond's drainage area and the Parkway boundary. Once the controlled impervious area was assessed for each Parkway, the uncontrolled area was calculated by subtracting the controlled impervious area from the total impervious area. The resulting area was multiplied by 0.2 (i.e., 20 percent) to determine the 20 percent the restoration area target required by the MS4 permit. These results are shown below in Table 1. Note that all tables in this document show area first in square feet, and then convert that area to acres. This is because GIS analysis uses units of square feet, but MDE's requirements are expressed in acres.

Table 1. Results of the Impervious Area Analysis by Parkway

Parkway	Parkway Impervious Area (sq ft)	Controlled Impervious (sq ft)	Uncontrolled Impervious (sq ft)	Uncontrolled impervious (ac)	20% of Uncontrolled impervious (ac)
BW Parkway	10272264.66	58695.04[1]	10213569.62	234.47	46.89
Suitland Parkway	3290862.17	0.00	3290862.17	75.55	15.11
Clara Barton Parkway	2072861.54	0.00	2072861.54	47.59	9.52

[1]Some impervious area at BW Parkway is controlled by a stormwater pond that is not owned by NPS, as described above.

Restoration Opportunity Analysis

In order to meet MS4 permit requirements, each Parkway must implement BMPs to manage runoff from 20 percent of uncontrolled impervious surfaces, as calculated in the impervious area assessment. As identified by and discussed with NPS, there are many constraints for implementation of stormwater BMPs at the Parkways. First, most of the impervious area at the Parkways is roadway, and it is difficult to develop and implement BMPs for roadways because they are linear without much room for BMPs in the right-of-way. Second, the Parkways are considered cultural landscapes, which means there are requirements for maintaining the historical character of the area, as well as limits to alterations of the physical landscape. Third, there are also safety issues: the primary requirement is to keep the roadways safe for drivers, so stormwater control can't compromise road safety. Finally, all three Parkways have extensive of curb and gutter drainage systems, so stormwater BMPs would either have to be installed end-of-pipe or would require reconfiguring the storm drain system.

In discussing these constraints with NPS, stream restoration emerged as a good option for all three Parkways. Stream restoration addresses impacts of stormwater instream in the receiving waters rather than through upland BMPs, which, as stated above, would be difficult for NPS to implement, given the land development constraints of working on NPS property. Stream restoration also allows NPS to potentially work with partners and/or to keep the projects on adjacent NPS land, which potentially makes implementation easier. Despite the need to preserve the historical character of the Parkways, NPS also indicated potential interest in the option of constructing stormwater ponds at highway interchanges at BW and Suitland Parkways.

Stream restoration candidates were identified through a GIS analysis by intersecting the Maryland Rivers data layer with the Parkway boundary layer, to determine the length of stream reaches on NPS property. If the stream reach crossed road, it was assumed that the stream flowed underneath the roadway through a culvert (unless a bridge was clearly visible through aerial imagery) and the width of the road was subtracted from the stream reach length. The remaining stream length was determined to be the maximum potential length available for stream restoration. This length was translated to impervious area credit using the formula presented below in Table 2, provided by MDE. Clara Barton Parkway lies in the Piedmont region, while BW and Suitland Parkways are in the Coastal Plain.

Table 2. Conversion from Linear Feet of Stream Restoration to Impervious Acre Equivalents (MDE, 2019)

Geography	Equivalent Impervious Acres (acres/ft)
Coastal Plain	0.2
Piedmont	0.3

For each stream reach identified, LimnoTech also consulted corresponding watershed assessment reports published by the Counties to determine the condition of the stream and its sub-watershed. This information was included to help NPS prioritize potential stream restoration projects. LimnoTech provided more potential project options than are necessary to fulfill the MS4 permit restoration requirement, so that NPS would have multiple options and combinations of projects to choose for inclusion in the Impervious Area Restoration Work Plan. In the case of Clara Barton, NPS had already been working with partners to identify stream restoration projects. These projects were included in the options presented to NPS.

For BW and Suitland Parkways, potential sites for stormwater ponds were assessed through a visual analysis of aerial imagery to find potentially suitable project areas at the highway interchanges. Areas with dense tree cover were eliminated, under the assumption that NPS would not want to cut down large numbers of trees to implement a BMP. The areas were further assessed using a topography GIS layer to determine if runoff from surrounding impervious areas drained to the potential pond location. Once the potential pond locations were selected, an approximate drainage area was drawn in GIS using the topography layer. The impervious layer was then intersected with these drainage areas to calculate the impervious area potentially managed by these ponds.

Considerations and Opportunities by Parkway

Baltimore-Washington Parkway

The results of BW Parkway's impervious area analysis are presented below in Table 3. As described, above a small portion of BW Parkway's impervious area is already managed by a stormwater pond adjacent to Parkway property.

Table 3. Impervious Area Analysis Results for BW Parkway

	Sq. Ft.	Acres
Parkway Impervious Area	10,272,264.66	235.82
Managed Impervious Area	58,695.04	1.35
Unmanaged Impervious Area	10,213,569.62	234.47
20% of Unmanaged Impervious Area	2,042,713.92	46.89

There are no existing or planned stormwater management or stream restoration projects on BW Parkway land. The potential restoration projects identified in LimnoTech's analysis are listed below in Table 4. The target restoration area is 46.89 acres, which could be met through various combinations of the projects listed.

Table 4. Potential Restoration Opportunities for BW Parkway

	BMP Type	Description	Amount (impervious drainage area or linear feet of stream restoration)	Estimated cost (at $25,000/acre for wet ponds and $1,000/ft. of restoration)[1]	Equivalent Impervious Acreage Treated (ac.)
Project 1	New Wet Pond	Interchange of BW and US-50 and Rte. 201	3.98	$99,620	3.98
Project 2	New Wet Pond	Interchange of BW and Rte. 450	1.35	$33,629	1.35
Project 3	New Wet Pond	Interchange of BW and Rte. 202	2.11	$52,661	2.11
Project 4	Stream Restoration	Unnamed Tributary to Northeast Branch Anacostia River, near interchange with Bladensburg Rd	556	$555,527	11.11
Project 5	Stream Restoration	Unnamed Tributary to Northeast Branch Anacostia River, south of Riverdale Rd	531	$531,003	10.62
Project 6	Stream Restoration	Brier Ditch	530	$529,520	10.59
Project 7	Stream Restoration	Unnamed tributary to Brier Ditch, south-east of Greenbelt Park	907	$906,994	18.14

Table 4. Potential Restoration Opportunities for BW Parkway					
	BMP Type	**Description**	**Amount (impervious drainage area or linear feet of stream restoration)**	**Estimated cost (at $25,000/acre for wet ponds and $1,000/ft. of restoration)[1]**	**Equivalent Impervious Acreage Treated (ac.)**
Project 8	Stream Restoration	Unnamed tributary to Brier Ditch, east of Greenbelt Park	1536	$1,536,000	30.72
Project 9	Stream Restoration	Unnamed tributary to Beaverdam Creek, south of interchange to Explorer Road	637	$636,717	12.73
Project 10	Stream Restoration	Beck Branch	833	$833,489	16.67
Project 11	Stream Restoration	Beaverdam Creek	209	$208,688	4.17
Project 12	Stream Restoration	Unnamed tributary to Beaverdam Creek, south of interchange with Powdermill Rd	220	$220,300	4.41
Project 13	Stream Restoration	Unnamed tributary to Beaverdam Creek, north of interchange with Powdermill Rd	280	$279,967	5.60
Project 14	Stream Restoration	Unnamed tributary to Patuxent River, north of Lowell Bowie Rd	544	$544,200	10.88
Project 15	Stream Restoration	Dorsey Run, at confluence to Little Patuxent River	363	$363,000	7.26
Project 16	Stream Restoration	Little Patuxent River	714	$714,000	14.28
Project 17	Stream Restoration	Unnamed tributary to Dorsey Run, between Rte 32 and 175	371	$371,000	7.42
Project 18	Stream Restoration	Unnamed tributary to Dorsey Run, south of interchange with Rte 32	1411	$1,411,487	28.23
Target					**46.9 acres**

[1]These cost estimates are based on rounded costs from the University of Maryland Center for Environmental Science's 2011 document *Costs of Stormwater Management Practices In Maryland Counties* (for wet ponds) and from Anne Arundel County's recent TMDL restoration plans, which include estimated costs for stream restoration projects.

Clara Barton Parkway

The results of Clara Barton Parkway's impervious area analysis are presented in Table 5 below. There is currently no management of runoff from the Parkway's impervious surfaces.

Table 5. Impervious Area Analysis Results for Clara Barton Parkway		
	Sq. Ft.	**Acres**

Parkway Impervious Area	2,072,861.54	47.59
Managed Impervious Area	-	0.00
Unmanaged Impervious Area	2,072,861.54	47.59
20% of Unmanaged Impervious Area	414,572.31	9.52

Prior to this analysis, NPS had already been working with others to identify potential stream restoration projects on Parkway land. Information about two such projects was obtained from a 2019 document entitled "George Washington Memorial Parkway Parkland Restoration Plan Environmental Assessment" (NPS, 2019). The stream restoration projects discussed in the document - the Wapakoneta Channel and Midsite Channel - are included with other opportunities identified through LimnoTech's analysis, in Table 6 below. The target restoration area is 9.52 acres, which would be exceeded by any of the listed projects individually. The target could also be met through restoring a smaller portion (or combinations of smaller portions) of the identified stream reaches.

Table 6. Restoration Opportunities for Clara Barton Parkway

	BMP Type	Description	Amount (impervious drainage area or linear feet of stream restoration)	Equivalent Impervious Acreage Treated (ac.)	Estimated cost (at $1,000/ft. of restoration)[1]
Project 1	Stream Restoration	Little Falls Branch	2339	70.17	$2,339,000
Project 2	Stream Restoration	Minnehaha Branch	389	11.67	$389,000
Project 3	Stream Restoration	Unnamed tributary to C&O Canal, between confluence with Cabin John Creek and Minnehaha Branch	629	18.87	$629,000
Project 4	Stream Restoration	Cabin John Creek	1132	33.96	$1,132,000
Project 5	Stream Restoration	Unnamed tributary to C&O Canal, between confluence with Carroll Branch and Cabin John Creek	476	14.28	$476,000
Project 6	Stream Restoration	Wapakoneta Channel	860	25.8	$860,000
Project 7	Stream Restoration	Midsite Channel	1110	33.3	$1,110,000

[1]These cost estimates are based on rounded costs from Anne Arundel County's recent TMDL restoration plans, which include estimated costs for stream restoration projects.

Suitland Parkway

The results of Suitland Parkway's impervious area analysis are presented in Table 7 below. There is currently no management of runoff from the Parkway's impervious surfaces.

Table 7. Impervious Area Analysis Results for Suitland Parkway		
	Sq. Ft.	**Acres**
Parkway Impervious Area	3,290,862.17	75.55
Managed Impervious Area	-	0.00
Unmanaged Impervious Area	3,290,862.17	75.55
20% of Unmanaged Impervious Area	658,172.43	15.11

There are no existing or planned stormwater management or stream restoration projects on Suitland Parkway land. The potential restoration projects identified in LimnoTech's analysis are listed in Table 8 below. The target restoration area is 15.11 acres, which could be fulfilled through various combinations of the projects listed, or by certain projects individually.

Table 8. Restoration Opportunities for Suitland Parkway					
	BMP Type	**Description**	**Amount (impervious drainage area or linear feet of stream restoration)**	**Estimated cost (at $25,000/acre for wet ponds and $1,000/ft. of restoration)[1]**	**Equivalent Impervious Acreage Treated (ac.)**
Project 1	New Wet Pond	Interchange of Suitland and Rte. 5, NE loop	1.80	$45,011	1.80
Project 2	New Wet Pond	Interchange of Suitland and Rte. 5, SW loop	0.71	$17,675	0.71
Project 3	New Wet Pond	Interchange of Suitland and Rte. 458	0.92	$23,059	0.92
Project 4	Stream Restoration	Oxon Run	2932	$2,931,870	58.64
Project 5	Stream Restoration	Unnamed Tributary to Henson Creek, west of Suitland Rd	429	$429,316	8.59
Project 6	Stream Restoration	Henson Creek, east of Suitland Rd	4705	$4,705,241	94.10
Project 7	Stream Restoration	Unnamed tributary to Henson Creek, at Suitland Rd	224	$224,000	4.48
Project 8	Stream Restoration	Unnamed tributary to Henson Creek, east of Suitland Rd	789	$789,107	15.78
Project 9	Stream Restoration	Unnamed Tributary to Henson Creek, west of Spaulding Junior High School	814	$814,098	16.28

Table 8. Restoration Opportunities for Suitland Parkway					
	BMP Type	**Description**	**Amount (impervious drainage area or linear feet of stream restoration)**	**Estimated cost (at $25,000/acre for wet ponds and $1,000/ft. of restoration)[1]**	**Equivalent Impervious Acreage Treated (ac.)**
Project 10	Stream Restoration	Henson Creek, west of I-95	2787	$2,786,948	55.74
Project 11	Stream Restoration	Henson Creek east of I-95	1548	$1,547,681	30.95
Target					**15.1 acres**

[1]These cost estimates are based on rounded costs from the University of Maryland Center for Environmental Science's 2011 document *Costs of Stormwater Management Practices In Maryland Counties* (for wet ponds) and from Anne Arundel County's recent TMDL restoration plans, which include estimated costs for stream restoration projects.

Conclusion

NPS is required by MDE to restore 20 percent of uncontrolled impervious area for the Clara Barton, Baltimore-Washington, and Suitland Parkways according to Maryland's NPDES General Permit for Discharges from State and Federal Small MS4s. LimnoTech provided an assessment of impervious area and proposed several restoration options to NPS for each Parkway. Based on these options, NPS can identify specific options to meet the restoration requirements for each Parkway.

References

Anne Arundel County. 2016. *Little Patuxent Watershed Assessment Comprehensive Summary Report*.

Maryland Department of Environment. 2011. *Costs of Stormwater Management Practices in Maryland Counties.* Prepared by Dennis King and Patrick Hagan, University of Maryland Center for Environmental Science.

Maryland Department of Environment. 2019. *Memorandum: Stream Restoration Crediting Clarification for MS4 Permitting Purposes*.

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