OP•LANES™
MARYLAND

I-495 & I-270 Managed Lanes Study

FINAL COMPENSATORY WETLANDS AND WATERWAYS MITIGATION PLAN

June 2022

U.S. Department of Transportation
Federal Highway Administration

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

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1 EXECUTIVE SUMMARY

The Federal Highway Administration (FHWA), as the Lead Federal Agency, and the Maryland Department of Transportation State Highway Administration (MDOT SHA), as the Local Project Sponsor, are preparing a Final Environmental Impact Statement (FEIS) in accordance with the National Environmental Policy Act (NEPA) for the I-495 & I-270 Managed Lanes Study (Study). The I-495 & I-270 Managed Lanes Study (Study) is the first environmental study under the broader I-495 & I-270 Public-Private Partnership (P3) Program.

This Final Compensatory Wetlands and Waterways Mitigation Plan (Final CMP) has been prepared to support the FEIS and focuses on the analysis of the Preferred Alternative. The Preferred Alternative, also referred to as Alternative 9 – Phase 1 South, includes building a new American Legion Bridge and delivering two high-occupancy toll (HOT) managed lanes in each direction on I-495 from the George Washington Memorial Parkway in Virginia to west of MD 187 on I-495, and on I-270 from I-495 to north of I-370 and on the I-270 eastern spur from west of MD 187 to I-270. Refer to **Figure 1-1**. This Preferred Alternative was identified after extensive coordination with agencies, the public and stakeholders to respond directly to feedback received on the DEIS to avoid displacements and impacts to significant environmental resources, and to align the NEPA approval with the planned project phased delivery and permitting approach. The Preferred Alternative will result in unavoidable impacts to regulated resources and require permits from the US Army Corps of Engineers (USACE), Maryland Department of Environment (MDE), and Virginia Department of Environmental Quality (VDEQ). This Final CMP presents the proposed compensatory mitigation package for the Preferred Alternative and includes mitigation bank credit purchases and permittee-responsible Phase II Mitigation Design Plans.

The Preferred Alternative impacts are located entirely within the Middle Potomac-Catoctin HUC-8 watershed. Impacts were analyzed and quantified within the Limits of Disturbance (LOD) for each regulatory jurisdiction. In Maryland, MDE impacts include 152,934 square feet (3.51 acres) of permanent wetland impacts and 28,594 linear feet of non-culverted stream impacts; and USACE impacts include 148,598 square feet (3.41 acres) of permanent wetland impacts and 29,769 linear feet of non-culverted stream impacts. In Virginia, VDEQ and USACE impacts include 944 linear feet of non-culverted streams. The Preferred Alternative impacts are further divided in the Final CMP into two impact types based on their location: 1) On-Site Improvement Impacts and 2) Off-Site Compensatory Stormwater Quality Treatment Impacts. On-site Improvement Impacts include resource impacts related to the mainline roadway improvements, including road widenings, culvert extensions, SWM facilities, SWM outfalls, augmented culvert improvements, outfall repair/improvements, and stream improvements associated with augmented culverts. Off-Site Compensatory Stormwater Quality Treatment Impacts consist of impacts related to off-site stormwater quality treatment sites proposed to fulfill the water quality requirement that could not be met on-site. Impacts are discussed in further detail in **Sections 3.3** and **3.4**. Mitigation is required by the USACE, MDE and VDEQ for these unavoidable impacts to compensate for lost function and value, and to comply with the “no net loss” policy.

In Maryland, wetland mitigation requirements were developed based on MDE’s *Maryland Nontidal Wetland Mitigation Guidance, Second Edition January 2011*, and stream mitigation requirements were determined using the USACE’s *Maryland Stream Mitigation Framework Version 1 (MSMF V.1) Draft Manual for Stream Impact and Stream Mitigation Calculation, 2022*. In Virginia, wetland mitigation requirements were determined based on replacement ratios in the Virginia Administrative Code (9VAC25-680-70), and stream mitigation requirements were developed based on the USACE's *Unified Stream Methodology for use in Virginia, January 2007*. In Maryland, MDE mitigation requirements include 190,761 square feet (4.38 acres) of wetland mitigation and 7,400 functional feet of stream mitigation, and USACE mitigation requirements include 186,425 square feet (4.28 acres) of wetland mitigation and 7,511 functional feet of stream mitigation. In Virginia, VDEQ and USACE mitigation requirements includes 472 linear feet of riverine mitigation. For further details on the Preferred Alternative mitigation requirements see **Section 4**.

Several mitigation opportunities were explored including mitigation banking, in-lieu fee programs, and off-site permittee-responsible mitigation on public and private lands. In Maryland, opportunities for mitigation banks within an appropriate service area or in-lieu fee programs did not exist until recently. One potential mitigation bank was recently identified in an appropriate service area that will have available credits in the summer of 2022. Due to the lack of mitigation bank credits and in-lieu fee programs in Maryland at the initiation of the project, permittee-responsible mitigation was pursued. A two-tiered approach was used to identify potential off-site, permittee-responsible mitigation sites that included a traditional mitigation site search on public lands and developer proposals on private lands. Permittee-responsible mitigation sites were chosen to compensate for unavoidable impacts based on their potential for functional uplift, watershed improvements, construction feasibility, proximity to the study area, mitigation credits, and replacement of lost functions and values resulting from roadway improvements. See **Section 5** for further details on the mitigation approach for the project.

In Maryland, most of the mitigation needs for the Preferred Alternative will be met with two (2) off-site, permittee-responsible mitigation sites, CA-5 and RFP-2, that provide 201,262 square feet (4.61 acres) of wetland mitigation credit, and 6,304 functional feet of stream mitigation credit. The remaining stream mitigation requirement of 1,207 functional feet will be met by purchasing credits from the Even Flow Mitigation Bank, resulting in a total of 7,511 functional feet of proposed stream mitigation credits for the Preferred Alternative in Maryland. Credits from the permittee-responsible mitigation sites will not be used for advance mitigation or off-site stormwater management. The permittee-responsible mitigation package is discussed in further detail in **Section 6.1**. A location map of the proposed mitigation sites is included in **Appendix O** and Phase II Mitigation Plans for each site are included in **Appendix P**. Coordination with the regulatory agencies and landowners on the Phase II Mitigation Plans is documented in the meeting minutes that are included in **Appendix N**. The 12 fundamental components of the Federal Mitigation Rule are discussed in **Section 6.1.3** and in further detail in the Phase II Mitigation Plans in **Appendix P**. The Even Flow Mitigation Bank credit purchases are discussed in **Section 6.2** and a letter from Resource Environmental Solutions, LLC (RES) confirming available credits at the bank is included in **Appendix M**.

The Virginia mitigation requirement of 472 linear feet of riverine mitigation credits will be met by purchasing credits from the Northern Virginia Stream Mitigation Bank. Mitigation bank credit availability is discussed in **Section 5.1.1**. The Northern Virginia Stream Restoration Bank credit purchases are discussed in **Section 6.2** and a letter from Davey Mitigation confirming available credits at the bank is included in **Appendix M**.

The Preferred Alternative impacts and mitigation requirements in Maryland and Virginia are summarized in **Tables 1-1**, **1-2**, and **1-3.** A further detailed summary of the impacts and mitigation requirements by resource type is included in **Appendix A**.

Table 1-1: Preferred Alternative - Maryland Wetland Mitigation Summary

Federal HUC-8 Watershed	Jurisdiction	Impacts*		Mitigation Requirement		Proposed Permittee-Responsible Mitigation		
		SF	AC	SF	AC	Sites	SF	AC
Middle Potomac-Catoctin	MDE	152,934	3.51	190,761	4.38	1	201,262	4.61
	USACE	148,598	3.41	186,425	4.28			

**Temporary wetland impacts are not included.*

Table 1-2: Preferred Alternative - Maryland Stream Mitigation Summary

Federal HUC-8 Watershed	Jurisdiction	Impacts*	Mitigation Requirement	Proposed Permittee-Responsible Mitigation		Proposed Even Flow Bank Mitigation	Proposed Total Mitigation
		LF	FF	Sites	FF	FF	FF
Middle Potomac-Catoctin	MDE	28,594	7,400	2	6,304	1,207	7,511
	USACE	29,769	7,511				

**Impacts do not include culverted streams.*

Table 1-3: Preferred Alternative - Virginia Mitigation Summary

Federal HUC-8 Watershed	Jurisdiction	Resource Type	Impacts	Mitigation Requirement	Proposed Northern Virginia Stream Restoration Bank Mitigation
Middle Potomac-Catoctin	VDEQ & USACE	Waterways (LF)	944	472	472

Note: There are no permanent wetland impacts or wetland mitigation requirements in Virginia.

Final CMP Table Color Codes

Color	Description
Grey	Existing Features & Impacts
Green	Mitigation Requirements
Yellow	Proposed Off-Site Mitigation

2 INTRODUCTION

2.1 Overview

The Federal Highway Administration (FHWA), as the Lead Federal Agency, and the Maryland Department of Transportation State Highway Administration (MDOT SHA), as the Local Project Sponsor, are preparing a Final Environmental Impact Statement (FEIS) in accordance with the National Environmental Policy Act (NEPA) for the I-495 & I-270 Managed Lanes Study (Study). The I-495 & I-270 Managed Lanes Study (Study) is the first environmental study under the broader I-495 & I-270 Public-Private Partnership (P3) Program.

This Final Compensatory Wetlands and Waterways Mitigation Plan (Final CMP) has been prepared to support the FEIS and focuses on the analysis of the Preferred Alternative. The Preferred Alternative, also referred to as Alternative 9 – Phase 1 South, includes building a new American Legion Bridge and delivering two high-occupancy toll (HOT) managed lanes in each direction on I-495 from the George Washington Memorial Parkway in Virginia to west of MD 187 on I-495, and on I-270 from I-495 to north of I-370 and on the I-270 eastern spur from west of MD 187 to I-270. Refer to **Figure 1-1**. This Preferred Alternative was identified after extensive coordination with agencies, the public and stakeholders to respond directly to feedback received on the DEIS to avoid displacements and impacts to significant environmental resources, and to align the NEPA approval with the planned project phased delivery and permitting approach.

The purpose of this Final CMP is to present the existing conditions, an assessment of potential direct impacts of the Preferred Alternative to wetlands and waterways, and final mitigation for unavoidable impacts. This Final CMP builds upon the analysis in the Draft CMP, DEIS and Supplemental DEIS (SDEIS), and has been prepared to support and inform the FEIS.

2.2 Study Corridors & the Preferred Alternative

In the SDEIS, published on October 1, 2021, FHWA and MDOT SHA identified the Preferred Alternative: Alternative 9 – Phase 1 South to be consistent with the previously determined phased delivery and permitting approach, which focuses on Phase 1 South. As a result, Alternative 9 – Phase 1 South includes the same improvements proposed as part of Alternative 9 in the DEIS but focuses the build improvements within the Phase 1 South limits only. The limits of Phase 1 South are along I-495 from the George Washington Memorial Parkway to west of MD 187 and along I-270 from I-495 to north of I-370 and on the I-270 east and west spurs as shown in **dark blue** in **Figure 1-1**. The improvements include two new HOT managed lanes in each direction along I-495 and I-270 within the Phase 1 South limits. There is no action, or no improvements included at this time on I-495 east of the I-270 east spur to MD 5 (shown in **light blue** in **Figure 1-1**). While the Preferred Alternative does not include improvements to the remaining parts of I-495 within the Study limits, improvements on the remainder of the interstate system may still be needed in the future. Any such improvements would advance separately and would be subject to additional environmental studies and analysis and collaboration with the public, stakeholders and agencies.

The 48-mile corridor Study limits remain unchanged: I-495 from south of the George Washington Memorial Parkway in Fairfax County, Virginia, to west of MD 5 and along I-270 from I-495 to north of I-

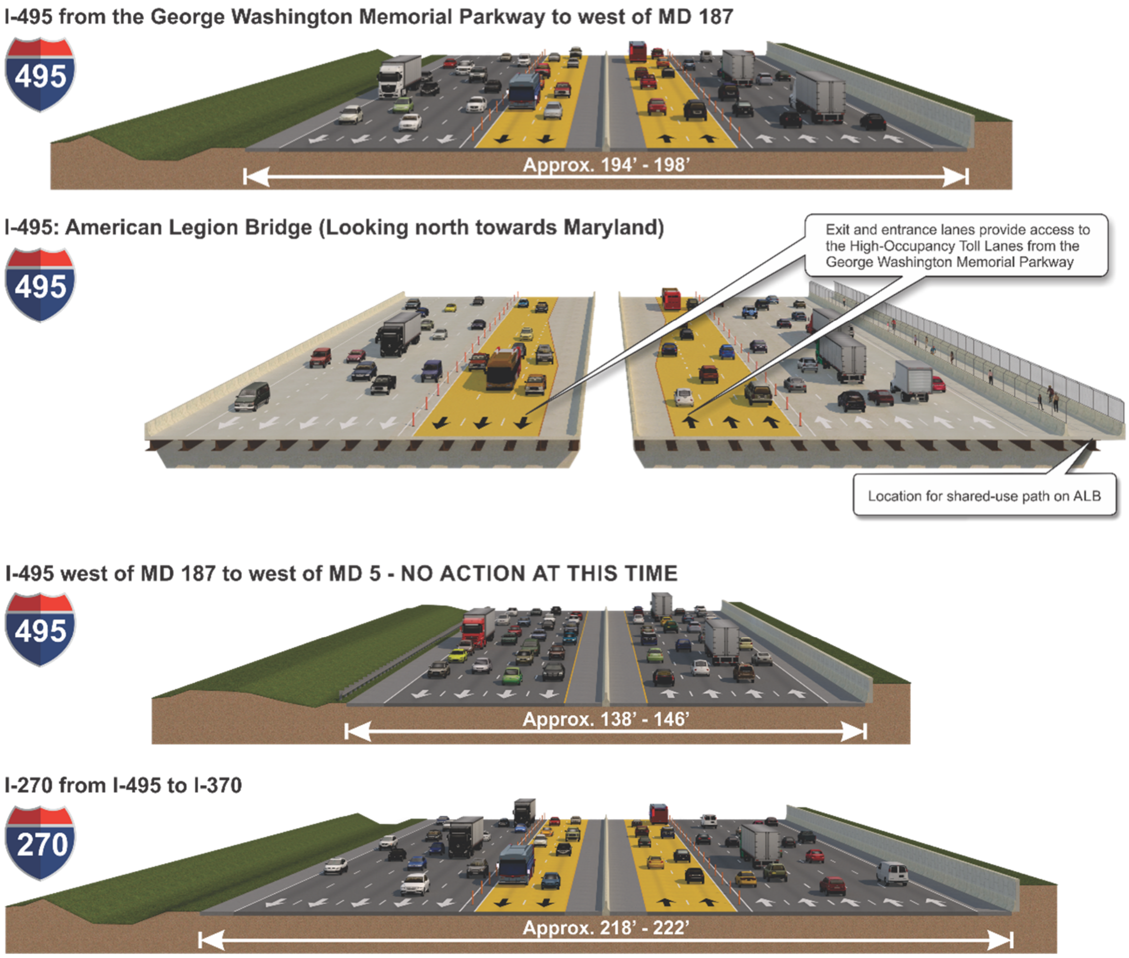
370, including the east and west I-270 spurs in Montgomery and Prince George's Counties, Maryland (shown in both dark and light blue in **Figure 1-1**).

Figure 2-1: I-495 & I-270 MLS Study Corridors – Preferred Alternative

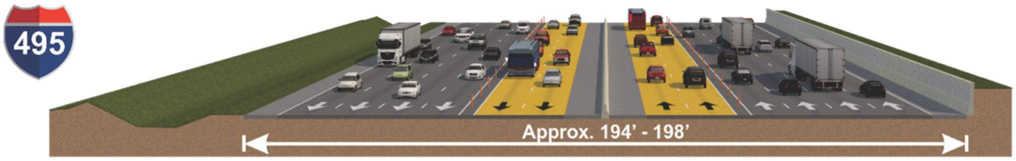
2.3 Description of the Preferred Alternative

The Preferred Alternative includes a two-lane HOT managed lanes network on I-495 and I-270 within the limits of Phase 1 South only (**Figure 1-2**). On I-495, the Preferred Alternative consists of adding two, new HOT managed lanes in each direction from the George Washington Memorial Parkway to west of MD 187. On I-270, the Preferred Alternative consists of converting the one existing HOV lane in each direction to a HOT managed lane and adding one new HOT managed lane in each direction on I-270 from I-495 to north of I-370 and on the I-270 east and west spurs. There is no action, or no improvements included at this time on I-495 east of the I-270 east spur to MD 5. Along I-270, the existing collector-distributor (C-D) lanes from Montrose Road to I-370 would be removed as part of the proposed improvements. The managed lanes would be separated from the general purpose lanes using pylons placed within a four-foot wide buffer. Transit buses and HOV 3+ vehicles would be permitted to use the managed lanes toll-free.

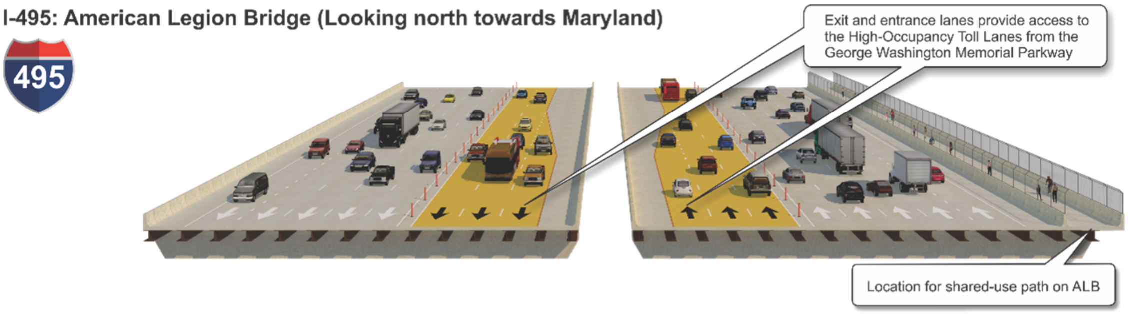
Figure 2-2: Preferred Alternative Typical Sections (HOT Managed Lanes Shown in Yellow)



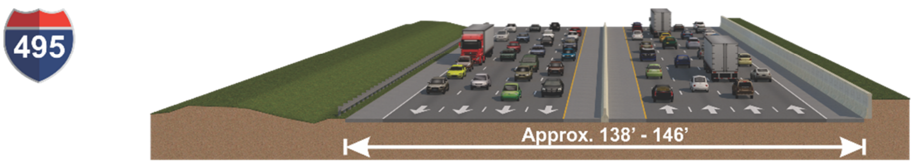
I-495 from the George Washington Memorial Parkway to west of MD 187



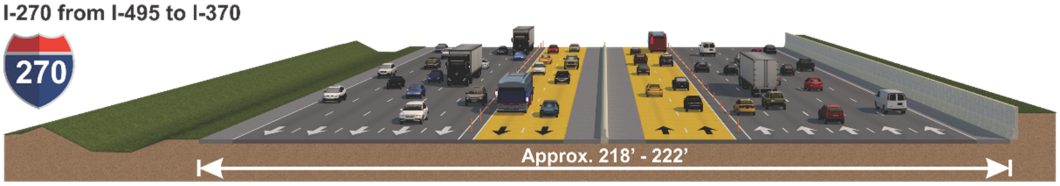
I-495: American Legion Bridge (Looking north towards Maryland)



I-495 west of MD 187 to west of MD 5 - NO ACTION AT THIS TIME



I-270 from I-495 to I-370



2.4 Preferred Alternative Impacts & Mitigation

The Preferred Alternative will result in unavoidable impacts to natural resources regulated by the USACE under Section 404 of the Clean Water Act, MDE under the Maryland Nontidal Wetlands Protection Act, and VDEQ under the Code of Virginia (VAC 62.1-44.15). The USACE Baltimore District will regulate Waters of the US within Virginia that are typically regulated by the Norfolk District. Permits will be required from the USACE, MDE and VDEQ for unavoidable impacts to regulated resources. For further information on the permits and DEIS Build Alternatives see the *Natural Resources Technical Report* (NRTR), and the *Alternatives Technical Report*.

The purpose of this Final CMP is to present the proposed mitigation package for impacts associated with the Preferred Alternative. The report begins with a summary of the existing conditions and impacts, followed by the mitigation requirements and the different types of proposed mitigation, including mitigation banking and off-site permittee responsible mitigation on private and public lands. The report discusses how the mitigation requirements were determined and concludes with a discussion on the proposed final mitigation package needed to fulfill the Preferred Alternative mitigation requirements.

3 EXISTING CONDITIONS & IMPACTS

3.1 HUC-8 Watersheds

The Preferred Alternative impacts that require mitigation are located entirely within the Middle Potomac-Catoctin HUC-8 watershed (See **Figure 5-1** in **Section 5**). A small section of the Preferred Alternative is located within the Middle Potomac-Anacostia-Occoquan watershed, however the proposed impacts in that watershed do not require mitigation. The Middle Potomac-Catoctin watershed drains approximately 1,227 square miles in Maryland and Virginia. The watershed drains to the Potomac River from Harpers Ferry, MD east to Washington D.C. The smaller watersheds within the Middle Potomac-Catoctin that overlap with the Preferred Alternative include Fairfax County Middle Potomac, Potomac River/Rock Run, Cabin John Creek, Watts Branch, and Muddy Branch. The dominant land use in the Fairfax County Middle Potomac consists of residential, open space/parks/recreational areas, road rights-of-way, and commercial. The 2008 Fairfax County Middle Potomac Watersheds Management Plan describes the majority of the in-stream habitat quality in the watershed as Fair with inadequate riparian buffers that are less than 100 feet wide or with non-native, non-diversified, or insufficient vegetation. In Maryland, most of the watersheds are highly degraded with several developed areas including the Potomac Village, City of Rockville, and City of Gaithersburg. Degraded streams in the Maryland watersheds exhibit highly eroded banks, over-widened stream channels, piped/straightened channels, limited instream habitat, insufficient riparian buffer, inorganic pollutants, and fair to poor biological communities.

One of the goals of the proposed compensatory mitigation package is to improve upon the ecological functions in the Middle Potomac-Catoctin watershed with a focus on the impaired conditions and needs that have been described above. For further details on existing watershed conditions see the *Natural Resources Technical Report* (NRTR).

3.2 Existing Wetlands & Waterways

A total of 122 nontidal wetlands and 390 waterway features were delineated within the Phase 1 South portion of the corridor study boundary[1] and the off-site compensatory stormwater quality treatment study area. One Traditional Navigable Waterway (TNW), the Potomac River, was identified, and all other perennial waters are classified as tributaries to the Potomac River. The total number of features delineated by classification within Phase 1 South of the corridor study boundary and the off-site compensatory stormwater quality treatment study area is provided in **Table 3-1** below. Detailed information on these features and their impacts can be found in the *I-495 & I-270 Managed Lanes Study Wetland Delineation Memorandum, Preferred Alternative: Alternative 9 – Phase 1 South*, *Natural Resources Technical Report* (NRTR), *Wetland and Waterway Delineation Report for the I-495 and I-270 Managed Lanes Study Compensatory Stormwater Quality Treatment Sites*, and the *Compensatory Stormwater Mitigation Plan*.

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[1] The corridor study boundary is a 48-mile-long and approximately 600-foot-wide area along the centerlines of I-495 and I-270, spanning two states and three counties. Corridor study boundary limits are displayed on the MLS JPA Impact Plates.

Table 3-1: Phase 1 South & Off-Site Compensatory Stormwater Quality Treatment Delineated Features

Watershed	Resource Type	Phase 1 South Corridor Study Boundary		Off-Site Compensatory Stormwater Quality Treatment Study Area		Total	
Middle Potomac-Catoctin	Wetlands	Total Number	Acres	Total Number	Acres	Total Number	Acres
	Palustrine Forested (PFO)	38	8.85	31	5.61	69	14.46
	Palustrine Scrub-Shrub (PSS)	1	0.01	1	0.02	2	0.03
	Palustrine Emergent (PEM)	27	7.01	24	1.38	51	8.39
	Total	**66**	**15.87**	**56**	**7.01**	**122**	**22.88**
	Waterways	Total Number	Linear Feet	Total Number	Linear Feet	Total Number	Linear Feet
	Perennial	122	52,464	77	30,184	199	82,648
	Intermittent	102	19,432	41	5,981	143	25,413
	Ephemeral	20	3,527	28	2,210	48	5,737
	Total	**244**	**75,423**	**146**	**38,375**	**390**	**113,798**
	Palustrine Open Water (POW)	0	0	7	0.99 AC	7	0.99 AC

3.3 Impact Summary

The Preferred Alternative will impact USACE, MDE, and VDEQ regulated nontidal emergent, scrub-shrub, and forested wetlands, in addition to regulated Waters of the U.S. other than wetlands. The Preferred Alternative impacts requiring mitigation are located entirely within the Middle Potomac-Catoctin HUC-8 watershed. A small section of the Preferred Alternative is located in the Middle Potomac-Anacostia-Occoquan watershed, however proposed impacts in that watershed do not require mitigation. Unavoidable impacts associated with the Preferred Alternative have been calculated and described in the NRTR and *Avoidance, Minimization, and Impacts Report* (AMR), and are based on the design details described therein. Unavoidable impacts associated with the Off-Site Compensatory Stormwater Quality Treatment Sites are discussed in further detail in the *Compensatory Stormwater Mitigation Plan*. Regulatory jurisdiction under the CWA of 1972 differs from the Maryland Nontidal Wetlands Protection Act jurisdiction (COMAR 26.23.01), resulting in slightly different MDE and USACE impact quantities. MDE and USACE impact quantities have been assessed and quantified separately in the Final CMP due to differences in jurisdictional resources. In Virginia, the VDEQ and USACE regulate the same jurisdictional resources, and therefore the same impact quantities are presented for each agency.

In Maryland, impacts that do not require mitigation include temporary wetland impacts and waterway impacts in existing culverts. In some cases, waterway impacts that were processed with the USACE's Draft *Maryland Stream Mitigation Framework Version 1 (MSMF V.1)* resulted in no loss in functional feet and thus also did not require mitigation. Temporary wetland impacts are documented in the Joint Permit Application (JPA) Wetland and Waterway Impact Plates and Summary Tables. Detailed information on impacts to waterway features in existing culverts is included in **Appendix D** and waterway impacts resulting in no loss in functional feet are documented in **Appendix E**.

In Maryland, MDE impacts include 152,934 square feet (3.51 acres) of permanent wetland impacts and 28,594 linear feet of non-culverted stream impacts; and USACE impacts include 148,598 square feet (3.41 acres) of permanent wetland impacts and 29,769 linear feet of non-culverted stream impacts. Maryland impacts have been separated into two types based on their location: 1) On-Site Improvement Impacts and 2) Off-Site Compensatory Stormwater Quality Treatment Impacts. On-Site Improvement Impacts include resource impacts related to the mainline roadway improvements, including road widenings, culvert extensions, SWM facilities, SWM outfalls, augmented culvert improvements, outfall repair/improvements, and stream improvements associated with augmented culverts. Off-Site Compensatory Stormwater Quality Treatment Impacts consist of impacts related to off-site stormwater quality treatment sites proposed to fulfill the water quality requirement that could not be met on-site. There are no Off-Site Compensatory Stormwater Quality Treatment wetland impacts. Summaries of the MDE and USACE impacts are included in **Tables A-1** through **A-4** in **Appendix A**. Detailed information on wetland feature impacts is included in **Appendix B** and details on stream feature impacts are included in **Appendix E** and **F**. Detailed information on avoidance and minimization of impacts is included in the AMR.

In Virginia, the Preferred Alternative will impact a total of 944 linear feet of non-culverted streams. There are no permanent wetland impacts proposed in Virginia. Virginia resources will be impacted by On-Site Improvement Impacts only, and no impacts will occur from Off-Site Compensatory Stormwater Quality Treatment. Impacts that do not require mitigation in Virginia include temporary wetland impacts and waterway impacts that were processed with the Unified Stream Methodology (USM) that resulted in a zero linear foot mitigation requirement. A summary of the proposed VDEQ and USACE waterway impacts by resource type is included in **Table A-5** in **Appendix A**. Further detailed information on waterway feature impacts is included in **Appendix K** and USM forms are included in **Appendix L**. The USM is discussed in further detail in **Section 4.1.2**.

3.4 Function & Value Impacts

Ecological functions and values lost due to the proposed impacts vary based on several factors including the location, size, and quality of the existing resource and the level of disturbance. All wetlands and waterways that will be impacted by the Preferred Alternative provide some level of ecological function. Qualitative functions and values were assessed for each resource and reviewed by participating and concurring agencies, including USACE, MDE, U.S. Fish and Wildlife Service (USFWS), Maryland National Capital Park and Planning Commission (M-NCPPC), and Maryland Department of Natural Resource (DNR), and revised in some cases based on agency input. Only certain resources were reviewed by the agencies and thus not all function and value assessments were approved. A summary of the wetland and waterway function and value impacts is included in the following sections. To simplify reporting, wetland and stream functional impact numbers discussed below represent the total number of features being impacted, regardless of jurisdiction.

3.4.1 Wetlands

Wetland functions and values were assessed using the USACE New England Method as presented in *The Highway Methodology Workbook Supplement – Wetland Functions and Values; A Descriptive Approach* (USACE, 1999). This method incorporates both wetland science and human judgement of values. Functions are self-sustaining properties of a wetland ecosystem that exist in the absence of society. They relate to the ecological significance of wetland properties without regard to subjective human values.

Values are benefits that derive from these functions and the physical characteristics associated with a wetland. The value of a specific wetland function, or combination thereof, is based on human judgement of the worth, merit, quality, or importance attributed to those functions. The Preferred Alternative will impact all types of wetland functions and values to some degree. Impacts to functions and values from the On-Site Improvements are summarized below from greatest to least impact. There are no Off-Site Compensatory Stormwater Quality Treatment wetland impacts. Function and value impacts were quantified by totaling the impact acreage of wetlands that provide each function and value.

The On-Site Improvements will permanently impact 36 wetlands, resulting in a total of 3.51 acres of wetland impact. Wetland functions that will be most impacted include nutrient removal (3.50 acres), sediment/toxicant retention (3.45 acres), groundwater discharge/recharge (3.40 acres), and floodflow alteration (3.31 acres). The wetlands that provide these functions include several small wetlands (<0.5 acres) situated in drainage areas or floodplains along the toe of roadway embankments, and a couple larger wetlands (>0.5 acres) located in abandoned stormwater facilities or along the fringes of in-line stormwater facilities. Due to their position in the landscape and the highly developed surrounding area, the majority of these wetlands provide nutrient/toxicant trapping that likely reduces the degradation of downstream water quality. Wetlands in the floodplain and/or that receive stormwater runoff from surrounding developed areas provide floodflow alteration functions by providing water retention and reducing downstream floodflows. Approximately 61 percent of the wetlands that provide these functions will be completely lost, while the remaining 39 percent will be partially impacted, with portions of the wetlands outside the Limits of Disturbance (LOD) that will continue to function following construction completion.

The On-Site Improvements will also permanently impact 2.92 acres of wetlands that provide a wildlife habitat function and 2.71 acres of wetlands that provide a sediment/shoreline stabilization function. Wetlands that provide wildlife habitat have a high degree of plant community structural diversity that provides habitat and food sources for various types of animals. Most of the wetlands being impacted that provide wildlife habitat consist of PEM wetlands (2.45 acres), while the remainder consist of PFO wetlands (0.47 acres). Wetlands with a sediment/shoreline stabilization function are located adjacent to stream channels and provide bank stabilization via dense herbaceous vegetation and/or tree roots. Most of the impacts to the sediment/shoreline stabilization function are less than 0.5 acres, except for Wetlands 25K (0.80 acres) and 26F (1.46 acres), which consist of larger PEM wetlands surrounding stream channels or in-line stormwater facilities.

On-Site Improvements will also have permanent impacts to production export (2.67 acres) and fish and shellfish habitat (2.46 acres) functions. Wetlands that provide production export produce food or usable products for living organisms. The majority of these wetlands are a mix of PFO and PEM wetlands that are dominated by native vegetation with a diverse plant community structure and large amounts of organic materials. Most of the wetlands with fish/shellfish habitat consist of fringe wetlands abutting small streams that provide very limited fish/shellfish habitat due to their shallow flows and small sizes. Wetland 25K is likely the only wetland that provides sufficient fish habitat due to its location around an open water feature. Wetland vegetation along the fringes of the pond provides in-stream habitat and cover for fish.

The On-Site Improvement impacts to wetland values include uniqueness/heritage (2.48 acres), visual quality/aesthetics (2.34 acres), recreation (1.55 acres), and education/scientific value (1.46 acres). A summary of the wetland function and value impacts from the On-Site Improvements and Off-Site Compensatory Stormwater Quality Treatment is included in **Table 3-2** on the following page. Information on the lost functions and values of each wetland feature is included in **Appendix C**.

Table 3-2: Wetland Function & Value Impact Summary

	Function/Value	On-Site Improvements		
		Function/Value Loss (AC)	Number of Wetlands with Function/Value Loss	Percentage of Wetlands with Function/Value Loss
Functions	Nutrient Removal	3.50	35	97
	Sediment/Toxicant Retention	3.45	34	94
	Groundwater Discharge/Recharge	3.40	33	92
	Floodflow Alteration	3.31	28	78
	Wildlife Habitat	2.92	21	58
	Sediment/Shoreline Stabilization	2.71	15	42
	Production Export	2.67	12	33
	Fish and Shellfish Habitat	2.46	9	25
Values	Uniqueness/Heritage	2.48	4	11
	Visual Quality/Aesthetics	2.34	5	14
	Recreation	1.55	3	8
	Education/Scientific Value	1.46	2	6
	Endangered Species Habitat	0.00	0	0

Note: The Preferred Alternative will permanently impact a total of 36 wetlands, resulting in 3.51 acres of impact.

3.4.2 Waterways

Waterway functions were assessed using the USACE's *Maryland Stream Mitigation Framework Version 1 (MSMF V.1) Draft Manual for Stream Impact and Stream Mitigation Calculation, 2022*. Waterway functions are inherently built into the USACE Stream Impact Calculator for each stream reach, via the stream quality score. The stream quality score is determined by an approved USACE Functional or Conditional Assessment Methodology (FCAM). Approved USACE FCAM's include the EPA's *Rapid Bioassessment Habitat* (RBH) for stream reaches less than 300 linear feet and the USFWS *Stream Functions Pyramid* Framework (SFPF) *Rapid Assessment* for stream reaches greater than 300 linear feet. Stream quality scores were calculated for existing reach conditions to determine the functional loss for each stream reach. For further details on mitigation requirement calculations under the MSMF, see **Section 4.1.1**. A summary on the RBH and SFPS methods is included below, followed by a summary on stream function impacts from the On-Site Improvements and the Off-Site Compensatory Stormwater Quality Treatment.

The RBH are separated into two different assessment types depending on the stream gradient. RBH high gradient assessments were completed for channels with slopes equal to or greater than two percent, and low gradient assessments were completed for channels with slopes less than two percent. Ten habitat parameters were scored individually on a scale from 0 to 20 for each stream reach. Habitat parameters scores of 0 to 5 represent poor conditions, 6 to 10 represent marginal conditions, 11 to 15 represent suboptimal conditions, and 16 to 20 represent optimal conditions. The habitat parameter scores were then added together and divided by the total possible score (200) to determine a stream quality score for each reach that ranges from 0 to 1. Existing habitat parameter scores were determined for each reach based on field reviews by a two-person team of environmental scientists.

The SFPF rates stream quality based on a hierarchy of five functional categories, including Level 1 – Hydrology, Level 2 – Hydraulics, Level 3 – Geomorphology, Level 4 – Physiochemical, and Level 5 – Biology. Within each category, specific measurement methods were used to quantify function-based assessment parameters. Stream conditions scores of 1 to 3 correspond to a "Not-Functioning" stream condition, scores between 4 and 7 correspond to a "Functioning-at-Risk" stream condition, and scores between 8 and 10 correspond to "Functioning" stream condition. The stream condition scores were then added together and divided by the total possible score (190) to determine a stream quality score for each reach that ranges from 0 to 1. Existing condition scores were determined for each reach based on field data collected by a two-person team consisting of a water resource engineer and environmental scientist.

The On-Site Improvements will impact 122 stream reaches with unique functional characteristics, resulting in a total of 29,584 linear feet of non-culverted stream impact. The RBH functional scores range from Poor to Optimal for most of the stream reaches, except for the epifaunal substrate and velocity depth diversity that range from Sub-optimal to Optimal. Most of the SFPF functional scores range from Not-Functioning to Functioning, except for flashiness, shelter for fish and benthic macroinvertebrates, and macroinvertebrate tolerance that range from Functioning-at-Risk to Functioning. Existing stream quality scores for the On-site Improvements range from 0.18 to 0.70.

The Off-Site Compensatory Stormwater Quality Treatment will permanently impact 3 non-culverted stream reaches, resulting in a total of 185 linear feet of stream impact. All of the RBH functional scores range from Poor to Optimal. None of the reaches were assessed with the SFPF due their small sizes of less than 300 liner feet in length. Existing stream quality scores for the Off-Site Compensatory Stormwater Quality Treatment range from 0.19 to 0.53.

The Preferred Alternative will permanently impact a total of 125 stream reaches, resulting in 29,769 linear feet of total non-culverted stream impact. The Preferred Alternative will impact all types of stream functions to some degree. Existing stream reaches have a wide range of functional scores, ranging from poor to optimal for RBH assessments and Not-Functioning to Functioning for SFPF assessments. Existing quality scores for the Preferred Alternative range from 0.18 to 0.70. Summaries of the existing stream function impact ranges for RBH and SFPF assessments are included in **Table 3-3** and **3-4** on the following page. Detailed tables of the existing condition quality scores for each stream reach are included in **Appendix G**.

Table 3-3: RBH Assessments – Stream Functions Impact Summary

Function	Total Possible Score	Existing Score Ranges		Combined Existing Score Ranges
		On-Site Improvements	Off-Site Compensatory Stormwater Quality Treatment	
Epifaunal Substrate	20	0-15	1-18	0-18
Embeddedness	20	0-19	2-18	0-19
Velocity/Depth Regime	20	0-15	1-16	0-16
Sediment Deposition	20	2-20	3-13	2-20
Channel Flow Status	20	0-20	2-11	0-20
Channel Alteration	20	0-19	4-15	0-19
Frequency of Riffles	20	0-20	2-7	0-20
Bank Stability	20	1-20	5-10	1-20
Vegetative Protection	20	0-16	4-6	0-16
Riparian Vegetative Zone	20	0-20	1-9	0-20

Table 3-4: SFPF Assessments – Stream Functions Impact Summary

Function	Total Possible Score	Existing Score Ranges
		On-Site Improvements
Concentrated Flow	10	2-8
Flashiness	10	2-7
Bank Height Ratio	10	1-10
Entrenchment	10	1-9
Floodplain Drainage	10	2-8
Vertical Stability Extent	10	2-9
Riparian Vegetation Zone*	20	4-18
Dominant Bank Erosion Rate Potential*	20	4-18
Lateral Stability	10	3-9
Shelter for Fish and Macros	10	2-7
Pool to pool spacing	10	1-9
Pool max depth	10	0-10
Water appearance	10	3-8
Detritus	10	3-8
Macroinvertebrate Presence	10	1-8
Macroinvertebrate Tolerance	10	1-6
Fish Presence	10	1-8

* Total possible score is out of 10 for each stream bank.

4 MITIGATION REQUIREMENTS

4.1 Determination of Mitigation Requirements

4.1.1 Maryland

Wetland mitigation requirements in Maryland were developed based on MDE's *Maryland Nontidal Wetland Mitigation Guidance, Second Edition January 2011*. MDE's standard replacement ratios were used to determine the amount of mitigation required based on the wetland impact type (forested, scrub-shrub, or emergent). Replacement ratios are expressed as a relationship between two numbers. The first number specifies the acreage to be mitigated and the second number specifies the acreage of wetlands being impacted. Forested and scrub-shrub wetlands have higher replacement ratios than emergent wetlands because it is more difficult and takes longer to successfully reproduce the functions of these types of wetlands.

Wetland mitigation requirements for the Preferred Alternative in Maryland are based on the following standard MDE replacement ratios.

- 2:1 – Forested wetland (PFO)
- 2:1 – Scrub-shrub wetland (PSS)
- 1:1 – Emergent wetland (PEM)

Stream mitigation requirements in Maryland were determined using the USACE's *Maryland Stream Mitigation Framework Version 1 (MSMF V.1) Draft Manual for Stream Impact and Stream Mitigation Calculation, 2022*. The MSMF Stream Impact Calculator was used to compute the functional feet of stream loss (stream mitigation requirement) for each temporary and permanent stream reach impact. The *Draft MSMF V.1* Stream Impact Calculator uses the length, quality and size of the existing and proposed stream conditions to determine the quantity of lost functional feet. In some cases, waterway impacts that were processed with the MSMF Stream Impact Calculator resulted in no loss in functional feet and thus did not require mitigation. Due to the large number of stream reaches and impact types, a geodatabase was created for the project that provides the same impact calculations and functional feet determinations as the *Draft MSMF V.1* Stream Impact Calculator excel spreadsheet. The existing condition stream assessments are discussed in further detail in **Section 3.4.2** and the framework for the proposed stream conditions is discussed below. For further details on the *Draft MSMF V.1* Stream Impact Calculator, see the *MSMF V.1 Draft Manual for Stream Impact and Stream Mitigation Calculation, 2022* included in **Appendix J**.

Proposed stream condition scores were determined based on the impact type. Six potential impact types were identified for the project that are discussed below.

1. **<u>Channel Filled or Placed in Culvert</u>**

The "Channel Filled or Placed in Culvert" impact type consists of open channels that will be placed in pipes for culvert augmentations or filled for construction. This impact type is considered a complete functional loss.

2. Scour Pool or Energy Dissipator

The "Scour Pool or Energy Dissipator" impact type consists of open channels typically located downstream of culvert outfalls that will be regraded and stabilized with rip-rap to create pre-formed scour pools that will dissipate concentrated flows. Rip-rap and/or other rock protection will be placed within the channel and along the banks for stabilization.

3. Hardened Channel

The "Hardened Channel" impact type consists of open channels that will be armored with rip-rap and/or other rock protection for stabilization. This impact type is typically located downstream of scour pools or energy dissipators. Rock protection will be placed along stream banks in areas with high shear stresses to minimize bank erosion and provide a stable transition from the scour pool to the downstream channel.

4. Relocated or Altered Channel

The "Relocated or Altered Channel" impact type consists of open channels that will be relocated or moved from their existing location for construction of the roadway expansion. This impact type typically occurs in areas where an existing stream is located near the proposed roadway and there is ample room to re-locate the channel within close proximity to its existing location. Re-located or altered channels will result in re-routing of existing channels but will not result in channel armoring. Channel sinuosity and morphology may be affected.

5. Temporary Impact for Construction or Maintenance of Stream Flow

The "Temporary Impact for Construction or Maintenance of Stream Flow" impact type consists of open channel sections that are located within the Limits of Disturbance (LOD) where no permanent in-stream work is proposed. While the stream will not be permanently impacted by construction, impacts to the riparian zone next to the channel may occur.

6. Segment under New or Extended Bridge

The "Segment under New or Extended Bridge" impact type consists of open channels located under new or extended bridges. The stream may be affected by bridge scour protection measures and the new or extended bridge will likely increase shading to the channel that will limit plant growth in the riparian zone.

Standardized proposed condition scoring systems were developed for each impact type under both assessment methods and are included in **Appendix H**. The systems rely on incorporating existing channel type, condition scoring, and flow status to determine a proposed condition score for each assessment metric. Many assessment metric scores could be automatically generated, however some assessment metrics required environmental scientists to review the individual impact location to develop a score.

To determine the stream mitigation requirement using the MSMF, each impacted stream reach with a unique assessment score was divided into sub-reaches based on the proposed impact type. Proposed condition scores were developed using the standardized protocols and applied to each sub-reach resulting in a proposed condition stream quality score. Final MSMF calculations were conducted on each sub-reach to determine the functional foot loss. In some cases, proposed condition quality improvements or length increases resulted in gain in functional feet for a sub-reach, however the scores for these sub-reaches were held at zero so these on-site improvements would not be considered mitigation for project impacts and subject to the requirements of the 2008 mitigation rule.

The Potomac River (Feature 22MM.S1 and 22MM_B) mitigation requirement was determined based on the footprint (square feet) of the proposed American Legion Bridge piers. Due to the localized impacts from the proposed bridge piers and large size of the river, it was determined by USACE Baltimore District that a mitigation requirement based on square feet of impacts was better suited than using the *Draft MSMF V.1* stream impact calculator that is based on linear feet of impacts. A similar equation to the *Draft MSMF V.1* was used to convert square feet of impact to functional feet of impact. The existing bridge piers will be completely removed and replaced with new bridge piers and therefore the square footage of impact was determined by subtracting the existing piers square footage from the proposed piers square footage. The square footage of impact was then divided by 14.78, which is equivalent to one functional foot based on the piedmont bankfull drainage curves, to convert square feet of impacts to functional feet of impacts. The functional foot of impact was then multiplied by the existing RBH stream quality score to calculate a raw functional foot value that was entered into the below equation to determine the stream losses (mitigation requirement) in functional feet. Details on the Potomac River (Feature 22M.S1 and 22MM_B) impacts and functional foot loss calculations are included in **Table F-2** in **Appendix F**.

*[Raw FF + (Raw FF * 30%)] * 1.55 = FF Mitigation Requirement*

SF of impact = SF of proposed bridge piers – SF of existing bridge piers
Raw FF = SF of impact/Piedmont bankfull curve conversion (14.78 SF)
30% = Site Sensitivity Rating of 3
1.55 = Mitigation Delay Adjustment Factor

4.1.2 Virginia

Wetland mitigation requirements for the Preferred Alternative in Virginia were determined based on replacement ratios in the Virginia Administrative Code (9VAC25-680-70). These standard replacement ratios were used to determine the amount of mitigation required based on the wetland type (forested, scrub-shrub, or emergent) being impacted. Replacement ratios are expressed as a relationship between two numbers. The first number specifies the acreage to be mitigated and the second number specifies the acreage of wetlands being impacted.

Wetland mitigation requirements for the Preferred Alternative in Virginia are based on the following Virginia Administrative Code replacement ratios.

- 2:1 – Forested wetland (PFO)
- 1.5:1 – Scrub-shrub wetland (PSS)
- 1:1 – Emergent wetland (PEM)

Stream mitigation requirements for the Preferred Alternative in Virginia are based on the Unified Stream Methodology (USM), which is an accepted method used by the USACE's regulatory program and VDEQ's Virginia Water Protection Permit (VWPP) Program. USM Stream Assessment Forms were used to calculate mitigation requirements for each impacted stream based on a combination of factors including the existing conditions of the channel (condition, buffers, instream habitat & channel alteration), the length of the reach being impacted, and the type of impact (severe, significant, moderate or negligible). The stream mitigation requirement for each impacted feature is calculated by using the following formula:

RCI x LF x IF = Required Mitigation (LF)

RCI = Reach Condition Index
LF = Impact Linear Footage
IF = Impact Factor

For additional information on the USM, see "*Unified Stream Methodology for Use in Virginia*", January, 2007.

4.2 Required Mitigation

In Maryland, wetland mitigation requirements were calculated separately for MDE and the USACE due to differences in jurisdictional resources. MDE mitigation requirements include 190,761 square feet (4.38 acres) of wetland mitigation and 7,400 functional feet of stream mitigation, and USACE mitigation requirements include 186,425 square feet (4.28 acres) of wetland mitigation and 7,511 functional feet of stream mitigation. The wetland and stream mitigation requirements for MDE and the USACE are displayed by resource type in **Tables A-1** through **A-4** in **Appendix A**. Detailed information on wetland feature impacts and required mitigation is included in **Appendix B**. A summary of the MSMF stream feature impacts and functional foot loss (required mitigation) by feature ID is included in **Appendix E** and details on each MSMF stream feature impact and required mitigation by feature ID and impact type are included in **Appendix F**. Details on the Potomac River (Feature 22M.S1 and 22MM_B) impacts and functional foot loss calculations are included in **Table F-2** in **Appendix F**. The stream assessment existing condition scores for each feature are included in **Appendix G** and the stream assessment proposed condition scores for each feature are included in **Appendix I**.

In Virginia, VDEQ and USACE mitigation requirements include 472 linear feet of riverine mitigation. There are no permanent wetland impacts or wetland mitigation requirements in Virginia. The riverine mitigation requirements for VDEQ and USACE are displayed by resource type in **Table A-5** in **Appendix A**. Detailed information on waterway feature impacts and required mitigation is include in **Appendix K**, and USM Stream Assessment Forms for each waterway impact are included in **Appendix L**.

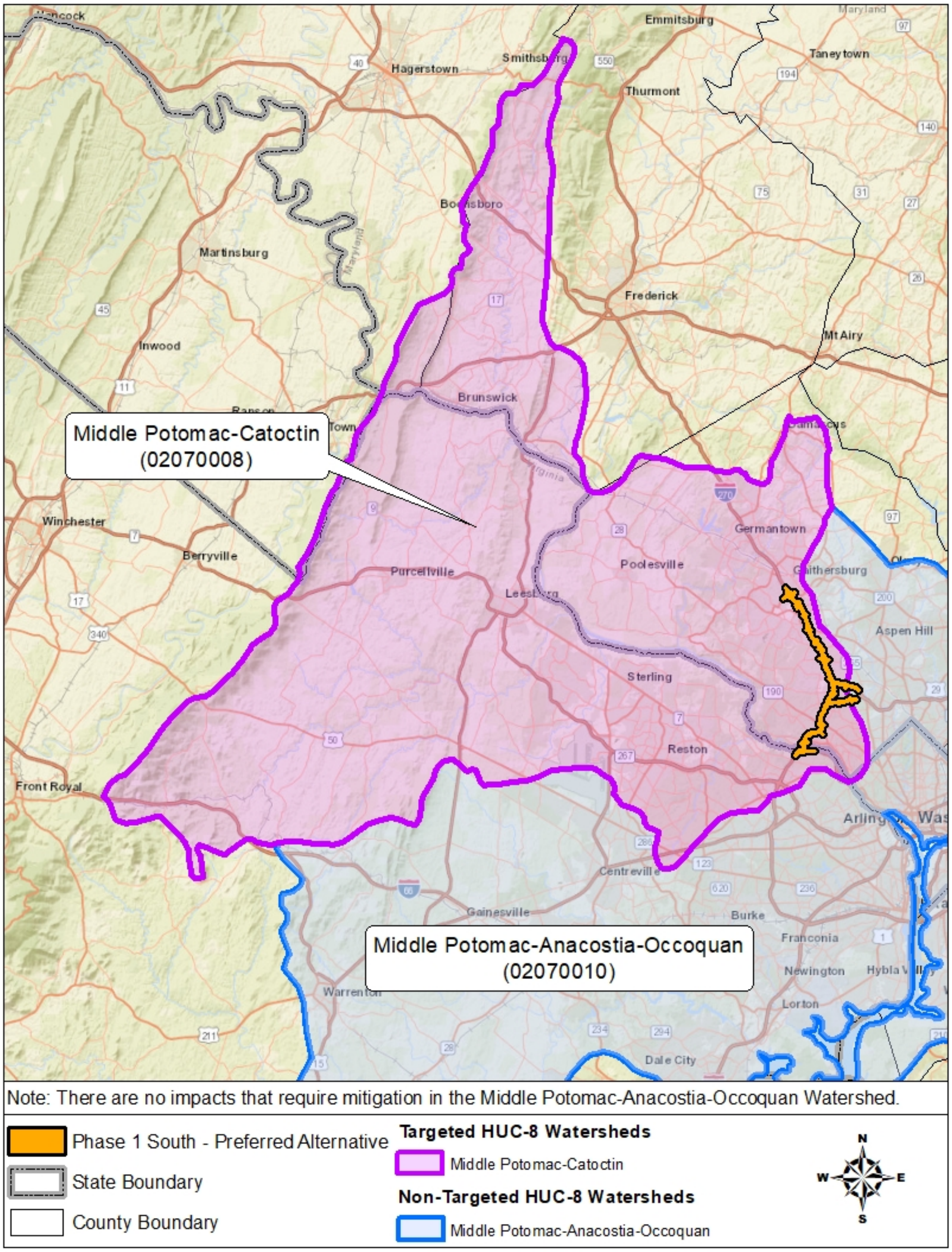
5 MITIGATION APPROACH

Mitigation opportunities for the Preferred Alternative were targeted within the Middle Potomac-Catoctin federal HUC-8 watershed (**Figure 5-1**). On-site wetland and stream mitigation was not proposed due to concerns with the potential failure of replacing functions and values adjacent to the proposed roadway expansion. Off-site mitigation options were pursued by state and watershed, based on the Federal Mitigation Rule hierarchy, beginning with mitigation banking and in-lieu fee programs, and followed by permittee-responsible mitigation. Available mitigation bank credits were identified in Virginia that will compensate for the proposed Virginia impacts. Opportunities for mitigation banks within an appropriate service area or in-lieu fee programs did not exist in Maryland until recently. One potential mitigation bank was recently identified in an appropriate service area that will have available credits in the summer of 2022. Due to the lack of mitigation bank credits and in-lieu fee programs in Maryland at the initiation of the project, permittee-responsible mitigation was pursued. A two-tiered approach was used to identify potential permittee-responsible mitigation that included a traditional mitigation site search on public lands and a Request for Proposals (RFP) on private lands. Any remaining mitigation credit requirements that are not fulfilled by the permittee-responsible mitigation sites will be satisfied by purchasing bank credits.

The following is a list of the potential mitigation types that were investigated for the Preferred Alternative:

- Mitigation Banking & In-lieu Fee Programs
- Traditional Mitigation Site Search on Public Lands
- Request for Proposals (RFP) on Private Lands

Figure 5-1: Federal HUC-8 Watersheds



5.1 Mitigation Banking & In-Lieu Fee Programs

5.1.1 Availability

Mitigation banking and in-lieu fee programs were pursued in Maryland and Virginia to compensate for unavoidable impacts from the Preferred Alternative. The following agencies and mitigation banking organizations were consulted: US Environmental Protection Agency (EPA), USACE, Ecotone, Inc., Montgomery County Department of Environmental Protection (MCDEP), and M-NCPPC. In Maryland, one potential mitigation bank known as the Even Flow Mitigation Bank under the Resource Environmental Solutions Maryland Umbrella Mitigation Banking Instrument (RES MD UMBI) was recently identified in the USACE's RIBITS database. The Middle Potomac-Catoctin HUC-8 watershed is a Secondary Service Area to the Even Flow Mitigation Bank. Stream and wetland mitigation credits from the bank will be available in the summer of 2022.

In Virginia, three potential mitigation banking sites were identified in the USACE's RIBITS database within the Middle Potomac-Catoctin watershed on March 31, 2022. A total of 14,673 linear feet of stream mitigation credits are available from these banks. The available mitigation banking credits exceed the 472 stream credits required for the Preferred Alternative. The three mitigation banks identified within the Middle Potomac-Catoctin watershed in Virginia are summarized in **Table 5-1**.

Table 5-1: Potential Virginia Mitigation Banking Sites

Mitigation Banking Site	Mitigation Permit Number	Riverine Mitigation Credits Available (LF)
Northern Virginia Stream	NAO-2007-3620	14,557
Rock Hedge	NAO-2008-2553	57
Red Hill Farm	NAO-2007-2803	59
Total		**14,673**

5.2 Permittee-Responsible Mitigation

A two-tiered approach was used to identify potential permittee-responsible mitigation sites for the off-site mitigation requirements in Maryland that included a traditional mitigation site search on public lands and a Request for Proposals (RFP) on private lands. The site selection process and results of the two approaches are discussed in the following sections.

5.2.1 Traditional Mitigation Site Search on Public Lands

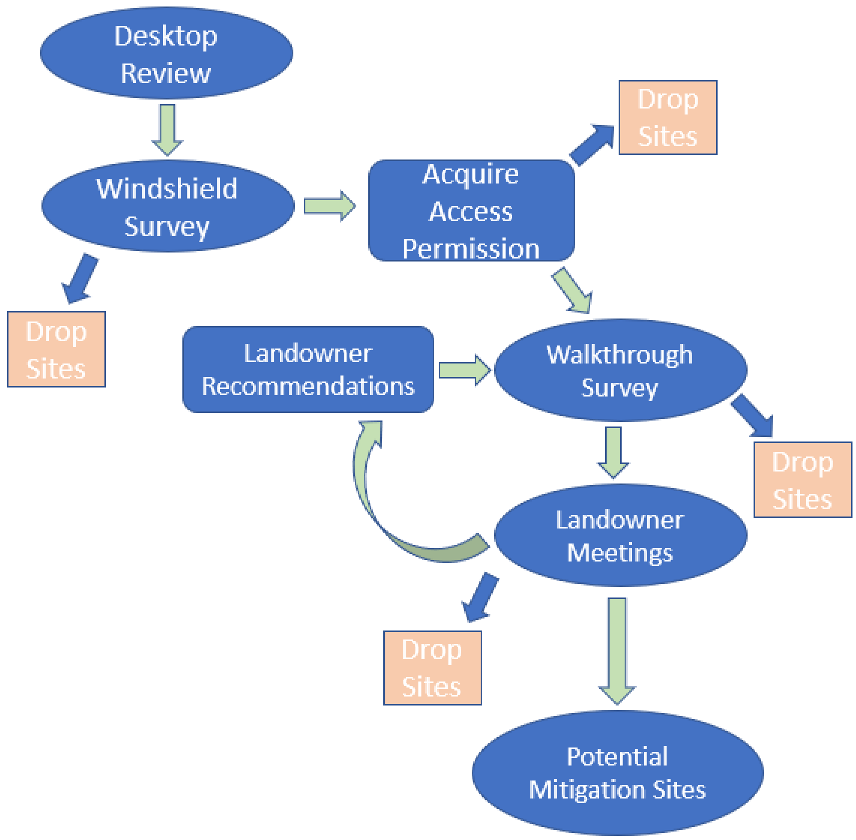
A. Site Search

The traditional mitigation site search focused on potential stream, wetland, and fish passage mitigation sites on public lands within the Middle Potomac-Catoctin watershed. The traditional mitigation site search process occurred in the following five stages.

1. Desktop Review
2. Windshield Survey
3. Walkthrough Survey
4. Landowner Meetings
5. Potential Mitigation Site Selection

The process for the traditional mitigation site search and selection is illustrated in **Figure 5-2** below. A more detailed discussion on each of the five stages of the process follows.

Figure 5-2: Traditional Mitigation Site Selection Process



Stage 1 – Desktop Review

The first stage of the traditional mitigation site selection process consisted of a desktop review of the MDOT SHA Environmental Program Division's (EPD) Master Site Selection geodatabase, which includes a compiled database of sites identified in the Water Resources Registry (WRR), state-wide TMDL program, and numerous watershed assessments, along with sites submitted by consultants identified through GIS analysis and from previous site searches and outreach coordination. All sites within the database were evaluated in accordance with the draft 2015 MDOT/SHA Site Selection Process Document. A list of potential fish passage sites located within MDOT SHA right-of-way (ROW) was also compiled from the Chesapeake Fish Passage Prioritization (CFPP) and North Atlantic Aquatic Connectivity Collaborative (NAACC) databases.

Stage 2 – Windshield Survey

A windshield survey was conducted for all wetland and stream sites identified in the desktop review. The windshield survey for stream and wetland sites consisted of reviewing sites on public land from the road ROW to determine their feasibility and potential for ecological uplift. Sites with constructability or feasibility constraints (i.e., steep slopes, utilities, limited access, private properties, etc.) and/or had limited potential for ecological uplift (i.e., stable conditions, ephemeral channels, high position in landscape, existing restoration, etc.) were removed from consideration. A windshield survey was not conducted for fish passage sites due to their location within the state road ROW that allowed for direct access to the sites for a walkthrough survey.

Stage 3 – Walkthrough Survey

Permission to access all sites retained from the windshield survey was then requested from public landowners for a more detailed walkthrough survey. All sites that were granted access were rated by a team of environmental scientists and water resource engineers using MDOT SHA's Mitigation Field Assessment Forms. A similar assessment form was created for potential fish passage sites that includes criteria referenced from the NAACC and CFPP databases. All of the site assessment forms provide a quantitative means to assess and rank a site's mitigation potential based on feasibility, potential for ecological uplift, and associated construction impacts. The following criteria were rated in the site assessment form based on the mitigation type proposed at each site.

Wetland Site Criteria

1. Percentage of hydric soils
2. Hydrology connection to stream/wetlands
3. Evidence of flooding
4. Geomorphic position
5. Estimated cut to wetland hydrology
6. Vegetation cover type
7. Land use
8. Contiguous wetland/upland habitat value
9. Ease of access
10. Presence of utilities

Stream Site Criteria

1. Percentage of bank erosion
2. Degree of channel incision
3. Existing floodplain access
4. Opportunity for floodplain development
5. Drainage Area Evaluation
6. Vegetation cover type
7. Land Use
8. Opportunity for Ecological Lift
9. Ease of Access
10. Presence of utilities

Fish Passage Site Criteria

1. Functional upstream network
2. Number of downstream fish blockages
3. NAACC diadromous fish HUC 12 watershed score
4. Percentage of upstream impervious surface
5. Fish habitat diversity
6. Fish blockage height
7. Adjacent land use
8. Ease of construction
9. Ease of Access
10. Presence of utilities

Each criterion was scored on a scale from 1-10, with 1 representing the lowest rating and 10 representing the highest rating. The scores for each criterion were then combined for a total score for each site out of 100. The potential acreage or linear feet of mitigation credit was also estimated for each site and included on the site assessment form. Photographs were taken at representative locations of the sites. Upon completion of the field site assessments, the results from all the sites were compared to identify sites with the greatest potential for overall ecological uplift and construction feasibility. Sites that had limited potential for ecological uplift, mitigation credit, or construction feasibility were removed from consideration. Other criteria considered in the site selection included the proximity of the site to the proposed impacts, potential mitigation credits, long-term sustainability of the site, and their potential for replacement of functions and values lost by the proposed roadway improvements.

Stage 4 – Landowner Meetings

Meetings were held with public landowners to discuss sites with the greatest mitigation potential that were identified during the walkthrough survey. Landowners either agreed with the proposed site, requested the site be removed, or were unfamiliar with the site and requested a follow-up field meeting to review the site. Sites recommended for removal by the landowner were dropped from the Potential Mitigation Site List. Most landowners provided additional mitigation site recommendations located on their properties at these meetings. Sites provided by the landowners were evaluated with the same walkthrough survey procedures as the sites originally identified.

Stage 5 – Potential Mitigation Site Selection

Sites with the greatest mitigation potential that received preliminary approval from the landowners were included in the Potential Mitigation Site List that was presented to the agencies.

B. Results

A total of 9 wetland sites and 16 stream sites were identified in the desktop review of the Middle Potomac-Catoctin watershed and investigated during the windshield survey. Five fish passage sites were identified within the watershed during the desktop review that were investigated later during the walkthrough survey. Windshield survey results eliminated 5 wetland sites and 4 stream sites, and added one wetland site and two stream sites. Wetland sites were removed following the windshield survey for a variety of reasons including: high position in the landscape, extensive forest or high-quality wetlands, conflicts with existing land use, and lack of potential hydrology. Stream sites were removed from further investigations following the windshield survey due to stable channel conditions and ephemeral channels. Sites that were added during the windshield survey included unstable channels and open floodplain areas on public land located directly upstream or downstream of MDOT SHA database sites.

The initial walkthrough survey in the Middle Potomac-Catoctin watershed included a total of five wetland sites, 14 stream sites and 5 fish passage sites. Initial walkthrough survey results eliminated three wetland sites, 10 stream sites, and all 5 fish passage sites. Wetland sites removed following the initial walkthrough survey included sites with limited credit potential and those located in existing high-quality wetlands. Stream sites that were removed from further investigation following the initial walkthrough survey included sites with limited potential for ecological uplift and long-term sustainability, land use conflicts, limited credit potential, existing stream restoration, existing stable conditions, high-risk due to large watershed size, access challenges due to steep slopes, and sites with high quality natural resources such as mature forests and wetlands. All of the fish passage sites were removed following the initial walkthrough survey due to the following reasons: no blockages were identified, limited upstream credit potential, access/restoration required on private properties, or access challenges due to steep slopes.

Meetings with public landowners, including DNR, M-NCPPC Montgomery Parks, and MDOT SHA, were held to discuss good potential sites retained from the walkthrough survey. A total of two wetland sites, nine stream sites and zero fish passage sites were recommended by landowners or agencies and added to the walkthrough survey. One wetland site and four stream sites were removed from the potential mitigation site list at the request of the landowner due to existing or proposed stream restoration at the site, potential impacts to natural resources, or land use conflicts. Sites recommended by landowners were either retained or removed following the final walkthrough survey. Sites were removed for the following reasons: limited potential for ecological lift and long-term sustainability, limited credit potential, ephemeral nature of the channel, and access constraints. The final walkthrough survey resulted in the removal of one wetland site, eight stream sites, and zero fish passage sites. Three wetland sites, five stream sites, and zero fish passage site were identified in the traditional mitigation site search on public lands that were included in the Potential Mitigation Site List in Appendix H of the Draft CMP.

Results from the traditional mitigation site search on public lands in the Middle Potomac-Catoctin watershed are summarized in **Table 5-2.** A vicinity map and detailed site list of all the potential public mitigation sites that were investigated in the windshield and walkthrough surveys is included in Appendix F of the Draft CMP. The site list includes general information on sites including the property owner, location, length, field assessment score and reason for removing or retaining sites. Assessment forms for all of the walkthrough sites, which includes criteria rankings, site photographs, and maps, are included in Appendix E of the Draft CMP; and public landowner meeting minutes can be found in Appendix G of the Draft CMP. A vicinity map and list of sites with the greatest mitigation potential that were presented to the agencies is included in Appendix H of the Draft CMP.

Table 5-2: Traditional Mitigation Site Search Results

Watershed	Mitigation Type		Windshield Survey			Walkthrough Survey			Potential Sites
			Initial Sites	Removed Sites	Added Sites	Initial Sites	Removed Sites	Added Sites	
Middle Potomac-Catoctin	Wetland	Number of Sites	9	5	1	5	3	2	3
		AC	81.22	47.90	8.54	41.86	20.10	23.24	32.63
	Stream	Number of Sites	16	4	2	14	10	9	5
		LF	48,907	14,783	6,285	40,409	25,755	12,557	13,816
	Fish Passage	Number of Sites	NA	NA	NA	5	5	0	0

5.2.2 Request for Proposals (RFP) on Private Lands

A. Summary

MDOT SHA issued a Request for Proposals (RFP) for full delivery services to provide permittee-responsible stream and wetland mitigation credits on private lands to mitigate for unavoidable impacts associated with the DEIS Build Alternatives. The awarded providers are responsible for accomplishing mitigation through resource agency-approved mitigation practices including, but not limited to: stream restoration and wetland restoration, creation, and enhancement services. Providers are responsible for site selection, land acquisition, survey, design, agency mitigation site approval, permitting support, construction, monitoring and adaptive management, as well as any other services required to deliver successful mitigation to MDOT SHA to ensure USACE and MDE permit compliance.

The solicitation process was designed to leverage the growing natural resource credit market by requesting full delivery of mitigation credits from providers under a permittee-provided mitigation framework. MDOT SHA issued the request to provide mitigation credits on private property, which required Phase I Mitigation Plans along with other supporting documents as the response to the RFP. The providers were required to demonstrate that they possessed the financial, technical and administrative qualifications necessary to complete their projects and meet the MDE and USACE mitigation requirements. If it was determined that the provider did not possess these qualifications, or the proposed site did not meet the technical requirements, the site was removed from consideration.

The provider is responsible for submitting stream and wetland mitigation credits in two stages. The first stage, Preliminary Design and Preconstruction Services, includes all activities required to secure a MDE Phase II Mitigation Plan approval and a USACE Final Mitigation Plan approval. Stage 2, Credit Delivery Services, includes Final Design, right-of-way certification, construction and monitoring/maintenance of mitigation credits and will conclude with USACE and MDE determination of site success and release from monitoring/maintenance requirements.

MDOT SHA developed the RFP to allow for concise review of multiple sites from a single provider as well as single sites from multiple providers. For example, if a provider proposed two independent sites and MDOT SHA accepted both sites, the provider would enter into two stand-alone contracts with MDOT SHA. MDOT SHA reserves the right to enter into contracts with any provider deemed qualified and whose proposal are most advantageous to the State. MDOT SHA made multiple awards to secure the palustrine emergent (PEM), palustrine forested (PFO) / palustrine scrub-shrub (PSS), and stream mitigation credits for the DEIS Build Alternatives and entered into multiple contracts on a mitigation site basis with providers to achieve the desired mitigation credits requested through the RFP.

B. Results

The RFP was advertised on April 16, 2019, and responses from the proposers were due on July 17, 2019. A total of two combined stream/wetland mitigation sites were chosen by MDOT SHA in the Middle Potomac-Catoctin watershed based on the administrative qualifications. A summary of the proposed RFP mitigation site credits is displayed in **Table 5-3**. A vicinity map and list of the potential private and public sites is included in Appendix H of the Draft CMP.

Table 5-3: Potential RFP Mitigation Sites

Watershed	Sites	Potential Wetland Credit (AC)	Potential Stream Credit (LF)
Middle Potomac-Catoctin	2	9.92	11,776

5.2.3 Agency Coordination

Field meetings were conducted with MDE, USACE, DNR, USFWS, EPA and the potential mitigation site landowners in November and December of 2019 to review public and private sites included in the Potential Mitigation Site Vicinity Map and List in Appendix H of the Draft CMP. A total of eight mitigation sites were reviewed with the agencies in the Middle Potomac-Catoctin watershed, including four stream/wetland sites, three stream sites, and one wetland site. Meetings entailed walking the mitigation sites and discussing existing site conditions, site constructability, functional uplift potential, site constraints, and conceptual designs. Meeting minutes and attendee lists for each of the field meetings are included in Appendix I of the Draft CMP.

Following completion of the field reviews, a meeting was held with the USACE and MDE on January 10, 2020 to discuss all of the potential mitigation sites that were reviewed in the field and determine which sites had the greatest mitigation potential that should be included in the Phase I Mitigation Site List. Based on agency and landowner feedback, sites were revised, retained, or removed from consideration. Sites were removed due to limited functional uplift potential, site constraints, or lack of mitigation credit need in the watershed. Results from the meeting are included in the meeting minutes in Appendix I of the Draft CMP and documented in the "status" column of the Potential Mitigation Site List in Appendix H of the Draft CMP. Five potential mitigation sites in the Middle-Potomac Catoctin were included in the Phase I Mitigation Site List that are displayed in **Table 5-4** below.

Table 5-4: Phase I Mitigation Sites

Watershed	Site ID	Site Name	Mitigation Type
Middle Potomac-Catoctin	CA-2	Lower Magruder Branch	Stream & Wetland
	CA-3	Upper Magruder Branch	Stream & Wetland
	CA-5	Unnamed Tributary to Great Seneca Creek	Stream
	RFP-2	Cabin Branch	Stream & Wetland
	RFP-3	Tuscarora Creek	Stream & Wetland

Following development of the Draft CMP, the Tuscarora site (RFP-3) was removed from the mitigation package at the landowner's request, and the CA-2 and CA-3 sites were combined into one site (CA-2/3 – Magruder Branch) at the recommendation of M-NCPPC. After further refinement of the Preferred Alternative stream and wetland mitigation requirements, it was determined that the CA-2/3 (Magruder Branch) mitigation site would provide a large amount of excess mitigation credits. Due to the large excess of credits and lack of potential future MDOT SHA projects that could use the site for mitigation, the CA-

2/3 site was removed from the proposed permittee-responsible mitigation package. The remaining sites (CA-5 and RFP-2) were incorporated into the permittee-responsible mitigation package that is presented in **Section 6.1**. The remaining stream mitigation credit requirements that are not fulfilled by the permittee-responsible mitigation sites will be satisfied by purchasing credits from the Even Flow Mitigation Bank that is discussed in **Section 6.2**.

6 FINAL MITIGATION PACKAGE

In Maryland, wetland mitigation requirements were calculated separately for MDE and the USACE due to differences in jurisdictional resources. The Preferred Alternative MDE mitigation requirements include 190,761 square feet (4.38 acres) of wetland mitigation and 7,400 functional feet of stream mitigation, and USACE mitigation requirements include 186,425 square feet (4.28 acres) of wetland mitigation and 7,511 functional feet of stream mitigation. To meet the mitigation needs of the Preferred Alternative in Maryland, two permittee-responsible mitigation sites, CA-5 and RFP-2, and credit purchases from one mitigation bank, Even Flow Mitigation Bank, are proposed. The permittee-responsible mitigation sites will provide 201,262 square feet (4.61 acres) of wetland mitigation credit and 6,304 functional feet of stream mitigation credit. To meet the remaining stream mitigation credit requirements in Maryland, 1,207 functional feet of stream mitigation credits will be purchased from the Even Flow Mitigation Bank, resulting in a total of 7,511 functional feet of proposed stream mitigation credit for the Preferred Alternative in Maryland. Credits from the permittee-responsible mitigation sites will not be used for advance mitigation or off-site stormwater management. The proposed permittee-responsible mitigation sites are summarized below in **Section 6.1** and the proposed bank credit purchases are discussed in **Section 6.2**. A summary of the resource impacts, mitigation requirements, and proposed mitigation for MDE and the USACE is included in **Tables A-1** through **A-4** in **Appendix A**.

In Virginia, the VDEQ and USACE regulate the same jurisdictional resources, and therefore the same impact quantities are presented for each agency. The Preferred Alternative VDEQ and USACE mitigation requirements include 472 linear feet of riverine mitigation credits. There are no permanent wetland impacts or wetland mitigation requirements in Virginia. To meet the stream mitigation requirements of the Preferred Alternative in Virginia, 472 linear feet of riverine mitigation credits will be purchased from the Northern Virginia Stream Mitigation Bank. The proposed bank credit purchases are discussed in **Section 6.2** and a summary of the resource impacts, mitigation requirements, and proposed mitigation for VDEQ and USACE is included in **Table A-5** in **Appendix A**.

6.1 Proposed Permittee-Responsible Mitigation

6.1.1 Phase II Mitigation Sites

Two Phase II mitigation sites, CA-5 and RFP-2, are proposed to help meet the Preferred Alternative mitigation requirements in Maryland. The sites provide 201,262 square feet (4.61 acres) of wetland mitigation credit, and 6,304 functional feet of stream mitigation credit that meet the MDE and USACE mitigation requirements. Proposed stream mitigation credits were determined for each site based on the USACE's *Maryland Stream Mitigation Framework Version 1 (MSMF V.1) Draft Manual for Stream Impact and Stream Mitigation Calculation, 2022*. Proposed wetland mitigation credits were determined based on MDE's *Typical Nontidal Wetland Mitigation Credit Values Using Ratio Method, June 3, 2021*. Permanent wetland impacts resulting from the mitigation sites will be mitigated on-site based on guidance from MDE. Details on the total available credits for each of the sites, and the proposed credits for the Preferred Alternative are included in **Table 6-1** on the following page, and a vicinity map of the sites is included in **Appendix O**. Meeting minutes from the design coordination with the regulatory agencies and landowners are included in **Appendix N** and Phase II Mitigation Plans for each of the sites are included in **Appendix P**. The replacement of functions and values that are lost due to the Preferred Alternative are discussed in

Section 6.1.2 and the 12 fundamental components of the Federal Mitigation Rule are discussed in **Section 6.1.3.**

Table 6-1: Phase II Mitigation Sites

Watershed	Site ID	Site Name	Mitigation Type & Credit Ratios	Proposed Credits for the Preferred Alternative		
				Wetlands		Streams
				SF	AC	FF
Middle Potomac-Catoctin	CA-5	Unnamed Tributary to Great Seneca Creek	Stream Restoration (FF)	-	-	721
	RFP-2	Cabin Branch	Stream Restoration (FF)	-	-	5,583
			Wetland Restoration (1:1)	190,793	4.38	-
			Wetland Enhancement (4:1)	653	0.01	-
			Wetland Buffer Enhancement (15:1)	7,115	0.16	-
			Riparian Buffer Enhancement (15:1)	2,701	0.06	-
Total				**201,262**	**4.61**	**6,304**

6.1.2 Replacement of Lost Functions & Values

Ecological functions and values that are lost due to the Preferred Alternative will be offset by the Phase II mitigation site function and value improvements. Function and value impacts were assessed for each wetland and waterway feature and are discussed in further detail in **Section 3.4**. A summary of the replacement of lost wetland functions and values is discussed below. The wetland function and value improvements for the Phase II mitigation site are discussed in further detail in the Phase II Mitigation Plans in **Appendix P**. Stream function impacts and requirements are inherently built into the USACE's *Draft Maryland Stream Mitigation Framework Version 1* (*MSMF V.1*) and are therefore not discussed below. A summary of the Preferred Alternative functional feet requirements and proposed mitigation is included in the **Section 6** introduction. To simplify reporting, wetland functional impact numbers discussed below represent the total number of features being impacted, regardless of jurisdiction.

The Preferred Alternative will permanently impact a total of 36 wetlands, resulting in 3.51 acres of total wetland impact. All of the wetlands that will be impacted provide some level of ecological function. Wetland functions with the greatest impact include nutrient removal (3.50 acres), sediment/toxicant retention (3.45 acres), groundwater discharge/recharge (3.40 acres), floodflow alteration (3.31 acres), and Wildlife Habitat (2.92 acres). Impacts to other functions and values range between 0.00 and 2.71 acres. The RFP-2 (Cabin Branch) mitigation site is proposed to off-set the Preferred Alternative wetland function and value impacts.

The RFP-2 (Cabin Branch) mitigation site consists of restoring a primary and several secondary channels within an abandoned golf course. The restored channels will be reconnected to the floodplain, where several man-made ponds will be filled and converted to PFO wetlands. Replacing the man-made ponds with forested floodplain wetlands will provide significant functional uplift to most of the functions and values that will be lost due to the Preferred Alternative. The proposed PFO restoration will provide 4.38 acres of improvements to nutrient removal, sediment/toxicant retention, groundwater discharge/recharge, floodflow alteration, wildlife habitat and several other functions and values.

The Preferred Alternative wetland function and value losses and the proposed mitigation site function and value gains are summarized by acreage in **Table 6-2**. The proposed acreage for most of the function and value improvements at the proposed mitigation sites exceed the acreage of the Preferred Alternative function and value impacts. See the Phase II Mitigation Plans in **Appendix P** for further details on the function and value improvements for the RFP-2 (Cabin Branch) mitigation site.

Table 6-2: Wetland Function & Value Replacement

	Function/Value	Preferred Alternative Function/Value Loss (AC)	RFP-2 (Cabin Branch) Function/Value Gain (AC)
Functions	Nutrient Removal	3.50	4.38
	Sediment/Toxicant Retention	3.45	4.38
	Groundwater Discharge/Recharge	3.40	4.38
	Floodflow Alteration	3.31	4.38
	Wildlife Habitat	2.92	4.38
	Sediment/Shoreline Stabilization	2.71	4.38
	Production Export	2.67	4.38
	Fish and Shellfish Habitat*	2.46	NA
Values	Uniqueness/Heritage	2.48	0.00
	Visual Quality/Aesthetics	2.34	4.38
	Recreation	1.55	4.38
	Education/Scientific Value	1.46	4.38
	Endangered Species Habitat	0.00	0.00

* Fish and Shellfish Habitat improvements are proposed as part of the stream restoration functional uplift at the RFP-2 Mitigation Site.

6.1.3 Twelve Mitigation Plan Components

In accordance with 33 CFR parts 325 and 332, and 40 CFR part 230 of the Federal Compensatory Mitigation Rule, the following section discusses the universal fundamental components that apply to the Phase II mitigation sites. Site-specific fundamental components (objectives, baseline information, determination of credits, mitigation work plan, maintenance plan, and monitoring requirements) are discussed in further detail in the Phase II Mitigation Design Plans in **Appendix P**.

1. **Project Objectives**

   Project objectives for the proposed mitigation sites are site specific and discussed in the Phase II Mitigation Plans in **Appendix P**.

2. **Site Selection**

   Site selection for public mitigation sites was based on the traditional mitigation site search that is discussed in **Section 5.2.1**. The private mitigation sites were selected based on MDOT SHA's RFP process that is summarized in **Section 5.2.2**.

3. **Site Protection Instrument**

   All of the proposed mitigation sites are either located on M-NCPPC property or will be deeded to M-NCPPC following construction completion. M-NCPPC Montgomery County mitigation sites are typically already considered protected by park policies and M-NCPPC does not encumber properties with deed restrictions on parkland mitigation sites. M-NCPPC mitigation sites will be protected in accordance with M-NCPPC Montgomery County's *Natural Resource Management Plan for Natural Areas in M-NCPPC Parkland in Montgomery County, Maryland*. This plan published in February 2013 requires preservation and conservation of natural areas and wetlands like the proposed mitigation sites.

   The proposed mitigation sites would be considered environmentally sensitive areas in the *Natural Resource Management Plan for Natural Areas in M-NCPPC Parkland in Montgomery County, Maryland* and are protected park resources. The following goals, visions and legal protection are identified in the plan.

   - M-NCPPC Montgomery County Mission: Protect and interpret our valuable natural and cultural resources; balance the demand for recreation with the need for conservation; offer a variety of enjoyable recreational activities that encourage healthy lifestyles; and provide clean, safe, and accessible places for leisure-time activities.
   - Goal 11 of the Vision 2030 Strategic Plan: Inventory, conserve, and enhance ecologically healthy and biologically diverse natural areas with a focus on Park Best Natural Areas, Biodiversity Areas, and Environmentally Sensitive Areas as defined in the Land Preservation, Parks, and Recreation Plan (M-NCPPC, 2005).
   - Environmental Guidelines for Management and Development in Montgomery County Parks: "…the Montgomery County General Plan and local area master plans articulate County-wide and planning area-wide goals, objectives, principles, and policies to protect sensitive areas from the adverse effects of development, as required by the Annotated Code of Maryland Article 66B…

4. **Baseline Information**

Baseline information for each mitigation site, including: wetland delineations, surveys, groundwater well data, etc. is included in the Phase II Mitigation Plans in **Appendix P**.

5. **Determination of Credits**

A detailed explanation of the mitigation credit requirements is included in **Section 4**. Mitigation credits provided by each of the proposed mitigation sites are summarized in **Section 6.1.1** and discussed in further detail in the Phase II Mitigation Plans in **Appendix P.**

6. **Mitigation Work Plan**

The Phase II Mitigation Plans for each site are included in **Appendix P**. The Phase II Mitigation Plans include the site geographical boundaries, construction methods, construction access, timing and sequence of construction, groundwater well data, access to hydrology/water source, planting specifications, elevations, and erosion and sediment control measures.

7. **Maintenance Plan**

The Section Developer will be responsible for all maintenance, monitoring, and remediation work at the Unnamed Tributary to Great Seneca Creek (CA-5) site until the site is deemed successful by the agencies and the landowner, at which time the site will be closed out and long-term management will become the responsibility of the landowner. The RFP-2 (Cabin Branch) site will be monitored separately by the RFP provider. All mitigation sites will be subject to regular inspections to determine the progress and continued viability of the project. The post-construction monitoring period for each of the sites is included in the Phase II Mitigation Design Plans in **Appendix P**. If remediation action is needed during the post-construction monitoring period, the Section Developer will be responsible for preparing a remediation plan for the CA-5 site and the RFP contractor will be responsible for preparing a remediation plan for the RFP-2 site that will be submitted for agency review and approval.

8. **Performance Standards**

Each mitigation site has its own ecologically based performance standards that are tied to site-specific objectives and values that are included in the Phase II Mitigation Plans in **Appendix P**. Performance standards for all of the wetland mitigation sites are in accordance with the *Performance Standards and Monitoring Protocol for Permittee-responsible Nontidal Wetland Mitigation Sites in Maryland*, October 30, 2020.

9. **Monitoring Requirements**

Mitigation sites will be monitored for up to ten years. If MDE and the USACE determines that the site is successful prior to year 10, monitoring may be abbreviated. If it is determined that the site is not meeting the performance standards during the monitoring period, an adaptive management plan will be developed, and remedial action will occur to ensure the success of the site. Specific monitoring requirements have been negotiated with the agencies and are included in the Phase II Mitigation Plans located in **Appendix P**. All sites that require wetland monitoring will be evaluated in accordance with the *Performance Standards and Monitoring Protocol for Permittee-responsible Nontidal Wetland Mitigation Sites*, October 30, 2020.

10. Long-term Management Plan

The landowner will be the responsible party for the long-term management of all the sites. Following the completion of monitoring, each site will be visited annually to assess the site's condition as it relates to invasive species presence, trespassing, vandalism, nuisance wildlife, erosion, and hydrology.

11. Adaptive Management Plan

The Adaptive Management Plan for the mitigation sites will include monitoring the site, analyzing the site for success and having contingencies in place for changes in site conditions to address deficiencies or changes in management strategies and objectives. If deficiencies are found, remedial action will occur, and additional monitoring will take place to ensure success. If the mitigation goals of the site are not being met, an Adaptive Management Plan will be developed to assess and remediate the problem. Depending on the problem, the plan could include various assessments such as:

- Adjustment of monitoring schedule based on site conditions,
- Additional hydrologic monitoring,
- Hydrologic adjustment,
- Invasive species treatment recommendations,
- Vegetation protective measures,
- Supplemental plantings,
- Soil amendments, and
- Animal control/protection (beaver/deer/Canada goose, etc.).

Once a site is assessed, the monitoring team will coordinate the findings with the designers and MDOT SHA and recommendations will be developed. The agencies will be informed of the assessment findings and the recommendations. If needed, an interagency meeting will be conducted with the regulatory agencies, landowners, and MDOT SHA to determine the best course of action.

12. Financial Assurance

MDOT SHA will be responsible for funding monitoring and any necessary remedial actions for the CA-5 (Unnamed Tributary to Great Seneca Creek) site. Private mitigation site monitoring will be funded by MDOT SHA; however, the awarded RFP contractors will be responsible for monitoring and any required remedial actions. On an annual basis MDOT SHA reviews its need for funding and includes costs associated with monitoring, management and remediation. The site's monitoring, maintenance, and management will be included in the annual review. A spreadsheet-based estimate outlining proposed financial assurance cost components with the financial assurances will be submitted to the USACE and MDE for each mitigation site under a separate cover for review and approval.

6.2 Proposed Mitigation Banking

In Maryland, the remaining stream mitigation requirement of 1,207 functional feet will be met by purchasing credits from the Even Flow Mitigation Bank under the Resource Environmental Solutions Maryland Umbrella Mitigation Banking Instrument (RES MD UMBI). The Middle Potomac-Catoctin HUC-8 watershed is a secondary service area to the Even Flow Mitigation Bank. Stream and wetland mitigation credits from the bank will be available in the summer of 2022. A letter from Resource Environmental Solutions, LLC (RES) confirming available credits at the Even Flow Mitigation Bank is included in **Appendix M**.

In Virginia, the mitigation requirement of 472 linear feet of riverine mitigation credits (1,328 stream condition units) will be met by purchasing credits from the Northern Virginia Stream Restoration Bank. A letter from Davey Mitigation confirming available credits at the Northern Virginia Stream Restoration Bank and a spreadsheet displaying the conversion of mitigation requirements from linear feet to stream condition units (SCUs) are included in **Appendix M**.

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APPENDIX A: MITIGATION SUMMARY TABLES

Table A-1. MDE Wetland Mitigation Summary

Watershed	Resource Type	Wetland Impacts*						Total Wetland Mitigation Requirement			Proposed Permittee-Responsible Wetland Mitigation		
		On-Site Improvements		Off-Site Compensatory Stormwater Management		Total							
		SF	AC	SF	AC	SF	AC	Replacement Ratio	SF	AC	Sites	SF	AC
Middle Potomac-Catoctin	PFO	37,346	0.86	-	-	37,346	0.86	2:1	74,692	1.72	**1**	**201,262**	**4.61**
	PSS	481	0.01	-	-	481	0.01	2:1	962	0.02			
	PEM	115,107	2.64	-	-	115,107	2.64	1:1	115,107	2.64			
	Total	**152,934**	**3.51**	**0**	**0.00**	**152,934**	**3.51**		**190,761**	**4.38**			

**Temporary wetland impacts not included.*

Table A-2 MDE Stream Mitigation Summary

Watershed	Resource Type	Stream Impacts*			Total Stream Mitigation Requirement		Proposed Permittee-Responsible Stream Mitigation		Proposed Even Flow Bank Mitigation	Total Proposed Stream Mitigation
		On-Site Improvements	Off-Site Compensatory Stormwater Management	Total						
		LF	LF	LF	Replacement Method	FF	Sites	FF	FF**	FF
Middle Potomac-Catoctin	Perennial	21,243	156	21,399	MSMF	6,703	**2**	**6,304**	**1,207**	**7,511**
	Intermittent	7,166	29	7,195		697				
	Total	**28,409**	**185**	**28,594**		**7,400**				

**Stream impacts do not include culverted streams.*

***The Middle Potomac-Catoctin watershed is a secondary service area for the Even Flow Mitigation Bank.*

Table A-3. USACE Maryland Wetland Mitigation Summary

Watershed	Resource Type	Wetland Impacts*						Total Wetland Mitigation Requirement			Proposed Permittee-Responsible Wetland Mitigation		
		On-Site Improvements		Off-Site Compensatory Stormwater Management		Total							
		SF	AC	SF	AC	SF	AC	Replacement Ratio	SF	AC	Sites	SF	AC
Middle Potomac-Catoctin	PFO	37,346	0.86	-	-	37,346	0.86	2:1	74,692	1.72	**1**	**201,262**	**4.61**
	PSS	481	0.01	-	-	481	0.01	2:1	962	0.02			
	PEM	110,771	2.54	-	-	110,771	2.54	1:1	110,771	2.54			
	Total	**148,598**	**3.41**	**0**	**0.00**	**148,598**	**3.41**		**186,425**	**4.28**			

**Temporary wetland impacts not included.*

Table A-4. USACE Maryland Stream Mitigation Summary

Watershed	Resource Type	Stream Impacts*			Total Stream Mitigation Requirement		Proposed Permittee-Responsible Stream Mitigation		Proposed Even Flow Bank Mitigation	Total Proposed Stream Mitigation
		On-Site Improvements	Off-Site Compensatory Stormwater Management	Total						
		LF	LF	LF	Replacement Method	FF	Sites	FF	FF**	FF
Middle Potomac-Catoctin	Perennial	21,243	156	21,399	MSMF	6,703	**2**	**6,304**	**1,207**	**7,511**
	Intermittent	7,166	29	7,195		697				
	Ephemeral	1,175	0	1,175		111				
	Total	**29,584**	**185**	**29,769**		**7,511**				

**Stream impacts do not include culverted streams.*

***The Middle Potomac-Catoctin watershed is a secondary service area for the Even Flow Mitigation Bank.*

Table A-5. VDEQ & USACE Virginia Riverine Mitigation Summary

Watershed	Resource Type	Stream Impacts	Riverine Mitigation Requirement		Proposed Northern Virginia Stream Restoration Bank Mitigation
		LF	Replacement Method	LF	LF
Middle Potomac-Catoctin	Perennial	0	USM	0	**472**
	Intermittent	913		452	
	Ephemeral	31		20	
	Total	**944**		**472**	

Note: There are no permanent wetland impacts or wetland mitigation requirements in Virginia.

APPENDIX B: MARYLAND WETLAND MITIGATION REQUIREMENT TABLE

Table B-1. Maryland Wetland Mitigation Requirements - On-Site Improvements

Feature ID	Classification	Replacement Ratio	Impact (SF)	MDE Jurisdiction	USACE Jurisdiction	MDE Required Mitigation (SF)	USACE Required Mitigation (SF)
21P	PFO	2:1	709	X	X	1,418	1,418
21T	PFO	2:1	1,054	X	X	2,108	2,108
22E	PEM	1:1	237	X	-	237	-
22F	PEM	1:1	928	X	X	928	928
22G	PFO	2:1	850	X	X	1,700	1,700
22GG	PEM	1:1	804	X	X	804	804
22OO	PFO	2:1	2,471	X	X	4,942	4,942
22PP	PFO	2:1	643	X	X	1,286	1,286
22U	PFO	2:1	1,007	X	X	2,014	2,014
22W	PEM	1:1	4,099	X	-	4,099	-
22X	PFO	2:1	1,120	X	X	2,240	2,240
22Y	PEM	1:1	1,791	X	X	1,791	1,791
23BB	PEM	1:1	1,406	X	X	1,406	1,406
23CC	PFO	2:1	2,985	X	X	5,970	5,970
23F	PEM	1:1	365	X	X	365	365
23GG	PFO	2:1	1,389	X	X	2,778	2,778
23L	PEM	1:1	253	X	X	253	253
23LL	PEM	1:1	570	X	X	570	570
23MM	PFO	2:1	2,932	X	X	5,864	5,864
23W	PEM	1:1	3,981	X	X	3,981	3,981
23X	PEM	1:1	1,039	X	X	1,039	1,039
24N	PFO	2:1	917	X	X	1,834	1,834
24Q	PFO	2:1	1,744	X	X	3,488	3,488
24X	PEM	1:1	91	X	X	91	91
25D	PFO	2:1	637	X	X	1,274	1,274
25K	PEM	1:1	34,215	X	X	34,215	34,215
25P	PFO	2:1	85	X	X	170	170
26A	PFO	2:1	12,406	X	X	24,812	24,812
26D	PEM	1:1	817	X	X	817	817
26E	PEM	1:1	356	X	X	356	356
26F	PEM	1:1	63,439	X	X	63,439	63,439
26H	PEM	1:1	10	X	X	10	10
27F	PFO	2:1	535	X	X	1,070	1,070
27G	PSS	2:1	481	X	X	962	962
27M	PFO	2:1	5,862	X	X	11,724	11,724
27Q	PEM	1:1	706	X	X	706	706
Total SF:			152,934			**190,761**	**186,425**
Total AC:			3.51			**4.38**	**4.28**

APPENDIX C: MARYLAND WETLAND FUNCTION & VALUE IMPACT TABLE

Table C-1. Wetland Function and Value Impacts - On-Site Improvements

Feature ID	Classification	Impacted Area (SF)	Impacted Area (AC)	Functions								Values					
				Nutrient Removal	Sediment/ Toxicant Retention	Groundwater Recharge / Discharge	Floodflow Alteration	Wildlife Habitat	Sediment/ Shoreline Stabilization	Production Export	Fish and Shellfish Habitat	Visual Quality/ Aesthetics	Uniqueness/ Heritage	Education/ Scientific Value	Recreation	Endangered Species Habitat	Other
Subsegment 20 – No wetlands identified																	
Subsegment 21																	
21P	PFO	709	0.02	X	X	X	X	X									
21T	PFO	1,054	0.02	X	X	X		X									
Subsegment 22																	
22E	PEM	237	<0.01	X	X	X											
22F	PEM	928	0.02	X	X	X											
22G	PFO	850	0.02	X	X	X	X										
22GG	PEM	804	0.02	X	X			X									
22OO	PFO	2,471	0.06	X				X		X							
22PP	PFO	643	0.01			X											
22U	PFO	1,007	0.02	X	X	X	X	X		X							
22W	PFO	4,099	0.09	X	X	X	X	X		X			X		X		
22X	PFO	1,120	0.03	X	X	X		X									
22Y	PEM	1,791	0.04	X	X			X									
Subsegment 23																	
23BB	PEM	1,406	0.03	X	X	X	X		X								
23CC	PFO	2,985	0.07	X	X	X	X		X	X	X						
23F	PEM/PFO	365	<0.01	X	X	X	X	X	X	X	X						
23GG	PFO	1,389	0.03	X	X	X	X										
23L	PEM	253	<0.01	X	X	X	X										
23LL	PEM	570	0.01	X	X	X	X	X									
23MM	PFO	2,932	0.07	X	X	X	X	X				X					
23W	PEM	3,981	0.09	X	X	X	X	X	X		X						
23X	PEM	1,039	0.02	X	X	X	X		X								
Subsegment 24																	
24N	PFO	917	0.02	X	X	X	X		X								
24Q	PFO	1,744	0.04	X	X	X	X		X								
24X	PEM	91	<0.01	X	X	X	X	X	X	X		X					
Subsegment 25																	
25D	PFO	637	0.01	X	X	X	X	X	X	X	X						
25K	PEM	34,215	0.80	X	X	X	X	X	X	X	X	X	X				
25P	PSS	85	<0.01	X	X	X	X	X									
Subsegment 26																	
26A	PEM	12,406	0.30	X	X	X	X										
26D	PEM	817	0.02	X	X	X	X										
26E	PEM	356	<0.01	X	X	X	X										
26F	PEM	63,439	1.46	X	X	X	X	X	X	X	X	X	X	X	X		
26H	PEM	10	<0.01	X	X	X	X	X	X	X	X	X		X	X		
Subsegment 27																	
27F	PFO	535	0.01	X	X	X	X	X	X	X	X						
27G	PSS	481	0.01	X	X	X	X										
27M	PFO	5,862	0.13	X	X	X	X	X	X	X			X				

Table C-1. Wetland Function and Value Impacts - On-Site Improvements

				Functions								Values					
Feature ID	Classification	Impacted Area (SF)	Impacted Area (AC)	Nutrient Removal	Sediment/ Toxicant Retention	Groundwater Recharge / Discharge	Floodflow Alteration	Wildlife Habitat	Sediment/ Shoreline Stabilization	Production Export	Fish and Shellfish Habitat	Visual Quality/ Aesthetics	Uniqueness/ Heritage	Education/ Scientific Value	Recreation	Endangered Species Habitat	Other
27Q	PEM	706	0.02	X	X	X	X	X	X		X						
Subsegment 28 - No wetlands identified																	
Subsegment 29 - No wetlands impacted																	

APPENDIX D: MARYLAND EXISTING CULVERT IMPACT TABLE

Table D-1. Maryland Existing Culvert Impact Table

Feature ID	Classification	Impact Length (LF)	Impact Plate No.	MDE Jurisdiction	USACE Jurisdiction	MDE Culvert Impacts (LF)	USACE Culvert Impacts (LF)
20C_C	Intermittent	169	25	X	X	169	169
20D_C	Perennial	180	25	X	X	180	180
21B_C	Perennial	261	8	X	X	261	261
21C_C	Perennial	252	7	X	X	252	252
21C_C1	Perennial	321	6	X	X	321	321
21C_C2	Perennial	328	6	X	X	328	328
21D_C	Intermittent	316	6	X	X	316	316
21D_C1	Intermittent	119	6	X	X	119	119
21F_C	Intermittent	258	6	X	X	258	258
21L_C	Perennial	270	7	X	X	270	270
22A_C	Intermittent	152	6	X	X	152	152
22C_C	Intermittent	91	6	X	X	91	91
22CC_C	Ephemeral	139	5	-	X	-	139
22H_C	Intermittent	95	5	X	X	95	95
22HH_C	Intermittent	114	3	X	X	114	114
22M_C	Perennial	39	3	X	X	39	39
22Q_C	Perennial	223	3	X	X	223	223
22Z_C	Perennial	99	5	X	X	99	99
23A_C	Perennial	216	10	X	X	216	216
23A_C1	Perennial	407	9, 10	X	X	407	407
23A_C2	Perennial	236	9	X	X	236	236
23AA_C	Perennial	101	9	X	X	101	101
23AA_C1	Perennial	220	9	X	X	220	220
23D_C	Intermittent	255	9	X	X	255	255
23K_C	Perennial	178	11	X	X	178	178
23K_C1	Perennial	84	11	X	X	84	84
23N_C	Intermittent	583	22	X	X	583	583
23Q_C	Perennial	203	24	X	X	203	203
23R_C	Intermittent	204	23	X	X	204	204
23U_C	Perennial	317	22	X	X	317	317
23V_C	Intermittent	777	10	X	X	777	777
24A_C	Perennial	320	11	X	X	320	320
24F_C1	Perennial	191	14	X	X	191	191
24F_C2	Perennial	390	13	X	X	390	390
24V_C	Intermittent	425	13	X	X	425	425
25H_C	Perennial	420	16	X	X	420	420
26B_C	Intermittent	306	17	X	X	306	306
26B_C1	Intermittent	47	17	X	X	47	47
26C_C	Intermittent	360	17	X	X	360	360
26C_C1	Intermittent	22	17	X	X	22	22
27A_C	Perennial	325	18	X	X	325	325
27A_C1	Perennial	152	18	X	X	152	152

Table D-1. Maryland Existing Culvert Impact Table

Feature ID	Classification	Impact Length (LF)	Impact Plate No.	MDE Jurisdiction	USACE Jurisdiction	MDE Culvert Impacts (LF)	USACE Culvert Impacts (LF)
27A_C2	Perennial	85	18	X	X	85	85
27L_C	Intermittent	405	19	X	X	405	405
29A_C	Perennial	48	20	X	X	48	48
29A_C1	Perennial	224	20	X	X	224	224
29A_C2	Perennial	465	20, 21	X	X	465	465
29B_C	Perennial	366	21	X	X	366	366
Total		**11,758**				**11,619**	**11,758**

APPENDIX E: MSMF IMPACT SUMMARY TABLES

Table E-1. Maryland Stream Mitigation Framework Impact Summary - On-Site Improvements

Feature ID	Stream Name	Classification	Assessment Type	Impact Length (LF)	Drainage Area (SQ Miles)	Existing Stream Quality	MDE Jurisdiction	USACE Jurisdiction	MDE Stream Losses in Functional Feet (FF required)	USACE Stream Losses in Functional Feet (FF required)
20B	UNT to Thomas Branch	Intermittent	RBH	83	0.1	0.21	X	X	-6.2	-6.2
20C	UNT to Thomas Branch	Perennial	RBH	37	0.1	0.62	X	X	-14.0	-14.0
20D	UNT to Thomas Branch	Perennial	SFPF	390	0.1	0.557895	X	X	0.0	0.0
20E	UNT to Thomas Branch	Intermittent	RBH	47	0.1	0.235	X	X	0.0	0.0
21B	UNT to Thomas Branch	Perennial	SFPF	1,836	0.2	0.505263	X	X	-413.9	-413.9
21C	Thomas Branch	Perennial	SFPF	5,539	1.6	0.510526	X	X	-3,684.4	-3,684.4
21C_1	Thomas Branch	Perennial	SFPF	2,132	2	0.457895	X	X	-178.3	-178.3
21C_2	Thomas Branch	Perennial	SFPF	1,233	2.2	0.363158	X	X	-944.0	-944.0
21D	UNT to Thomas Branch	Intermittent	RBH	106	0.1	0.595	X	X	-40.3	-40.3
21D_1.S1	UNT to Thomas Branch	Intermittent	RBH	172	0.1	0.41	X	X	-45.0	-45.0
21D_1.S2	UNT to Thomas Branch	Intermittent	RBH	119	0.1	0.395	X	X	-29.5	-29.5
21F	UNT to Thomas Branch	Intermittent	RBH	228	0.1	0.18	X	X	-7.8	-7.8
21G	UNT to Thomas Branch	Intermittent	RBH	54	0.1	0.365	X	X	-12.4	-12.4
21H	UNT to Thomas Branch	Ephemeral	RBH	61	0.1	0.345	-	X	-	-4.7
21I	UNT to Thomas Branch	Perennial	RBH	6	0.1	0.515	X	X	-1.6	-1.6
21J	UNT to Thomas Branch	Perennial	RBH	13	0.3	0.5	X	X	-6.2	-6.2
21K	UNT to Thomas Branch	Intermittent	RBH	5	0.1	0.415	X	X	-1.6	-1.6

Table E-1. Maryland Stream Mitigation Framework Impact Summary - On-Site Improvements

Feature ID	Stream Name	Classification	Assessment Type	Impact Length (LF)	Drainage Area (SQ Miles)	Existing Stream Quality	MDE Jurisdiction	USACE Jurisdiction	MDE Stream Losses in Functional Feet (FF required)	USACE Stream Losses in Functional Feet (FF required)
21L_D	UNT to Thomas Branch	Perennial	RBH	40	0.1	0.52	X	X	-7.8	-7.8
21L_D1	UNT to Thomas Branch	Perennial	RBH	20	0.1	0.57	X	X	-7.8	-7.8
21M	UNT to Thomas Branch	Intermittent	RBH	25	0.1	0.29	X	X	-4.7	-4.7
21U	UNT to Thomas Branch	Perennial	RBH	143	0.1	0.46	X	X	-32.6	-32.6
21V	UNT to Thomas Branch	Intermittent	RBH	125	0.1	0.54	X	X	-32.6	-32.6
22A	UNT to Cabin John Creek	Intermittent	RBH	269	0.1	0.53	X	X	-89.9	-89.9
22AA	Cabin John Creek	Perennial	RBH	182	19.9	0.66	X	X	-3.1	-3.1
22AA_1	Cabin John Creek	Perennial	RBH	77	20.3	0.45	X	X	0.0	0.0
22AA_2	Cabin John Creek	Perennial	RBH	99	20.3	0.545	X	X	-37.5	-37.5
22AA_3	Cabin John Creek	Perennial	RBH	332	20.3	0.43	X	X	-88.2	-88.2
22AA_B	Cabin John Creek	Perennial	RBH	42	20.3	0.34	X	X	0.0	0.0
22AA_B1	Cabin John Creek	Perennial	RBH	201	20.3	0.355	X	X	0.0	0.0
22B	UNT to Cabin John Creek	Intermittent	RBH	36	0.1	0.39	X	X	-9.3	-9.3
22BB	UNT to Cabin John Creek	Ephemeral	RBH	24	0.1	0.33	-	X	-	-5.1
22C	UNT to Cabin John Creek	Intermittent	RBH	51	0.1	0.61	X	X	-20.2	-20.2
22CC	UNT to Cabin John Creek	Ephemeral	SFPF	457	0.1	0.33	-	X	-	-51.2
22CC_1	UNT to Cabin John Creek	Ephemeral	RBH	184	0.1	0.245	-	X	-	-1.7
22D	UNT to Cabin John Creek	Intermittent	RBH	144	0.1	0.33	X	X	0.0	0.0

Table E-1. Maryland Stream Mitigation Framework Impact Summary - On-Site Improvements

Feature ID	Stream Name	Classification	Assessment Type	Impact Length (LF)	Drainage Area (SQ Miles)	Existing Stream Quality	MDE Jurisdiction	USACE Jurisdiction	MDE Stream Losses in Functional Feet (FF required)	USACE Stream Losses in Functional Feet (FF required)
22DD.S1	UNT to Cabin John Creek	Intermittent	RBH	136	0.1	0.39	X	X	-1.7	-1.7
22DD.S2	UNT to Cabin John Creek	Intermittent	RBH	31	0.1	0.285	X	X	0.0	0.0
22EE	UNT to Cabin John Creek	Ephemeral	RBH	126	0.1	0.305	-	X	-	-20.5
22FF	UNT to Potomac River	Ephemeral	RBH	126	0.1	0.335	-	X	-	-28.2
22H	UNT to Cabin John Creek	Intermittent	RBH	78	0.1	0.395	X	X	-22.2	-22.2
22H_1	UNT to Cabin John Creek	Intermittent	RBH	10	0.1	0.395	X	X	-3.4	-3.4
22HH	UNT to Rock Run	Intermittent	RBH	230	0.1	0.345	X	X	-1.9	-1.9
22HH_1	UNT to Rock Run	Intermittent	RBH	154	0.1	0.345	X	X	0.0	0.0
22HH_2	UNT to Rock Run	Intermittent	RBH	117	0.1	0.3	X	X	0.0	0.0
22KK	UNT to Cabin John Creek	Perennial	RBH	58	0.1	0.49	X	X	0.0	0.0
22MM.S2	Potomac River	Perennial	SFPF	519	11560	0.494737	X	X	-92.7	-92.7
22NN	UNT to Potomac River	Intermittent	RBH	276	0.1	0.395	X	X	-22.2	-22.2
22NN_B	UNT to Potomac River	Intermittent	RBH	167	0.1	0.27	X	X	0.0	0.0
22P	UNT to Rock Run	Intermittent	RBH	10	0.1	0.585	X	X	0.0	0.0
22Q	UNT to Potomac River	Perennial	RBH	136	0.1	0.42	X	X	0.0	0.0
22QQ	UNT to Potomac River	Intermittent	RBH	106	0.1	0.285	X	X	-4.0	-4.0
22T	UNT to Rock Run	Intermittent	RBH	9	0.1	0.35	X	X	0.0	0.0
22T_1	UNT to Rock Run	Intermittent	RBH	35	0.1	0.35	X	X	-1.9	-1.9
22T_2	UNT to Rock Run	Intermittent	RBH	92	0.1	0.325	X	X	-3.7	-3.7
22T_B	UNT to Rock Run	Intermittent	RBH	153	0.1	0.27	X	X	0.0	0.0

Table E-1. Maryland Stream Mitigation Framework Impact Summary - On-Site Improvements

Feature ID	Stream Name	Classification	Assessment Type	Impact Length (LF)	Drainage Area (SQ Miles)	Existing Stream Quality	MDE Jurisdiction	USACE Jurisdiction	MDE Stream Losses in Functional Feet (FF required)	USACE Stream Losses in Functional Feet (FF required)
22T_B1	UNT to Rock Run	Intermittent	RBH	28	0.1	0.35	X	X	0.0	0.0
22V	UNT to Potomac River	Intermittent	RBH	76	0.1	0.355	X	X	-4.0	-4.0
22V_1	UNT to Potomac River	Intermittent	RBH	41	0.1	0.455	X	X	-4.0	-4.0
22V_2	UNT to Potomac River	Intermittent	RBH	255	0.1	0.405	X	X	-3.7	-3.7
22V_B	UNT to Potomac River	Intermittent	RBH	168	0.1	0.31	X	X	0.0	0.0
22V_B1	UNT to Potomac River	Intermittent	RBH	29	0.1	0.44	X	X	0.0	0.0
22Z	Booze Creek	Perennial	RBH	75	4.3	0.7	X	X	-3.7	-3.7
22Z_1	Booze Creek	Perennial	RBH	81	4.3	0.635	X	X	-1.7	-1.7
23A	Thomas Branch	Perennial	RBH	44	0.3	0.61	X	X	0.0	0.0
23A_1	Thomas Branch	Perennial	SFPF	454	0.3	0.436842	X	X	-10.9	-10.9
23A_2	Thomas Branch	Perennial	RBH	200	0.4	0.645	X	X	-24.8	-24.8
23A_3	Thomas Branch	Perennial	SFPF	473	0.8	0.447368	X	X	0.0	0.0
23A_3_D	Thomas Branch	Perennial	SFPF	987	0.8	0.336842	X	X	-272.8	-272.8
23AA	UNT to Thomas Branch	Perennial	SFPF	104	0.1	0.447368	X	X	-29.5	-29.5
23AA_1	UNT to Thomas Branch	Perennial	SFPF	257	0.1	0.447368	X	X	-32.6	-32.6
23D	UNT to Thomas Branch	Intermittent	SFPF	775	0.3	0.442105	X	X	-130.2	-130.2
23DD	UNT to Old Farm Creek	Intermittent	RBH	98	0.1	0.44	X	X	-27.9	-27.9
23K	UNT to Old Farm Creek	Perennial	SFPF	89	0.2	0.489474	X	X	-15.5	-15.5
23K_1	UNT to Old Farm Creek	Perennial	SFPF	102	0.2	0.489474	X	X	0.0	0.0

Table E-1. Maryland Stream Mitigation Framework Impact Summary - On-Site Improvements

Feature ID	Stream Name	Classification	Assessment Type	Impact Length (LF)	Drainage Area (SQ Miles)	Existing Stream Quality	MDE Jurisdiction	USACE Jurisdiction	MDE Stream Losses in Functional Feet (FF required)	USACE Stream Losses in Functional Feet (FF required)
23K_D	UNT to Old Farm Creek	Perennial	SFPF	699	0.3	0.452632	X	X	-275.9	-275.9
23M	UNT to Old Farm Creek	Ephemeral	RBH	8	0.1	0.43	-	X	-	0.0
23N.S1	UNT to Old Farm Creek	Intermittent	RBH	146	0.3	0.415	X	X	-6.2	-6.2
23N.S2	UNT to Old Farm Creek	Intermittent	RBH	53	0.3	0.585	X	X	0.0	0.0
23N_1.S2	UNT to Old Farm Creek	Perennial	RBH	184	0.3	0.585	X	X	-20.2	-20.2
23N_D	UNT to Old Farm Creek	Intermittent	RBH	33	0.1	0.605	X	X	0.0	0.0
23U	UNT to Old Farm Creek	Perennial	RBH	31	0.1	0.645	X	X	-10.9	-10.9
23U_1	UNT to Old Farm Creek	Perennial	RBH	18	0.1	0.305	X	X	-3.1	-3.1
23V	UNT to Old Farm Creek	Intermittent	RBH	51	0.1	0.45	X	X	-14.0	-14.0
24A	Old Farm Creek	Perennial	RBH	138	3.4	0.53	X	X	-4.7	-4.7
24A_1	Old Farm Creek	Perennial	RBH	224	3.4	0.455	X	X	-12.4	-12.4
24C	UNT to Cabin John Creek	Intermittent	RBH	44	0.1	0.365	X	X	0.0	0.0
24D	UNT to Cabin John Creek	Perennial	SFPF	697	0.1	0.368421	X	X	0.0	0.0
24F_2	Cabin John Creek	Perennial	RBH	135	2.7	0.59	X	X	-38.8	-38.8
24F_3	Cabin John Creek	Perennial	RBH	134	2.7	0.655	X	X	-79.1	-79.1
24K	UNT to Cabin John Creek	Intermittent	RBH	67	0.1	0.615	X	X	-4.7	-4.7
24V	UNT to Cabin John Creek	Intermittent	RBH	52	0.1	0.255	X	X	-6.2	-6.2

Table E-1. Maryland Stream Mitigation Framework Impact Summary - On-Site Improvements

Feature ID	Stream Name	Classification	Assessment Type	Impact Length (LF)	Drainage Area (SQ Miles)	Existing Stream Quality	MDE Jurisdiction	USACE Jurisdiction	MDE Stream Losses in Functional Feet (FF required)	USACE Stream Losses in Functional Feet (FF required)
25E	UNT to Cabin John Creek	Perennial	RBH	360	0.1	0.395	X	X	0.0	0.0
25F	UNT to Cabin John Creek	Ephemeral	RBH	141	0.1	0.335	-	X	-	0.0
25H	UNT to Cabin John Creek	Perennial	RBH	220	0.1	0.495	X	X	-27.9	-27.9
25H_1	UNT to Cabin John Creek	Perennial	RBH	336	0.1	0.435	X	X	-1.6	-1.6
25N	UNT to Cabin John Creek	Intermittent	RBH	72	0.1	0.47	X	X	-1.6	-1.6
26B	UNT to Watts Branch	Intermittent	SFPF	432	0.2	0.578947	X	X	0.0	0.0
26B_1	UNT to Watts Branch	Intermittent	RBH	22	0.2	0.395	X	X	0.0	0.0
26C	UNT to Watts Branch	Intermittent	SFPF	373	0.1	0.494737	X	X	0.0	0.0
26C_1	UNT to Watts Branch	Intermittent	RBH	30	0.2	0.405	X	X	0.0	0.0
26J	UNT to Watts Branch	Intermittent	RBH	31	0.1	0.545	X	X	0.0	0.0
26K	UNT to Watts Branch	Intermittent	SFPF	328	0.1	0.563158	X	X	0.0	0.0
26L	UNT to Watts Branch	Intermittent	RBH	11	0.1	0.32	X	X	0.0	0.0
27A	Watts Branch	Perennial	RBH	141	2.4	0.53	X	X	-1.6	-1.6
27A_1	Watts Branch	Perennial	RBH	648	2.5	0.58	X	X	-176.7	-176.7
27A_2	Watts Branch	Perennial	RBH	89	2.5	0.455	X	X	-1.6	-1.6
27A_3	Watts Branch	Perennial	RBH	131	2.5	0.455	X	X	-7.8	-7.8
27B	UNT to Watts Branch	Intermittent	RBH	46	0.1	0.245	X	X	0.0	0.0

Table E-1. Maryland Stream Mitigation Framework Impact Summary - On-Site Improvements

Feature ID	Stream Name	Classification	Assessment Type	Impact Length (LF)	Drainage Area (SQ Miles)	Existing Stream Quality	MDE Jurisdiction	USACE Jurisdiction	MDE Stream Losses in Functional Feet (FF required)	USACE Stream Losses in Functional Feet (FF required)
27C	UNT to Watts Branch	Ephemeral	RBH	6	0.1	0.35	-	X	-	0.0
27D	UNT to Watts Branch	Intermittent	RBH	162	0.1	0.395	X	X	-3.1	-3.1
27H	UNT to Watts Branch	Intermittent	RBH	35	2.5	0.44	X	X	-1.6	-1.6
27K	UNT to Watts Branch	Ephemeral	RBH	42	0.0029	0.335	-	X	-	0.0
27L	UNT to Watts Branch	Intermittent	RBH	19	0.1	0.365	X	X	-4.7	-4.7
27N	UNT to Watts Branch	Intermittent	RBH	19	0.1	0.36	X	X	0.0	0.0
27P	UNT to Watts Branch	Perennial	RBH	39	1.05	0.575	X	X	0.0	0.0
28B	UNT to Muddy Branch	Intermittent	RBH	354	0.4	0.28	X	X	-107.0	-107.0
29A	UNT to Muddy Branch	Perennial	RBH	169	0.4	0.465	X	X	0.0	0.0
29A_1	UNT to Muddy Branch	Perennial	RBH	26	0.1	0.365	X	X	-6.2	-6.2
29A_2	UNT to Muddy Branch	Perennial	RBH	280	0.4	0.355	X	X	0.0	0.0
29D_D	UNT to Muddy Branch	Intermittent	RBH	119	0.1	0.495	X	X	-6.2	-6.2
29K	UNT to Muddy Branch	Intermittent	RBH	129	0.1	0.585	X	X	-12.4	-12.4
Total				**28,941**					**-7,268.4**	**-7,379.7**

Table E-2. Maryland Stream Mitigation Framework Impact Summary - On-Site Improvements (Potomac River)

Feature ID	Stream Name	Classification	Impact Reach Length (LF)	Assessment Type	Increase in Pier Impact (SF)*	Existing Stream Quality	MDE Jurisdiction	USACE Jurisdiction	MDE Stream Losses in Functional Feet (FF required)	USACE Stream Losses in Functional Feet (FF required)
22MM.S1 and 22MM_B	Potomac River	Perennial	643	RBH	1,269	0.68	X	X	117.6	117.6
Total					1,269				**117.6**	**117.6**

*Potomac River impacts were calculated on a net fill basis. Existing pier footprint subtracted from the proposed pier footprint, measured in Square Feet. Square feet of impact were converted to functional feet using bankfull drainage curves for the piedmont where one functional foot is equivalent to approximately 14.78 square feet.

Table E-3. Maryland Stream Mitigation Framework Impact Summary - Off-Site Compensatory Stormwater Management

Feature ID	Stream Name	Classification	Assessment Type	Impact Length (LF)	Drainage Area (SQ Miles)	Existing Stream Quality	MDE Jurisdiction	USACE Jurisdiction	MDE Stream Losses in Functional Feet (FF required)	USACE Stream Losses in Functional Feet (FF required)
31OOO	UNT to Watts Branch	Intermittent	RBH	29	0.020	0.29	X	X	0	0
32L	Minnehaha Branch	Perennial	RBH	95	1.048	0.53	X	X	-5.1	-5.1
32M	UNT to Minnehaha Branch	Perennial	RBH	61	0.003	0.19	X	X	-8.5	-8.5
Total				185					**-13.6**	**-13.6**

APPENDIX F: MSMF DETAILED IMPACT TABLES

Table F-1. Maryland Stream Mitigation Framework Detailed Impacts - On-Site Improvements

Feature ID	Stream Name	Assessment Type	Physiographic Region	Impact Type or Activity	Resource Type	Impacted Reach Length (LF)	Existing Stream Quality	Proposed Stream Quality	Channel Thread	Drainage Area (SQ Miles)	Drainage Area Adjustment	PRE Raw Reach Functional Value	Proposed Raw Reach Functional Value	Raw Change in Value	Site Sensitivity	Site Sensitivity Adjustment	MDE Jurisdiction	USACE Jurisdiction	Stream Losses in Functional Feet
20B	UNT to Thomas Branch	RBH	Piedmont	Hardened Channel	Intermittent	20	0.21	0.255	Primary	0.1	0.40738	1.710997	2	0	0	0	X	X	0.0
20B	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	45	0.21	0	Primary	0.1	0.40738	3.849744	0	-4	0	0	X	X	-6.2
20B	UNT to Thomas Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	18	0.21	0.33	Primary	0.1	0.40738	1.539897	2	0	0	0	X	X	0.0
20C	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	37	0.62	0	Primary	0.1	0.40738	9.345304	0	-9	0	0	X	X	-14.0
20D	UNT to Thomas Branch	SFPF	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	390	0.557895	0.557895	Primary	0.1	0.40738	88.637372	89	0	0	0	X	X	0.0
20E	UNT to Thomas Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	14	0.235	0.31	Primary	0.1	0.40738	1.340281	2	0	0	0	X	X	0.0
20E	UNT to Thomas Branch	RBH	Piedmont	Hardened Channel	Intermittent	33	0.235	0.235	Primary	0.1	0.40738	3.159234	3	0	0	0	X	X	0.0
21B	UNT to Thomas Branch	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	941	0.505263	0	Primary	0.2	0.533828	253.81013	0	-254	0	0	X	X	-393.7
21B	UNT to Thomas Branch	SFPF	Piedmont	Scour Pool Energy Dissipator	Perennial	113	0.505263	0.552632	Primary	0.2	0.533828	30.478794	33	0	0	0	X	X	0.0
21B	UNT to Thomas Branch	SFPF	Piedmont	Hardened Channel	Perennial	170	0.505263	0.473684	Primary	0.2	0.533828	45.853052	43	-3	0	0	X	X	-4.7
21B	UNT to Thomas Branch	SFPF	Piedmont	Hardened Channel	Perennial	612	0.505263	0.473684	Primary	0.2	0.533828	165.07099	155	-10	0	0	X	X	-15.5
21C	Thomas Branch	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	3795	0.510526	0	Primary	1.6	1.201176	2327.2161	0	-2327	0	0	X	X	-3606.9
21C	Thomas Branch	SFPF	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	434	0.510526	0.510526	Primary	1.6	1.201176	266.14276	266	0	0	0	X	X	0.0
21C	Thomas Branch	SFPF	Piedmont	Scour Pool Energy Dissipator	Perennial	181	0.510526	0.515789	Primary	1.6	1.201176	110.99502	112	0	0	0	X	X	0.0
21C	Thomas Branch	SFPF	Piedmont	Hardened Channel	Perennial	1129	0.510526	0.473684	Primary	1.6	1.201176	692.33912	642	-50	0	0	X	X	-77.5
21C_1	Thomas Branch	SFPF	Piedmont	Hardened Channel	Perennial	1837	0.457895	0.447368	Primary	2	1.310393	1102.2408	1077	-25	0	0	X	X	-38.8
21C_1	Thomas Branch	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	150	0.457895	0	Primary	2	1.310393	90.003329	0	-90	0	0	X	X	-139.5
21C_1	Thomas Branch	SFPF	Piedmont	Scour Pool Energy Dissipator	Perennial	145	0.457895	0.457895	Primary	2	1.310393	87.003218	87	0	0	0	X	X	0.0
21C_2	Thomas Branch	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	1233	0.363158	0	Primary	2.2	1.360019	608.98054	0	-609	0	0	X	X	-944.0
21D	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	106	0.595	0	Primary	0.1	0.40738	25.693474	0	-26	0	0	X	X	-40.3
21D_1.S1	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	172	0.41	0	Primary	0.1	0.40738	28.728457	0	-29	0	0	X	X	-45.0
21D_1.S2	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	119	0.395	0	Primary	0.1	0.40738	19.14891	0	-19	0	0	X	X	-29.5
21F	UNT to Thomas Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	159	0.18	0.19	Primary	0.1	0.40738	11.659224	12	0	0	0	X	X	0.0
21F	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	69	0.18	0	Primary	0.1	0.40738	5.059663	0	-5	0	0	X	X	-7.8
21G	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	54	0.365	0	Primary	0.1	0.40738	8.029465	0	-8	0	0	X	X	-12.4
21H	UNT to Thomas Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Ephemeral	38	0.345	0.335	Primary	0.1	0.40738	5.340752	5	0	0	0	-	X	0.0
21H	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Ephemeral	23	0.345	0	Primary	0.1	0.40738	3.23256	0	-3	0	0	-	X	-4.7
21I	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	6	0.515	0	Primary	0.1	0.40738	1.258805	0	-1	0	0	X	X	-1.6
21J	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	13	0.5	0	Primary	0.3	0.625284	4.064346	0	-4	0	0	X	X	-6.2
21K	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	5	0.415	0	Primary	0.1	0.40738	0.845314	0	-1	0	0	X	X	-1.6
21L_D	UNT to Thomas Branch	RBH	Piedmont	Relocated or Altered Channel	Perennial	18	0.52	0.57	Primary	0.1	0.40738	3.813079	4	0	0	0	X	X	0.0
21L_D	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	22	0.52	0	Primary	0.1	0.40738	4.66043	0	-5	0	0	X	X	-7.8
21L_D1	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	20	0.57	0	Primary	0.1	0.40738	4.644135	0	-5	0	0	X	X	-7.8
21M	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	25	0.29	0	Primary	0.1	0.40738	2.953507	0	-3	0	0	X	X	-4.7
21U	UNT to Thomas Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	31	0.46	0.45	Primary	0.1	0.40738	5.809243	6	0	0	0	X	X	0.0
21U	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	112	0.46	0	Primary	0.1	0.40738	20.988232	0	-21	0	0	X	X	-32.6
21V	UNT to Thomas Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	30	0.54	0.54	Primary	0.1	0.40738	6.599556	7	0	0	0	X	X	0.0
21V	UNT to Thomas Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	95	0.54	0	Primary	0.1	0.40738	20.898594	0	-21	0	0	X	X	-32.6
22A	UNT to Cabin John Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	269	0.53	0	Primary	0.1	0.40738	58.080206	0	-58	0	0	X	X	-89.9
22AA	Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	182	0.66	0.655	Primary	19.9	2.45	294.294	292	-2	0	0	X	X	-3.1
22AA_1	Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	77	0.45	0.45	Primary	20.3	2.45	84.8925	85	0	1	0	X	X	0.0
22AA_2	Cabin John Creek	RBH	Piedmont	Segment is under a new or widened bridge, excludes existing bridges	Perennial	97	0.545	0.455	Primary	20.3	2.45	129.51925	108	-22	1	-2.2	X	X	-37.5
22AA_2	Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	2	0.545	0.545	Primary	20.3	2.45	2.6705	3	0	1	0	X	X	0.0
22AA_3	Cabin John Creek	RBH	Piedmont	Hardened Channel	Perennial	176	0.43	0.385	Primary	20.3	2.45	185.416	166	-19	2	-3.8	X	X	-35.3
22AA_3	Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	47	0.43	0.425	Primary	20.3	2.45	49.5145	49	-1	1	-0.1	X	X	-1.7
22AA_3	Cabin John Creek	RBH	Piedmont	Segment is under a new or widened bridge, excludes existing bridges	Perennial	109	0.43	0.32	Primary	20.3	2.45	114.8315	85	-30	1	-3	X	X	-51.2
22AA_B	Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	42	0.34	0.34	Primary	20.3	2.45	34.986	35	0	1	0	X	X	0.0
22AA_B1	Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	201	0.355	0.355	Primary	20.3	2.45	174.81975	175	0	1	0	X	X	0.0
22B	UNT to Cabin John Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	36	0.39	0	Primary	0.1	0.40738	5.719619	0	-6	0	0	X	X	-9.3
22BB	UNT to Cabin John Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Ephemeral	24	0.33	0	Primary	0.1	0.40738	3.22645	0	-3	1	-0.3	-	X	-5.1
22C	UNT to Cabin John Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	51	0.61	0	Primary	0.1	0.40738	12.6736	0	-13	0	0	X	X	-20.2
22CC	UNT to Cabin John Creek	SFPF	Piedmont	Temporary Impacts for Construction or Water Management	Ephemeral	149	0.33	0.33	Primary	0.1	0.40738	20.030875	20	0	1	0	-	X	0.0
22CC	UNT to Cabin John Creek	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Ephemeral	222	0.33	0	Primary	0.1	0.40738	29.844659	0	-30	1	-3	-	X	-51.2
22CC	UNT to Cabin John Creek	SFPF	Piedmont	Relocated or Altered Channel	Ephemeral	86	0.33	0.389	Primary	0.1	0.40738	11.561444	14	0	1	0	-	X	0.0
22CC_1	UNT to Cabin John Creek	RBH	Piedmont	Hardened Channel	Ephemeral	161	0.245	0.235	Primary	0.1	0.40738	16.069104	15	-1	1	-0.1	-	X	-1.7
22CC_1	UNT to Cabin John Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Ephemeral	23	0.245	0.325	Primary	0.1	0.40738	2.295586	3	0	1	0	-	X	0.0
22D	UNT to Cabin John Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	32	0.33	0.42	Primary	0.1	0.40738	4.301936	5	0	0	0	X	X	0.0
22D	UNT to Cabin John Creek	RBH	Piedmont	Hardened Channel	Intermittent	112	0.33	0.335	Primary	0.1	0.40738	15.056775	15	0	0	0	X	X	0.0

Table F-1. Maryland Stream Mitigation Framework Detailed Impacts - On-Site Improvements

Feature ID	Stream Name	Assessment Type	Physiographic Region	Impact Type or Activity	Resource Type	Impacted Reach Length (LF)	Existing Stream Quality	Proposed Stream Quality	Channel Thread	Drainage Area (SQ Miles)	Drainage Area Adjustment	PRE Raw Reach Functional Value	Proposed Raw Reach Functional Value	Raw Change in Value	Site Sensitivity	Site Sensitivity Adjustment	MDE Jurisdiction	USACE Jurisdiction	Stream Losses in Functional Feet
22DD.S1	UNT to Cabin John Creek	RBH	Piedmont	Hardened Channel	Intermittent	80	0.39	0.36	Primary	0.1	0.40738	12.710265	12	-1	1	-0.1	X	X	-1.7
22DD.S1	UNT to Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	41	0.39	0.395	Primary	0.1	0.40738	6.514011	7	0	1	0	X	X	0.0
22DD.S1	UNT to Cabin John Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	15	0.39	0.425	Primary	0.1	0.40738	2.383175	3	0	1	0	X	X	0.0
22DD.S2	UNT to Cabin John Creek	RBH	Piedmont	Hardened Channel	Intermittent	31	0.285	0.285	Primary	0.1	0.40738	3.599205	4	0	1	0	X	X	0.0
22EE	UNT to Cabin John Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Ephemeral	93	0.305	0	Primary	0.1	0.40738	11.555334	0	-12	1	-1.2	-	X	-20.5
22EE	UNT to Cabin John Creek	RBH	Piedmont	Relocated or Altered Channel	Ephemeral	33	0.305	0.42	Primary	0.1	0.40738	4.10028	6	0	1	0	-	X	0.0
22FF	UNT to Potomac River	RBH	Piedmont	Channel is Filled or Placed in Culvert	Ephemeral	95	0.335	0	Primary	0.1	0.40738	12.964869	0	-13	3	-3.9	-	X	-26.2
22FF	UNT to Potomac River	RBH	Piedmont	Scour Pool Energy Dissipator	Ephemeral	21	0.335	0.29	Primary	0.1	0.40738	2.865918	2	-1	3	-0.3	-	X	-2.0
22FF	UNT to Potomac River	RBH	Piedmont	Relocated or Altered Channel	Ephemeral	10	0.335	0.37	Primary	0.1	0.40738	1.364723	2	0	3	0	-	X	0.0
22H	UNT to Cabin John Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	78	0.395	0	Primary	0.1	0.40738	12.551386	0	-13	1	-1.3	X	X	-22.2
22H_1	UNT to Cabin John Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	10	0.395	0	Primary	0.1	0.40738	1.609152	0	-2	1	-0.2	X	X	-3.4
22HH	UNT to Rock Run	RBH	Piedmont	Hardened Channel	Intermittent	185	0.345	0.35	Primary	0.1	0.40738	26.001046	26	0	3	0	X	X	0.0
22HH	UNT to Rock Run	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	5	0.345	0	Primary	0.1	0.40738	0.702731	0	-1	2	-0.2	X	X	-1.9
22HH	UNT to Rock Run	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	40	0.345	0.39	Primary	0.1	0.40738	5.621848	6	0	2	0	X	X	0.0
22HH_1	UNT to Rock Run	RBH	Piedmont	Hardened Channel	Intermittent	113	0.345	0.34	Primary	0.1	0.40738	15.88172	16	0	2	0	X	X	0.0
22HH_1	UNT to Rock Run	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	41	0.345	0.39	Primary	0.1	0.40738	5.762394	7	0	3	0	X	X	0.0
22HH_2	UNT to Rock Run	RBH	Piedmont	Hardened Channel	Intermittent	117	0.3	0.325	Primary	0.1	0.40738	14.299048	15	0	2	0	X	X	0.0
22KK	UNT to Cabin John Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	36	0.49	0.505	Primary	0.1	0.40738	7.186188	7	0	2	0	X	X	0.0
22KK	UNT to Cabin John Creek	RBH	Piedmont	Relocated or Altered Channel	Perennial	22	0.49	0.565	Primary	0.1	0.40738	4.391559	5	0	2	0	X	X	0.0
22MM.S2	Potomac River	SFPF	Piedmont	Segment is under a new or widened bridge, excludes existing bridges	Perennial	323	0.494737	0.436842	Primary	11560	2.45	391.51	346	-46	3	-13.8	X	X	-92.7
22MM.S2	Potomac River	SFPF	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	196	0.494737	0.494737	Primary	11560	2.45	237.57263	238	0	3	0	X	X	0.0
22NN	UNT to Potomac River	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	50	0.395	0.395	Primary	0.1	0.40738	8.04576	8	0	3	0	X	X	0.0
22NN	UNT to Potomac River	RBH	Piedmont	Segment is under a new or widened bridge, excludes existing bridges	Intermittent	226	0.395	0.27	Primary	0.1	0.40738	36.366837	25	-11	3	-3.3	X	X	-22.2
22NN_B	UNT to Potomac River	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	167	0.27	0.27	Primary	0.1	0.40738	18.368777	18	0	3	0	X	X	0.0
22P	UNT to Rock Run	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	10	0.585	0.48	Primary	0.1	0.40738	2.383175	2	0	2	0	X	X	0.0
22Q	UNT to Potomac River	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	104	0.42	0.425	Primary	0.1	0.40738	17.794371	18	0	3	0	X	X	0.0
22Q	UNT to Potomac River	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	32	0.42	0.455	Primary	0.1	0.40738	5.475191	6	0	3	0	X	X	0.0
22QQ	UNT to Potomac River	RBH	Piedmont	Hardened Channel	Intermittent	72	0.285	0.315	Primary	0.1	0.40738	8.359443	9	0	3	0	X	X	0.0
22QQ	UNT to Potomac River	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	18	0.285	0.395	Primary	0.1	0.40738	2.089861	3	0	3	0	X	X	0.0
22QQ	UNT to Potomac River	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	16	0.285	0	Primary	0.1	0.40738	1.857654	0	-2	3	-0.6	X	X	-4.0
22T	UNT to Rock Run	RBH	Piedmont	Segment is under a new or widened bridge, excludes existing bridges	Intermittent	9	0.35	0.285	Primary	0.1	0.40738	1.283248	1	0	2	0	X	X	0.0
22T_1	UNT to Rock Run	RBH	Piedmont	Segment is under a new or widened bridge, excludes existing bridges	Intermittent	35	0.35	0.285	Primary	0.1	0.40738	4.990408	4	-1	2	-0.2	X	X	-1.9
22T_2	UNT to Rock Run	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	54	0.325	0.315	Primary	0.1	0.40738	7.149524	7	0	2	0	X	X	0.0
22T_2	UNT to Rock Run	RBH	Piedmont	Segment is under a new or widened bridge, excludes existing bridges	Intermittent	38	0.325	0.225	Primary	0.1	0.40738	5.031146	3	-2	2	-0.4	X	X	-3.7
22T_B	UNT to Rock Run	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	153	0.27	0.27	Primary	0.1	0.40738	16.828879	17	0	2	0	X	X	0.0
22T_B1	UNT to Rock Run	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	10	0.35	0.35	Primary	0.1	0.40738	1.425831	1	0	2	0	X	X	0.0
22T_B1	UNT to Rock Run	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	18	0.35	0.37	Primary	0.1	0.40738	2.566496	3	0	2	0	X	X	0.0
22V	UNT to Potomac River	RBH	Piedmont	Segment is under a new or widened bridge, excludes existing bridges	Intermittent	62	0.355	0.28	Primary	0.1	0.40738	8.96644	7	-2	3	-0.6	X	X	-4.0
22V	UNT to Potomac River	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	14	0.355	0.33	Primary	0.1	0.40738	2.02468	2	0	3	0	X	X	0.0
22V_1	UNT to Potomac River	RBH	Piedmont	Segment is under a new or widened bridge, excludes existing bridges	Intermittent	41	0.455	0.375	Primary	0.1	0.40738	7.599679	6	-2	3	-0.6	X	X	-4.0
22V_2	UNT to Potomac River	RBH	Piedmont	Segment is under a new or widened bridge, excludes existing bridges	Intermittent	55	0.405	0.32	Primary	0.1	0.40738	9.074396	7	-2	2	-0.4	X	X	-3.7
22V_2	UNT to Potomac River	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	200	0.405	0.41	Primary	0.1	0.40738	32.997803	33	0	2	0	X	X	0.0
22V_B	UNT to Potomac River	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	168	0.31	0.31	Primary	0.1	0.40738	21.216365	21	0	3	0	X	X	0.0
22V_B1	UNT to Potomac River	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	25	0.44	0.46	Primary	0.1	0.40738	4.481183	5	0	3	0	X	X	0.0
22V_B1	UNT to Potomac River	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	4	0.44	0.44	Primary	0.1	0.40738	0.716989	1	0	3	0	X	X	0.0
22Z	Booze Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	75	0.7	0.69	Primary	4.3	2.45	128.625	127	-2	2	-0.4	X	X	-3.7
22Z_1	Booze Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	81	0.635	0.63	Primary	4.3	2.45	126.01575	125	-1	1	-0.1	X	X	-1.7
23A	Thomas Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	44	0.61	0.62	Primary	0.3	0.625284	16.78262	17	0	0	0	X	X	0.0
23A_1	Thomas Branch	SFPF	Piedmont	Hardened Channel	Perennial	364	0.436842	0.452632	Primary	0.3	0.625284	99.426732	103	0	0	0	X	X	0.0
23A_1	Thomas Branch	SFPF	Piedmont	Scour Pool Energy Dissipator	Perennial	63	0.436842	0.515789	Primary	0.3	0.625284	17.208473	20	0	0	0	X	X	0.0
23A_1	Thomas Branch	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	27	0.436842	0	Primary	0.3	0.625284	7.37506	0	-7	0	0	X	X	-10.9
23A_2	Thomas Branch	RBH	Piedmont	Hardened Channel	Perennial	128	0.645	0.515	Primary	0.4	0.699525	57.752805	46	-12	0	0	X	X	-18.6
23A_2	Thomas Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	72	0.645	0.55	Primary	0.4	0.699525	32.485953	28	-4	0	0	X	X	-6.2
23A_3	Thomas Branch	SFPF	Piedmont	Hardened Channel	Perennial	473	0.447368	0.484211	Primary	0.8	0.916653	193.96865	210	0	0	0	X	X	0.0
23A_3_D	Thomas Branch	SFPF	Piedmont	Hardened Channel	Perennial	355	0.336842	0.431579	Primary	0.8	0.916653	109.61243	140	0	0	0	X	X	0.0
23A_3_D	Thomas Branch	SFPF	Piedmont	Scour Pool Energy Dissipator	Perennial	63	0.336842	0.563158	Primary	0.8	0.916653	19.452347	33	0	0	0	X	X	0.0
23A_3_D	Thomas Branch	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	569	0.336842	0	Primary	0.8	0.916653	175.68866	0	-176	0	0	X	X	-272.8
23AA	UNT to Thomas Branch	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	104	0.447368	0	Primary	0.1	0.40738	18.953903	0	-19	0	0	X	X	-29.5

Table F-1. Maryland Stream Mitigation Framework Detailed Impacts - On-Site Improvements

Feature ID	Stream Name	Assessment Type	Physiographic Region	Impact Type or Activity	Resource Type	Impacted Reach Length (LF)	Existing Stream Quality	Proposed Stream Quality	Channel Thread	Drainage Area (SQ Miles)	Drainage Area Adjustment	PRE Raw Reach Functional Value	Proposed Raw Reach Functional Value	Raw Change in Value	Site Sensitivity	Site Sensitivity Adjustment	MDE Jurisdiction	USACE Jurisdiction	Stream Losses in Functional Feet
23AA_1	UNT to Thomas Branch	SFPF	Piedmont	Hardened Channel	Perennial	78	0.447368	0.489474	Primary	0.1	0.40738	14.215428	16	0	0	0	X	X	0.0
23AA_1	UNT to Thomas Branch	SFPF	Piedmont	Scour Pool Energy Dissipator	Perennial	63	0.447368	0.478947	Primary	0.1	0.40738	11.481692	12	0	0	0	X	X	0.0
23AA_1	UNT to Thomas Branch	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	116	0.447368	0	Primary	0.1	0.40738	21.140892	0	-21	0	0	X	X	-32.6
23D	UNT to Thomas Branch	SFPF	Piedmont	Hardened Channel	Intermittent	335	0.442105	0.442105	Primary	0.3	0.625284	92.607846	93	0	0	0	X	X	0.0
23D	UNT to Thomas Branch	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	305	0.442105	0	Primary	0.3	0.625284	84.314606	0	-84	0	0	X	X	-130.2
23D	UNT to Thomas Branch	SFPF	Piedmont	Scour Pool Energy Dissipator	Intermittent	135	0.442105	0.505263	Primary	0.3	0.625284	37.31958	43	0	0	0	X	X	0.0
23DD	UNT to Old Farm Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	98	0.44	0	Primary	0.1	0.40738	17.566238	0	-18	0	0	X	X	-27.9
23K	UNT to Old Farm Creek	SFPF	Piedmont	Relocated or Altered Channel	Perennial	49	0.489474	0.552632	Primary	0.2	0.533828	12.803453	14	0	0	0	X	X	0.0
23K	UNT to Old Farm Creek	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	40	0.489474	0	Primary	0.2	0.533828	10.451799	0	-10	0	0	X	X	-15.5
23K_1	UNT to Old Farm Creek	SFPF	Piedmont	Scour Pool Energy Dissipator	Perennial	18	0.489474	0.552632	Primary	0.2	0.533828	4.703309	5	0	0	0	X	X	0.0
23K_1	UNT to Old Farm Creek	SFPF	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	61	0.489474	0.489474	Primary	0.2	0.533828	15.938993	16	0	0	0	X	X	0.0
23K_1	UNT to Old Farm Creek	SFPF	Piedmont	Relocated or Altered Channel	Perennial	23	0.489474	0.589474	Primary	0.2	0.533828	6.009784	7	0	0	0	X	X	0.0
23K_D	UNT to Old Farm Creek	SFPF	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	26	0.452632	0.452632	Primary	0.3	0.625284	7.358605	7	0	0	0	X	X	0.0
23K_D	UNT to Old Farm Creek	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	630	0.452632	0	Primary	0.3	0.625284	178.30466	0	-178	0	0	X	X	-275.9
23K_D	UNT to Old Farm Creek	SFPF	Piedmont	Relocated or Altered Channel	Perennial	43	0.452632	0.468421	Primary	0.3	0.625284	12.17	13	0	0	0	X	X	0.0
23M	UNT to Old Farm Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Ephemeral	8	0.43	0.43	Primary	0.1	0.40738	1.401387	1	0	0	0	-	X	0.0
23N.S1	UNT to Old Farm Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	63	0.415	0.425	Primary	0.3	0.625284	16.348049	17	0	0	0	X	X	0.0
23N.S1	UNT to Old Farm Creek	RBH	Piedmont	Hardened Channel	Intermittent	83	0.415	0.345	Primary	0.3	0.625284	21.537906	18	-4	0	0	X	X	-6.2
23N.S2	UNT to Old Farm Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	53	0.585	0.58	Primary	0.3	0.625284	19.386929	19	0	0	0	X	X	0.0
23N_1.S2	UNT to Old Farm Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	35	0.585	0.495	Primary	0.3	0.625284	12.802689	11	-2	0	0	X	X	-3.1
23N_1.S2	UNT to Old Farm Creek	RBH	Piedmont	Hardened Channel	Perennial	149	0.585	0.475	Primary	0.3	0.625284	54.502877	44	-11	0	0	X	X	-17.1
23N_D	UNT to Old Farm Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	33	0.605	0.605	Primary	0.1	0.40738	8.133347	8	0	0	0	X	X	0.0
23U	UNT to Old Farm Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	10	0.645	0.53	Primary	0.1	0.40738	2.627603	2	-1	0	0	X	X	-1.6
23U	UNT to Old Farm Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	21	0.645	0	Primary	0.1	0.40738	5.517966	0	-6	0	0	X	X	-9.3
23U_1	UNT to Old Farm Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	18	0.305	0	Primary	0.1	0.40738	2.236518	0	-2	0	0	X	X	-3.1
23V	UNT to Old Farm Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	51	0.45	0	Primary	0.1	0.40738	9.349377	0	-9	0	0	X	X	-14.0
24A	Old Farm Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	138	0.53	0.515	Primary	3.4	1.611672	117.87772	115	-3	0	0	X	X	-4.7
24A_1	Old Farm Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	90	0.455	0.48	Primary	3.4	1.611672	65.997986	70	0	0	0	X	X	0.0
24A_1	Old Farm Creek	RBH	Piedmont	Hardened Channel	Perennial	134	0.455	0.415	Primary	3.4	1.611672	98.263668	90	-8	0	0	X	X	-12.4
24C	UNT to Cabin John Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	32	0.365	0.425	Primary	0.1	0.40738	4.758202	6	0	0	0	X	X	0.0
24C	UNT to Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	12	0.365	0.365	Primary	0.1	0.40738	1.784326	2	0	0	0	X	X	0.0
24D	UNT to Cabin John Creek	SFPF	Piedmont	Hardened Channel	Perennial	649	0.368421	0.384211	Primary	0.1	0.40738	97.406755	102	0	0	0	X	X	0.0
24D	UNT to Cabin John Creek	SFPF	Piedmont	Scour Pool Energy Dissipator	Perennial	45	0.368421	0.5	Primary	0.1	0.40738	6.753935	9	0	0	0	X	X	0.0
24D	UNT to Cabin John Creek	SFPF	Piedmont	Channel is Filled or Placed in Culvert	Perennial	3	0.368421	0	Primary	0.1	0.40738	0.450262	0	0	0	0	X	X	0.0
24F_2	Cabin John Creek	RBH	Piedmont	Hardened Channel	Perennial	135	0.59	0.465	Primary	2.7	1.473099	117.33232	92	-25	0	0	X	X	-38.8
24F_3	Cabin John Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	72	0.655	0.5	Primary	2.7	1.473099	69.471338	53	-16	0	0	X	X	-24.8
24F_3	Cabin John Creek	RBH	Piedmont	Hardened Channel	Perennial	37	0.655	0.465	Primary	2.7	1.473099	35.700549	25	-11	0	0	X	X	-17.1
24F_3	Cabin John Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	25	0.655	0	Primary	2.7	1.473099	24.121992	0	-24	0	0	X	X	-37.2
24K	UNT to Cabin John Creek	RBH	Piedmont	Hardened Channel	Intermittent	67	0.615	0.505	Primary	0.1	0.40738	16.786104	14	-3	0	0	X	X	-4.7
24V	UNT to Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	10	0.255	0.255	Primary	0.1	0.40738	1.03882	1	0	0	0	X	X	0.0
24V	UNT to Cabin John Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	42	0.255	0	Primary	0.1	0.40738	4.363043	0	-4	0	0	X	X	-6.2
25E	UNT to Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	360	0.395	0.395	Primary	0.1	0.40738	57.929476	58	0	0	0	X	X	0.0
25F	UNT to Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Ephemeral	141	0.335	0.335	Primary	0.1	0.40738	19.242594	19	0	0	0	-	X	0.0
25H	UNT to Cabin John Creek	RBH	Piedmont	Hardened Channel	Perennial	96	0.495	0.44	Primary	0.1	0.40738	19.358711	17	-2	0	0	X	X	-3.1
25H	UNT to Cabin John Creek	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	79	0.495	0	Primary	0.1	0.40738	15.930606	0	-16	0	0	X	X	-24.8
25H	UNT to Cabin John Creek	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	45	0.495	0.485	Primary	0.1	0.40738	9.074396	9	0	0	0	X	X	0.0
25H_1	UNT to Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	336	0.435	0.43	Primary	0.1	0.40738	59.542701	59	-1	0	0	X	X	-1.6
25N	UNT to Cabin John Creek	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	72	0.47	0.46	Primary	0.1	0.40738	13.785749	13	-1	0	0	X	X	-1.6
26B	UNT to Watts Branch	SFPF	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	432	0.578947	0.578947	Primary	0.2	0.533828	133.5133	134	0	0	0	X	X	0.0
26B_1	UNT to Watts Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	22	0.395	0.395	Primary	0.2	0.533828	4.638969	5	0	0	0	X	X	0.0
26C	UNT to Watts Branch	SFPF	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	355	0.494737	0.494737	Primary	0.1	0.40738	71.548841	72	0	0	0	X	X	0.0
26C	UNT to Watts Branch	SFPF	Piedmont	Scour Pool Energy Dissipator	Intermittent	18	0.494737	0.526316	Primary	0.1	0.40738	3.627829	4	0	0	0	X	X	0.0
26C_1	UNT to Watts Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	30	0.405	0.405	Primary	0.2	0.533828	6.486015	6	0	0	0	X	X	0.0
26J	UNT to Watts Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	31	0.545	0.545	Primary	0.1	0.40738	6.88269	7	0	0	0	X	X	0.0
26K	UNT to Watts Branch	SFPF	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	328	0.563158	0.563158	Primary	0.1	0.40738	75.249518	75	0	0	0	X	X	0.0
26L	UNT to Watts Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	11	0.32	0.33	Primary	0.1	0.40738	1.433979	1	0	0	0	X	X	0.0
27A	Watts Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	141	0.53	0.525	Primary	2.4	1.406962	105.14227	104	-1	0	0	X	X	-1.6
27A_1	Watts Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	90	0.58	0.48	Primary	2.5	1.429541	74.622038	62	-13	0	0	X	X	-20.2

Table F-1. Maryland Stream Mitigation Framework Detailed Impacts - On-Site Improvements

Feature ID	Stream Name	Assessment Type	Physiographic Region	Impact Type or Activity	Resource Type	Impacted Reach Length (LF)	Existing Stream Quality	Proposed Stream Quality	Channel Thread	Drainage Area (SQ Miles)	Drainage Area Adjustment	PRE Raw Reach Functional Value	Proposed Raw Reach Functional Value	Raw Change in Value	Site Sensitivity	Site Sensitivity Adjustment	MDE Jurisdiction	USACE Jurisdiction	Stream Losses in Functional Feet
27A_1	Watts Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	8	0.58	0	Primary	2.5	1.429541	6.63307	0	-7	0	0	X	X	-10.9
27A_1	Watts Branch	RBH	Piedmont	Hardened Channel	Perennial	550	0.58	0.46	Primary	2.5	1.429541	456.02357	362	-94	0	0	X	X	-145.7
27A_2	Watts Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	72	0.455	0.465	Primary	2.5	1.429541	46.831762	48	0	0	0	X	X	0.0
27A_2	Watts Branch	RBH	Piedmont	Hardened Channel	Perennial	17	0.455	0.41	Primary	2.5	1.429541	11.057499	10	-1	0	0	X	X	-1.6
27A_3	Watts Branch	RBH	Piedmont	Hardened Channel	Perennial	131	0.455	0.425	Primary	2.5	1.429541	85.207789	80	-5	0	0	X	X	-7.8
27B	UNT to Watts Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	46	0.245	0.245	Primary	0.1	0.40738	4.591176	5	0	0	0	X	X	0.0
27C	UNT to Watts Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Ephemeral	6	0.35	0.35	Primary	0.1	0.40738	0.855498	1	0	0	0	-	X	0.0
27D	UNT to Watts Branch	RBH	Piedmont	Hardened Channel	Intermittent	121	0.395	0.35	Primary	0.1	0.40738	19.47074	17	-2	0	0	X	X	-3.1
27D	UNT to Watts Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	41	0.395	0.39	Primary	0.1	0.40738	6.514011	7	0	0	0	X	X	0.0
27H	UNT to Watts Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	35	0.44	0.425	Primary	2.5	1.429541	22.014931	21	-1	0	0	X	X	-1.6
27K	UNT to Watts Branch	RBH	Piedmont	Hardened Channel	Ephemeral	42	0.335	0.35	Primary	0.0029	0.41	5.7687	6	0	0	0	-	X	0.0
27L	UNT to Watts Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	19	0.365	0	Primary	0.1	0.40738	2.825182	0	-3	0	0	X	X	-4.7
27N	UNT to Watts Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Intermittent	19	0.36	0.345	Primary	0.1	0.40738	2.786481	3	0	0	0	X	X	0.0
27P	UNT to Watts Branch	RBH	Piedmont	Temporary Impacts for Construction or Water Management	Perennial	39	0.575	0.57	Primary	1.05	1.01921	22.855792	23	0	0	0	X	X	0.0
28B	UNT to Muddy Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Intermittent	354	0.28	0	Primary	0.4	0.699525	69.336943	0	-69	0	0	X	X	-107.0
29A	UNT to Muddy Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	169	0.465	0.57	Primary	0.4	0.699525	54.972192	67	0	0	0	X	X	0.0
29A_1	UNT to Muddy Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial	26	0.365	0	Primary	0.1	0.40738	3.866039	0	-4	0	0	X	X	-6.2
29A_2	UNT to Muddy Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Perennial	63	0.355	0.48	Primary	0.4	0.699525	15.644882	21	0	0	0	X	X	0.0
29A_2	UNT to Muddy Branch	RBH	Piedmont	Hardened Channel	Perennial	217	0.355	0.405	Primary	0.4	0.699525	53.887928	61	0	0	0	X	X	0.0
29D_D	UNT to Muddy Branch	RBH	Piedmont	Hardened Channel	Intermittent	65	0.495	0.4	Primary	0.1	0.40738	13.10746	11	-2	0	0	X	X	-3.1
29D_D	UNT to Muddy Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	54	0.495	0.415	Primary	0.1	0.40738	10.889275	9	-2	0	0	X	X	-3.1
29K	UNT to Muddy Branch	RBH	Piedmont	Scour Pool Energy Dissipator	Intermittent	36	0.585	0.45	Primary	0.1	0.40738	8.579429	7	-2	0	0	X	X	-3.1
29K	UNT to Muddy Branch	RBH	Piedmont	Hardened Channel	Intermittent	93	0.585	0.425	Primary	0.1	0.40738	22.163524	16	-6	0	0	X	X	-9.3

Table F-2. Maryland Stream Mitigation Framework Detailed Impacts - On-Site Improvements (Potomac River)

Feature ID	Stream Name	Assessment Type	Physiographic Region	Impact Type or Activity	Resource Type	Impact Reach Length (LF)	Existing SF of Pier Impacts	Proposed SF of Pier Impacts	Increase in SF of Pier Impacts	SF of impact converted to FF	Raw FF Value	MDE Jurisdiction	USACE Jurisdiction	Stream Losses in Functional Feet
22MM.S1 and 22MM_B	Potomac River	RBH	Piedmont	Increase in pier footprint	Perennial	643	945	2,214	1,269	86	58	X	X	117.60

Potomac River impacts were calculated on a net fill basis. Existing pier footprint subtracted from the proposed pier footprint, measured in Square Feet. Square feet of impact were converted to functional feet using bankfull drainage curves for the piedmont where one functional foot is equivalent to approximately 14.78 square feet.

Potomac River Functional Foot Calculations:

Proposed pier footprint (SF) - existing pier footprint (SF) = 2,214 – 945 = 1,269 SQ FT of new Potomac River Impact

New SQ FT of Impact Converted to Functional Feet = 1,269 / 14.78 = 86 FF (14.78 is the Piedmont bankfull curve conversion factor)

Raw Functional Foot Value = FF * Existing Quality = 86 * .68 = 58 (0.68 is the existing stream quality as determined by the RBH)

FF Required = [Raw FF + (Raw FF * 30%)] * 1.55 = [58 + (58 * 0.3)] * 1.55 = 117.6

(30% is a Site Sensitivity Rating of 3 and 1.55 is the Mitigation Delay Adjustment Factor)

Table F-3. Maryland Stream Mitigation Framework Detailed Impacts - Off-Site Compensatory Stormwater Management

Feature ID	Stream Name	Assessment Type	Physiographic Region	Impact Type or Activity	Resource Type	Impacted Reach Length (LF)	Existing Stream Quality	Proposed Stream Quality	Channel Thread	Drainage Area (SQ Miles)	Drainage Area Adjustment	PRE Raw Reach Functional Value	Proposed Raw Reach Functional Value	Raw Change in Value	Site Sensitivity	Site Sensitivity Adjustment	MDE Jurisdiction	USACE Jurisdiction	Stream Losses in Functional Feet
31OOO	UNT to Watts Branch	RBH	Piedmont	Hardened Channel	Intermittent	29	0.29	0.315	Primary	0.02009	0.41	3.4481	4	0	2	0	X	X	0.00
32L	Minnehaha Branch	RBH	Piedmont	Hardened Channel	Perennial Headwater	95	0.53	0.475	Primary	1.04781	0.408648	20.575403	18	-3	1	-0.3	X	X	-5.12
32M	UNT to Minnehaha Branch	RBH	Piedmont	Channel is Filled or Placed in Culvert	Perennial Headwater	61	0.19	0	Primary	0.00261	0.41	4.7519	0	-5	1	-0.5	X	X	-8.53

APPENDIX G: STREAM ASSESSMENT EXISTING CONDITION SCORE TABLES

ON-SITE IMPROVEMENTS EXISTING CONDITION SCORES

Table G-1. RBH Existing Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Epifaunal Substrate/ Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
20B	UNT to Thomas Branch	1	0	1	6	4	6	0	5	6	1	4	4	4	42	0.21
20C	UNT to Thomas Branch	5	18	8	15	10	16	16	8	8	5	5	5	5	124	0.62
20E	UNT to Thomas Branch	1	0	1	2	4	7	0	8	7	5	2	5	5	47	0.235
21D	UNT to Thomas Branch	5	17	9	16	15	2	16	10	10	5	5	6	3	119	0.595
21D_1.S1	UNT to Thomas Branch	2	19	2	13	7	6	1	8	8	3	3	5	5	82	0.41
21D_1.S2	UNT to Thomas Branch	0	19	0	19	0	0	0	10	10	6	5	5	5	79	0.395
21F	UNT to Thomas Branch	1	0	2	2	1	13	1	2	2	1	2	3	6	36	0.18
21G	UNT to Thomas Branch	2	0	3	19	6	1	0	10	10	4	4	7	7	73	0.365
21H	UNT to Thomas Branch	0	8	0	18	0	15	0	4	4	5	5	5	5	69	0.345
21I	UNT to Thomas Branch	8	17	3	15	11	15	1	8	9	3	3	5	5	103	0.515
21J	UNT to Thomas Branch	8	18	9	7	6	5	18	10	10	2	1	2	4	100	0.5
21K	UNT to Thomas Branch	5	0	7	13	19	7	0	10	10	1	3	4	4	83	0.415
21L_D	UNT to Thomas Branch	5	11	9	14	8	0	18	10	10	5	4	4	6	104	0.52
21L_D1	UNT to Thomas Branch	8	16	5	13	17	6	17	9	9	4	4	3	3	114	0.57
21M	UNT to Thomas Branch	1	0	1	18	1	0	0	10	10	2	2	6	7	58	0.29
21U	UNT to Thomas Branch	12	11	3	7	8	11	19	4	3	2	2	5	5	92	0.46
21V	UNT to Thomas Branch	6	18	14	6	8	13	3	6	6	5	5	9	9	108	0.54
22A	UNT to Cabin John Creek	2	15	6	13	16	0	16	10	10	5	5	4	4	106	0.53
22AA	Cabin John Creek	15	11	15	9	10	10	19	8	9	5	5	6	10	132	0.66
22AA_1	Cabin John Creek	10	0	7	11	19	8	0	9	3	5	5	4	9	90	0.45
22AA_2	Cabin John Creek	13	13	10	5	10	7	20	10	3	5	5	4	4	109	0.545
22AA_3	Cabin John Creek	2	0	3	19	20	0	0	10	10	5	5	5	7	86	0.43

Table G-1. RBH Existing Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Epifaunal Substrate/ Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
22AA_B	Cabin John Creek	10	18	7	5	8	5	1	9	0	3	0	1	1	68	0.34
22AA_B1	Cabin John Creek	6	0	6	18	19	1	0	10	10	0	1	0	0	71	0.355
22B	UNT to Cabin John Creek	0	16	0	16	0	6	0	10	10	5	5	5	5	78	0.39
22BB	UNT to Cabin John Creek	0	0	0	19	0	15	0	9	9	2	2	5	5	66	0.33
22C	UNT to Cabin John Creek	8	14	9	15	15	7	17	9	8	5	5	5	5	122	0.61
22CC_1	UNT to Cabin John Creek	0	0	0	6	0	12	0	5	5	5	5	4	7	49	0.245
22D	UNT to Cabin John Creek	1	0	1	19	1	0	1	10	10	4	5	9	5	66	0.33
22DD.S1	UNT to Cabin John Creek	1	0	1	19	18	0	0	9	10	3	2	9	6	78	0.39
22DD.S2	UNT to Cabin John Creek	3	1	3	2	5	11	0	6	4	4	3	9	6	57	0.285
22EE	UNT to Cabin John Creek	0	8	0	17	0	15	0	1	0	2	2	8	8	61	0.305
22FF	UNT to Potomac River	0	0	0	19	0	16	0	5	5	6	7	2	7	67	0.335
22H	UNT to Cabin John Creek	1	0	1	19	19	0	0	10	10	5	5	4	5	79	0.395
22H_1	UNT to Cabin John Creek	1	0	1	19	19	0	0	10	10	5	5	4	5	79	0.395
22HH	UNT to Rock Run	2	0	6	13	7	0	0	10	10	4	4	5	8	69	0.345
22HH_1	UNT to Rock Run	2	0	6	13	7	0	0	10	10	4	4	5	8	69	0.345
22HH_2	UNT to Rock Run	1	0	1	19	2	0	0	10	10	3	3	7	4	60	0.3
22KK	UNT to Cabin John Creek	6	16	13	5	8	13	8	2	4	3	4	8	8	98	0.49
22MM.S1	Potomac River	12	10	13	13	19	16	6	9	10	5	5	9	9	136	0.68
22MM_B	Potomac River	12	10	13	13	19	12	6	8	10	1	4	3	2	113	0.565
22NN	UNT to Potomac River	3	0	3	14	3	16	3	6	6	4	5	6	10	79	0.395
22NN_B	UNT to Potomac River	4	0	6	12	4	14	0	2	7	1	1	2	1	54	0.27
22P	UNT to Rock Run	2	7	7	19	20	13	2	9	9	6	5	9	9	117	0.585
22Q	UNT to Potomac River	4	0	6	13	9	12	1	9	9	3	3	6	9	84	0.42
22QQ	UNT to Potomac River	2	0	2	11	2	14	0	2	2	1	1	10	10	57	0.285

Table G-1. RBH Existing Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Epifaunal Substrate/ Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
22T	UNT to Rock Run	2	6	1	19	8	1	0	10	10	2	2	4	5	70	0.35
22T_1	UNT to Rock Run	2	6	1	19	8	1	0	10	10	2	2	4	5	70	0.35
22T_2	UNT to Rock Run	1	0	1	20	2	0	1	10	10	5	5	6	4	65	0.325
22T_B	UNT to Rock Run	1	6	2	18	2	6	1	9	9	0	0	0	0	54	0.27
22T_B1	UNT to Rock Run	3	8	2	19	13	1	0	10	10	3	0	1	0	70	0.35
22V	UNT to Potomac River	2	8	2	13	3	11	1	8	8	3	3	4	5	71	0.355
22V_1	UNT to Potomac River	3	16	2	18	2	11	5	9	9	5	5	3	3	91	0.455
22V_2	UNT to Potomac River	8	9	6	10	7	11	5	4	4	5	5	3	4	81	0.405
22V_B	UNT to Potomac River	5	16	5	11	4	1	0	10	10	0	0	0	0	62	0.31
22V_B1	UNT to Potomac River	6	16	2	19	3	11	0	9	9	5	4	2	2	88	0.44
22Z	Booze Creek	14	13	15	15	12	13	18	10	10	3	4	9	4	140	0.7
22Z_1	Booze Creek	12	13	14	11	10	5	18	10	10	5	5	6	8	127	0.635
23A	Thomas Branch	6	18	6	20	20	2	17	9	8	5	5	3	3	122	0.61
23A_2	Thomas Branch	10	18	10	17	17	6	18	7	9	4	5	1	7	129	0.645
23DD	UNT to Old Farm Creek	5	2	6	16	12	6	1	8	7	2	5	9	9	88	0.44
23M	UNT to Old Farm Creek	0	15	0	19	0	9	0	6	7	6	6	9	9	86	0.43
23N.S1	UNT to Old Farm Creek	7	12	2	12	11	3	1	10	10	4	4	3	4	83	0.415
23N.S2	UNT to Old Farm Creek	10	18	9	11	9	4	18	8	8	5	5	5	7	117	0.585
23N_1.S2	UNT to Old Farm Creek	10	18	9	11	9	4	18	8	8	5	5	5	7	117	0.585
23N_D	UNT to Old Farm Creek	10	10	8	10	15	15	16	7	7	5	5	6	7	121	0.605
23U	UNT to Old Farm Creek	11	17	7	18	17	6	18	9	9	6	4	4	3	129	0.645
23U_1	UNT to Old Farm Creek	1	0	2	16	8	10	0	5	5	3	3	4	4	61	0.305
23V	UNT to Old Farm Creek	4	0	3	16	16	13	0	9	9	5	5	5	5	90	0.45
24A	Old Farm Creek	5	11	11	10	13	13	5	5	7	4	5	9	8	106	0.53
24A_1	Old Farm Creek	8	10	7	6	11	11	5	4	3	4	4	9	9	88	0.455

Table G-1. RBH Existing Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Epifaunal Substrate/ Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
24C	UNT to Cabin John Creek	4	11	2	6	8	5	1	6	6	3	3	9	9	73	0.365
24F_2	Cabin John Creek	4	12	9	11	15	13	16	6	7	4	4	9	8	118	0.59
24F_3	Cabin John Creek	14	12	13	8	15	13	17	7	7	3	5	9	8	125	0.655
24K	UNT to Cabin John Creek	9	13	8	12	14	11	16	7	7	4	4	9	9	123	0.615
24V	UNT to Cabin John Creek	0	0	0	16	1	1	0	8	8	1	2	7	7	51	0.255
25E	UNT to Cabin John Creek	0	9	0	16	0	11	1	9	9	5	5	7	7	79	0.395
25F	UNT to Cabin John Creek	0	15	0	8	0	16	0	2	2	3	3	9	9	67	0.335
25H	UNT to Cabin John Creek	7	10	8	7	16	8	7	4	4	5	5	9	9	99	0.495
25H_1	UNT to Cabin John Creek	0	16	0	16	0	11	1	9	9	5	5	7	8	87	0.435
25N	UNT to Cabin John Creek	7	7	3	6	7	13	2	8	5	8	8	10	10	94	0.47
26B_1	UNT to Watts Branch	2	8	3	7	14	6	3	8	7	5	4	6	6	79	0.395
26C_1	UNT to Watts Branch	3	8	3	7	16	6	3	6	6	5	4	6	8	81	0.405
26J	UNT to Watts Branch	12	8	6	7	17	13	2	9	9	5	5	8	8	109	0.545
26L	UNT to Watts Branch	6	0	0	6	5	0	3	10	10	4	4	8	8	64	0.32
27A	Watts Branch	6	13	9	12	17	11	6	6	7	3	2	8	6	106	0.53
27A_1	Watts Branch	8	9	13	10	16	13	16	4	4	5	5	7	6	116	0.58
27A_2	Watts Branch	5	11	9	6	15	12	10	2	3	2	4	7	5	91	0.455
27A_3	Watts Branch	5	11	9	6	15	12	10	2	3	2	4	7	5	91	0.455
27B	UNT to Watts Branch	0	8	0	5	0	8	0	4	4	3	4	6	7	49	0.245
27C	UNT to Watts Branch	0	3	0	16	0	13	0	7	7	3	3	9	9	70	0.35
27D	UNT to Watts Branch	2	8	3	7	15	9	3	4	5	4	3	7	4	74	0.37
27H	UNT to Watts Branch	1	0	1	20	1	19	0	10	10	5	5	6	10	88	0.44
27K	UNT to Watts Branch	0	11	0	18	0	15	0	3	4	2	3	4	7	67	0.335
27L	UNT to Watts Branch	1	10	3	9	13	6	3	6	6	3	2	8	3	73	0.365
27N	UNT to Watts Branch	0	0	0	19	0	16	0	7	10	2	2	6	10	72	0.36
27P	UNT to Watts Branch	11	7	10	10	12	19	13	8	3	4	4	4	10	115	0.575
28B	UNT to Muddy Branch	0	0	1	5	14	1	1	9	9	1	1	7	7	56	0.28
29A	UNT to Muddy Branch	3	18	3	19	3	6	2	10	10	3	3	7	6	93	0.465
29A_1	UNT to Muddy Branch	0	11	1	8	11	1	2	8	8	3	4	8	8	73	0.365

Table G-1. RBH Existing Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Epifaunal Substrate/ Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
29A_2	UNT to Muddy Branch	1	7	7	10	8	1	4	8	8	1	1	8	7	71	0.355
29D_D	UNT to Muddy Branch	8	11	8	6	9	6	16	5	6	4	3	9	8	99	0.495
29K	UNT to Muddy Branch	11	8	11	18	20	11	0	9	9	5	5	5	5	117	0.585

Table G-2. SFPF Existing Condition Scores - On-Site Improvements

Feature ID	Stream Name	(1) Conc. Flow	(2) Flashiness	(3) Bank Height Ratio (BHR)	(4a) Entrenchment Meandering	(4b) Non-Entrenchment Meandering	(5) Floodplain Drainage	(6) Vert. Stability Extent	(7) LB Riparian Vege. Zone	(7) RB Riparian Vege. Zone	(8) RB Dominant Bank Erosion Rate Potential	(8) LB Dominant Bank Erosion Rate Potential	(9) Lateral Stability Extent	(10) Shelter for Fish and Macro.	(11a) Pool-to-Pool Spacing (Watershed<10 mi^2)	(11b) Pool-to-Pool Spacing (Watershed>10 mi^2)	(12a) Pool Max Depth Ratio/Depth Variability (Gravel Bed Streams)	(12b) Pool Max Depth Ratio/Depth Variability (Sand Bed Streams)	(11) Colluvial Valleys Pool-to-Pool Spacing (3-5% Slope)	(12) Colluvial Valleys Pool Max Depth Ratio/Depth Variability	(13) Water Appearance and Nutrient Enrichment	(14) Detritus	(15) Macro-invertebrate	(16) Macro-invertebrate Tolerance	(17) Fish Presence	Habitat Parameter Sum	Overall Quality Score
20D	UNT to Thomas Branch	7	3	1	8	-	4	7	4	7	8	7	9	4	2	-	9	-	-	-	7	6	4	4	5	**106**	**0.558**
21B	UNT to Thomas Branch	4	3	1	2	-	5	6	7	6	5	9	5	6	2	-	9	-	-	-	7	6	4	4	5	**96**	**0.505**
21C	Thomas Branch	3	3	2	-	7	4	9	2	2	3	2	6	7	9	-	8	-	-	-	4	6	7	5	8	**97**	**0.511**
21C_1	Thomas Branch	4	3	9	4	-	3	8	4	2	6	7	3	4	2	-	10	-	-	-	4	4	3	3	5	**88**	**0.463**
21C_2	Thomas Branch	4	3	1	1	-	3	8	2	4	8	10	6	3	1	-	1	-	-	-	4	4	2	2	2	**69**	**0.363**
22CC	UNT to Cabin John Creek	4	2	2	-	4	4	4	4	6	3	3	6	3	5	-	0	-	-	-	5	5	1	1	1	**63**	**0.332**
22MM.S2	Potomac River	3	7	5	5	-	5	9	4	6	8	8	6	5	-	3	3	-	-	-	4	4	3	3	3	**94**	**0.495**
23A_1	Thomas Branch	5	2	2	2	-	5	6	4	6	6	6	5	5	3	-	3	-	-	-	5	5	5	5	3	**83**	**0.437**
23A_3	Thomas Branch	5	2	1	3	-	4	2	7	7	3	2	5	4	1	-	10	-	-	-	8	8	4	4	5	**85**	**0.447**
23A_3_D	Thomas Branch	2	2	1	5	-	2	2	1	7	2	2	8	4	1	-	1	-	-	-	5	8	4	4	4	**65**	**0.342**
23AA	UNT to Thomas Branch	8	3	9	8	-	6	6	7	3	2	3	5	2	1	-	-	10	-	-	3	3	2	2	2	**85**	**0.447**
23AA_1	UNT to Thomas Branch	8	3	9	8	-	6	6	7	3	2	3	5	2	1	-	-	10	-	-	3	3	2	2	2	**85**	**0.447**
23D	UNT to Thomas Branch	3	3	2	2	-	8	8	6	2	2	8	5	5	1	-	9	-	-	-	5	5	3	3	4	**84**	**0.442**
23K	UNT to Old Farm Creek	3	3	6	2	-	5	4	7	6	3	3	4	5	8	-	8	-	-	-	5	5	8	4	4	**93**	**0.489**
23K_1	UNT to Old Farm Creek	3	3	6	2	-	5	4	7	6	3	3	4	5	8	-	8	-	-	-	5	5	8	4	4	**93**	**0.489**
23K_D	UNT to Old Farm Creek	7	4	10	1	-	4	4	4	1	8	8	8	4	1	-	5	-	-	-	4	4	3	3	3	**86**	**0.453**
24D	UNT to Cabin John Creek	5	3	1	-	4	6	6	9	9	3	3	3	3	1	-	1	-	-	-	4	4	2	2	1	**70**	**0.368**
26B	UNT to Watts Branch	5	3	4	-	9	6	6	7	4	6	6	6	6	9	-	4	-	-	-	8	7	5	6	3	**110**	**0.579**
26C	UNT to Watts Branch	6	2	2	9	-	7	7	5	7	3	3	5	5	3	-	-	9	-	-	5	6	4	4	2	**94**	**0.495**
26K	UNT to Watts Branch	8	3	9	-	9	8	4	6	6	5	5	7	6	1	-	-	1	-	-	7	6	7	6	3	**107**	**0.563**

OFF-SITE STORMWATER MANAGEMENT EXISTING CONDITION SCORES

Table G-3. RBH Existing Condition Scores - Off-Site Compensatory Stormwater Management

Feature ID	Stream Name	Epifaunal Substrate/ Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall quality Score
31OOO	UNT to Watts Branch	1	11	1	6	2	15	2	3	2	3	3	5	4	**58**	**0.29**
32L	Minnehaha Branch	18	18	16	13	11	8	7	5	5	2	2	0	1	**106**	**0.53**
32M	UNT to Minnehaha Branch	4	2	2	3	5	4	2	3	3	4	1	4	1	**38**	**0.19**

APPENDIX H: STREAM ASSESSMENT PROPOSED CONDITION ASSUMPTION TABLES

Table H-1. RBH Proposed Condition Assumptions
Note: Based on 5-year grow-out condition

Rapid Habitat Parameter Rankings	Impact Types					
	Channel Filled or Placed in Culvert	Scour Pool or Energy Dissipator	Hardened Channel	Relocated or Altered Channel	Temporary Impact for Construction or Water Management	Segment under New or Extended Bridge
1. Epifaunal Substrate/Available Cover	0	8 for perennial, 2 for intermittent, stays the same for ephemeral	8 for perennial, 2 for intermittent, stays the same for ephemeral	Stays the same as existing condition, unless existing concrete channel – score 8	Stays the same as existing condition	Stays the same as existing condition
2. Embeddedness (High Gradient Streams)	0	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition, unless existing concrete channel – score 8	Stays the same as existing condition	Stays the same as existing condition
2. Pool Substrate Character (Low Gradient Streams)	0	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition, unless existing concrete channel – score 8	Stays the same as existing condition	Stays the same as existing condition
3. Velocity/Depth Regime (High Gradient Streams)	0	5 for perennial, 2 for intermittent, stays the same for ephemeral	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition
3. Pool Variability (Low Gradient Streams)	0	Rank according to scour pool depth from WRE Table for perennial; 2 for intermittent, stays the same for ephemeral	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition

Table H-1. RBH Proposed Condition Assumptions
Note: Based on 5-year grow-out condition

Rapid Habitat Parameter Rankings	Impact Types					
	Channel Filled or Placed in Culvert	Scour Pool or Energy Dissipator	Hardened Channel	Relocated or Altered Channel	Temporary Impact for Construction or Water Management	Segment under New or Extended Bridge
4.Sediment Deposition	0	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition
5.Channel Flow Status	0	18 for both perennial and intermittent, stays the same for ephemeral	Stays the same if existing condition ≤ 6. If existing condition is > 6, score 6. If existing concrete channel, score 6	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition
6.Channel Alteration	0	6 for perennial, intermittent, and ephemeral	Stays the same if existing condition ≤ 6. If existing condition is > 6, score 6. If existing concrete channel, score 6	Rank according to proposed channel geometry and existing score/ photos	Stays the same as existing condition	Stays the same as existing condition
7.Frequency of Riffles (High Gradient Streams)	0	Scour Pool - Intermittent - 0 Scour Pool - Perennial – 3, Step Pool (slope greater than X) – 8, stays the same for ephemeral	Stays the same if existing condition < 3. If existing condition is >3, score 3, stays the same for ephemeral	Stays the same as existing condition	Stays the same as existing condition	Stays the same as existing condition
7.Sinuosity (Low Gradient Streams)	0	2 for perennial, intermittent, and ephemeral	Rank according to proposed channel geometry and	Rank according to proposed channel	Stays the same as existing condition	Stays the same as existing condition

Table H-1. RBH Proposed Condition Assumptions
Note: Based on 5-year grow-out condition

Rapid Habitat Parameter Rankings	Impact Types					
	Channel Filled or Placed in Culvert	Scour Pool or Energy Dissipator	Hardened Channel	Relocated or Altered Channel	Temporary Impact for Construction or Water Management	Segment under New or Extended Bridge
			existing score/ photos	geometry and existing score/ photos		
8. Bank Stability – Left Bank	0	10 for perennial, intermittent, and ephemeral	10 for perennial, intermittent, and ephemeral	10 for perennial, intermittent, and ephemeral	Stays the same as existing condition	Stays the same as existing condition
Bank Stability – Right Bank	0	10 for perennial, intermittent, and ephemeral	10 for perennial, intermittent, and ephemeral	10 for perennial, intermittent, and ephemeral	Stays the same as existing condition	Stays the same as existing condition
9. Vegetative Protection – Left Bank	0	2 for perennial, intermittent, and ephemeral	2 for perennial, intermittent, and ephemeral	If the existing condition is 5 or less, score 5. If the existing condition is 6 or more, score 6.	Stays the same as existing condition	0
Vegetative Protection – Right Bank	0	2 for perennial, intermittent, and ephemeral	2 for perennial, intermittent, and ephemeral	If the existing condition is 5 or less, score 5. If the existing condition is 6 or more, score 6.	Stays the same as existing condition	0

Table H-1. RBH Proposed Condition Assumptions
Note: Based on 5-year grow-out condition

Rapid Habitat Parameter Rankings	Impact Types					
	Channel Filled or Placed in Culvert	**Scour Pool or Energy Dissipator**	**Hardened Channel**	**Relocated or Altered Channel**	**Temporary Impact for Construction or Water Management**	**Segment under New or Extended Bridge**
10. Riparian Vegetative Zone Width – Left Bank	0	Stays the same as existing condition, with maximum score of 8.	Stays the same as existing condition, with maximum score of 8.	Determine the Condition Category based on the width of the riparian area. Then, determine score within Condition Category based on existing riparian condition. If existing forest, score in middle of Condition Category, If existing herbaceous, score on low end of Condition Category.	Determine the Condition Category based on the width of the riparian area. Then, determine score within Condition Category based on existing riparian condition. If existing forest, score in middle of Condition Category, If existing herbaceous, score on low end of Condition Category.	0
Riparian Vegetative Zone Width – Right Bank	0	Stays the same as existing condition, with maximum score of 8.	Stays the same as existing condition, with maximum score of 8.	Determine the Condition Category based on the width of the riparian area. Then, determine score within Condition Category based on existing riparian condition. If existing forest, score in middle of Condition Category, If existing herbaceous, score on low end of Condition Category.	Determine the Condition Category based on the width of the riparian area. Then, determine score within Condition Category based on existing riparian condition. If existing forest, score in middle of Condition Category, If existing herbaceous, score on low end of Condition Category.	0

Table H-2. SFPF Proposed Condition Assumptions

Impact Types	Existing → Proposed	Hydrology		Hydraulics				Geomorphology						Physicochemical		Biology		
		1	2	3	4a- 4b	5	6	7	8	9	10	11a-11b	12a-12b	13	14	15	16	17
		Concentrated Flow	Flashiness	BHR	Entrenchment	Floodplain Drainage	Vertical Stability	Riparian Vegetation	Dominant Bank Erosion Rate Potential	Lateral Stability	Shelter for Fish and Macros	Pool-to-Pool Spacing Ratio	Pool Max Depth Ratio	Water Appearance	Detritus	Macroinvertebrate Presence	Macroinvertebrate Tolerance	Fish Presence
Channel Filled or Placed in Culvert	Open Channel → Piped Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scour Pool or Energy Dissipator	N/A	Score Functioning at Risk (5)	Same Score	Score Not Functioning (3)	Score Not Functioning (3)	Same Score	Score Functioning (9)	Measure Estimate from Proposed: Max Score of 8	Score Functioning Low Bank Erosion Potential (8)	Score Functioning (9)	1) Functioning at Risk (4) of ex. Score is above 4, 2) Same score if existing score is lower than 4	Score as NF (1)	Score functioing (8) (Should be Scored as Parameter 12a)	Same Score	Same Score	Same Score	Same Score	Same Score
Hardened Channel	Concrete Channel → Hardened Rip-rap Channel	Same Score	Same Score	Same Score	Same Score	Same Score	Score Functioning (8)	1) Same Score: if only adding hardened material and channel is staying in the same place, Max Score of 8 2) Measure Estimate: from proposed if excessive clearing or channel manipulation; Max Score of 8	Score Functioning Low Bank Erosion Potential (8)	Score Functioning (8)	Score Functioning at Risk (3), unless existing score is lower use same score	Same Score	Score Functioning at Risk (3), unless existing score is lower use same score	Same Score	Same Score	Same Score	Same Score	Same Score
	Rip-rap Channel → Hardened Rip-rap Channel																	
	Roadside Ditch → Hardened Rip-rap Channel															Decrease Not Functioning (3) or Same Score if Lower	Decrease Not Functioning (3) or Same Score if Lower	Decrease Not Functioning (3) or Same Score if Lower
	Natural Channel → Hardened Rip-rap Channel																	
Relocated/Altered	Concrete Channel → Ditch w/ Scour Protection/NCD	Same Score	Same Score	Score Functioning by Design (8)	1) Score Functioning by Design (8)** 2)If very tight floodplain rank lower to FAR (6)**	1) Same Score: with minor relocation 2) If Majorly Relocting: measure from proposed, decrease 1 point for every 10% increase of slope or loss of 50 feet	Score Functioning by Design (8)	Measure Estimate from Proposed; Max Score of 8	Score Functioning Low Bank Erosion Potential (8)	Functioning by Design (8)	Increase to Score as Functioning (8)	1) Functioning as Design (8): if pools are designed. *** 2) If straight ditch score as NF (1)***	1) Functioning as Design (8): if pools are designed.*** 2) If straight ditch score as NF (1)***	Same Score	Same Score	Same Score	Same Score	Same Score
	Rip-rap Channel → Ditch w/ Scour Protection/NCD																	
	Roadside Ditch → Ditch w/ Scour Protection/NCD										Same Score							
	Natural Channel → Ditch w/ Scour Protection/NCD																	
Temporary Impact for Construction or Water Management	N/A	Same Score	Same Score	Same Score	Same Score	Same Score	Same Score	Same Score; Max Score of 8	Same Score	Same Score	Same Score	Same Score	Same Score	Same Score	Same Score	Same Score	Same Score	Same Score
Stream Segment Under a New or Extended Bridge (Assuming Only Bridge Work and No Conversion of Channel)	N/A	Same Score	Same Score	Same Score	1) Same Score:existing score 3 or below (NF) 2) Score 4 (FAR): if existing score is above 4 (FAR or F)	Measure from Propsed: if bridge is 50 feet or more away from stream score as 4 (FAR). If less than 50 feet away from stream score 3 (NF)	Score Functioning (8)	Score N/A Not Functioning (0)	Score Functioining (8)	Score Functioning (8)	Same Score	Same Score	Same Score	Same Score	Same Score	Same Score	Same Score	Same Score

Note: Proposed condition scores based on 5-year grow-out conditions

**For Parameter 4 - Entrenchment
If the relocated channel segment is >300 ft AND the DA is >0.1 SqMi AND the floodplain is wide (not squeezed between a bridge abutment or roads), then assume the entrenchment ratio will be in the functioning category, so score it an 8.
If the relocated channel segment is >300 ft AND the DA is >0.1 SqMi but the floodplain is restricted score it a 6 (Functioning At Risk category).
If the relocated channel segment does not meet either the above length and/or drainage area criteria, then score a 6.

*** For Parameters 11 and 12
If the relocated channel length is >300 ft AND the DA is >0.1 SqM, then the assume the reconstructed channel will be in the functioning category, so the score will be an 8.
If the channel does not meet BOTH the >300 ft length AND the >0.1 SqM DA criteria, assume there will be no pools designed, so score a 1.

APPENDIX I: STREAM ASSESSMENT PROPOSED CONDITION SCORE TABLES

ON-SITE IMPROVEMENTS PROPOSED CONDITION SCORES

Table I-1. RBH Proposed Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Impact Type	Epifaunal Substrate / Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
20B	UNT to Thomas Branch	Hardened Channel	2	0	1	6	4	6	0	10	10	2	2	4	4	**51**	**0.255**
20B	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
20B	UNT to Thomas Branch	Scour Pool or Energy Dissipator	2	0	2	6	18	6	0	10	10	2	2	4	4	**66**	**0.33**
20C	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
20E	UNT to Thomas Branch	Hardened Channel	2	0	1	2	4	6	0	10	10	2	2	4	4	**47**	**0.235**
20E	UNT to Thomas Branch	Scour Pool or Energy Dissipator	2	0	2	2	18	6	0	10	10	2	2	4	4	**62**	**0.31**
21D	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21D_1.S1	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21D_1.S2	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21F	UNT to Thomas Branch	Temporary Impacts For Construction or Water Management	1	0	2	2	1	13	1	2	2	1	2	4	7	**38**	**0.19**
21F	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21G	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21H	UNT to Thomas Branch	Temporary Impacts For Construction or Water Management	0	8	0	18	0	15	0	4	4	5	5	4	4	**67**	**0.335**
21H	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21I	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21J	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21K	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21L_D	UNT to Thomas Branch	Relocated or Altered Channel	5	11	9	14	8	8	18	10	10	5	5	4	7	**114**	**0.57**
21L_D	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21L_D1	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21M	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21U	UNT to Thomas Branch	Temporary Impacts For Construction or Water Management	12	11	3	7	8	11	19	4	3	2	2	4	4	**90**	**0.45**
21U	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
21V	UNT to Thomas Branch	Temporary Impacts For Construction or Water Management	6	18	14	6	8	13	3	6	6	5	5	9	9	**108**	**0.54**
21V	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**

Table I-1. RBH Proposed Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Impact Type	Epifaunal Substrate / Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
22A	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
22AA	Cabin John Creek	Temporary Impacts For Construction or Water Management	15	11	15	9	10	10	19	8	9	5	5	6	9	**131**	**0.655**
22AA_1	Cabin John Creek	Temporary Impacts For Construction or Water Management	10	0	7	11	19	8	0	9	3	5	5	4	9	**90**	**0.45**
22AA_2	Cabin John Creek	Segment is under a new or widened bridge, excludes existing bridges	13	13	10	5	10	7	20	10	3	0	0	0	0	**91**	**0.455**
22AA_2	Cabin John Creek	Temporary Impacts For Construction or Water Management	13	13	10	5	10	7	20	10	3	5	5	4	4	**109**	**0.545**
22AA_3	Cabin John Creek	Hardened Channel	8	0	3	19	6	6	0	10	10	2	2	4	7	**77**	**0.385**
22AA_3	Cabin John Creek	Temporary Impacts For Construction or Water Management	2	0	3	19	20	0	0	10	10	5	5	4	7	**85**	**0.425**
22AA_3	Cabin John Creek	Segment is under a new or widened bridge, excludes existing bridges	2	0	3	19	20	0	0	10	10	0	0	0	0	**64**	**0.32**
22AA_B	Cabin John Creek	Temporary Impacts For Construction or Water Management	10	18	7	5	8	5	1	9	0	3	0	1	1	**68**	**0.34**
22AA_B1	Cabin John Creek	Temporary Impacts For Construction or Water Management	6	0	6	18	19	1	0	10	10	0	1	0	0	**71**	**0.355**
22B	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
22BB	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
22C	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
22CC_1	UNT to Cabin John Creek	Hardened Channel	0	0	0	6	0	6	0	10	10	2	2	4	7	**47**	**0.235**
22CC_1	UNT to Cabin John Creek	Scour Pool or Energy Dissipator	0	0	0	6	18	6	0	10	10	2	2	4	7	**65**	**0.325**
22D	UNT to Cabin John Creek	Scour Pool or Energy Dissipator	2	0	2	19	18	6	0	10	10	2	2	8	5	**84**	**0.42**
22D	UNT to Cabin John Creek	Hardened Channel	2	0	1	19	1	6	1	10	10	2	2	8	5	**67**	**0.335**
22DD.S1	UNT to Cabin John Creek	Hardened Channel	2	0	1	19	6	6	0	10	10	2	2	7	7	**72**	**0.36**
22DD.S1	UNT to Cabin John Creek	Temporary Impacts For Construction or Water Management	1	0	1	19	18	0	0	9	10	3	2	9	7	**79**	**0.395**
22DD.S1	UNT to Cabin John Creek	Scour Pool or Energy Dissipator	2	0	2	19	18	6	0	10	10	2	2	7	7	**85**	**0.425**
22DD.S2	UNT to Cabin John Creek	Hardened Channel	2	1	3	2	5	6	0	10	10	2	2	7	7	**57**	**0.285**
22EE	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
22EE	UNT to Cabin John Creek	Relocated or Altered Channel	0	8	0	17	0	15	0	10	10	5	5	7	7	**84**	**0.42**
22FF	UNT to Potomac River	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
22FF	UNT to Potomac River	Scour Pool or Energy Dissipator	0	0	0	19	0	6	0	10	10	2	2	2	7	**58**	**0.29**
22FF	UNT to Potomac River	Relocated or Altered Channel	0	0	0	19	0	16	0	10	10	5	5	2	7	**74**	**0.37**

Table I-1. RBH Proposed Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Impact Type	Epifaunal Substrate / Available Cover	Embeddedness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
22H	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
22H_1	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
22HH	UNT to Rock Run	Hardened Channel	2	0	6	13	6	6	0	10	10	2	2	5	8	**70**	**0.35**
22HH	UNT to Rock Run	Scour Pool or Energy Dissipator	2	0	2	13	18	6	0	10	10	2	2	5	8	**78**	**0.39**
22HH	UNT to Rock Run	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
22HH_1	UNT to Rock Run	Scour Pool or Energy Dissipator	2	0	2	13	18	6	0	10	10	2	2	5	8	**78**	**0.39**
22HH_1	UNT to Rock Run	Hardened Channel	2	0	6	13	6	6	0	10	10	2	2	4	7	**68**	**0.34**
22HH_2	UNT to Rock Run	Hardened Channel	2	0	1	19	2	6	0	10	10	2	2	7	4	**65**	**0.325**
22KK	UNT to Cabin John Creek	Scour Pool or Energy Dissipator	8	16	5	5	18	6	3	10	10	2	2	8	8	**101**	**0.505**
22KK	UNT to Cabin John Creek	Relocated or Altered Channel	6	16	13	5	8	13	8	10	10	5	5	7	7	**113**	**0.565**
22NN	UNT to Potomac River	Temporary Impacts For Construction or Water Management	3	0	3	14	3	16	3	6	6	4	5	7	9	**79**	**0.395**
22NN	UNT to Potomac River	Segment is under a new or widened bridge, excludes existing bridges	3	0	3	14	3	16	3	6	6	0	0	0	0	**54**	**0.27**
22NN_B	UNT to Potomac River	Temporary Impacts For Construction or Water Management	4	0	6	12	4	14	0	2	7	1	1	2	1	**54**	**0.27**
22P	UNT to Rock Run	Scour Pool or Energy Dissipator	2	7	2	19	18	6	2	10	10	2	2	8	8	**96**	**0.48**
22Q	UNT to Potomac River	Temporary Impacts For Construction or Water Management	4	0	6	13	9	12	1	9	9	3	3	7	9	**85**	**0.425**
22Q	UNT to Potomac River	Scour Pool or Energy Dissipator	8	0	5	13	18	6	3	10	10	2	2	6	8	**91**	**0.455**
22QQ	UNT to Potomac River	Hardened Channel	2	0	2	11	2	6	0	10	10	2	2	8	8	**63**	**0.315**
22QQ	UNT to Potomac River	Scour Pool or Energy Dissipator	2	0	2	11	18	6	0	10	10	2	2	8	8	**79**	**0.395**
22QQ	UNT to Potomac River	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
22T	UNT to Rock Run	Segment is under a new or widened bridge, excludes existing bridges	2	6	1	19	8	1	0	10	10	0	0	0	0	**57**	**0.285**
22T_1	UNT to Rock Run	Segment is under a new or widened bridge, excludes existing bridges	2	6	1	19	8	1	0	10	10	0	0	0	0	**57**	**0.285**
22T_2	UNT to Rock Run	Temporary Impacts For Construction or Water Management	1	0	1	20	2	0	1	10	10	5	5	4	4	**63**	**0.315**
22T_2	UNT to Rock Run	Segment is under a new or widened bridge, excludes existing bridges	1	0	1	20	2	0	1	10	10	0	0	0	0	**45**	**0.225**
22T_B	UNT to Rock Run	Temporary Impacts For Construction or Water Management	1	6	2	18	2	6	1	9	9	0	0	0	0	**54**	**0.27**
22T_B1	UNT to Rock Run	Temporary Impacts For Construction or Water Management	3	8	2	19	13	1	0	10	10	3	0	1	0	**70**	**0.35**
22T_B1	UNT to Rock Run	Temporary Impacts For Construction or Water Management	3	8	2	19	13	1	0	10	10	3	0	3	3	**75**	**0.375**
22V	UNT to Potomac River	Segment is under a new or widened bridge, excludes existing bridges	2	8	2	13	3	11	1	8	8	0	0	0	0	**56**	**0.28**
22V	UNT to Potomac River	Temporary Impacts For Construction or Water Management	2	8	2	13	3	11	1	8	8	3	3	2	2	**66**	**0.33**
22V_1	UNT to Potomac River	Segment is under a new or widened bridge, excludes existing bridges	3	16	2	18	2	11	5	9	9	0	0	0	0	**75**	**0.375**

Table I-1. RBH Proposed Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Impact Type	Epifaunal Substrate / Available Cover	Embeddedness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
22V_2	UNT to Potomac River	Segment is under a new or widened bridge, excludes existing bridges	8	9	6	10	7	11	5	4	4	0	0	0	0	**64**	**0.32**
22V_2	UNT to Potomac River	Temporary Impacts For Construction or Water Management	8	9	6	10	7	11	5	4	4	5	5	4	4	**82**	**0.41**
22V_B	UNT to Potomac River	Temporary Impacts For Construction or Water Management	5	16	5	11	4	1	0	10	10	0	0	0	0	**62**	**0.31**
22V_B1	UNT to Potomac River	Temporary Impacts For Construction or Water Management	6	16	2	19	3	11	0	9	9	5	4	4	4	**92**	**0.46**
22V_B1	UNT to Potomac River	Temporary Impacts For Construction or Water Management	6	16	2	19	3	11	0	9	9	5	4	2	2	**88**	**0.44**
22Z	Booze Creek	Temporary Impacts For Construction or Water Management	14	13	15	15	12	13	18	10	10	3	4	7	4	**138**	**0.69**
22Z_1	Booze Creek	Temporary Impacts For Construction or Water Management	12	13	14	11	10	5	18	10	10	5	5	6	7	**126**	**0.63**
23A	Thomas Branch	Temporary Impacts For Construction or Water Management	6	18	6	20	20	2	17	9	8	5	5	4	4	**124**	**0.62**
23A_2	Thomas Branch	Hardened Channel	8	18	10	17	6	6	3	10	10	2	2	7	4	**103**	**0.515**
23A_2	Thomas Branch	Scour Pool or Energy Dissipator	8	18	5	17	18	6	3	10	10	2	2	7	4	**110**	**0.55**
23DD	UNT to Old Farm Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
23M	UNT to Old Farm Creek	Temporary Impacts For Construction or Water Management	0	15	0	19	0	9	0	6	7	6	6	9	9	**86**	**0.43**
23N.S1	UNT to Old Farm Creek	Scour Pool or Energy Dissipator	2	12	2	12	18	6	2	10	10	2	2	3	4	**85**	**0.425**
23N.S1	UNT to Old Farm Creek	Hardened Channel	2	12	2	12	6	3	1	10	10	2	2	3	4	**69**	**0.345**
23N.S2	UNT to Old Farm Creek	Temporary Impacts For Construction or Water Management	10	18	9	11	9	4	18	8	8	5	5	4	7	**116**	**0.58**
23N_1.S2	UNT to Old Farm Creek	Scour Pool or Energy Dissipator	8	18	2	11	18	6	0	10	10	2	2	5	7	**99**	**0.495**
23N_1.S2	UNT to Old Farm Creek	Hardened Channel	8	18	9	11	6	4	3	10	10	2	2	5	7	**95**	**0.475**
23N_D	UNT to Old Farm Creek	Temporary Impacts For Construction or Water Management	10	10	8	10	15	15	16	7	7	5	5	6	7	**121**	**0.605**
23U	UNT to Old Farm Creek	Scour Pool or Energy Dissipator	8	17	5	18	18	6	3	10	10	2	2	4	3	**106**	**0.53**
23U	UNT to Old Farm Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
23U_1	UNT to Old Farm Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
23V	UNT to Old Farm Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
24A	Old Farm Creek	Temporary Impacts For Construction or Water Management	5	11	11	10	13	13	5	5	7	4	5	7	7	**103**	**0.515**
24A_1	Old Farm Creek	Scour Pool or Energy Dissipator	8	10	5	6	18	6	3	10	10	2	2	8	8	**96**	**0.48**
24A_1	Old Farm Creek	Hardened Channel	5	10	7	6	6	6	3	10	10	2	2	8	8	**83**	**0.415**
24C	UNT to Cabin John Creek	Scour Pool or Energy Dissipator	2	11	2	6	18	6	0	10	10	2	2	8	8	**85**	**0.425**
24C	UNT to Cabin John Creek	Temporary Impacts For Construction or Water Management	4	11	2	6	8	5	1	6	6	3	3	9	9	**73**	**0.365**
24F_2	Cabin John Creek	Hardened Channel	8	12	9	11	6	6	3	10	10	2	2	7	7	**93**	**0.465**

Table I-1. RBH Proposed Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Impact Type	Epifaunal Substrate / Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
24F_3	Cabin John Creek	Scour Pool or Energy Dissipator	8	12	5	8	18	6	3	10	10	2	2	8	8	**100**	**0.5**
24F_3	Cabin John Creek	Hardened Channel	5	12	13	8	6	6	3	10	10	2	2	8	8	**93**	**0.465**
24F_3	Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
24K	UNT to Cabin John Creek	Hardened Channel	2	13	8	12	6	6	16	10	10	2	2	7	7	**101**	**0.505**
24V	UNT to Cabin John Creek	Temporary Impacts For Construction or Water Management	0	0	0	16	1	1	0	8	8	1	2	7	7	**51**	**0.255**
24V	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
25E	UNT to Cabin John Creek	Temporary Impacts For Construction or Water Management	0	9	0	16	0	11	1	9	9	5	5	7	7	**79**	**0.395**
25F	UNT to Cabin John Creek	Temporary Impacts For Construction or Water Management	0	15	0	8	0	16	0	2	2	3	3	9	9	**67**	**0.335**
25H	UNT to Cabin John Creek	Hardened Channel	8	10	8	7	6	6	3	10	10	2	2	8	8	**88**	**0.44**
25H	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
25H	UNT to Cabin John Creek	Scour Pool or Energy Dissipator	8	10	5	7	18	6	3	10	10	2	2	8	8	**97**	**0.485**
25H_1	UNT to Cabin John Creek	Temporary Impacts For Construction or Water Management	0	16	0	16	0	11	1	9	9	5	5	7	7	**86**	**0.43**
25N	UNT to Cabin John Creek	Temporary Impacts For Construction or Water Management	7	7	3	6	7	13	2	8	5	8	8	9	9	**92**	**0.46**
26B_1	UNT to Watts Branch	Scour Pool or Energy Dissipator	2	8	2	7	18	6	0	10	10	2	2	6	6	**79**	**0.395**
26C_1	UNT to Watts Branch	Scour Pool or Energy Dissipator	2	8	2	7	18	6	0	10	10	2	2	6	8	**81**	**0.405**
26J	UNT to Watts Branch	Temporary Impacts For Construction or Water Management	12	8	6	7	17	13	2	9	9	5	5	9	7	**109**	**0.545**
26L	UNT to Watts Branch	Temporary Impacts For Construction or Water Management	6	0	0	6	5	0	3	10	10	4	4	9	9	**66**	**0.33**
27A	Watts Branch	Temporary Impacts For Construction or Water Management	6	13	9	12	17	11	6	6	7	3	2	7	6	**105**	**0.525**
27A_1	Watts Branch	Scour Pool or Energy Dissipator	8	9	5	10	18	6	3	10	10	2	2	7	6	**96**	**0.48**
27A_1	Watts Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
27A_1	Watts Branch	Hardened Channel	8	9	13	10	6	6	3	10	10	2	2	7	6	**92**	**0.46**
27A_2	Watts Branch	Scour Pool or Energy Dissipator	8	11	5	6	18	6	3	10	10	2	2	7	5	**93**	**0.465**
27A_2	Watts Branch	Hardened Channel	5	11	9	6	6	6	3	10	10	2	2	7	5	**82**	**0.41**
27A_3	Watts Branch	Hardened Channel	8	11	9	6	6	6	3	10	10	2	2	7	5	**85**	**0.425**
27B	UNT to Watts Branch	Temporary Impacts For Construction or Water Management	0	8	0	5	0	8	0	4	4	3	4	6	7	**49**	**0.245**
27C	UNT to Watts Branch	Temporary Impacts For Construction or Water Management	0	3	0	16	0	13	0	7	7	3	3	9	9	**70**	**0.35**
27D	UNT to Watts Branch	Hardened Channel	2	8	3	7	6	6	3	10	10	2	2	7	4	**70**	**0.35**
27D	UNT to Watts Branch	Scour Pool or Energy Dissipator	2	8	2	7	18	6	0	10	10	2	2	7	4	**78**	**0.39**
27H	UNT to Watts Branch	Temporary Impacts For Construction or Water Management	1	0	1	20	1	19	0	10	10	5	5	6	7	**85**	**0.425**
27K	UNT to Watts Branch	Hardened Channel	0	11	0	18	0	6	0	10	10	2	2	4	7	**70**	**0.35**

Table I-1. RBH Proposed Conditions Scores - On-Site Improvements

Feature ID	Stream Name	Impact Type	Epifaunal Substrate / Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall Quality Score
27L	UNT to Watts Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
27N	UNT to Watts Branch	Temporary Impacts For Construction or Water Management	0	0	0	19	0	16	0	7	10	2	2	6	7	**69**	**0.345**
27P	UNT to Watts Branch	Temporary Impacts For Construction or Water Management	11	7	10	10	12	19	13	8	3	4	4	4	9	**114**	**0.57**
28B	UNT to Muddy Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
29A	UNT to Muddy Branch	Scour Pool or Energy Dissipator	8	18	5	19	18	6	3	10	10	2	2	7	6	**114**	**0.57**
29A_1	UNT to Muddy Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
29A_2	UNT to Muddy Branch	Scour Pool or Energy Dissipator	8	7	5	10	18	6	3	10	10	2	2	8	7	**96**	**0.48**
29A_2	UNT to Muddy Branch	Hardened Channel	8	7	7	10	6	1	3	10	10	2	2	8	7	**81**	**0.405**
29D_D	UNT to Muddy Branch	Hardened Channel	2	11	8	6	6	6	3	10	10	2	2	7	7	**80**	**0.4**
29D_D	UNT to Muddy Branch	Scour Pool or Energy Dissipator	2	11	2	6	18	6	0	10	10	2	2	7	7	**83**	**0.415**
29K	UNT to Muddy Branch	Scour Pool or Energy Dissipator	2	8	2	18	18	6	2	10	10	2	2	5	5	**90**	**0.45**
29K	UNT to Muddy Branch	Hardened Channel	2	8	11	18	6	6	0	10	10	2	2	5	5	**85**	**0.425**

Table I-2. SFPF Proposed Condition Scores - On-Site Improvements

Feature ID	Stream Name	Impact Type	(1) Conc. Flow	(2) Flashiness	(3) Bank Height Ratio (BHR)	(4) Entrenchment Meandering	(5) Floodplain Drainage	(6) Vert. Stability Extent	(7) LB Riparian Vege. Zone	(7) RB Riparian Vege. Zone	(8) RB Dominant Bank Erosion Rate Potential	(8) LB Dominant Bank Erosion Rate Potential	(9) Lateral Stability Extent	(10) Shelter for Fish and Macro.	(11) Pool-to-Pool Spacing	(12) Pool Max Depth Ratio/Depth Variability	(13) Water Appearance and Nutrient Enrichment	(14) Detritus	(15) Macro-invertebrate	(16) Macro-invertebrate Tolerance	(17) Fish Presence	Habitat Parameter Sum	Overall Quality Score
20D	UNT to Thomas Branch	Temporary Impacts for Construction or Water Management	7	3	1	8	4	7	4	7	8	7	9	4	2	9	7	6	4	4	5	**106**	**0.56**
21B	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
21B	UNT to Thomas Branch	Scour Pool Energy Dissipator	5	3	3	3	5	9	7	6	8	8	9	4	1	8	7	6	4	4	5	**105**	**0.55**
21B	UNT to Thomas Branch	Hardened Channel	4	3	1	2	5	8	7	6	8	8	8	3	2	3	7	6	3	3	3	**90**	**0.47**
21B	UNT to Thomas Branch	Hardened Channel	4	3	1	2	5	8	7	6	8	8	8	3	2	3	7	6	3	3	3	**90**	**0.47**
21C	Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
21C	Thomas Branch	Temporary Impacts for Construction or Water	3	3	2	7	4	9	2	2	3	2	6	7	9	8	4	6	7	5	8	**97**	**0.51**
21C	Thomas Branch	Scour Pool Energy Dissipator	5	3	3	3	4	9	1	2	8	8	9	4	1	8	4	6	7	5	8	**98**	**0.52**
21C	Thomas Branch	Hardened Channel	3	3	2	7	4	9	2	2	8	8	8	3	9	8	4	6	3	3	3	**95**	**0.50**
21C_1	Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
21C_1	Thomas Branch	Scour Pool Energy Dissipator	5	3	3	3	3	9	3	1	8	8	9	4	1	8	4	4	3	3	5	**87**	**0.46**
21C_1	Thomas Branch	Hardened Channel	4	3	9	4	3	8	4	2	8	8	8	2	2	10	4	4	3	3	3	**92**	**0.48**
21C_2	Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
22CC	UNT to Cabin John Creek	Temporary Impacts for Construction or Water	4	2	2	4	4	4	4	6	3	3	6	3	5	0	5	5	1	1	1	**63**	**0.33**
22CC	UNT to Cabin John Creek	Relocated or Altered Channel	4	2	8	6	4	8	4	6	3	3	8	3	1	1	5	5	1	1	1	**74**	**0.39**
22CC	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
22MM.S2	Potomac River	Segment is under a new or widened bridge, excludes existing bridges	3	7	5	4	4	8	0	0	8	8	8	5	3	3	4	4	3	3	3	**83**	**0.44**
22MM.S2	Potomac River	Temporary Impacts for Construction or Water Management	3	7	5	5	5	9	4	6	8	8	6	5	3	3	4	4	3	3	3	**94**	**0.49**
23A_1	Thomas Branch	Hardened Channel	5	2	2	2	5	8	4	6	8	8	8	3	3	3	5	5	3	3	3	**86**	**0.45**
23A_1	Thomas Branch	Scour Pool Energy Dissipator	5	2	3	3	5	9	4	6	8	8	9	4	1	8	5	5	5	5	3	**98**	**0.52**
23A_1	Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
23A_3	Thomas Branch	Hardened Channel	5	2	1	3	4	8	7	7	8	8	8	3	1	3	8	8	2	3	3	**92**	**0.48**
23A_3_D	Thomas Branch	Hardened Channel	2	2	1	5	2	8	1	7	8	8	8	3	1	1	5	8	4	4	4	**82**	**0.43**
23A_3_D	Thomas Branch	Scour Pool Energy Dissipator	5	2	3	3	4	9	7	7	8	8	9	4	1	8	8	8	4	4	8	**110**	**0.58**
23A_3_D	Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
23AA	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
23AA_1	UNT to Thomas Branch	Hardened Channel	8	3	8	8	6	8	7	3	8	8	8	2	1	3	3	3	2	2	2	**93**	**0.49**
23AA_1	UNT to Thomas Branch	Scour Pool Energy Dissipator	5	3	3	3	6	9	7	7	8	8	8	2	1	8	3	3	2	2	2	**90**	**0.47**
23AA_1	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**

Table I-2. SFPF Proposed Condition Scores - On-Site Improvements

Feature ID	Stream Name	Impact Type	(1) Conc. Flow	(2) Flashiness	(3) Bank Height Ratio (BHR)	(4) Entrenchment Meandering	(5) Floodplain Drainage	(6) Vert. Stability Extent	(7) LB Riparian Vege. Zone	(7) RB Riparian Vege. Zone	(8) RB Dominant Bank Erosion Rate Potential	(8) LB Dominant Bank Erosion Rate Potential	(9) Lateral Stability Extent	(10) Shelter for Fish and Macro.	(11) Pool-to-Pool Spacing	(12) Pool Max Depth Ratio/Depth Variability	(13) Water Appearance and Nutrient Enrichment	(14) Detritus	(15) Macro-invertebrate	(16) Macro-invertebrate Tolerance	(17) Fish Presence	Habitat Parameter Sum	Overall Quality Score
23D	UNT to Thomas Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
23D	UNT to Thomas Branch	Scour Pool Energy Dissipator	5	3	3	3	8	9	6	2	8	8	8	4	1	8	5	5	3	3	4	**96**	**0.51**
23D	UNT to Thomas Branch	Hardened Channel	3	3	2	2	8	8	6	2	8	8	8	3	1	9	5	5	3	3	3	**90**	**0.47**
23K	UNT to Old Farm Creek	Relocated or Altered Channel	3	3	8	8	5	8	7	6	8	8	8	5	1	1	5	5	8	4	4	**105**	**0.55**
23K	UNT to Old Farm Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
23K_1	UNT to Old Farm Creek	Scour Pool Energy Dissipator	5	3	3	3	5	9	7	6	8	8	9	4	1	8	5	5	8	4	4	**105**	**0.55**
23K_1	UNT to Old Farm Creek	Temporary Impacts for Construction or Water Management	3	3	6	2	5	4	7	6	3	3	4	5	8	8	5	5	8	4	4	**93**	**0.49**
23K_1	UNT to Old Farm Creek	Relocated or Altered Channel	3	3	8	8	5	8	7	6	8	8	8	5	1	8	5	5	8	4	4	**112**	**0.59**
23K_D	UNT to Old Farm Creek	Temporary Impacts for Construction or Water Management	7	4	10	1	4	4	4	1	8	8	8	4	1	5	4	4	3	3	3	**86**	**0.45**
23K_D	UNT to Old Farm Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
23K_D	UNT to Old Farm Creek	Relocated or Altered Channel	7	4	8	6	4	8	4	1	8	8	8	4	1	1	4	4	3	3	3	**89**	**0.47**
24D	UNT to Cabin John Creek	Hardened Channel	5	3	1	4	6	8	2	2	8	8	8	3	1	1	4	4	2	2	1	**73**	**0.38**
24D	UNT to Cabin John Creek	Scour Pool Energy Dissipator	5	3	3	3	6	9	8	8	8	8	9	3	1	8	4	4	2	2	1	**95**	**0.50**
24D	UNT to Cabin John Creek	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.00**
26B	UNT to Watts Branch	Temporary Impacts for Construction or Water Management	5	3	4	9	6	6	7	4	6	6	6	6	9	4	8	7	5	6	3	**110**	**0.58**
26C	UNT to Watts Branch	Temporary Impacts for Construction or Water Management	6	2	2	9	7	7	5	7	3	3	5	5	3	9	5	6	4	4	2	**94**	**0.49**
26C	UNT to Watts Branch	Scour Pool Energy Dissipator	5	2	3	3	7	9	5	7	8	8	9	4	1	8	5	6	4	4	2	**100**	**0.53**
26K	UNT to Watts Branch	Temporary Impacts for Construction or Water Management	8	3	9	9	8	4	6	6	5	5	7	6	1	1	7	6	7	6	3	**107**	**0.56**

OFF-SITE STORMWATER MANAGEMENT PROPOSED CONDITION SCORES

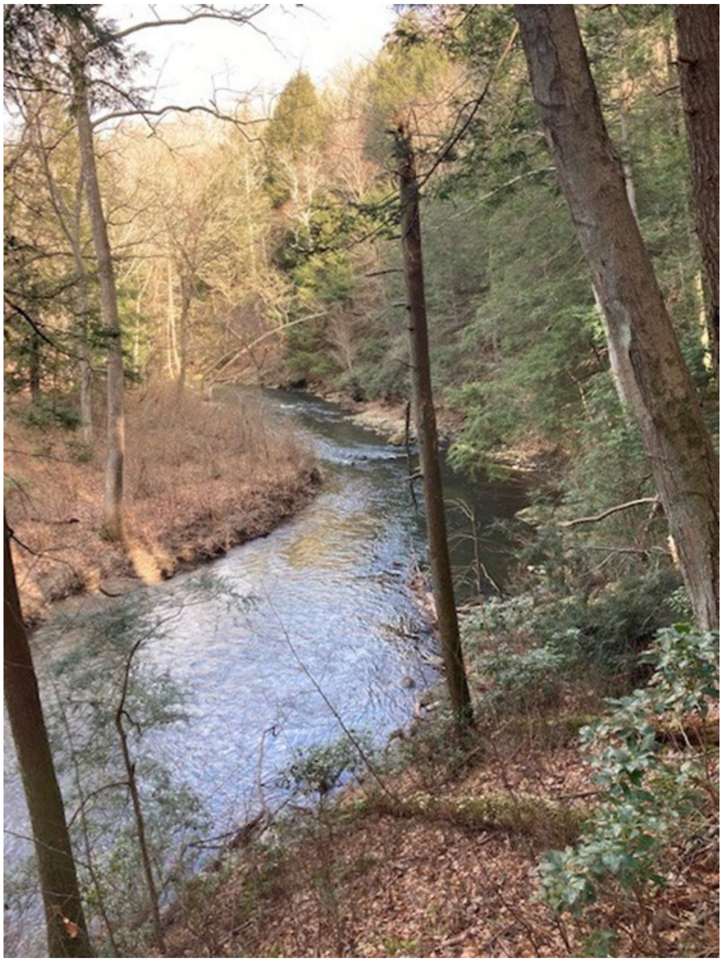
Table I-3. RBH Proposed Condition Scores - Off-Site Compensatory Stormwater Management

Feature ID	Stream Name	Impact Type	Epifaunal Substrate/ Available Cover	Embeddeness (High Gradient) Pool Substrate Character (Low Gradient)	Velocity/Depth Regime (High Gradient) Pool Variability (Low Gradient)	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles (High Gradient) Sinuosity (Low Gradient)	Bank Stability (Left Bank)	Bank Stability (Right Bank)	Vegetative Protection (Left Bank)	Vegetative Protection (Right Bank)	Riparian Vegetative Zone (Left Bank)	Riparian Vegetative Zone (Right Bank)	Habitat Parameter Sum	Overall quality Score
31OOO	UNT to Watts Branch	Hardened Channel	2	11	1	6	2	6	2	10	10	2	2	5	4	**63**	**0.315**
32L	Minnehaha Branch	Hardened Channel	8	18	16	13	6	6	3	10	10	2	2	0	1	**95**	**0.475**
32M	UNT to Minnehaha Branch	Channel is Filled or Placed in Culvert	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**

APPENDIX J: THE MARYLAND STREAM MITIGATION FRAMEWORK VERSION 1 (MSMF V.1) DRAFT MANUAL FOR STREAM IMPACT AND STREAM MITIGATION CALCULATION, 2022

2022

US ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
REGULATORY BRANCH



THE MARYLAND STREAM MITIGATION FRAMEWORK VERSION 1 (MSMF V.1.)

DRAFT MANUAL FOR STREAM IMPACT AND STREAM MITIGATION CALCULATION

AKNOWLEDGEMENTS

The Maryland Stream Mitigation Framework Version 1 (MSMF V.1.) is a product of collaboration between the U.S. Army Corps of Engineers (Baltimore District) and multiple partner agencies with valuable input from the regulated public. Project partners and other contributers are named below.

MSMF V.1. Team Members (Past and Present)

Nick Ozburn (USACE/Lead), Matt Hynson (USACE), Denise Clearwater (MDE), Randah Kamel (MDE), Alex Sicard (MDE), Mark Secrist (USFWS), Jack Dinne (USACE), Aaron Blair (EPA), Carrie Traver (EPA)

Contributions and feedback on MSMF V.1 and Beta Tool:

The Maryland Interagency Review Team, Maryland Environmental Service, The Ecosystem Restoration and Banking Association, Maryland Water Resources Registry Team, Maryland DNR, USACE Baltimore District (Regulatory Branch and Planning Division), The Maryland Wetland Assessment Team, USACE-Institute for Water Resources, Maryland State Highways Administration, Rich Starr (USFWS/EPR), and numerous consultants who provided valuable feedback on the MSMF Beta tool.

Stream Mitigation Protocols Reviewed In creation of MSMF V.1.

Several Mitigation Protocols from multiple Corps Districts were reviewed during creation of MSMF V.1. Reviews of the Minnesota Stream Quantification Tool (USACE-St.Paul District), The Unified Stream Methodology for Virginia (USACE-Norfolk District), The West Virginia Stream and Wetland Valuation Metric v2.1 (USACE-Huntington District), TXRAM (USACE-Galveston District), and The Tennessee SQT (USACE-Nashville District/TN Dept of Environment and Conservation), the Draft Maryland Wetland Assessment Methodology, and USACE-Louisville District mitigation protocols helped inform decisions made in development of MSMF V.1. Other mitigation protocols were also reviewed.

I. BACKGROUND

The Maryland Stream Mitigation Framework Version 1 (MSMF V.1.) provides a consistent and transparent process for stream impact and mitigation quantification where unavoidable impacts occur to Waters of the US, protected under Section 404 of the Clean Water Act. The Framework was established primarily as a tool for USACE (Baltimore District) regulators in Maryland to promote minimization and avoidance of impacts to streams and provide an accounting tool when unavoidable impacts occur and must be mitigated, with the goal of achieving “no net loss” of stream functions. Additionally, the framework has utility for project planners and mitigation providers in forecasting stream credits required or generated by various activities. The framework promotes impact minimization and avoidance, as well as strategic mitigation planning by allowing for distinction between stream habitats of different quality, landscape position, and sensitivity.

Initial testing was conducted using the MSMF Beta Tool on multiple impact and mitigation projects between May 2020 and February 2022, and knowledge from the associated project reviews informed creation of MSMF V.1.

The MSMF V.1. provides two calculators: the “Stream Impact Calculator” and the “Stream Mitigation Calculator,” which share a common unit of measure (the functional foot). The functional foot reflects losses and gains in stream functions and conditions by combining factors such as stream quality and stream size to the traditional measure of stream length. Please note that the Stream Impact Calculator and Stream Mitigation Calculator sheets are not relational, each providing independent calculations for impact and mitigation sites respectively.

The Framework will be implemented by the USACE Baltimore District for quantification of stream losses associated with unavoidable impacts to Waters of the U.S. in Maryland. Stream mitigation should be considered only after diligent avoidance and minimization efforts have been completed during permit application review. Functional foot values provided by the calculation sheets may be adjusted by the Corps based on site specific factors. Further, while the tool provides functional foot estimates by comparing existing and proposed conditions, total functional feet awarded for mitigation proposals will be updated during the monitoring period, based on site performance.

The MSMF V.1. Calculation sheets are provided in a single Microsoft Excel Workbook titled ”MSMF V.1..” Two calculation sheets are provided in the workbook: the “Stream Impact Calculator” and “Stream Mitigation Calculator.” The calculators display text in **BLACK**, ORANGE (Impact Tab), and GREEN (Mitigation Tab). Note that the user will only enter data in the cells with **BLACK** text or those which are blank. Boxes with ORANGE and GREEN text are locked and will populate when necessary, data is entered in the worksheet.

Example scenarios and solutions are provided in *Appendix A* at the bottom of this document to help provide understanding of the tool.

SECTION II
MSMF V.1. STREAM IMPACT CALCULATOR

II. STREAM IMPACT CALCULATION TAB

To populate the Stream Impact Calculator Tab, the user will need the following documents and tools:

The Maryland Watershed Resources Registry, USGS Stream Stats, mapping software, and one or more of the stream assessments listed below (*see also Table 1*):

The Functions Based Rapid Stream Assessment (FBRSA with numeric scoring), the EPA Rapid Bioassessment Protocol Habitat Form for High Gradient Streams (RBP HG), EPA Rapid Bioassessment Protocol Habitat Form for Low Gradient Streams (RBP LG), EPA RBP Habitat form for High Gradient Intermittent/Ephemeral Streams (RBP HG Int/Eph), and the EPA RBP Habitat form for Low Gradient Intermittent/Ephemeral Streams (RBP LG Int/Eph). *See information regarding stream assessments selection under "Section II. c. vii Stream Quality" below*.

In the Impact Calculation Tab, rows with white backgrounds represent "existing" conditions, which rows with orange backgrounds represent "proposed" conditions.

When submitting the MSMF Impact Calculation sheet to the Corps for review, the user must also include site mapping (showing locations of each resource which is tabulated in the Impact Calculator), a stream assessment form for each reach with a reach photograph, and labeling must be consistent between assessment sheets and maps. In addition, mapping from the Watershed Resources Registry "Maryland Stream Mitigation Framework Layers: Site Sensitivity for Stream Impacts"

a. <u>Background Information</u>

i. *Corps Project ID #*

Enter the Corps Permit Number if known. The Corps Permit number will become available after a permit application is received by the Corps.

ii. *Project Name*

iii. *Lat/Long*

Provide site coordinates in decimal degrees (*ex. 39.54876, -78.09878*)

iv. *County*

v. *Corps PM*

Enter the Corps project manager (reviewer) name. This may be added at a later time if the Corps PM had not yet been assigned.

vi. *Date*

Enter the date the Impact Calculator Tab was populated with site information

vii. *Sponsor*

Indicate the project sponsor or applicant

viii. *Collaborators*

Provide the name and affiliation of users

b. Total Stream Losses
Located in the top far right corner of the Impact Calculator, a number will be seen which tabulates the functional foot values for all stream impacts provided in the sheet from Column O "Stream Losses (functional feet)."

c. *Raw Change in Reach Value (functional feet)*: The "Raw Change in Reach Value" section produces a raw functional foot value (Proposed Value–Existing Value) using several variables described below. The score will then be run through a second section (*See II.d Below* "Stream *Impact Adjustments"*) yielding "Stream Losses" by reach.

i. *Reach Name*: The user must identify a stream reach name. We recommend that you identify reaches which are unique in quality, drainage area, and proposed treatment. Specifically for stream impacts, where stream quality changes noticeably or a major tributary enters the stream, a new reach should be entered as a new Row in the Stream Impact Calculator.

ii. *Physiographic Region*: The user must identify a general physiographic region for their reach: Mountain, Piedmont, or Coastal Plain.

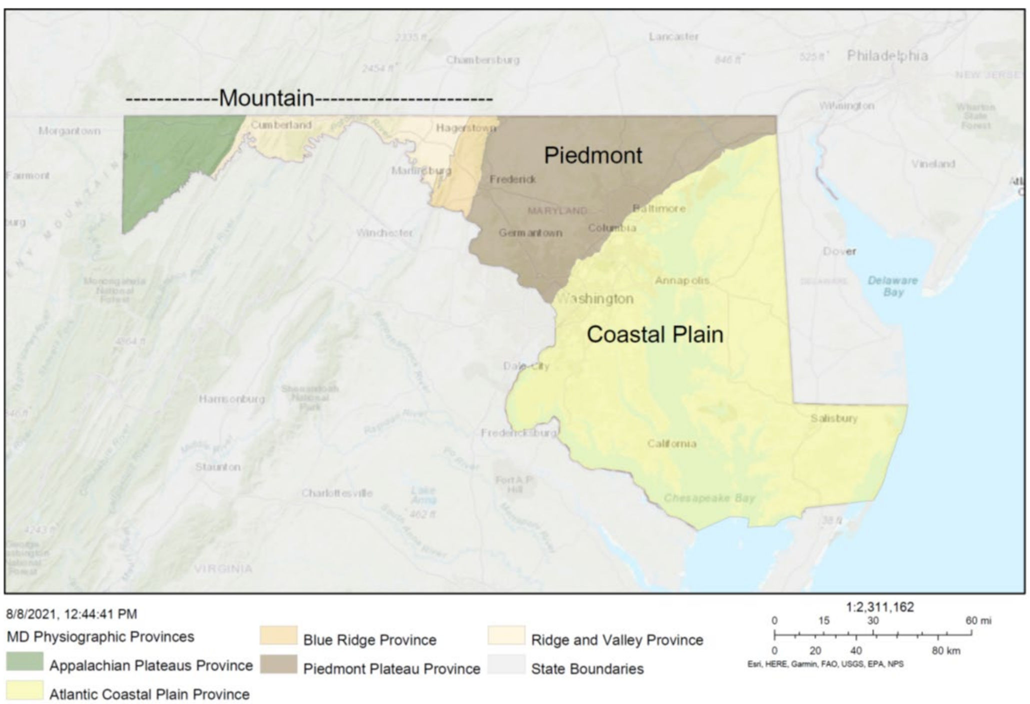


Figure 1 showing general physiographic regions of Maryland

iii. *Evaluation*: For each Stream Reach, there will be two evaluations (rows), one for existing conditions, the other for proposed conditions after an impact (See Table 1 above).

iv. *Activity*: Activity refers to the action affecting the stream reach. In the Stream Impact Calculator Tab, for Existing conditions, "Preliminary Resource Evaluation" is set. When a section of stream is proposed to be impacted, please select the appropriate impact type from the drop-down menu. Please note that the credits are determined from the existing vs. proposed stream quality values, and the impact category is for categorical only purposes, and is not reflected in the crediting.

v. *Resource Type*: Resource type corresponds to channel flow. It may be either Ephemeral, Intermittent, Perennial Headwater, or Perennial Wadeable. Perennial Wadeable streams are defined as those with a drainage area exceeding 5 square miles. Select the "Resource Type" from the dropdown. Definitions of stream resource types by flow class can be found in the definitions section. Please note that the resource type is only descriptive and does not factor into the credit determination. Questions regarding Corps jurisdiction over aquatic resources should be coordinated with the assigned project manager or a jurisdictional determination request may be requested by sending an email to: NAB-regulatory@usace.army.mil.

vi. *Reach Length (linear feet)*: The user must indicate the length of the stream reach as measured from the centerline of the active baseflow channel.

vii. *Stream Quality*: Stream quality ranges from 0-100% based on the total score of a reach divided by total possible score (*X 100*) of an approved Functional or Conditional Assessment Methodology (FCAM). A Stream Quality of "100%" represents a perfect condition score. The user will enter values in the Stream Quality boxes for both existing and proposed condition scores. Where a stream will be filled or placed in a pipe or culvert as a result of the proposed activity, please enter the FCAM Score to the Stream Quality Column under "Existing" and a 0 in the "Proposed" condition. For all other impact types, the user will need to assess stream conditions before the impact and then project conditions following the impact to fill out the "proposed" stream quality. Streams will be assessed following stream impacts to ensure "proposed" condition values were accurate. As mentioned in Section "II. I Reach Name", when a stream reach changes noticeably in quality, treatment, or drainage area, a new stream reach should be entered in rows below the previous reach, and a separate stream quality assessment recorded.

FCAM's by Resource Type, stream gradient, and reach length:
The following FCAMS should be applied to determine stream quality for impact reaches less than 300 linear feet in length (*see also Table 1 below*): "EPA RBP Habitat Form HG" for perennial streams with slopes exceeding 2%, "EPA RBP Habitat Form LG" for perennial streams with slopes below 2%,, "EPA RBP Habitat Form Int/Eph HG" for intermittent and ephemeral streams with slopes exceeding 2%, and "EPA RBP Habitat Form Int/Eph LG" for intermittent and ephemeral streams with slopes less than 2%. For intermittent or perennial streams reaches exceeding 300 linear feet in length, or reaches exhibiting excellent quality, the "Function Based Rapid Stream Assessment (with numeric scoring)" must be used. Flexibility regarding the appropriate stream assessment for streams with slopes near 2% may be discussed with the Corps project reviewer. Citations for the EPA RBP Habitat forms can be found in the "References" section below (Barbour and others, 1999), and the Function Based Rapid Stream Assessment (USFWS, 2015). The manual for the FBRSA can be found at: https://www.fws.gov/chesapeakebay/restoring-habitat/stream-restoration/stream-protocols.html. Please disregard sections referring to the "Watershed Assessment" for the purpose of the MSMF V.1.

Table 1: Functional and Conditional Assessment Methodologies to determine "Stream Quality" values for MSMF V.1. Stream Impact Calculator				
Reach Length	Resource Type	Stream Slope	FCAM	Citation
<300 linear feet	Perennial	>2%	EPA RBP Habitat Form High Gradient	Barbour & others, 1999
<300 linear feet	Perennial	<2%	EPA RBP Habitat Form Low Gradient	Barbour & others, 1999
<300 linear feet	Intermittent or Ephemeral	>2%	EPA RBP Habitat Form High Gradient for Int/Eph Streams	Barbour & others, 1999
<300 linear feet	Intermittent or Ephemeral	<2%	EPA RBP Habitat Form Low Gradient for Int/Eph Streams	Barbour & others, 1999
>300 linear feet	Perennial	All	Function Based Rapid Stream Assessment (with numeric scoring)	USFWS, 2015

Table 1 showing applicable FCAM to determine "Stream Quality" values organized by impact reach length, resource type, and stream slope. Note that a Corps reviewer may require a more rigorous stream assessment for resources occurring in sensitive areas or exhibiting excellent quality.

viii. *Channel Thread*: Channel Thread was included in the Framework for multi-threaded channels and oxbow channels. There are three options for channel thread (primary, second, or third). Single thread channels are considered "primary" channels and awarded at a ratio of 1.0 (no adjustment). For multi-threaded channels, the user must designate a primary or main channel, then may label any additional channels as second channels (0.2 multiplier) or third channels (0.1 multiplier). For second or third channels, credit will only be debited (or awarded) for perennial channels with active channels at least 1 foot wide with pools 0.5 feet deep. Oxbows may be treated as second or third channels. For the Channel Thread factor, it is important that we note the difference between "Multi-thread channels" and "Braided Channels." For the purpose of the MSMF, multi-thread channels are those channels in the same valley and general flowpath of a primary channel separated by an upland (or wetland) island where vegetation is established and soil formation is occurring. Braided channels are typically very dynamic streams and a result of high bed load (where soil development and vegetation do not occur on areas between channels). Braided channels are to be treated as one single primary channel for a given valley.

ix. *Drainage Area (sqmi)*: For primary channels, enter the drainage area (in square miles rounded to the nearest tenth) in the top box of the column (I) and the adjustment factor will populate in the box below. Drainage area must be determined using USGS stream stats: https://www.usgs.gov/mission-areas/water-resources/science/streamstats-streamflow-statistics-and-spatial-analysis-tools?qt-science_center_objects=0#qt-science_center_objects The drainage area must be measured from the center of the subject reach. Where drainage area is unavailable on USGS Stream stats, the user must measure the drainage area from a topographic map. For multi-threaded streams, indicate the drainage area for primary channels in Column I, and for second or third channels, use a value of 1 sqmi for the drainage area. The Drainage Area Adjustment applies only to primary stream channels, and is a set value where

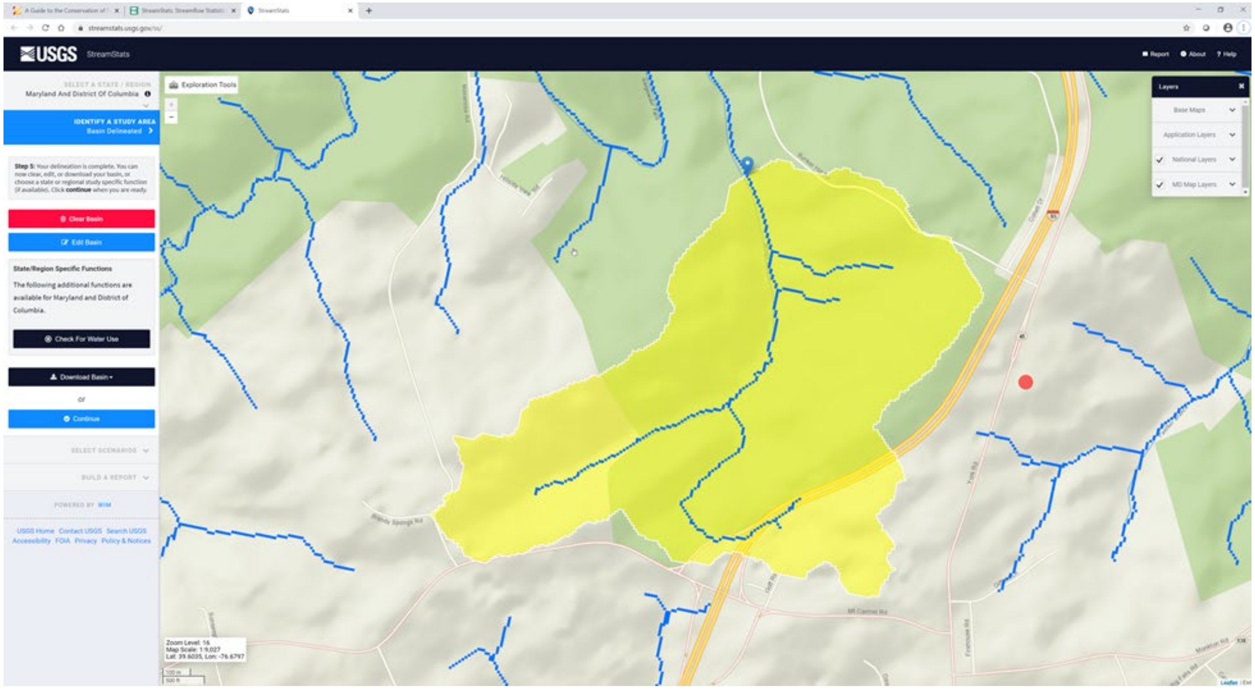


Figure 2 showing drainage area from the center of a subject reach using USGS Stream Stats (Mingo Branch, Baltimore County Maryland). The Drainage area (and other information) can be calculated when generating a report in USGS Stream Stats.

The drainage area adjustment is based on the bankfull regional curves for Maryland relating drainage area to bankfull stream width. It captures differences in stream sizes in the Framework and differences in estimated regulated stream area. For example, in the Maryland Piedmont (Wbkfl=14.78DA^0.39), (USFWS 2002). MSMF V.1. sets the benchmark drainage area value at 1 sqmi drainage area (Where DA of 1 square mile receives a multiplier of 1, or no adjustment). The Drainage area adjustment is effective in a range between 0.1-10 square miles, and values above and below the range are capped. The Stream Impact Calculator will apply the appropriate Maryland regional curve equation (USFWS 2002, USFWS 2003) based on the physiographic region you select in Column B.

x. *Raw Reach Value (Functional Feet):* The Raw Reach Value (Functional Feet) is the raw functional foot value of a reach before stream impact (or mitigation) adjustments are taken into account. Raw reach value is the product of Stream Length, Stream Quality, Channel Thread factor, and the Drainage Area factor. Raw Reach Value is calculated for both the existing and proposed conditions.

xi. *Raw Change in Reach Value (Functional Feet):* The Raw Change in Reach Value is the difference in the Raw Reach Value between existing and proposed conditions.

d. <u>Stream Impact Adjustments</u>

After the Raw change in stream reach value is determined, two adjustment factors apply to the Raw change in Reach value: Site Sensitivity Adjustment and the Mitigation Ratio.

i. *Site sensitivity*: "Site sensitivity" was included in the Framework to apply general concepts of landscape ecology (MacArthur & Wilson 1967) to mitigation and impact siting. The purpose is to incentivize minimization and avoidance of impacts to streams as well as implement a watershed approach to mitigation as encouraged by the Mitigation Rule (Final Rule, 2008). The Stream Sensitivity adjustment is added to both the Mitigation and Impact Calculators. The score will range from 1-3 where 10% or 0.1 will be added (max of 0.3 or 30%) for each item from the following list which is reflected in the Maryland Watershed Resources Registry (WRR) https://watershedresourcesregistry.org/states/maryland.html under the title: "Maryland Stream Mitigation Framework Layers: Site Sensitivity Analysis for Stream Impacts." The WRR also provides a color-coded map with a composite score for specific areas which reflect the following items below:

> *Low impervious Cover*: Streams in catchments with <10% impervious cover from National Land Cover Data 2016 receive a one point increase.
> *Located in Target Ecological Areas*: Sites located in Target Ecological Areas as defined by Maryland Department of Natural Resources receive a one point increase.
> *Located Near Protected Lands*: Sites located within 1 mile of protected lands or the Chesapeake Bay Critical Area receive a one point increase.

Note that adjustments to Site Sensitivity factor may be made by the Corps reviewer where justified based on ecological factors (ex. site connecting two Target ecological areas, etc). The user may request an adjustment to this factor based on ecological justification.

ii. *Mitigation Ratio*: Per the recommendation of the 2008 mitigation Rule (33 CFR 332), the mitigation ratio addresses temporal loss and other adjustments to provide balance between the Stream Impact Calculator and Stream Mitigation Calculator to help achieve "no net loss." *Note: Temporal loss values applied by the USACE Jacksonville District, Huntington District, Louisville District, and others were considered in setting the temporal loss value applied to the Mitigation Ratio for MSMF V.1..*

e. Stream Losses (functional feet): Produces the stream mitigation required for an impact activity on a given reach in Functional Feet. Stream Losses are calculated automatically by adjusting the Raw change in reach value by the Site Sensitivity Adjustment and Mitigation Ratio.

f. Remarks: The remarks section provides space to make notes about the reach for the Corps project manager.

SECTION III

MSMF V.1. STREAM MITIGATION CALCULATOR

III. STREAM MITIGATION CALCULATION

To populate the Stream Mitigation Calculator Tab, the user will need the following documents and tools:

The Maryland Watershed Resources Registry, USGS Stream Stats, mapping software, the Stream Buffer Quality Assessment (with instructions), and one or more the following stream assessments The Functions Based Rapid Stream Assessment (FBRSA with numeric scoring), the EPA Rapid Bioassessment Protocol Habitat Form for Int/Eph High Gradient Streams (RBP Int/Eph HG), and the EPA Rapid Bioassessment Protocol Habitat Form for Int/Eph Low Gradient Streams (RBP Int/Eph LG). *See information regarding stream assessments selection under Section III. C. vii Stream Quality below*.

In the Mitigation Calculation Tab, rows with white backgrounds represent "existing" conditions, which rows with green backgrounds represent "proposed" conditions.

When submitting the MSMF Impact Calculation sheet to the Corps for review, the user must also include site mapping (showing locations of each resource which is tabulated in the Mitigation Calculator), a stream assessment form for each reach with a reach photograph, and labeling must be consistent between assessment sheets and maps. In addition, mapping from the Watershed Resources Registry "Maryland Stream Mitigation Framework Layers: Site Sensitivity for Stream Mitigation" is recommended.

a. <u>Background Information</u>

i. *Corps Project ID #*
Enter the Corps Permit Number if known. The Corps Permit number will become available after a permit application is received by the Corps.

ii. *Project Name*

iii. *Lat/Long*
Provide site coordinates in decimal degrees (*ex. 39.54876, -78.09878*)

iv. *County*

v. *Corps PM*
Enter the Corps project manager (reviewer) name. This may be added at a later time if the Corps PM had not yet been assigned.

vi. *Date*
Enter the date the Mitigation Calculator Tab was populated with site information

vii. *Sponsor*
Indicate the project sponsor or applicant

viii. *Collaborators*
Provide the name and affiliation of users

b. Total Stream Gains
Located in the top far right corner of the Impact Calculator, a number will be seen which tabulates the functional foot values for all stream impacts provided in the sheet from Column R "Stream Gains (functional feet)."

c. *Raw Change in Reach Value (functional feet)*: The "Raw Change in Reach Value" section produces a raw functional foot value (Proposed Value–Existing Value) using several variables described below. The score will then be run through a second section (*See II.d Below* "Stream *Mitigation Adjustments"*) yielding "Stream Gains" by reach.

i. *Reach Name*: The user must identify a stream reach name. We recommend that you identify reaches which are unique in quality, drainage area, and proposed treatment. Specifically for stream mitigation, where stream quality changes noticeably or a major tributary enters the stream, a new reach should be entered as a new Row in the Stream Mitigation Calculator. Reach splitting may also be helpful when a stream reach treatment changes (*ex. different restoration approach*).

ii. *Physiographic Region*: The user must identify a general physiographic region for their reach: Mountain, Piedmont, or Coastal Plain.

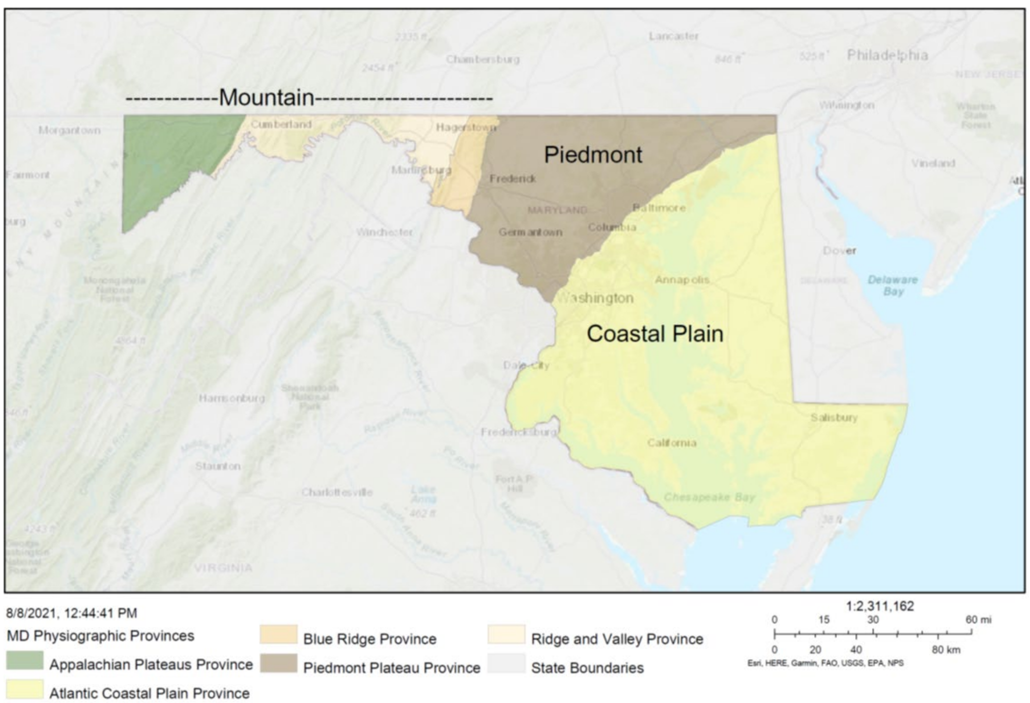


Figure 4 showing general physiographic regions of Maryland

iii. *Evaluation*: For each Stream Reach, there will be two evaluations (rows), one for existing conditions, the other for proposed conditions after an activity.

iv. *Activity*: Activity refers to the action affecting the stream reach. In the Stream Mitigation Calculator Tab, for Existing conditions, "Preliminary Resource Evaluation" is set. When a section of stream or its buffer is proposed to be restored or enhanced, select "Restoration/Enhancement" drop-down menu. When a stream reach or its buffer are to be preserved, select “Preservation.” Where a stream reach is restored but the buffer is to be preserved (or the other way around), create a new row for the stream buffer, and do not include buffer information for that reach and instead add the buffer preservation in its own row “existing” vs “proposed”. Equations for “Restoration/Enhancement” and “Preservation” are unique. Stream reaches generally must be of excellent quality to be considered for preservation. In some instances, streams of above average quality may be preserved when part of a larger mitigation proposal and restoration is infeasible for the subject stream reach. Please note that channel creation is not generally supported in MSMF V.1. unless evidence supports its previous occurrence. In such an instance, the work would classified as “Re-establishment,” “Restoration/Enhancement” should be selected from the dropdown list, and a note should be placed in the remarks section for that row. Channel creation (“Establishment”) may be acceptable when creating multi-thread systems (new second and third channels).

v. *Resource Type*: Resource type corresponds to channel flow. It may be either Ephemeral, Intermittent, Perennial Headwater, or Perennial Wadeable. Perennial Wadeable streams are defined as those with a drainage area exceeding 5 square miles. Select the “Resource Type” from the dropdown. Definitions of stream resource types by flow class can be found in the definitions section. Please note that the resource type is only descriptive and does not factor into the credit determination. Additionally, mitigation work on ephemeral channels should be limited to the minimum necessary to provide stable elevations for a larger proposal and address erosion presenting design challenges for receiving waters that will be worked. Preservation is also acceptable on high quality ephemeral reaches. Questions regarding Corps jurisdiction over aquatic resources should be coordinated with the assigned project manager or a jurisdictional determination request may be requested by sending an email to: NAB-regulatory@usace.army.mil.

vi. *Reach Length (linear feet)*: The user must indicate the length of the stream reach as measured from the centerline of the active baseflow channel. For tributaries meeting a mainstem stream, excessive downstream extension of a channel may not be credited (extending a channel parallel with the receiving waterbody for an unnaturally long distance). The Corps reviewer will evaluate whether the proposed confluence between two channels is reasonably placed to assist in determining the credited stream length.

vii. *Stream Quality*: Stream quality ranges from 0-100% based on the total score of a reach divided by total possible score of an approved Functional or Conditional Assessment Methodology (FCAM). FCAMS are recommended by the 2008 Mitigation Rule to capture functional and conditional changes in resources (33 CFR 332). For the MSMF V.1. Stream Quality of “100%” represents a perfect FCAM score. The user will enter values in the Stream Quality boxes for both existing and proposed condition scores. As mentioned in Section “III.c.i Reach Name”, when a stream reach changes noticeably in quality, treatment, or drainage area, a new stream reach should be entered in rows below the previous reach, and a separate stream quality assessment recorded.

FCAM’s by Resource Type, stream gradient, and reach length:
One or more of the following FCAMS must be applied to determine stream quality for mitigation reaches for perennial and intermittent streams: the Function Based Rapid Stream Assessment (USFWS, 2015). The manual for the FBRSA can be found at:

https://www.fws.gov/chesapeakebay/restoring-habitat/stream-restoration/stream-protocols.html. Please disregard sections referring to the "Watershed Assessment" for the purpose of the MSMF V.1. For work in ephemeral streams, the user may use the EPA RBP Habitat Form Int/Eph HG for streams with slopes exceeding 2%, and "EPA RBP Habitat Form Int/Eph LG" for ephemeral streams with slopes less than 2%. Flexibility regarding the appropriate stream assessment for streams with slopes near 2% may be discussed with the Corps project reviewer. Citations for the EPA RBP Habitat forms can be found in the "References" section below (Barbour and others, 1999) and the Function Based Rapid Stream Assessment (USFWS, 2015).

Table 2: Functional and Conditional Assessment Methodologies to determine "Stream Quality" values for MSMF V.1. Stream Mitigation Calculator

Reach Length	Resource Type	Stream Slope	FCAM	Citation
All	Perennial and Intermittent	All	Function Based Rapid Stream Assessment (with numeric scoring)	USFWS, 2015
All	Ephemeral	<2%	EPA RBP Habitat Form Low Gradient for Int/Eph Streams	Barbour & others, 1999
All	Ephemeral	>2%	EPA RBP Habitat Form High Gradient for Int/Eph Streams	Barbour & others, 1999

Table 2 showing applicable FCAM to determine "Stream Quality" values organized by mitigation reach length, resource type, and stream slope. Note that a Corps reviewer may require a more rigorous stream assessment for resources occurring in sensitive areas or exhibiting excellent quality.

viii. *Channel Thread*: Channel Thread was included to describe calculations for multi-threaded channels and oxbow channels. There are three options for channel thread (primary, second, or third). Single thread channels are considered "primary" channels and awarded at a ratio of 1.0 (no adjustment). For multi-threaded channels, the user must designate a primary or main channel, then may be awarded additional credits for second (0.2 multiplier) or third channels (0.1 multiplier) improvements. For second or third channels, credit will only be debited (or awarded) for intermittent or perennial channels with active channels at least 1 foot wide with pools 0.5 feet deep. Oxbows may be treated as second or third channels. For the Channel Thread factor, it is important to note the difference between "Multi-thread channels" and "Braided Channels." For the purpose of the MSMF, multi-thread channels are those channels in the same valley and general flowpath of a primary channel separated by an upland (or wetland) island where vegetation is established and soil formation is occurring. Braided channels are typically very dynamic streams and a result of high bed load (where soil development and vegetation do not occur on areas between channels). Braided channels are to be treated as one single primary channel for a given valley.

ix. *Drainage Area (sqmi)*: For primary channels, enter the drainage area (in square miles rounded to the nearest tenth) in the top box of the column (I) and the adjustment factor will populate in the box below. Drainage area must be determined using USGS stream stats: https://www.usgs.gov/mission-areas/water-resources/science/streamstats-streamflow-statistics-and-spatial-analysis-tools?qt-science_center_objects=0#qt-science_center_objects

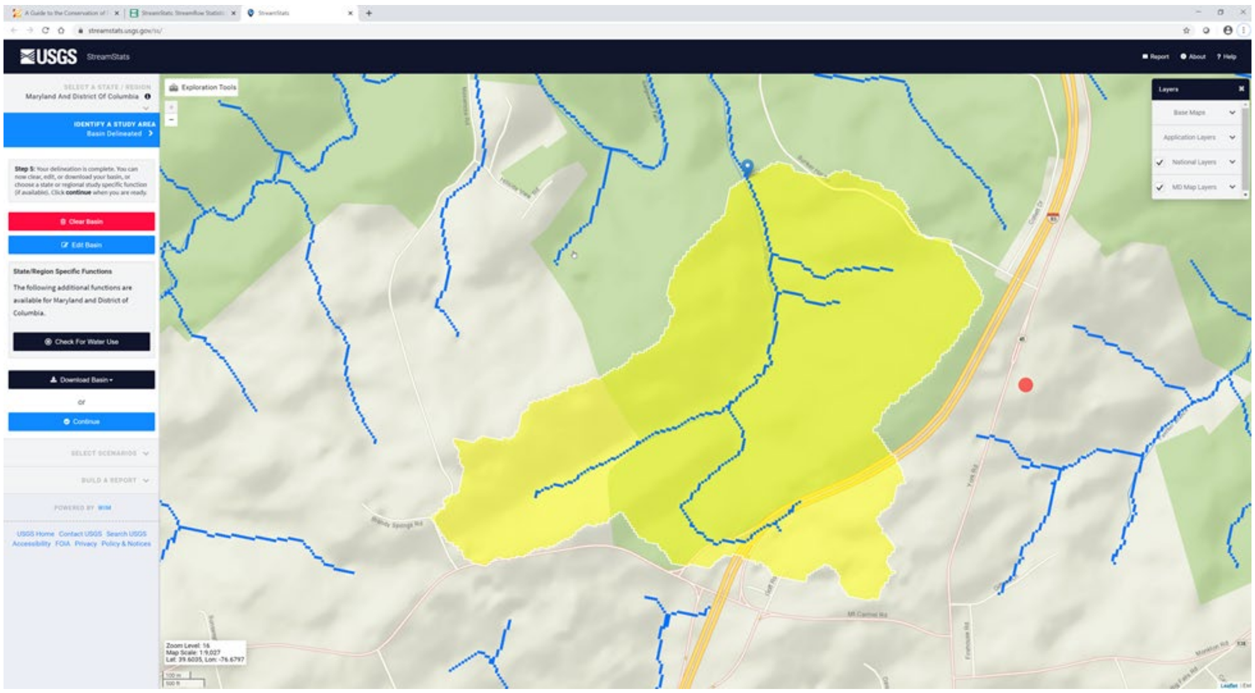


Figure 2 showing drainage area from the center of a subject reach using USGS Stream Stats (Mingo Branch, Baltimore County Maryland). The Drainage area (and other information) can be calculated when generating a report in USGS Stream Stats.

The drainage area adjustment is based on the bankfull regional curves for Maryland relating drainage area to bankfull stream width. It captures differences in stream sizes in the Framework and differences in estimated regulated stream area. For example, in the Maryland Piedmont (Wbkfl=14.78DA^0.39), (USFWS 2002). MSMF V.1. sets the benchmark drainage area value at 1 sqmi drainage area (Where DA of 1 square mile receives a multiplier of 1, or no adjustment). The Drainage area adjustment is effective in a range between 0.1-10 square miles, and values above and below the range are capped. The Stream Impact Calculator will apply the appropriate Maryland regional curve equation (USFWS 2002, USFWS 2003) based on the physiographic region you select in Column B.

x. *Raw Reach Value (Functional Feet):* The Raw Reach Value (Functional Feet) is the raw functional foot value of a reach before stream mitigation adjustments are taken into account. Raw reach value is the product of Stream Length, Stream Quality, Channel Thread factor, and the Drainage Area factor. Raw Reach Value is calculated for both the existing and proposed conditions.

xi. *Raw Change in Reach Value (Functional Feet):* The Raw Change in Reach Value is the difference in the Raw Reach Value between existing and proposed conditions.

d. Stream Mitigation Adjustments

After the Raw change in stream reach value is determined, three adjustment factors apply to the Raw change in Reach value: Site Sensitivity Adjustment, Site Protection, and Buffer Adjustment.

i. *Site sensitivity*: "Site sensitivity" was included in the Framework to apply general concepts of landscape ecology (MacArthur & Wilson 1967) to mitigation and impact siting. The purpose is to incentivize minimization and avoidance of impacts to streams as well as implement a watershed approach to mitigation as encouraged by the Mitigation Rule (Final Rule, 2008). The Stream Sensitivity adjustment is added to both the Mitigation and Impact Calculators. The score will range from 1-3 where 10% or 0.1 will be added (max of 0.3 or 30%) for each item from the following list which is reflected in the Maryland Watershed Resources Registry (WRR) https://watershedresourcesregistry.org/states/maryland.html under the title: "Maryland Stream Mitigation Framework Layers: Site Sensitivity Analysis for Stream Mitigation." The WRR also provides a color-coded map with a composite score for specific areas which reflect the following items below:

Low impervious Cover: Streams in catchments with <10% impervious cover from National Land Cover Data 2016 receive a one point increase.
Located in Target Ecological Areas: Sites located in Target Ecological Areas as defined by Maryland Department of Natural Resources receive a one point increase.
Located Near Protected Lands: Sites located within 1 mile of protected lands or the Chesapeake Bay Critical Area receive a one point increase.

Note that adjustments to Site Sensitivity factor may be made by the Corps reviewer where justified based on ecological factors (ex. site connecting two Target ecological areas, etc). They user may request an adjustment to this factor based on ecological justification. In instances where water quality is impaired or substantial constraints occur on the site, the Site Sensitivity factor should be reduced.

ii. *Site Protection*: The site protection factor captures the level of protection provided to the site. Easements are the preferred site protection mechanism, while Deed restrictions, or work on public lands may also be proposed. Adjustments to functional feet crediting based on site protection are as follows:

1. Easement (+3%): A Conservation easement held by a third party.
2. Accredited Easement (+5%): A conservation easement held by a third party which is accredited by the Land Trust Alliance.
3. Deed Restriction (0%): Deed restrictions are restrictions placed on the deed, limiting development and uses detrimental to the mitigation site.
4. Improved Protection (-3%): Improved protection is any form of protection listed above where existing protections exist on the site, but they are insufficient for mitigation purposes. Improved protection should be selected when additional protections are provided by the project sponsor.
5. Existing Protection (-5%): This includes work on public lands or other protected properties where no change in the level of site protection occurs as a result of the mitigation work. Note that the Corps reviewer will need to determine whether the

existing protection is sufficient, or if more rigorous protection is needed. If additional protections are provided, "Improved protection" should be selected instead.
Note: Conservation easements and deed restrictions were the assumed site protection mechanisms when setting the Mitigation Ratio for the Impact Calculator. "Improved Protection" and "Existing Protection" yield negative values because the assumed improvement to site protection is not in effect if working on land already protected.

iii. *Buffer adjustment:* The Stream Buffer Adjustment considers both buffer area (acres) and buffer quality and may be awarded only to stream buffers receiving permanent protection. The stream buffer adjustment is addressed in detail in the Stream Buffer Quality Assessment (and instructions). Stream buffers may receive credit for areas up to 200 feet from the edge of water at baseflow on a perennial stream and up to 100 feet from the edge of channel on intermittent or ephemeral streams. Buffers may extend out to the maximum distance on both sides of the stream, leaving a maximum stream buffer width of 400 feet on perennial channels and 200 feet on intermittent and ephemeral channels. The stream channel itself may not be included in the buffer area calculation (nor may credited wetlands). The user may elect to associate a stream buffer with each reach, or may elect to determine specific buffers areas based on topography and/or vegetation changes or planting zones. Delineated buffer areas may change for existing vs proposed conditions, and all changes are captured in the tabulations of the MSMF V.1. Stream Mitigation Calculator. See detailed instructions in "MSMF V.1. Stream Buffer Quality Assessment" and "MSMF V.1. Stream Buffer Quality Assessment Instructions."
Note: Mitigation proposals involving clearing of high quality mature forests or other high quality vegetative communities may result in a loss of stream credits (function feet) under the "Stream Buffer Adjustment."

e. <u>Stream Gains (functional feet)</u>: Provides the stream mitigation produced by a restored or preserved stream reach and/or stream buffer measured in functional feet. Stream Gains are calculated automatically by adjusting the Raw change in reach value by the Site Sensitivity Adjustment, Site Protection Factor, and Buffer Adjustment.

f. <u>Remarks</u>: The remarks section provides space to make notes about the reach for the Corps project manager.

IV. DEFINITIONS

Baseflow channel: Stream channel observed during typical low flow conditions.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource functions, but may also lead to decline in other resource functions. Enhancement does not result in a gain in aquatic resource area. (33 CFR 332.2).

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and functions. (33 CFR 332.2). For the purposes of the MSMF Beta version, Establishment Activities are not included as mitigation activities.

Functional Foot: For the purpose of the Maryland Stream Mitigation Framework, a functional foot is defined as a linear foot of stream of perfect quality (100% or 1.0 score) and a drainage area of 1 square mile. A functional foot relates to streams of any flow type and quality in a stream network and these factors influence the value of a linear foot of stream as a functional foot.

Impact: For the purposes of the MSMF Beta Tool, an impact is defined as an adverse effect to streams pursuant to Section 404 where a loss in stream functions or conditions occur.

Mitigation: Activities undertaken for the purpose of offsetting unavoidable impacts to Waters of the US. This may occur in the form of Preservation, Restoration (Rehabilitation or Reestablishment), or Enhancement.

<u>*Resource Type*</u>:
Ephemeral Stream: An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow. [77 Fed. Reg. 10184 (February 21, 2012)]

Intermittent Stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow. [77 Fed. Reg. 10184 (February 21, 2012)]

Perennial Stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow. [77 Fed. Reg. 10184 (February 21, 2012)]

Perennial Headwater Stream: A Perennial stream with a drainage area less than 5 square miles.

Perennial Wadeable Stream: A Perennial stream with a drainage area greater than 5 square miles.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: reestablishment and rehabilitation (33 CFR 332.2)

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions. (33 CFR 332.2)

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area. (33 CFR 332.2)

Riparian Areas: Riparian areas are lands adjacent to streams, rivers, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects riverine, lacustrine, estuarine, and marine waters with their adjacent wetlands, non-wetland waters, or uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. [77 Fed. Reg. 10184 (Feb. 21, 2012)]

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Appendix A: Example Scenarios and Solutions for MSMF V.1. Impact Calculator and Mitigation Calculator

IMPACT EXAMPLE: A residential development is proposed on an abandoned golf course in the Piedmont Region of Baltimore County, Maryland. The initial impacts proposed include 2,500 linear feet of a perennial stream (Reach 1), and 500 linear feet of a perennial tributary (Trib 1). After avoidance and minimization efforts have been completed, the impacts were reduced to 1,000 linear feet of perennial streams (Reach 1) and 250 linear feet of an perennial tributary (Trib 1), considered unavoidable impacts.

Reach 1 information: Piedmont Physiographic Region, Activity: Culvert, Resource Type: Perennial headwater, Reach Length: 1000 linear feet, Stream Quality (From FBRSA) 45%, Channel Thread: Primary-single channel, Drainage area: 1 sqmi, Site sensitivity (From WRR "Maryland Stream Mitigation Framework: Site Sensitivity for Stream Impacts") scored a 2.

Reach 2 information: Physiographic Region: Piedmont, Activity: Channel hardening (riprap), Resource Type: perennial headwater, Reach Length: 250 linear feet, Stream Quality (From EPA RBP HG) Existing 40% proposed 25%, Channel Thread: Primary-single channel, Drainage area: 0.75 sqmi, Site sensitivity (From WRR "Maryland Stream Mitigation Framework: Site Sensitivity for Stream Impacts") scored a 2.

MITIGATION EXAMPLE: A mitigation provider proposes a mitigation site on Mill Creek. He plans to work on two stream reaches on the site and their buffers, and preserve a third. A conservation easement will protect the site in perpetuity. For Mill Creek Reach 1, a single thread natural channel design approach is selected. For Mill Creek Tributary 1, a multi-thread channel is proposed (two channels= two entries in the mitigation calculator). Mill Creek Tributary 2 is a high quality intermittent stream proposed for preservation.

Mill Creek Reach 1 Information: Physiographic Region: Piedmont, Activity: Restoration/Enhancement, Resource Type: perennial headwater, Reach Length: 1000 linear feet, Existing stream Quality (From FBRSA) 30% proposed 75%, Channel Thread: Primary-single channel, Drainage area: 1 sqmi, Site sensitivity (From WRR "Maryland Stream Mitigation Framework: Site Sensitivity for Stream Mitigation") scored a 2. Site protection is a conservation easement. The Buffer will be 100 feet on each side (totalling 4.59 acres). The existing buffer quality is 30%, and proposed buffer quality is 65%.

Mill Creek Trib 1 Information: Physiographic Region: Piedmont, Activity: Restoration/Enhancement, Resource Type: perennial headwater, Reach Length: 1000 linear feet primary thread, 300 ft secondary thread, Existing stream Quality (From FBRSA) 25% proposed 80%, Channel Thread: Primary-single channel and second channel, Drainage area: 1.25 sqmi, Site sensitivity (From WRR "Maryland Stream Mitigation Framework: Site Sensitivity for Stream Mitigation") scored a 2. Site protection is a conservation easement. The Buffer will be 200 feet on each side (totalling 4.59 acres). The existing buffer quality is 30%, and proposed buffer quality is 65%.

Mill Creek Trib 2: Physiographic Region: Piedmont, Activity: Preservation, Resource Type: intermittent, Reach Length: 1500 linear feet, Existing stream Quality (From FBRSA) 80% proposed 80%, Channel Thread: Primary-single channel, Drainage area: 0.3 sqmi, Site sensitivity (From WRR "Maryland Stream Mitigation Framework: Site Sensitivity for Stream Mitigation") scored a 2. Site protection is a conservation easement. The Buffer will be 100 feet on each side (totalling 4.59 acres). The existing buffer quality is 75%, and proposed buffer quality is 75%.

STREAM IMPACT CALCULATOR

BACKGROUND INFORMATION

Corps Project ID #:		Corps PM:	
Project Name:		Date:	
Lat/Long:		Sponsor:	
County:		Collaborators:	

Total Stream Losses (Functional Feet) -899

Raw Change in Reach Value (Functional Feet)											Stream Impact Adjustments		Stream Losses (Functional Feet)	REMARKS
Reach Name	Physiographic Region	Evaluation	Activity	Resource Type	Reach Length (feet)	Stream Quality	Channel Thread	Drainage Area (sqmi)	Raw Reach Value (Functional Feet)	Raw Change in Value (Functional Feet)	Site Sensitivity	Mitigation Ratio (Temporal Loss)		
Reach 1	Piedmont	Existing	Preliminary Resource Evaluation	Perennial Headwater	1000	45%	Primary 1	1 1.00	450	-450	2 0.2	1.55	-837	
	Piedmont	Proposed	Piping/culvert	Perennial Headwater	1000	0%	Primary 1	1 1.00	0		-90			
Trib 1	Piedmont	Existing	Preliminary Resource Evaluation	Perennial Headwater	250	40%	Primary 1	0.75 0.89	89	-34	2 0.2	1.55	-62	
	Piedmont	Proposed	Channel Hardening	Perennial Headwater	250	25%	Primary 1	0.75 0.89	56		-7			
	Not Selected	Existing	Preliminary Resource Evaluation	NA			NA FALSE	 FALSE	0	0	0 0	1.55	0	
	Not Selected	Proposed	NA	NA			NA 0	0 FALSE	0		0			
	Not Selected	Existing	Preliminary Resource Evaluation	NA			NA FALSE	 FALSE	0	0	0 0	1.55	0	
	Not Selected	Proposed	NA	NA			NA 0	0 FALSE	0		0			
	Not Selected	Existing	Preliminary Resource Evaluation	NA			NA FALSE	 FALSE	0	0	0 0	1.55	0	
	Not Selected	Proposed	NA	NA			NA 0	0 FALSE	0		0			
	Not Selected	Existing	Preliminary Resource Evaluation	NA			NA FALSE	 FALSE	0	0	0 0	1.55	0	
	Not Selected	Proposed	NA	NA			NA 0	0 FALSE	0		0			
	Not Selected	Existing	Preliminary Resource Evaluation	NA			NA FALSE	 FALSE	0	0	0 0	1.55	0	
	Not Selected	Proposed	NA	NA			NA 0	0 FALSE	0		0			
	Not Selected	Existing	Preliminary Resource Evaluation	NA			NA FALSE	 FALSE	0	0	0 0	1.55	0	
	Not Selected	Proposed	NA	NA			NA 0	0 FALSE	0		0			
	Not Selected	Existing	Preliminary Resource Evaluation	NA			NA FALSE	 FALSE	0		0 0			

STREAM MITIGATION CALCULATOR

BACKGROUND INFORMATION

Corps Project ID #:		Corps PM:	
Project Name:		Date:	
Lat/Long:		Sponsor:	
County:		Collaborators:	

Total Stream Gains (Functional Feet) 1681

Raw Change in Reach Value (Functional Feet)											Stream Mitigation Adjustments					Stream Gains (Functional Feet)	REMARKS
Reach Name	Physiographic Region	Evaluation	Activity	Resource Type	Length (Feet)	Stream Quality	Channel Thread	Drainage Area (sqmi)	Raw Reach Value (Functional Feet)	Raw Change in Value (Functional Feet)	Site Sensitivity	Site Protection	Buffer Adjustment				
Mill Creek Reach 1	Piedmont	Existing	Preliminary Resource Evaluation	Perennial Headwater	1000	30%	Primary 1	1 1.00	300	450	2 0.2	Easement 0.03	Evaluation Existing Buffer	Buffer Area (Acres) 4.59	Buffer Quality 30%	646	
	Piedmont	Proposed	Restoration/Enhancement	Perennial Headwater	1000	75%	Primary 1	1 1.00	750		104	19	Proposed Buffer Functional Feet	4.59	65% 72		
Mill Creek Trib 1 Primary channel	Piedmont	Existing	Preliminary Resource Evaluation	Perennial Headwater	1000	25%	Primary 1	1.25 1.09	273	600	2 0.2	Easement 0.03	Evaluation Existing Buffer	Buffer Area (Acres) 4.59	Buffer Quality 30%	831	
	Piedmont	Proposed	Restoration/Enhancement	Perennial Headwater	1000	80%	Primary 1	1.25 1.09	873		134	24	Proposed Buffer Functional Feet	4.59	65% 72		
Mill Creek Trib 1 Second Channel	Piedmont	Existing	Preliminary Resource Evaluation	Perennial Headwater	300	25%	Second 0.2	1 1.00	15	33	2 0.2	Easement 0.03	Evaluation Existing Buffer	Buffer Area (Acres)	Buffer Quality	41	
	Piedmont	Proposed	Restoration/Enhancement	Perennial Headwater	300	80%	Second 0.2	1 1.00	48		7	1	Proposed Buffer Functional Feet		0		Buffer already covered by the primary thread in this instance.
Mill Creek Trib 2 Preservation	Piedmont	Existing	Preliminary Resource Evaluation	Intermittent	1500	80%	Primary 1	0.3 0.63	750	0	2 0.2	Easement 0.03	Evaluation Existing Buffer	Buffer Area (Acres) 4.59	Buffer Quality 80%	164	
	Piedmont	Proposed	Preservation	Intermittent	1500	80%	Primary 1	0.3 0.63	750		23	24	Proposed Buffer Functional Feet	4.59	80% 41		High quality resource under threat of development.
	Not Selected	Existing	Preliminary Resource Evaluation	NA	0	0%	NA 0	0 FALSE	0	0	0 0	Select From List 0	Evaluation Existing Buffer	Buffer Area (Acres)	Buffer Quality	NA	
	Not Selected	Proposed	NA	NA	0	0%	NA 0	0 FALSE	0		0	NA	Proposed Buffer Functional Feet		0		
	Not Selected	Existing	Preliminary Resource Evaluation	NA	0	0%	NA 0	0 FALSE	0	0	0 0	Select From List 0	Evaluation Existing Buffer	Buffer Area (Acres)	Buffer Quality	NA	
	Not Selected	Proposed	NA	NA	0	0%	NA 0	0 FALSE	0		0	NA	Proposed Buffer Functional Feet		0		
	Not Selected	Existing	Preliminary Resource Evaluation	NA	0	0%	NA 0	0 FALSE	0	0	0 0	Select From List 0	Evaluation Existing Buffer	Buffer Area (Acres)	Buffer Quality	NA	
	Not Selected	Proposed	NA	NA	0	0%	NA 0	0 FALSE	0		0	NA	Proposed Buffer Functional Feet		0		
	Not Selected	Existing	Preliminary Resource Evaluation	NA	0	0%	NA 0	0 FALSE	0	0	0 0	Select From List 0	Evaluation Existing Buffer	Buffer Area (Acres)	Buffer Quality	NA	
	Not Selected	Proposed	NA	NA	0	0%	NA 0	0 FALSE	0		0	NA	Proposed Buffer Functional Feet		0		
	Not Selected	Existing	Preliminary Resource Evaluation	NA	0	0%	NA 0	0 FALSE	0		0 0	Select From List 0	Evaluation Existing Buffer	Buffer Area (Acres)	Buffer Quality		

APPENDIX K: VIRGINIA WETLAND & STREAM MITIGATION REQUIREMENT TABLES

Table K-1. Virginia Stream Mitigation Requirements

Feature ID	Resource Type	Impact (LF)	Impact (SF)	Reach Condition Index (RCI)	Impact Factor Type	Impact Factor (IF)	Mitigation Requirement (LF)
22UU	Intermittent	543	10,481	0.74	Roadway	1	402
22VV	Ephemeral	26	358	0.75	Roadway	1	20
22VV	Ephemeral	5	31	0.75	Staging	0	0
22WW	Intermittent	56	2,188	0.90	Roadway	1	50
22WW	Intermittent	42	424	0.90	Staging	0	0
22WW_C	Intermittent	272	1,360	0.80	Existing Culvert	0	0
Total		**944**					**472**

Note: There are no permanent wetland impacts or wetland mitigation requirements in Virginia.

APPENDIX L: VIRGINIA USM STREAM ASSESSMENT FORMS

Stream Assessment Form (Form 1)

Unified Stream Methodology for use in Virginia

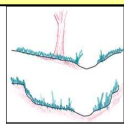
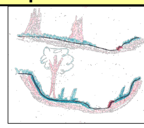
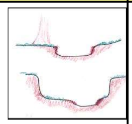
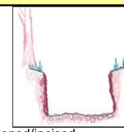
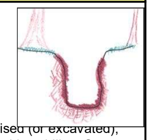
For use in wadeable channels classified as intermittent or perennial

Project #	Project Name	Locality	Cowardin Class.	HUC	Date	SAR #	Impact/SAR length	Impact Factor
	Managed Lanes Study	Fairfax	R3	02070008	8/20/2018	22UU	543	1.0

Name(s) of Evaluator(s)	Stream Name and Information
Scott Shifflett, Laura Cooper, Kyle Haynes, Evan Fowler, Emily Onufer	Unnamed tributary to the Potomac River

1. Channel Condition: Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

Conditional Category

	Optimal	Suboptimal	Marginal	Poor	Severe	
Channel Condition	 Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%). AND/OR Stable point bars/bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid-channel bars, and transverse bars few. Transient sediment deposition covers less than 10% of bottom.	 Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed floodplains along portions of the reach. Transient sediment covers 10-40% of the stream bottom.	 Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may be vertical or undercut. AND/OR 40-60% of stream is covered by sediment. Sediment may be temporary/transient, contribute instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	 Overwidened/incised. Vertically/laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-80% of banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. AND/OR 60-80% of the stream is covered by sediment. Sediment is temporary/transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on > 40% of the banks and stable sediment deposition is absent.	 Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average rooting depth, majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. Greater than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.	CI
Score	3	2.4	2	1.6	1	1.6

NOTES>> Banks are significantly incised throughout with evidence of erosion.

2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

Conditional Category

	Optimal	Suboptimal		Marginal		Poor	
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and a non-maintained understory. Wetlands located within the riparian areas.	**High Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with > 30% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	**High Marginal:** Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	**Low Marginal:** Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh >3 inches) present, with <30% tree canopy cover with maintained understory.	**High Poor:** Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.
		High	Low	High	Low	High	Low
Condition Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5

NOTES>> Both sides of the stream are wetland/floodplain mosaic. The right bank has I-495 which runs through it while the left bank has a home and yard.

1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors.
2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below.
3. Enter the % Riparian Area and Score for each riparian category in the blocks below.

Ensure the sums of % Riparian Blocks equal 100

Right Bank	% Riparian Area>	30%	70%						100%
	Score >	1.5	0.5						
Left Bank	% Riparian Area>	90%	10%						100%
	Score >	1.5	0.6						

CI= (Sum % RA * Scores*0.01)/2

		CI
Rt Bank CI >	0.80	
Lt Bank CI >	1.41	1.11

3. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embededness; shade; undercut banks; root mats; SAV; riffle poole complexes, stable features.

Conditional Category

	Optimal	Suboptimal	Marginal	Poor	CI
Instream Habitat/ Available Cover	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.	
Score	1.5	1.2	0.9	0.5	0.50

NOTES>> Habitat elements are not present, the majority of the channel has been riprapped.

Stream Impact Assessment Form Page 2

Project #	Applicant	Locality	Cowardin Class.	HUC	Date	Data Point	SAR length	Impact Factor
	MDOT SHA	Fairfax	R3	02070008	3/31/2020		1075	0.0

4. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock

NOTES>> The majority of the channel has been altered through straightening and riprap.

	Conditional Category					
	Negligible	Minor		Moderate		Severe
Channel Alteration	Channelization, dredging, alteration, or hardening absent. Stream has an unaltered pattern or has naturalized.	Less than 20% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	20-40% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	40 - 60% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	60 - 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines AND/OR 80% of banks shored with gabion, riprap, or cement.
SCORE	1.5	1.3	1.1	0.9	0.7	0.5

0.50

REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH

NOTE: The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.

THE REACH CONDITION INDEX (RCI) >>	**0.74**
RCI= (Sum of all CI's)/5	
COMPENSATION REQUIREMENT (CR) >>	**402**
CR = RCI X LF X IF	

INSERT PHOTOS:

DESCRIBE PROPOSED IMPACT:

Existing channel will be relocated due to roadway expansion.

Ephemeral Stream Assessment Form (Form 1a)

Unified Stream Methodology for use in Virginia

For use in ephemeral streams

Project #	Project Name	Locality	Cowardin Class.	HUC	Date	SAR #	Impact/SAR length	Impact Factor
	Managed Lanes Study	Fairfax	EPH	02070008	3/31/2020	22VV	26	1.0

Name(s) of Evaluator(s)	Stream Name and Information
Scott Shifflett, Laura Cooper, Kyle Haynes, Evan Fowler, Emily Onufer	Unnamed tributary to the Potomac River

2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

	Conditional Category						
	Optimal	Suboptimal		Marginal		Poor	
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and an non-maintained understory. Wetlands areas.	**High Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with >30% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	**High Marginal:** Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	**Low Marginal:** Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh >3 inches) present, with <30% tree canopy cover with maintained understory.	**High Poor:** Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.
		High	Low	High	Low	High	Low
Condition Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5

NOTES>> Both sides of the stream are wetland/floodplain mosaic.

1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors.
2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below.
3. Enter the % Riparian Area and Score for each riparian category in the blocks below.

Ensure the sums of % Riparian Blocks equal 100

Right Bank	% Riparian Area>	100%						100%
	Score >	1.5						
Left Bank	% Riparian Area>	100%						100%
	Score >	1.5						

CI= (Sum % RA * Scores*0.01)/2

		CI
Rt Bank CI >	1.50	
Lt Bank CI >	1.50	1.50

REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH

NOTE: **The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.**

THE REACH CONDITION INDEX (RCI) >>	0.75
RCI= (Riparian CI)/2	
COMPENSATION REQUIREMENT (CR) >>	20
CR = RCI X LF X IF	

INSERT PHOTOS:

DESCRIBE PROPOSED IMPACT:

Existing channel to be relocated due to roadway expansion.

Ephemeral Stream Assessment Form (Form 1a)

Unified Stream Methodology for use in Virginia

For use in ephemeral streams

Project #	Project Name	Locality	Cowardin Class.	HUC	Date	SAR #	Impact/SAR length	Impact Factor
	Managed Lanes Study	Fairfax	EPH	02070008	3/31/2020	22VV	5	0.0

Name(s) of Evaluator(s)	Stream Name and Information
Scott Shifflett, Laura Cooper, Kyle Haynes, Evan Fowler, Emily Onufer	Unnamed tributary to the Potomac River

2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

	Conditional Category						
	Optimal	Suboptimal		Marginal		Poor	
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and an non-maintained understory. Wetlands areas.	**High Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with >30% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	**High Marginal:** Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	**Low Marginal:** Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh >3 inches) present, with <30% tree canopy cover with maintained understory.	**High Poor:** Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.
		High	Low	High	Low	High	Low
Condition Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5

NOTES>> Both sides of the stream are wetland/floodplain mosaic.

1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors.
2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below.
3. Enter the % Riparian Area and Score for each riparian category in the blocks below.

Ensure the sums of % Riparian Blocks equal 100

Right Bank	% Riparian Area>	100%						100%
	Score >	1.5						
Left Bank	% Riparian Area>	100%						100%
	Score >	1.5						

CI= (Sum % RA * Scores*0.01)/2

Rt Bank CI >	1.50	CI
Lt Bank CI >	1.50	1.50

REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH

NOTE: The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.

THE REACH CONDITION INDEX (RCI) >>	0.75

RCI= (Riparian CI)/2

COMPENSATION REQUIREMENT (CR) >>	0

CR = RCI X LF X IF

INSERT PHOTOS:

DESCRIBE PROPOSED IMPACT:

Existing channel to be temporarily impacted by staging for the roadway construction.

Stream Assessment Form (Form 1)

Unified Stream Methodology for use in Virginia

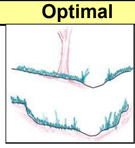
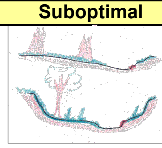
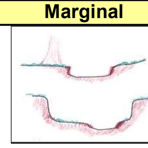
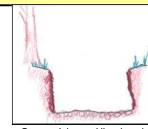
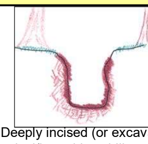
For use in wadeable channels classified as intermittent or perennial

Project #	Project Name	Locality	Cowardin Class.	HUC	Date	SAR #	Impact/SAR length	Impact Factor
	Managed Lanes Study	Fairfax	R3	02070008	3/31/2020	22WW	56	1.0

Name(s) of Evaluator(s)	Stream Name and Information
Karl Hellmann & Alex Nussbaum	Unnamed tributary to the Potomac River

1. Channel Condition: Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

Conditional Category

	Optimal	Suboptimal	Marginal	Poor	Severe	
						
Channel Condition	Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%). AND/OR Stable point bars/bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid-channel bars, and transverse bars few. Transient sediment deposition covers less than 10% of bottom.	Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed floodplains along portions of the reach. Transient sediment covers 10-40% of the stream bottom.	Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may bevertical or undercut. AND/OR 40-60% of stream is covered by sediment. Sediment may be temporary/transient, contribute instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	Overwidened/incised. Vertically/laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-80% of banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. AND/OR 60-80% of the stream is covered by sediment. Sediment is temporary/transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on > 40% of the banks and stable sediment deposition is absent.	Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average rooting depth, majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. Greater than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.	CI
Score	3	2.4	2	1.6	1	1.6
NOTES>>	Deeply incised channel with moderate erosion along stream banks.					

2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

Conditional Category

	Optimal	Suboptimal		Marginal		Poor	
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and a non-maintained understory. Wetlands located within the riparian areas.	**High Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with > 30% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	**High Marginal:** Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	**Low Marginal:** Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh >3 inches) present, with <30% tree canopy cover with maintained understory.	**High Poor:** Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.
		High	Low	High	Low	High	Low
Condition Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5

NOTES>> Both sides of the stream are surrounded by mature forest.

1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors.
2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below.
3. Enter the % Riparian Area and Score for each riparian category in the blocks below.

Ensure the sums of % Riparian Blocks equal 100

								Sum
Right Bank	% Riparian Area>	100%						100%
	Score >	1.5						
Left Bank	% Riparian Area>	100%						100%
	Score >	1.5						

CI= (Sum % RA * Scores*0.01)/2

		CI
Rt Bank CI >	1.50	
Lt Bank CI >	1.50	1.50

3. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embededness; shade; undercut banks; root mats; SAV; riffle poole complexes, stable features.

Conditional Category

	Optimal	Suboptimal	Marginal	Poor	CI
Instream Habitat/ Available Cover	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.	
Score	1.5	1.2	0.9	0.5	0.50

NOTES>> Habitat elements are lacking and largely absent throughout a majority of the reach due to shallow/intermittent flows.

Stream Impact Assessment Form Page 2

Project #	Applicant	Locality	Cowardin Class.	HUC	Date	Data Point	SAR length	Impact Factor
	MDOT SHA	Fairfax	R3	02070008	3/31/2020		1075	0.0

4. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock

NOTES>> Sections of the channel appear to have been straightened.

	Conditional Category					
	Negligible	Minor		Moderate		Severe
Channel Alteration	Channelization, dredging, alteration, or hardening absent. Stream has an unaltered pattern or has naturalized.	Less than 20% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	20-40% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	40 - 60% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	60 - 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines AND/OR 80% of banks shored with gabion, riprap, or cement.
SCORE	1.5	1.3	1.1	0.9	0.7	0.5

0.90

REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH

NOTE: **The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.**

THE REACH CONDITION INDEX (RCI) >>	**0.90**
RCI= (Sum of all CI's)/5	
COMPENSATION REQUIREMENT (CR) >>	**50**
CR = RCI X LF X IF	

INSERT PHOTOS:

DESCRIBE PROPOSED IMPACT:

Existing channel to be relocated due to roadway expansion.

Stream Assessment Form (Form 1)

Unified Stream Methodology for use in Virginia

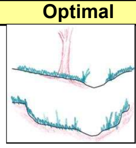
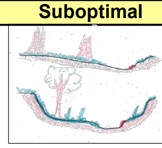
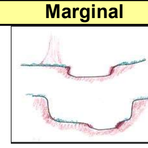
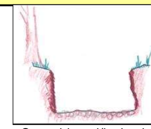
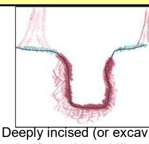
For use in wadeable channels classified as intermittent or perennial

Project #	Project Name	Locality	Cowardin Class.	HUC	Date	SAR #	Impact/SAR length	Impact Factor
	Managed Lanes Study	Fairfax	R3	02070008	3/31/2020	22WW	42	0.0

Name(s) of Evaluator(s)	Stream Name and Information
Karl Hellmann & Alex Nussbaum	Unnamed tributary to the Potomac River

1. Channel Condition: Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

Conditional Category

	Optimal	Suboptimal	Marginal	Poor	Severe	
						
Channel Condition	Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%). AND/OR Stable point bars/bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid-channel bars, and transverse bars few. Transient sediment deposition covers less than 10% of bottom.	Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed floodplains along portions of the reach. Transient sediment covers 10-40% of the stream bottom.	Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may be vertical or undercut. AND/OR 40-60% of stream is covered by sediment. Sediment may be temporary/transient, contribute instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	Overwidened/incised. Vertically/laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-80% of banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. AND/OR 60-80% of the stream is covered by sediment. Sediment is temporary/transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on > 40% of the banks and stable sediment deposition is absent.	Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average rooting depth, majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. Greater than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.	CI
Score	3	2.4	2	1.6	1	1.6
NOTES>>	Deeply incised channel with moderate erosion along stream banks.					

2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

Conditional Category

NOTES>> Both sides of the stream are surrounded by mature forest.

	Optimal	Suboptimal		Marginal		Poor	
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and a non-maintained understory. Wetlands located within the riparian areas.	**High Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with > 30% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	**High Marginal:** Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	**Low Marginal:** Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh >3 inches) present, with <30% tree canopy cover with maintained understory.	**High Poor:** Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.
		High	Low	High	Low	High	Low
Condition Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5

1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors.
2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below.
3. Enter the % Riparian Area and Score for each riparian category in the blocks below.

Ensure the sums of % Riparian Blocks equal 100

Right Bank	% Riparian Area>	100%							100%
	Score >	1.5							
Left Bank	% Riparian Area>	100%							100%
	Score >	1.5							

CI= (Sum % RA * Scores*0.01)/2

		CI
Rt Bank CI >	1.50	
Lt Bank CI >	1.50	1.50

3. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embededness; shade; undercut banks; root mats; SAV; riffle poole complexes, stable features.

Conditional Category

NOTES>> Habitat elements are lacking and largely absent throughout a majority of the reach due to shallow/intermittent flows.

	Optimal	Suboptimal	Marginal	Poor	
Instream Habitat/ Available Cover	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.	CI
Score	1.5	1.2	0.9	0.5	0.50

Stream Impact Assessment Form Page 2

Project #	Applicant	Locality	Cowardin Class.	HUC	Date	Data Point	SAR length	Impact Factor
	MDOT SHA	Fairfax	R3	02070008	3/31/2020		1075	0.0

4. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock

NOTES>> Sections of the channel appear to have been straightened.

	Conditional Category					
	Negligible	Minor		Moderate		Severe
Channel Alteration	Channelization, dredging, alteration, or hardening absent. Stream has an unaltered pattern or has naturalized.	Less than 20% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	20-40% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	40 - 60% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	60 - 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines AND/OR 80% of banks shored with gabion, riprap, or cement.
SCORE	1.5	1.3	1.1	0.9	0.7	0.5

0.90

REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH

NOTE: **The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.**

THE REACH CONDITION INDEX (RCI) >> **0.90**

RCI= (Sum of all CI's)/5

COMPENSATION REQUIREMENT (CR) >> **0**

CR = RCI X LF X IF

INSERT PHOTOS:

DESCRIBE PROPOSED IMPACT:

Existing channel to be temporarily impacted for staging.

Stream Assessment Form (Form 1)

Unified Stream Methodology for use in Virginia

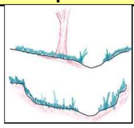
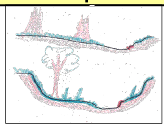
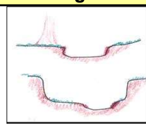
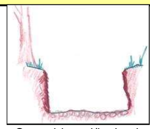
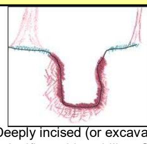
For use in wadeable channels classified as intermittent or perennial

Project #	Project Name	Locality	Cowardin Class.	HUC	Date	SAR #	Impact/SAR length	Impact Factor
	Managed Lanes Study	Fairfax	R3	02070008	3/31/2020	22WW_C	272	0.0

Name(s) of Evaluator(s)	Stream Name and Information
Karl Hellmann & Alex Nussbaum	Unnamed tributary to the Potomac River

1. Channel Condition: Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

Conditional Category

	Optimal	Suboptimal	Marginal	Poor	Severe	
						
Channel Condition	Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%). AND/OR Stable point bars/bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid-channel bars, and transverse bars few. Transient sediment deposition covers less than 10% of bottom.	Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed floodplains along portions of the reach. Transient sediment covers 10-40% of the stream bottom.	Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may be vertical or undercut. AND/OR 40-60% of stream is covered by sediment. Sediment may be temporary/transient, contribute instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	Overwidened/incised. Vertically/laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-80% of banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. AND/OR 60-80% of the stream is covered by sediment. Sediment is temporary/transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on > 40% of the banks and stable sediment deposition is absent.	Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average rooting depth, majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. Greater than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.	CI
Score	3	2.4	2	1.6	1	3.0
NOTES>>	Entire stream segment flows through an existing culvert and therefore lacks incision.					

2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

Conditional Category

	Optimal	Suboptimal		Marginal		Poor	
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and a non-maintained understory. Wetlands located within the riparian areas.	**High Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with > 30% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	**High Marginal:** Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	**Low Marginal:** Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh >3 inches) present, with <30% tree canopy cover with maintained understory.	**High Poor:** Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.
		High	Low	High	Low	High	Low
Condition Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5

NOTES>> Entire stream segment is within an existing culvert and therefore does not have a riparian buffer.

1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors.
2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below.
3. Enter the % Riparian Area and Score for each riparian category in the blocks below.

Ensure the sums of % Riparian Blocks equal 100

Right Bank	% Riparian Area>	100%							100%
	Score >	0							
Left Bank	% Riparian Area>	100%							100%
	Score >	0							

CI= (Sum % RA * Scores*0.01)/2

		CI
Rt Bank CI >	0.00	
Lt Bank CI >	0.00	0.00

3. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embededness; shade; undercut banks; root mats; SAV; riffle poole complexes, stable features.

Conditional Category

	Optimal	Suboptimal	Marginal	Poor	CI
Instream Habitat/ Available Cover	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.	
Score	1.5	1.2	0.9	0.5	0.50

NOTES>> Entire stream segment is within an existing culvert and lacks most habitat elements.

Stream Impact Assessment Form Page 2

Project #	Applicant	Locality	Cowardin Class.	HUC	Date	Data Point	SAR length	Impact Factor
	MDOT SHA	Fairfax	R3	02070008	3/31/2020		272	0.0

4. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock

NOTES>> Entire stream segment has been altered and consists of a waterway flowing through an existing culvert.

	Conditional Category					
	Negligible	Minor		Moderate		Severe
Channel Alteration	Channelization, dredging, alteration, or hardening absent. Stream has an unaltered pattern or has naturalized.	Less than 20% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	20-40% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	40 - 60% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	60 - 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines AND/OR 80% of banks shored with gabion, riprap, or cement.
SCORE	1.5	1.3	1.1	0.9	0.7	0.5

0.50

REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH

NOTE: **The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.**

THE REACH CONDITION INDEX (RCI) >> **0.80**

RCI= (Sum of all CI's)/5

COMPENSATION REQUIREMENT (CR) >> **0**

CR = RCI X LF X IF

INSERT PHOTOS:

DESCRIBE PROPOSED IMPACT:

Existing culvert to remain - temporary impact

APPENDIX M: MITIGATION BANK LETTERS

6958 Aviation Blvd., Ste. C
Glen Burnie, MD 21061

Corporate Headquarters
6575 West Loop South, Suite 300
Bellaire, TX 77401
Main: 713.520.5400

April 27, 2022

Mr. Jeffrey T. Folden, PE, DBIA
Director
I-495 & I-270 P3 Office
601 North Calvert Street
Baltimore, MD 21202

Re: Mitigation bank credits for the I-495 & I-270 Managed Lane Study

Dear Mr. Folden,

RES is the nation's leading provider of ecological restoration solutions and operates more mitigation banks than any other firm in the nation. We have enjoyed working with you and your colleagues at the P3 Office in recent years to understand and provide mitigation for the I-495 & I-270 Managed Lane Study (Project), and we thank you for the future opportunity to provide off-site mitigation bank credits for the Project.

We understand that the Preferred Alternative for Phase 1 South of the Project is anticipated to impact 1,207 functional feet of stream that are unable to be mitigated by on-site or off-site permittee responsible mitigation, and we are happy to inform you that RES' proposed Even Flow Mitigation Site (EFMS) is expected to generate credits at an amount and on a schedule that aligns with the outstanding mitigation need. RES is sponsoring and leading restoration of EFMS, located in the Monocacy HUC-8 and with a secondary service area including the Piedmont portion of the Middle Potomac-Catoctin HUC-8, where the Project's impacts will occur. The bank will generate both stream and wetland credits.

RES has developed EFMS in consultation with the Maryland Interagency Review Team (IRT) over more than 2 ½ years, including multiple agency site visits, discussions during six full IRT meetings, and several rounds of review and revision of EFMS banking instruments, and the regulators' consistently positive feedback has allowed RES to proceed towards bank approval. Currently, RES is developing the Final Mitigation Banking Instrument for EFMS, which we anticipate will be approved in late 2022.

Due to the flexibility provided by the Maryland Stream Mitigation Framework (Version 1, dated 2/28/22), RES has the option to generate either wetland credits or stream credits, but not both, by restoring the streamside buffers. The anticipated credit amount shown in the Attached information reflects a scenario in which the buffer restoration will generate only wetland credits, and thus EFMS would clear the 1,207-stream credit threshold in the bank's 4th credit release, expected to be Fall 2026. Through discussions with the P3 Office, we believe that this timeline is acceptable for the Project, however RES maintains the flexibility to generate more stream credits and thus fulfill the 1,207-credit need in the 3rd credit release, expected Fall 2025, if so desired by the P3 Office, AMP, and/or D&C Contractor.

Please see the Attachment on the following page for the anticipated credit amounts and release schedule from the Even Flow Mitigation Site. We look forward to working with you and your colleagues moving forward to provide mitigation bank credits for this and potential future phases of the Project.

Sincerely,

Ben Eubanks
General Manager

Attachment

Anticipated Credit Amounts

Stream Credits: 2,242 Functional Feet

Wetland Credits: 12.01 acres

Anticipated Credit Release Schedule

Stream Mitigation Credits

Milestone	Credit Received (%)	Cumulative (%)	Stream Credits Received (#)	Stream Credits Cumulative (#)	Anticipated Completion
Initial Credit Release	15%	15%	336.3	336.3	Fall 2022
Construction Credit Release	Up to 15%	30%	336.3	672.6	Summer 2023
1st Monitoring Report (Year 2)	Up to 20%	50%	448.4	1,121.0	Fall 2025
2nd Monitoring Report (Year 3)	Up to 10%	60%	224.2	1,345.2	Fall 2026
3rd Monitoring Report (Year 5)	Up to 10%	70%	224.2	1,569.4	Fall 2028
4th Monitoring Report (Year 7)	Up to 10%	80%	224.2	1,793.6	Fall 2030
5th Monitoring Report (Year 10)	20%	10%	448.4	2,242.0	Fall 2033

As of April 27, 2022

DAVEY
MITIGATION

March 14, 2022

Mr. Alex Nussbaum
700 East Pratt Street, Suite 500
Baltimore, Maryland 21202

Re: Credit Availability Letter to Provide Stream Credits

Dear Mr. Nussbaum:

We would like to acknowledge that the Northern Virginia Stream Restoration Bank currently has 1,328 stream condition units (SCUs) available for purchase for the above referenced project.

Sincerely,

NORTHERN VIRGINIA STREAM
RESTORATION, L.C.
a Virginia limited liability company

By: Jennifer Van Houten
Jennifer Van Houten, authorized signatory

R:\mitigation banks\mitigation credit inquiries-LOAs\RKK\credit availability.docx

Northern Virginia Stream Restoration Bank - Credit Estimation Form

Project Name: I-495 & I-270 Managed Lanes Study
Date: 3/13/2022
Prepared For: MDOT SHA
Company: RKK
Prepared By: AJN
Please send completed form to Jennifer Van Houten:

Impact	Stream Type[1]	Impact RCI RCI_{USM}	Equivalency Factor[2] EF	Impact Length L_I (linear ft)	Impact Factor[3] IF	Impact Drainage Area DA_{WI} (acres)	Compensation Drainage Area[4] DA_{WC} (acres)	Correlation Factor[5] $CF = (DA_{WI}/DA_{WC})^{0.39}$	Required Compensation[6] CMP_T (SCUs)
Section I.									
22UU	R4	0.74	1.64	543	1.00	52	210	0.58	1,154
22VV	RE	0.75	1.67	26	1.00	4	210	0.53	55
22VV	RE	0.75	1.67	5	0.00	4	210	0.53	0
22WW	R4	0.90	2.10	56	1.00	36	210	0.53	119
22WW	R4	0.90	2.10	42	0.00	36	210	0.53	0
22WW_C	R4	0.80	1.81	272	0.00	40	210	0.53	0
			---				210	---	---
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			---				210	---	---
			---				210	---	---
Section II. Case-by-Case Determinations for Ephemeral (RE) and Man-Made Channels (MM) [6]									
			---		N/A	N/A	N/A	N/A	
			---		N/A	N/A	N/A	N/A	
			---		N/A	N/A	N/A	N/A	
			---		N/A	N/A	N/A	N/A	
			---		N/A	N/A	N/A	N/A	
TOTALS				**944**					**1,328**

[1] Stream Type designations are as follows: R3 = Perennial; R4 = Intermittent; RE = Ephemeral; MM = Man-Made, COMP = Composite (i.e. combination of stream types)

[2] $EF = [2.398 * (RCI_{USM})^{1.2619}]$

[3] Impact Factor (IF) shall be assigned pursuant to the Unified Stream Methodology for Use in Virginia Final Draft For Implementation, January 2007 (USM), Section 2.0.

[4] The Compensation Drainage Area is the average drainage area for Phase I of the Northern Virginia Stream Restoration Bank per the Bank's Concept Plan dated May 15, 2006.

[5] If (D_{WI}/D_{WC}) is less than 0.2 then the Correlation Factor equals 0.53. If (D_{WI}/D_{WC}) is greater than 3.0 then the Correlation Factor equals 1.53. If (D_{WI}/D_{WC}) is between 0.2 and 3.0 then the Correlation Factor equals $(DWI/DWC)^{0.39.}$

[6] For all stream types, If $RCI_{USM} * EF * CF < 2.125$, Then $CMP_T = 2.125 * L_I * IF$

For all stream types, If $RCI_{USM} * EF * CF \geq 2.125$, Then $CMP_T = RCI_{USM} * EF * CF * L_I * IF$

(According to the USM, Pages 2 and 3, compensation requirements for RE and man-made channels are evaluated on a case-by-case basis. The credit purchaser may negotiate, with the COE and DEQ< a lower mitigation requriement than the calculations provided in Section I. If you chose to do so, use Section II to input the negotiated value for the "Required Compensation" (in terms of SCUs) and calculate the resulting mitigation cost).

APPENDIX N: PHASE II MITIGATION SITE AGENCY MEETING MINUTES

UNNAMED TRIBUTARY TO GREAT SENECA CREEK (CA-5)
MEETING MINUTES

I-495 & I-270 Managed Lanes Study
CA-5 Semi-Final Re-Design Interim Meeting
September 29, 2021 @ 10:00 AM

A meeting was conducted on September 29, 2021, with Maryland-National Capital Park and Planning Commission (M-NCPPC) Montgomery Parks to discuss resolutions to comments provided by M-NCPPC on April 26, 2021. During the meeting, the attendees reviewed outstanding comments provided by M-NCPPC and the proposed comment resolutions. The M-NCPPC comments and a summary on the discussion for each comment are discussed below. For the purposes of this document, all references to left and right banks are oriented looking downstream.

Attendees:

Name	Agency/Organization	Email
Ashby Strassburger	MDOT SHA M-NCPPC Montgomery Parks Liaison	ashby.strassburger@montgomeryparks.org
Erin McArdle	M-NCPPC / Montgomery Parks	Erin.Mcardle@montgomeryparks.org
Matthew Harper	M-NCPPC / Montgomery Parks	Matthew.Harper@montgomerypark.org
Karl Hellmann	MDOT SHA / RK&K	khellmann@rkk.com
Justin Reel	MDOT SHA / RK&K	jreel@rkk.com
Michele Floam	Coastal Resources, Inc.	michelef@cri.biz
Sarah Norton	Coastal Resources, Inc.	sarahn@cri.biz
Cal Novelli	Coastal Resources, Inc.	caln@cri.biz

Action Items:

- Coastal Resources Inc. (CRI) to provide M-NCPPC with a full set of revised plans
- M-NCPPC to review revised plans and provide feedback on whether revisions satisfactorily address M-NCPPC comments from April 26, 2021 by October 15, 2021
- The team agreed to schedule another meeting on Wednesday October 13, 2021 at 1 PM to discuss any remaining outstanding comments. This meeting may be moved or changed to a working meeting with M-NCPPC as needed. Coordination will continue in the upcoming weeks. [UPDATE: October 13, 2021 meeting has since been canceled due to lack of need.]

General Discussion:

- Matt Harper and Erin McArdle (M-NCPPC) noted that the CA-5 site was recently included in a Compensatory Stormwater Management (SWM) list for the Phase 1 South and stated that the site is being reviewed/approved specifically for Section 404 mitigation purposes and **that approval of the site cannot** be transferred for SWM mitigation purposes.
- Erin McArdle asked why the full list of M-NCPPC comments from April 26, 2021 had not been

addressed in the plan set that CRI sent to M-NCPPC for review prior to this meeting.

- Sarah Norton (CRI) responded that due to time and budget constraints, the goal was to have interim meetings between CRI and M-NCPPC to discuss the revisions that CRI is proposing and ensure that they adequately address M-NCPPC's comments, instead of fully re-designing the project without M-NCPPC's input on the revisions.

- Michele Floam (CRI) reiterated that CRI wanted to get buy-in from M-NCPPC on the re-designed elements of the project prior to moving forward on the project in an effort to avoid future conflicts.
  - Erin McArdle responded that M-NCPPC can provide feedback on elements of the re-design but will not provide full buy-in without the chance to review a complete plan set that addresses all M-NCPPC comments.
  - The Joint Permit Application (JPA) will be submitted to MDOT SHA for internal review in early November 2021 and submitted to the agencies in early December 2021. Therefore, buy-in from M-NCPPC on the major changes needs to be obtained by mid-October.
- The group then proceeded to discuss the plans with a focus on the re-design between STA 12+00 – 18+00 on Mainstem 1 and an entire re-design of Mainstem 2.
- The following comments were discussed with the group:

M-NCPPC Comment 62: *Ensure sanitary sewer has enough cover in the pool on the right bank STA 15+80.*

- Matthew Harper said he thought the channel realignment adequately addressed the comment. M-NCPPC did not have any additional comments on the revisions and will provide further comments if needed on the fully revised plans.

M-NCPPC Comment 65: *The tree takes on this page are not acceptable given the limited benefits of opening up this floodplain. Keep work within existing tributary and do not take the trees shown on this sheet.*

-and-

M-NCPPC Comment 9: *Tributary between 5+00 and 5+50 save clump of 6 trees indicated for removal near WL-4.*

- Matthew Harper and Erin McArdle both expressed that they would like CRI to attempt to raise the channel more in an effort to require less floodplain grading and save more trees at the downstream end of the channel. Matthew Harper and Erin McArdle were both OK with the proposed channel alignment as long as tree impacts can be further reduced by minimizing floodplain grading. Sarah Norton agreed that CRI could explore raising the channel more and reducing floodplain grading/tree impacts. CRI will also provide a ford crossing of the stream within the PEPCO right-of-way (ROW). Matthew Harper reiterated that with the large stormwater structure at the upstream end of this channel, fish passage should not be a design consideration, so a large drop structure at the downstream end of the channel is an acceptable way of tying the raised channel back into existing grade.

M-NCPPC Comment 4: *24+75 stabilize wetland channel headcut at downstream side of manhole on right bank, this was requested in the 30% review and not addressed. Suggestion is to add riffle grade control material in channel.*

- Erin McArdle asked if compacted fill could be used in the knickpoint treatment instead of natural channel material. Sarah Norton responded that natural channel material was proposed so the knickpoint treatment would be more resistant to continued erosion if it was to receive concentrated flow. Sarah Norton stated that CRI is concerned that compacted fill may be more susceptible to washout due to concentrated flow and may make the knickpoint treatment less effective. CRI will evaluate and add to the spec that high quality salvaged Natural Channel Material should be prioritized to be placed in the proposed stream channel.

M-NCPPC Comment 33 (RGC): *The Riffle Grade Control mix is too uniform. There should not be 75% of a single rock size included, even with the variations within that stone classification. Include both Class II and Class 0 mixed into the Class I to allow for better locking in of the RGC (Riffle Grade Control) mix.*

- And -

M-NCPPC Comment 34: *Define Natural Channel Material. Include both specifications for salvaged Natural Channel Material as well as Furnished Natural Channel Material. Ensure these specifications include a well-mixed variety of stone size.*

- Erin McArdle reiterated that they would like the riffle mix to include a larger variation of stone sizes. Sarah Norton explained that in CRI's professional experience, contractors often do not sufficiently mix stone sizes together, so it is better to keep RGC mix as simple as possible. Matthew Harper and Erin McArdle responded that riffle habitat is a high priority for M-NCPPC stream projects and a more diverse variation in rock sizes is better for habitat. Erin McArdle also responded that M-NCPPC has seen many riffles wash out due lack of gradient in stone sizes. Erin McArdle also suggested that the riffle grade control specification should require the contractor to place the largest of the riffle grade control material at the top and bottom of the riffle to prevent washout. Sarah Norton agreed that this could be added to the specification, and agreed to explore adding more diverse stone sizes to the riffle mix. M-NCPPC will provide further comments if needed on the fully revised plans.

M-NCPPC Comment 51 (OW): *OW Note #8 and Section View - any NCM (Natural Channel Material) harvested from the existing channel should be used in the proposed channel, not used to be buried in an oxbow feature. Compacted fill should be fine, or if you insist on channel material then use imported material here.*

- Sarah Norton asked which parts of the "Riparian Enhancement" detail provided by M-NCPPC should be incorporated into the oxbow wetland features. Erin McArdle responded that the detail should be used as guidance, but not all parts apply to the oxbow wetlands. Sarah Norton responded that CRI would incorporate parts of the riparian enhancement detail such as microtopography, as appropriate, into the oxbow wetland detail.

M-NCPPC Comment 57 (RS): *RS Section View with Bank Grading - Imbricated Stone should reflect bankfull shape and angle up to bankfull, not have NCM and soil forming the channel shape.*

-And-

M-NCPPC Comment 60 (RS): *RC Section B-B': Both RGC mix and boulder step should angle up to Bankfull. Bankfull channel should not be formed by NCM with matting.*

- Erin McArdle reiterated M-NCPPC's request to have the riffle material extend up the bank to the bankfull elevation. Sarah Norton responded that in their professional experience, extending the riffle material to the toe of slope is adequate for stability and makes the channel look more natural with fully vegetated banks. Erin McArdle responded that M-NCPPC has seen the banks of many projects fail before vegetation can be established and that M-NCPPC is more concerned with immediate project success and minimal maintenance than with aesthetics. Sarah Norton responded that CRI would further evaluate the proposed riffle design. M-NCPPC will provide further comments if needed on the fully revised plans.

These notes are considered to be a true and accurate record of the discussions that occurred during the meeting on September 29, 2021. If any discrepancies or inconsistencies are identified, please contact Sarah Norton within 10 business days of receipt. These notes will be considered final if no comments are received within the specified timeframe.

I-495 & I-270 Managed Lanes Study
CA-5 Semi-Final Design Field Meeting
June 30, 2021 @ 9:00 am

A field meeting was conducted on June 30, 2021, with Maryland-National Capital Park and Planning Commission (M-NCPPC) Montgomery County Parks, the Maryland Department of the Environment (MDE) and the United States Army Corps of Engineers (USACE) to discuss several comments provided by M-NCPPC on April 26, 2021. During the meeting, the attendees walked the restoration site from the upstream extent to the downstream extent, reviewing the comments provided by M-NCPPC. The M-NCPPC comments and a summary of the discussion for each one is included below. For the purposes of this document, all references to left and right banks are oriented looking downstream.

Attendees:

Name	Agency/Organization	Email
Ashby Strassburger	MDOT SHA M-NCPPC Mont. County Liaison	ashby.strassburger@montgomeryparks.org
Doug Stephens	M-NCPPC / Mont. County	Douglas.Stephens@montgomeryparks.org
Erin McArdle	M-NCPPC / Mont. County	Erin.Mcardle@montgomeryparks.org
Matthew Harper	M-NCPPC / Mont. County	Matthew.Harper@montgomerypark.org
Jacqueline Hoban	M-NCPPC / Mont. County	jacqueline.hoban@montgomeryparks.org
Steve Hurt	MDE / McCormick Taylor	steve.hurt1@maryland.gov smhurt@mccormicktaylor.com
Jack Dinne	USACE	john.j.dinne@nab02.usace.army.mil john.j.dinne@usace.army.mil
Karl Hellmann	MDOT SHA / RK&K	khellmann@rkk.com
Justin Reel	MDOT SHA / RK&K	jreel@rkk.com
Matthew Drennan	CRI	matthewd@cri.biz
Cal Novelli	CRI	caln@cri.biz

Action Items

- M-NCPPC to send CRI the riparian enhancement area detail (Ashby Strassburger sent on 7/1/2021)
- Evaluate the redesign of the channel based on M-NCPPC comments below and provide a typical cross section (MDOT SHA)

Meeting Summary - CA-5: Seneca Creek Tributary

General Discussion

- Doug Stephens asked how the M-NCPPC comments will be conveyed to the P3 and incorporated into the design, and more specifically whether MDOT SHA expects to make another design submittal to address the comments prior to moving to the next design phase.
  - Justin Reel responded that the Team would need to reach consensus on any comments that will affect the design geometry. Justin Reel stated that the goal would be to resubmit a package that reflects the resolutions discussed during the field meeting, prior to moving to the next design phase.
- In general, M-NCPPC would like the design team to evaluate areas of extensive tie-in grading and determine if there is a way to more quickly tie-in to the existing banks, outside of the active flow area, to reduce tree impacts.
  - The design team agreed to evaluate this possibility and will look into including a typical cross section that represents how this will be achieved.

M-NCPPC Comment 25: *Remove RGC-1 and add toe protection along bank.*

- Doug Stephens reiterated M-NCPPC's comment on removing RGC-1 because there is a stable riffle upstream of the proposed relocation.
- Matt Drennan stated that the intent of providing RGC-1 was to tie-in to the downstream end of the stable natural riffle. The RGC-1 is also proposed to tie-in to Cascade 5 with the proposed sill on the downstream end. Matt Drennan stated that the intent of these structures is to provide a cohesive structure for a stable confluence for the CA-5 Mainstem 1 and CA-5 Tributary 1.
- M-NCPPC stated that they were fine with the proposed RGC-1. A callout should be added to the plans that explains that the existing material should be used and adjusted to match the planned location of RGC-1 and tie-in to the proposed sill structure.
- Doug Stephens asked how the design team plans to work around the large rock in the center of the channel near the downstream end of the proposed RGC-1.
- Matt Drennan stated that the design team had planned for the contractor to remove the rock. A callout can be included on the plans that shows the location of the rock and details how the contractor is expected to work around or remove the rock for installation of the proposed structures.
- M-NCPPC and the design team agreed to the proposed addition of stone toe on the left bank facing downstream.

M-NCPPC Comment 23: *1+00 - shift LOD away from 34.4" sycamore.*
-and-
M-NCPPC Comment 24: *Access to stream should be 0+50 @ RGC-1*

- Matt Drennan stated that the access location and additional Limit of Disturbance (LOD), upstream of RGC-1, was included so that the contractor could easily place the sandbag diversion for the pump-around practices.
- M-NCPPC stated they did not want to impact the 34.4" Sycamore on the bank near the access and reiterated the request that the access be moved.
- Matt Drennan stated that moving the access to RGC-1 could be evaluated along with pulling in the LOD. A note can be added that states that the contractor should install the sandbag diversion (PA-1 US) by hand.
- Matt Drennan pointed out that moving the access will likely impact the 8" boxelder on the right

bank and M-NCPPC stated that removing the boxelder would be acceptable.

<u>M-NCPPC Comment 27:</u> *Tie sills of RJH-2 into upstream side of bridge abutment.*

- Matt Drennan stated that the intention of RJH-2 was to shift the flow away from the outside meander and under the bridge. Matt explained that extending the left arm of RJH-2 would cause the structure to function more like a cross-vane structure, which would not be appropriate in the middle of a meander turn and may shift flows more toward the right bank, downstream of the bridge. The intent of the design is to install the key-in rocks on the left side with minimal impacts to the 12” black cherry on the right bank, pushing the sill rocks tight to the left bank, under the roots of the 12” black cherry.
- Erin McArdle suggested that instead of extending the left arm of RJH-2 to the bridge abutment the stone toe requested in Comment 25 could continue through RJH-2 and tie-in to the bridge abutment. Erin acknowledged that the stone toe would be on the inside meander, which is not a typical place to install stone toe, but that the stone toe would protect the left bank from unusual flow patterns from the effects of the confluence.
- Doug Stephens suggested that the 12” black cherry on the left bank should be flush cut and the left arm of RJH-2 should key-in to the roots.

<u>M-NCPPC Comment 26:</u> *Add 5' RGC apron upstream of RJH-2*

- Erin McCardle reiterated the request to install a 5’ apron consisting of Riffle Grade Control (RGC) mix upstream of RJH-2.
- Matt Drennan agreed that an apron could be installed. The apron will act as a glide coming from the upstream pool up to the crest of the RJH.

<u>M-NCPPC Comment 81:</u> *Don't grade trib up at culvert; start tributary work at top of cascade.*

- Matt Drennan explained that the bank grading was proposed to lay back the actively eroding banks and the pool grading was proposed to provide energy dissipation downstream of the pedestrian bridge before entering the proposed cascade structure.
- Doug Stephens stated that M-NCPPC was concerned that the grading would unnecessarily impact the roots of the trees on the right bank and that M-NCPPC would prefer for the bank grading to start at the cascade. Doug suggested that bank grading could more quickly tie-in to the existing slopes outside of the active channel to reduce bank grading.
- Matt Drennan agreed that the design team could evaluate the bank grading beginning at the upstream end of the Cascade structure and bank grading tying-in more quickly rather than chasing a 3:1 slope up to the top of the bank.
- Matt Drennan stated that the pool grading is still necessary but that a callout note could be added to state that existing material in the pool should be adjusted to meet the proposed contours.
- Matt Drennan stated that the design team could evaluate pulling in the LOD on the left bank of the tributary to the top of bank. The large LOD area looked to be a carry-over from a previous design phase where stockpile had been proposed in this area.

<u>M-NCPPC Comment 22:</u> *All trees within LOD that are not takes should have tree planking and TPF.*

- M-NCPPC confirmed that all trees within the LOD, not intended to be removed, should have both tree protection fence (TPF) and tree planking. Groups of trees can be surrounded with TPF, however, each individual tree in the group should have tree planking shown on the plans.

M-NCPPC Comment 15: *2+00 try to save sycamore.*

- Matt Drennan stated that there was less than 12’ between the 14” American sycamore and the wetland boundary, which is slightly less than the typical width of the access roads used for heavy machinery and shifting the access road away from the tree would cause temporary impacts to the wetland.
- Steve Hurt stated that MDE would accept temporary impacts to the wetland for the access road to reduce impacts to trees.
- Matt Drennan agreed that the access road can be adjusted to avoid impacts to the Sycamore.

M-NCPPC Comment 16: *2+00 adjust sill tie in away from tulip poplar on left bank.*

- Erin McArdle and Doug Stephens stated that in general there should be no grading within 8’ of trees not being removed.
- Erin suggested that the left arm and key-in of LJH-1 should be adjusted downstream of the 14” tulip poplar on the left bank.
- Matt Drennan agreed that the design team will evaluate moving the arm and key-in angle and location downstream of the 14” tulip poplar on the bank. A note can be added to state that the contractor should not grade within 8’ of any trees not proposed for removal.

M-NCPPC Comment 13: *2+00 to 3+50 - remove FLS-1, FLS-2. FLS-3, FLS-4 and minimize LOD. The headcut near 3+50 should be stabilized by adding Riffle grade control into the existing head cut channel.*

- Matt Drennan stated that the design intent of the log sills was to create additional floodplain storage, provide wetland enhancement, and provide additional floodplain stability to reduce risk of future rills and headcuts.
- After discussion, Matt agreed that all proposed floodplain log sills could be removed. Matt pointed out that the channel will be lifted based on the proposed design, increasing floodplain connectivity, and reducing the risk of headcuts in the floodplain, therefore the floodplain sills are not required for future stability and enhancement.
- Matt Drennan agreed that riffle grade control (RGC) material could be shown at the headcut location near Station 3+60, where the wetland drainage channel meets the proposed channel at a pool.

M-NCPPC Comment 14: *2+75 save river birch and route access between two river birches.*

- Matt Drennan agreed that based on resolutions of Comments 13 and 15, the access road can be adjusted to reduce impacts to the 13” river birch.

M-NCPPC Comment 12: *Between 5+00 and 6+00 - limit grading beyond elevation 348 to protect trees up slope of the work.*

- Doug Stephens stated that grading should tie-in to the existing contours quicker to reduce impacts to root systems of trees upslope.
- Matt Drennan agreed that CRI could evaluate an opportunity to tie proposed grading in just above the active channel elevation, reducing possible impacts to roots of trees upslope.
- M-NCPPC stated that based on the placement of LR-1, M-NCPPC agreed to the removal of the 34”

tulip poplar on the left bank near station 5+50.

M-NCPPC Comment 38: *Remove Log J-Hooks from plans and use all rock j-hooks for this project.*

- M-NCPPC confirmed that all log j-hooks should be replaced with rock j-hooks. Erin McArdle stated that M-NCPPC has had experience with contractors having difficulty with selecting appropriate trees and placing in-stream wood structures correctly during construction.
- Jack Dinne expressed concerns in the longevity of wood in-stream structures to be used as grade control.
- Matt Drennan agreed that CRI could replace all log j-hooks with rock j-hooks.

M-NCPPC Comment 20: *11+00 left bank - add riparian enhancement area per Park's detail in area of old channel.*

-and-

M-NCPPC Comment 21: *OW-4 - use Park's riparian enhancement detail for this feature*.

- Matt Drennan agreed to the inclusion of the riparian enhancement areas, as requested. M-NCPPC will send the design team the Riparian Enhancement Area details.

M-NCPPC Comment 19: *12+50 left bank, move LOD east away for 45" tulip poplar, at least 20'*

- Matt Drennan agreed to evaluate moving the stockpile LOD 20' away from the 45" tulip poplar. Additionally, TPF and tree planking will be installed around the 45" tulip poplar.

M-NCPPC Comment 6: *16+00 save two trees on right bank.*

-and-

M-NCPPC Comment 63: *Can stream shift to the left and have less right bank grading (and tree loss) STA 16+00 to STA 17+50.*

-and-

M-NCPPC Comment 7: *17+50 save two trees on right bank, tie grading into trees on upstream side. these trees are holding the bank together*

- Matt Drennan pointed out that one of the trees at station 16+00 which were designated by M-NCPPC to save has fallen into the stream due to active bank erosion. Matt also pointed out that based on the upstream alignment, bankfull flows would likely be directed at the tree that M-NCPPC proposes to save, so saving the tree would require realignment of the channel.
- M-NCPPC requested that the stream alignment be shifted toward the left bank and save the tree on the right bank at station 16+10. M-NCPPC stated that the group of trees on the left bank around station 16+10 could be impacted to accommodate the shift in the alignment.
- Matt Drennan stated that to accommodate a shift in the alignment at station 16+00, the channel would likely need to be realigned starting around station 15+50 to maintain design channel planform and geometry. Matt stated that a realignment in this area would require a complete redesign of a large portion of the channel.
- Matt Drennan pointed out that one of the trees at station 17+00 was laying in the stream and the other tree M-NCPPC had requested to save was starting to become undercut on the upstream side.
- M-NCPPC requested that the fallen tree be flush cut and the roots left in place and that the proposed log toe structure be shortened to reduce the need to grade the right bank.
- M-NCPPC expressed concern that the pool at 17+60 was over or near an existing sanitary sewer

pipe. M-NCPPC requested that the channel be realigned so that there is not a pool above or near the sanitary sewer line.

M-NCPPC Comment 10: *Tributary 5+00 remove FSL-10*

- Matt Drennan agreed that CRI will evaluate removing all Floodplain Sill Log (FSL) structures from the proposed designs.

M-NCPPC Comment 65: *The tree takes on this page are not acceptable given the limited benefits of opening up this floodplain. Keep work within existing tributary and do not take the trees shown on this sheet.*

-and-

M-NCPPC Comment 9: *Tributary between 5+00 and 5+50 save clump of 6 trees indicated for removal near WL-4.*

- Matt Drennan stated that the intent of the design of CA-5 Mainstem 2 was to provide an undersized channel with regular access to an over-widened floodplain. Matt also explained that the cut from the floodplain grading would be used as fill for CA-5 Mainstem 1.
- M-NCPPC requested that CA-5 Mainstem 2 be redesigned to reduce floodplain grading. M-NCPPC requested that the proposed channel stay within the extents of the existing channel and be raised to meet the existing floodplain elevation.
- M-NCPPC suggested that a series of cascades or steps could be used at the downstream end of Mainstem 2 to drop the channel elevation down to the proposed channel elevation of Mainstem 1. M-NCPPC noted that due to the large stormwater structure at the upstream end of Mainstem 2, fish passage is likely not going to be a design constraint.

M-NCPPC Comment 11: *Tributary 0+00 - staging may be possible adjacent to the right bank in the open area. A few small recently planted trees may need to be relocated.*

-and-

M-NCPPC Comment 70: *Shift stockpile out of PEPCO ROW. Possible location adjacent 0+00 to 1+25 upland.*

- M-NCPPC suggested that the stockpile area currently proposed in the PEPCO right-of-way (ROW) could be moved near the upstream end of Mainstem 2, on the right bank, where trees were planted. Tree plantings could be removed and reinstalled at the end of construction.
- Matt Drennan agreed that the design team could evaluate moving the stockpile to the proposed location.

M-NCPPC Comment 4: *24+75 stabilize wetland channel headcut at downstream side of manhole on right bank, this was requested in the 30% review and not addressed. Suggestion is to add riffle grade control material in channel.*

- M-NCPPC requested that the headcut stabilization be extended from the beginning of the headcut, near the manhole, down to the M-NCPPC property line.
- Doug Stephens suggested that RGC material be used to fill the headcut channel.
- Matt Drennan stated that CRI has developed a design for the headcut channel that uses a series of clay channel plugs and native plantings to fill the channel. M-NCPPC stated that the proposed design sounds acceptable.

Discussion on Stream Restoration Details:

- M-NCPPC expressed concern that the RGC mix would be too uniform to provide diversity and stability.
- Matt Drennan stated that the goal was to use 75% of Class I and 25% natural channel material. Based on sediment sampling data, the natural channel material will have a wide range of material sizes, increasing the range of sediment size distribution of the RGC mix. CRI will include an expected sediment size distribution of the natural channel material and the RGC mix and will evaluate the need to include additional riprap size classes in the RGC mix for sediment size diversity.
- M-NCPPC requested that the RGC material extend up the banks to the bankfull elevation and expressed concern that natural channel material and soil stabilization matting, if not installed correctly, will not be stable enough.
- Matt Drennan stated that CRI has had success with installing the RGCs as proposed. Building the banks of natural channel material or compacted fill allows for native planting and live stake establishment, which provides long-term stability. Matt stated that the RGC is designed to be parabolic in shape so that baseflow would be concentrated in the middle of the channel and baseflow would not be actively flowing along the toe of the bank material and matting.
- Erin McCardle stated that there may be a compromise where the RGC material comes up to half of bankfull elevation and the rest of the bank is constructed of bank material.
- CRI and M-NCPPC agreed to continued coordination regarding the stream restoration details.

I-495 & I-270 Managed Lanes Study
CA-5 Semi-Final Design Meeting
Microsoft Teams Meeting
March 24, 2021 @ 1:00 PM

A meeting was conducted on Marth 24, 2021 with Maryland-National Capital Park and Planning Commission (M-NCPPC) Montgomery County Parks, the Maryland Department of the Environment (MDE), and the United States Army Corps of Engineers (USACE) to present the CA-5 mitigation site Semi-Final design and receive initial feedback from the agencies. A summary of the topics discussed at the meeting follows.

Attendees:

Name	Agency/Organization	Email
Jack Dinne	USACE	john.j.dinne@usace.army.mil
Steve Hurt	MDE / McCormick Taylor	smhurt@mccormicktaylor.com
Matthew Harper	M-NCPPC / Montgomery Parks	Matthew.Harper@montgomerypark.org
Erin McArdle	M-NCPPC / Montgomery Parks	Erin.Mcardle@montgomeryparks.org
Doug Stephens	M-NCPPC / Montgomery Parks	Douglas.Stephens@montgomeryparks.org
Ashby Strassburger	MDOT SHA M-NCPPC Montgomery Parks Liaison	ashby.strassburger@montgomeryparks.org
Karl Hellmann	MDOT SHA / RK&K	khellmann@rkk.com
Justin Reel	MDOT SHA /RK&K	jreel@rkk.com
Sarah Norton	Coastal Resources, Inc. (CRI)	sarahn@cri.biz
Michele Floam	Coastal Resources, Inc. (CRI)	michelef@cri.biz
Jon Stewart	Coastal Resources, Inc. (CRI)	jons@cri.biz

Action Items

- M-NCPPC, MDE and USACE to provide written comments on the Phase II Submittal and Semi-Final Design by April 23rd.
- CRI to provide Matt Harper with a copy of the MDE Phase II checklist. (CRI provided the checklist via email on 3/24/2021)
- CRI to clarify the tree save/take determination. (CRI provided additional clarification to M-NCPPC via email on 3/24/2021)
- RK&K to provide NNI Specification to M-NCPPC (RK&K provided the spec via email on 3/24/2021)

Meeting Summary - CA-5: Seneca Creek Tributary

- Steve Hurt (MDE) asked Coastal Resources Inc. (CRI) to confirm that wetland credits are not proposed with the project. Sarah Norton (CRI) explained that at this time CRI is not proposing wetland credits for the project. The project includes stream mitigation credits only.
- Erin McArdle (M-NCPPC) asked for clarification regarding the definition of a Phase II Mitigation Plan. Sarah and Michele Floam (CRI) explained that that Phase II mitigation plan was a generic term that MDE uses as a milestone for permit approval.
- Sarah gave a general overview of changes that had been made to the project since the previous submittal before providing further detail about the design and approach.
- Sarah began by explaining that the design will provide 3,600 linear feet (LF) of stream mitigation credit. She explained that the design length was increased by adding Mainstem 2 to the project. Credit will not be claimed for a section of Mainstem 2 due to an existing PEPCO right-of-way (ROW) that contains a temporary easement. Sarah made the following comments regarding the design:
    - Site Access has been added from Sioux Lane. This helped to reduce the overall Limit of Disturbance (LOD) and to minimize tree impacts for access.
    - Throughout the site, the LOD has been reduced as much as possible to minimize impacts to trees and other resources.
    - Throughout Mainstem 1, stream diversions are proposed to allow the contractor to work offline were possible.
    - Stockpile areas are limited throughout the project area due to tree coverage. A large stockpile area is proposed near Mainstem 2. The current stockpile size may change within the PEPCO ROW due to limitations on stockpiling material under the overhead transmission lines. CRI is working with PEPCO to determine a solution to allow stockpile within the PEPCO ROW.
    - Sarah explained that Tributary 1 would begin at the footbridge and tie into Mainstem 1. Tributary 1 includes a plunge pool and cascade structure.
    - Mainstem 1 will utilize riffle grade controls to provide bed stabilization and promote hyporheic exchange. Log and J-hook structures will provide small elevation drops in the stream in addition to bed stabilization and habitat creation. Log rollers will be used on steeper riffles for grade control. These structures will provide good benthic habitat. Toe log structures will be used along many outer meander bends to help reduce velocity and shear stress in addition to providing habitat. Oxbow wetlands will be planted with wetland plugs. Steeper riffles will have rock sills at the bottom of the riffle to account for higher shear stress and velocity. Existing and proposed wetlands will receive floodplain logs to minimize the potential for headcuts. The LOD was reduced through the existing wetlands to only include area for the floodplain logs. Stone toe has been added to areas where the H&H modeling indicated higher shear stress.
    - At the existing stormwater pipe, riffle slopes become steeper to follow the valley slope. Grading was brought in as much as possible in this area to avoid tree impacts.
    - Steeper slopes continue until approximately station 9+50. Currently, this area is unstable. Slopes drop down to approximately 3%. This area contains more access to the floodplain where channel realignment is proposed. The realignment will improve stability at the sanitary sewer crossing location.
    - At approximately station 18+00, riffle slopes drop down to 2% to match valley slopes.
    - The pond outfall elevation will be lowered to 213.0 to lower the existing water level and create more ideal wetland/floodplain conditions. This area will be planted with wetland plugs.
    - Riffle slopes remain 2 – 2.5% in Mainstem 1 below the pond outfall.
    - At the confluence of Mainstems 1 and 2, the stream remains in its existing location to avoid tree impacts.

  - Mainstem 2 starts below an existing outfall facility. This section of the project provides an additional 650 LF of stream restoration. The floodplain will be graded down in this area to allow flow to get out onto the floodplain. The design channel holds approximately 55% of the bankfull discharge. Mainstem 2 does not experience high peak flows due to the upstream stormwater facility. Smaller riffle slopes are proposed for Mainstem 2 to match the existing valley slope. Floodplain cut along Mainstem 2 will provide the necessary fill needed to raise the stream invert of Mainstem 1.
- Sarah continued to present the Landscape Plans.
  - Livestakes are proposed along the straight sections and outside meanders.
  - Riparian planting will be installed where there is existing forest.
  - Wetland plantings will be added in the existing pond area, oxbow wetlands, and existing and proposed wetlands.
  - The PEPCO ROW will be limited to shrub plantings and seed only.
- Doug Stephens (M-NCPPC) mentioned that PEPCO was concerned about wetland creation within their ROW. Sarah explained that further coordination is needed with PEPCO in the future to discuss wetland creation potential and if access is needed to cross the stream.
- Matt Harper (M-NCPPC) mentioned a wetland channel just south of the project limits that is eroding and has an exposed manhole. Matt asked that stabilization be included for this area. Sarah mentioned that CRI will evaluate a potential solution for this area. Matt and Erin asked if CRI 65% comments would be addressed. Sarah responded that CRI's current scope of work is to obtain Phase II Mitigation Plan approval from MDE and USACE before the project is passed on to the designers of the next phase. Therefore, only comments need to obtain Phase II Mitigation Plan approval will be addressed.
- Erin asked how unresolved comments would be documented and passed along to the designers of the next phase. Justin Reel (RK&K) stated that the process is still being worked out, however comments would likely be packaged with the report and plans for the next designer that advances the project.
- Doug asked if there was tracking of the previous comments provided and how these comments were addressed. Sarah responded that CRI provided a matrix with comment responses.
- Sarah asked Doug if he had an opportunity to review the seed mixes considering M-NCPPC had made a comment about using alternative seed mixes at the Preliminary Design stage. Doug said M-NCPPC would review the seed mixes and provide comments/substitutions in their Semi-Final comments.
- Matt stated that staging and stockpile areas are more defined along Mainstem 2. He asked if CRI felt that the staging and stockpile areas were too scarce and if CRI was looking for more opportunities for stockpiling. Sarah responded that overall, the project is tight on stockpile areas mainly due to the existing 100 yr. floodplain. Sarah stated that there will be a lot of earth moving for this project. If M-NCPPC could recommend additional areas to propose for stockpiling, it would be helpful.
- Erin stated that there are trees on sheet ES-04 with an "X", trees that show protection, and trees that do not have an "X" or show protection. She asked why some of the trees within the LOD were not marked as removed or protected. Sarah responded that she would check with her team and provide further clarification.
- Matt asked what was required to obtain the Phase II Mitigation Approval from MDE. Michele responded that MDE has a Phase II requirement checklist that CRI will send to M-NCPPC.
- Michele asked Steve if the H&H needs to be approved in order to receive 65% approval. Steve responded that at the 65% stage, H&H is typically not 100% complete. There may be some H&H comments, but not fully necessary to have final H&H approval at 65%.
- Erin asked if there was any invasive species on-site and if there was a plan to address them. Sarah responded that stilt grass and some invasive vines were present on-site. She mentioned that MDE

requirements have a threshold of invasive species allowable in order to accept the site. Karl noted that there are invasive species management special provisions for the project that were not included in the Phase II submittal and that he could send them to M-NCPPC.

- Steve asked if the previous design submittal included credit calculations based on the Maryland Stream Mitigation Framework (MSMF). Sarah confirmed that the preliminary design credits were not based on MSMF calculations.
- Steve mentioned that this was the first time hearing about the projects being handed off to another designer after 65% design. It was explained that all public mitigation sites have the potential to be handed to the P3 developer to take the design from final design through construction. Justin explained that the GEC is still in discussions on how to proceed with the next phase of the project. Mitigation sites on private properties will not be completed by the P3 developer.
- Matt stated that guidelines should be established so the P3 contractor does not redo work that everyone has previously agreed upon. Justin stated that there is incentive to not redo the 65% design plans since the P3 contractor would need to get approval from MDE and USACE, which could lead to delays.
- An internal M-NCPPC field visit is scheduled 4/15/21 from 9AM – 12PM. Ashby will provide details on this meeting.

I-495 & I-270 Managed Lanes Study
CA-5 PEPCO Meeting
Meeting Microsoft Teams Meeting
March 19, 2021 @ 10:00 AM

A meeting was conducted on March 19, 2021 with representatives from Potomac Electric and Power Company (PEPCO) to discuss the design of CA-5, one of the MLS mitigation sites located within PEPCO Right-of-way. A summary of the topics discussed at the meeting follows.

Attendees:

Name	Agency/Organization	Email
Doug Stephens	M-NCPPC / Mont. Parks	Douglas.Stephens@montgomeryparks.org
Paul Weiner	MDOT SHA GEC Utility Coordinator/WRA	PWeiner1.consultant@mdot.maryland.gov
Adel Kotb	MDOT SHA GEC Utilities/ALA	akotb@alaengr.com
Karl Hellmann	MDOT SHA / RK&K	khellmann@rkk.com
Frank Matchner	PEPCO	Frank.matchner@exeloncorp.com
Marcus Smith	EPEPCO	marcus.smith3@exeloncorp.com
Janique Williams	PEPCO	Janique.williams@exeloncorp.com
Jack Chu	PEPCO	jschu@pepco.com
Gustov Hamilton	PEPCO	gehamilton@pepco.com
Shirley Harmon	PEPCO	shharmon@pepcoholdings.com
Rinku. James	PEPCO	rjames@pepco.com
Thomas Rogers	PEPCO	trogers@pepco.com
Charles Schupler	PEPCO	csschupler@pepcoholdings.com
Ed May	PEPCO	
Matt Young	PEPCO	
Toli Tanu Olu	PEPCO	
Dan Landry	PEPCO	
Matthew Drennan	MDOT SHA GEC /Coastal Resources, Inc. (CRI)	matthewd@cri.biz
Michele Floam	MDOT SHA GEC Coastal Resources, Inc. (CRI)	michelef@cri.biz
Sarah Norton	MDOT SHA GEC Coastal Resources, Inc. (CRI)	sarahn@cri.biz

Action Items

- Sarah Norton will provide the CA-5 Semi-Final Plans and Report to the PEPCO Group for review.
- PEPCO will provide comments to Maryland Department of Transportation State Highway Administration (MDOT SHA) and the designers on the provided deliverables.
- PEPCO will discuss internally the potential of placing the restoration area in a protective covenant or conservation easement.
- Sarah Norton will provide the approximate linear feet (LF) of stream credit that could be claimed within PEPCO right-of-way (ROW).

Meeting Summary – CA-5: Seneca Creek Tributary

Paul Weiner began the meeting with introductions. Karl Hellmann (RK&K) then provided a brief summary of the I-495 & I-270 Managed Lanes Study (MLS) project as a whole as well as the overall site selection process. Mapping was presented showing all of the potential mitigation sites throughout the three impacted subwatersheds.

Sarah Norton (CRI) summarized the CA-5 Stream Restoration site. Sarah presented the existing conditions and overall design goals and concepts for the Great Seneca Creek Bradbury Drive Tributary site (CA-5). The project is currently scoped to semi-final design phase. The final design phase has not been scoped. Construction is not anticipated until 2022/2023. The design included the restoration of Mainstem 1, approximately 2,900 LF of restoration, and Mainstem 2 consists of approximately 640 LF of additional stream restoration (535 LF of additional stream mitigation credits, no credits accounted for within PEPCO ROW). The Mainstem 2 section of the project is an important addition to the project and would create a more complete overall project. Mainstem 2 begins at a Montgomery County Department of Environmental Protection (DEP) Stormwater Management facility outfall and continues to the confluence with Mainstem 1. MDOT SHA does not plan on claiming mitigation credit for the 184 LF of stream work within the PEPCO ROW. The Agencies require a perpetual easement or guarantee of site protection in order to claim mitigation credit, which is something that MDOT SHA does not expect to obtain within the PEPCO ROW.

Sarah described the general approach for Mainstem 2 of raising the channel slightly and cutting a wide floodplain within the existing terrace. Sarah explained the overall LOD requirements and how CRI plans on using the PEPCO temporary easement as a staging and stockpile area. The overall easement shown on the plans is 0.735 acres. The LOD is approximately 68 feet from the poles and 75 feet from the towers on the left bank, and 35 feet from the towers and 45 feet from the poles on the right bank. On the left bank, the grading ends 119/128' from the towers. PEPCO commented that there could not be any staging/stockpile area under the overhead lines due to clearance limitations. Sarah then described the vegetation plan, which currently shows riparian plantings proposed within the PEPCO ROW, however, this could be adjusted to remove the trees. The PEPCO vegetation representative agreed that herbaceous and shrub plantings would be acceptable, but they would not allow trees to be planted within the ROW.

There was then discussion about the need for an emergency stream ford or crossing. The vegetation management and maintenance crews may need to access the area. Doug Stephens (M-NCPPC) suggested that adding a ford to an existing proposed riffle grade control could be an easy design item that could provide access through the stream. The design team confirmed that incorporating a stream ford into a riffle grade control is possible. PEPCO is also concerned about the potential for wetlands forming in the graded floodplain. CRI suggested that the stream ford could be expanded to provide access across the floodplain as well as grade control in the floodplain, similar to the currently proposed floodplain logs.

PEPCO also mentioned that they were interested in potentially claiming banking credit for stream mitigation. Sarah mentioned that this would be possible only if the stream and immediate area was put into some sort of protective covenant or easement. PEPCO said they would discuss the options internally. There is PEPCO work scheduled for one of the lines within the project area in the upcoming year or two. MDOT SHA and PEPCO will need to further coordinate when a schedule for the project is better defined.

In Summary, the PEPCO representatives will continue to work with MDOT SHA to move this project forward, but would need to review the project in depth and provide comments and limitations for the ford, planting, stockpile areas, construction equipment, etc. PEPCO will also discuss internally and determine if they want to pursue stream restoration credit on their property.

CA-5 and AN-1 Wetland Delineation
Field Review Meeting @ 9 AM

Handouts: Wetland delineation mapping and datasheets

A field review meeting was conducted on January 14, 2021 with representatives of the U.S. Army Corps of Engineers (USACE) and Maryland Department of the Environment (MDE) to review the wetland delineation boundaries and Cowardin Classifications of features delineated at the **CA-5** and **AN-1** mitigation sites. A summary of the topics discussed at the meeting follows.

CA-5 – Great Seneca Creek Bradbury Dr. Tributary

The **CA-5** mitigation site was reviewed first, including associated tributaries and wetlands, located off of Suffolk Terrace in Gaithersburg, MD. The delineated resources at this site were presented by Emma Beck (Coastal Resources Inc. [CRI]). The group began the field review at the eastern end of the site with **Water Course 1** (**WC1)**, which was delineated as intermittent, but appeared to be receiving hydrology from a groundwater seep and was requested by MDE and the USACE to be changed to perennial. The group then reviewed **WC2**, which originates at a culvert as an ephemeral channel and transitions to an intermittent stream and a perennial stream further downstream. USACE and MDE agreed the ephemeral portion is non-jurisdictional and will not be regulated. They asked that the ephemeral channel be shown on the impact plate as an ephemeral channel not regulated by USACE or MDE. USACE and MDE requested the intermittent portion of **WC2** be changed to perennial. Palustrine Forested Wetland (PFO) **Wetland 1 (WL1)** was accepted as delineated.

The attendees followed perennial **WC7** downstream to PFO **WL2**, intermittent **WC3**, and PFO **WL6**. The eastern-most boundary of PFO **WL6** did not display strong hydrology, however the boundary was not revised. These four features were accepted as delineated. The group continued downstream along **WC7** to its tributary, **WC9**, which was delineated as ephemeral to a deep headcut and then as intermittent to its confluence with **WC7**. USACE and MDE accepted this system as delineated.

Continuing downstream along **WC7**, the group came to **WC10**, an open water feature, and its outlet channel, **WC8**. USACE and MDE accepted this system as delineated.

The group followed **WC7** downstream to its tributary, perennial **WC6**, and followed this channel upstream to review its associated wetlands. PFO **WL5** was separated from **WC6** by a natural berm. PEM **WL7,** PEM **WL8**, and PFO **WL4** were accepted as delineated. The attendees crossed **WC7** to review intermittent **WC5** and PFO **WL3**, which were accepted as delineated.

Overall, the Agencies were in agreeance with the resources delineated within the **CA-5** project area. CRI will provide an updated memo with appendices including the changes requested above. During the site visit, Adam Tatone (MDE) suggested providing mapping with flag numbers and a larger scale. This will be provided by CRI along with the updated wetland delineation memo.

AN-1 - Crabbs Branch

The **AN-1** mitigation site was reviewed next, including portions of Crabbs Branch and its associated tributaries and wetlands located off of Oskaloosa Drive in Derwood, MD. The delineated resources at this site were presented by Karl Hellmann (RK&K). The boundary of PEM **Wetland A** was reviewed, which provided a good example of how the boundaries were delineated within floodplain dominated by reed canary grass. Karl explained that soil and hydrology indicators were used to define the boundaries. The attendees reviewed the **Wetland A** boundary closest to Crabbs Branch and the natural upland berm separating the stream channel from the wetland, formed by deposition from out-of-bank stream flows. PFO **Wetland C** and intermittent **Waters AA** were reviewed next, with particular focus on the tributary transition into the wetland. Intermittent **Waters E** and PFO **Wetland D** were then reviewed, which was a similar system to **Wetland C**. The agencies agreed on the delineation of all of these features in the southeast quadrant of the site.

Attendees then crossed Crabbs Branch and reviewed PEM **Wetland I**, PFO **Wetland F**, and intermittent **Waters G** and **H. Waters H** was delineated as an intermittent channel, however Adam is going to discuss this feature with Steve Hurt (MDE) and Jack Dinne (USACE) in more detail to determine if the feature should be changed to a Perennial channel. The delineation of the other features was agreed upon. PFO **Wetland BB** was not reviewed by the group considering the wetland and its buffer are well outside the project's limits of disturbance. *After further discussions, Adam confirmed that **Waters H** should be changed from intermittent to perennial from its confluence with **Waters G** downstream to **Waters B**.*

The main channel of Crabbs Branch, **Waters B**, was reviewed as the attendees walked the site from east to west and its delineation was accepted.

The group reviewed PEM **Wetland L**, a linear wetland that drains to Crabbs Branch, Intermittent **Waters J** that runs along the toe of the valley slope, and PFO **Wetland K**, which is adjacent and abutting **Waters J**. The attendees continued west to PEM **Wetland M**, which connects to **Waters J** at its western source. The delineation of these features was agreed upon, except for **Waters J**, which Adam will discuss further with Steve and Jack to determine if the channel should be changed from intermittent to perennial. *After further discussions, Adam confirmed that **Waters J** has been accepted as delineated.*

Next, the group reviewed PEM **Wetland N**, PEM **Wetland O**, and intermittent **Waters CC**, which drains a stormwater pond. The delineation of these features was agreed upon.

Adam pointed-out an invasive species, Purple Fountain Grass (*Pennisetum setaceum*), which is a common nursery plant and is growing along the edges of the site.

Attendees reviewed PFO **Wetland P**, which Adam noted has a potential vernal pool that MDE may require the design avoid. The delineation for **Wetland P** was accepted.

PFO **Wetland Q** was not reviewed by the group considering the wetland and its buffer are well outside the project's limits of disturbance. PFO **Wetlands Y** and **Z** were not reviewed, since they have distinct boundaries and are not questionable – their boundaries were accepted. Perennial **Waters X** and **R** were not reviewed due to their distinct boundaries and hydrology.

PFO **Wetland S**, PEM **Wetland T**, Intermittent **Waters U** and Intermittent **Waters V** were reviewed and their boundaries were agreed upon as presented.

Overall, the Agencies were in agreeance with the resources delineated within the **AN-1** project area. Adam will further discuss classification changes to Intermittent **Waters H** and **J**, and avoidance of the potential **Wetland P** vernal pool with Steve and Jack. *After further discussions, Adam confirmed that impacts to **Wetland P** and its potential vernal pool should be avoided.*

Action Items:

- CRI will provide an updated **CA-5** wetland delineation memo with appendices including the feature changes indicated above.
- CRI will change the **CA-5** wetland delineation mapping to a larger scale and include flag numbers.
- RK&K will change **AN-1 Waters H** from intermittent to perennial from its confluence with **Waters G** downstream to **Waters B.**
- RK&K will modify the AN-1 design to avoid impacts to **Wetland P** and its potential vernal pool.

Attendees:

Name	Agency	Email
Jack Dinne	USACE	John.J.Dinne@usace.army.mil
Steve Hurt	MDE	SHurt@mccormicktaylor.com
Adam Tatone	MDE	adtatone@mccormicktaylor.com
Emma Beck	CRI	emmab@cri.biz
Shannon Pursell	CRI	shannonp@cri.biz
Maddy Sigrist	MDOT SHA / RK&K	msigrist@rkk.com
Karl Hellmann	MDOT SHA / RK&K	khellmann@rkk.com

I-495 & I-270 Managed Lanes Study
M-NCPPC Concept Mitigation Meeting
Microsoft Teams Meeting
July 22, 2020 @ 11:00 am

A meeting was conducted on July 22, 2020 with M-NCPPC Montgomery Parks to discuss concept comments for CA-5, one of the MLS mitigation sites located on M-NCPPC property. A summary of the topics discussed at the meeting follows.

Attendees:

Name	Agency/Organization	Email
Ashby Strassburger	MDOT SHA M-NCPPC Mont. County Liaison	ashby.strassburger@montgomeryparks.org
Doug Stephens	M-NCPPC / Mont. Parks	Douglas.Stephens@montgomeryparks.org
Erin McArdle	M-NCPPC / Mont. Parks	Erin.Mcardle@montgomeryparks.org
Matthew Harper	M-NCPPC / Mont. Parks	Matthew.Harper@montgomerypark.org
Jaqueline Hoban	M-NCPPC/Mont. Parks	jacqueline.hoban@montgomeryparks.org
Susan Lindstrom	MDOT SHA GEC/WSP	Susan.Lindstrom2@wsp.com
Karl Hellmann	MDOT SHA / RK&K	khellmann@rkk.com
Cal Novelli	CRI	caln@cri.biz
Matthew Drennan	CRI	matthewd@cri.biz
Katie Scott	CRI	katies@cri.biz
Sarah Norton	CRI	sarahn@cri.biz

Action Items

- Erin McArdle will provide CRI the MNCPPC, WSSC approved, asset protection details. *[Provided on 7/22]*
- Karl Hellmann will follow-up with any new information regarding the PEPCO coordination. *[PEPCO received our application to access the parcels on CA-5 and will need to review/approve prior to granting access – 8/10]*

Meeting Summary - CA-5: Seneca Creek Tributary
Sarah Norton (CRI) began the meeting by providing a summary of the project deadlines. PI is due August 18, 2020. Karl Helman gave a status update on the on-going coordination with PEPCO and WSSC. The PEPCO access requests were submitted for a few of the mitigation sites and Karl will follow up on the status of the requests. Access is needed to evaluate some of the tributaries. The WSSC coordination for the mitigation sites is being grouped with the overall project coordination being conducted by the GEC. There was a meeting scheduled for Friday 7/24 with WSSC to discuss all of the mitigation projects and the potential WSSC conflicts. Karl

is attending as an active participant. Matt Harper offered to coordinate with MNCPPC's WSSC contact if additional information is needed after the meeting.

Sarah then presented the existing conditions and concept ideas for the Great Seneca Creek Bradbury Drive Tributary (CA-5). The design would include stabilizing the smaller channels that drain to the mainstem, including a tie-in at the confluence at the downstream end of the site. There are several sewer crossings and exposed utilities within the site. Some of the sewer casings are not included in the County's GIS layer, and the as-builts were requested from SHA to confirm the elevations of those pipes. The group discussed the upstream tie in. Due to the presence of bedrock and the stability of the banks, MNCPPC was ok with not restoring the entire Tributary 1, but they requested that we evaluate the outfall at the upstream end and the confluence with the main stem. The downstream tie in should continue below the confluence to a stable point as well as upstream to the PEPCO easement.

The farm pond outlet will be lowered to reduce the water level in the pond and create a stable tie-in to the stream. Erin McArdle agreed with this approach and noted that they would like to know the approximate depth of the pond as it is today. MNCPPC would like to see it can function as more of a wetland feature and not a pond if at all possible, with a stable tie-in to the stream.

The proposed work shows a bankfull line and approximate floodplain extent. Matt Harper commented that MNCPPC would like to preserve the canopy and trees as much as possible while still designing a successful project. They understand that some trees and specimen trees will have to be taken down but would like to minimize the overall tree removal as much as possible. Matt pointed out that the typical section on the Concept drawings had a bankfull width of 12 feet and a floodplain width that looked to be about 40 feet. Sarah clarified that the floodplain was not to scale and the actual floodplain impact would be adjusted to fit within the constraints of the site, and minimize extensive earthwork and tree disturbance where possible. Matt Harper requested a profile of the site, and Sarah stated that a profile will be provided at 30% design.

Sarah described the general approach of raising the channel in the center of the project to better meet the existing floodplain. MNCPPC noted that they have standard structure details for WSSC pipe protection and Erin McArdle will provide to the CRI/RKK mitigation teams. Matt Harper commented on some of the log structure details; MNCPPC has had some log structures fail in the past and has some questions about the ones shown. Sarah stated that the structures shown in the concept plans were just typical structures that could be used in a B channel, and at 30% design CRI will have a better idea of what structures will be needed at this site. Erin agreed and MNCPPC will provide detailed comments on the stream details at 30%.

Sarah explained the overall LOD requirements and how CRI plans on using the WSSC access road as much as possible to avoid the steep slopes and unnecessary tree impacts. Matt Harper requested that the stockpile areas be shown on the 30% plans. He suggested that the design should maximize the floodplain storage in areas where the valley was wider, and CRI should consider using not filling the channel in areas of realignment to use as oxbow pool features. Erin requested representative cross sections at specific locations to show where the channel is being raised and/or relocated and the extents of the floodplain grading and overall disturbance. Sarah agreed that a couple representative cross sections could be provided with the 30% submission.

Overall, MNCPPC was happy with the level of detail provided in the concept report, and amount of background data that was collected at the site. They concurred with the overall design approach and are looking forward to seeing the next design submission with more detail. Matt noted that trying to include the confluence at the downstream end of the site is still important to MNCPPC and they are interested in including the area within the PEPCO property. Karl will keep the team updated on any progress with the access request.

CABIN BRANCH (RFP-2)
MEETING MINUTES

6958 Aviation Blvd, Suite C
Glen Burnie, MD 21061

Corporate Headquarters
6575 West Loop South, Suite 300
Bellaire, TX 77401
Main: 713.520.5400

Date: March 24, 2021

To Attendees: Jack Dinne – USACE
Steve Hurt, Adam Tatone – MDE
Susan Lindstrom – WSP
Karl Hellmann – RK&K
Reid Cook, Daniel Buczek – RES

From: Reid Cook, RES

Subject: RFP-2 Cabin Branch Wet Del Review

A Wet Del field review was conducted for the RFP-2 Cabin Branch site on March 9, 2021. The purpose of the meeting was to examine the wetland delineation previously conducted by RES and to receive feedback or make necessary revisions.

Prior to the site visit and wetland delineation was completed on September 10, 2021 for the Cabin Branch site with mapping, data sheets, and report provided as part of the Phase II Mitigation Plan submission. Overall, Waters of the US were originally classified as R3/perennial stream or Palustrine Open Water (POW) bodies.

Site Review Notes:

During the onsite field review, a total of seven (7) POW features were examined. The following was discussed at each location and agreed upon by agency staff.

POW-1: Mapped feature is consistent with field conditions.

POW-2: Mapped feature is consistent with field conditions.

POW-3: Due to failure of the existing pond outlet a portion of the POW has converted to Palustrine Emergent wetlands (PEM). An area of approximately 0.06 acres has been changed. Wetland delineation mapping has been updated to reflect this condition and is include with these minutes.

POW-4: Mapped feature is consistent with field conditions.

POW-5: Mapped feature is consistent with field conditions.

POW-6: Mapped feature is consistent with field conditions.

POW-7: Mapped feature is consistent with field conditions.

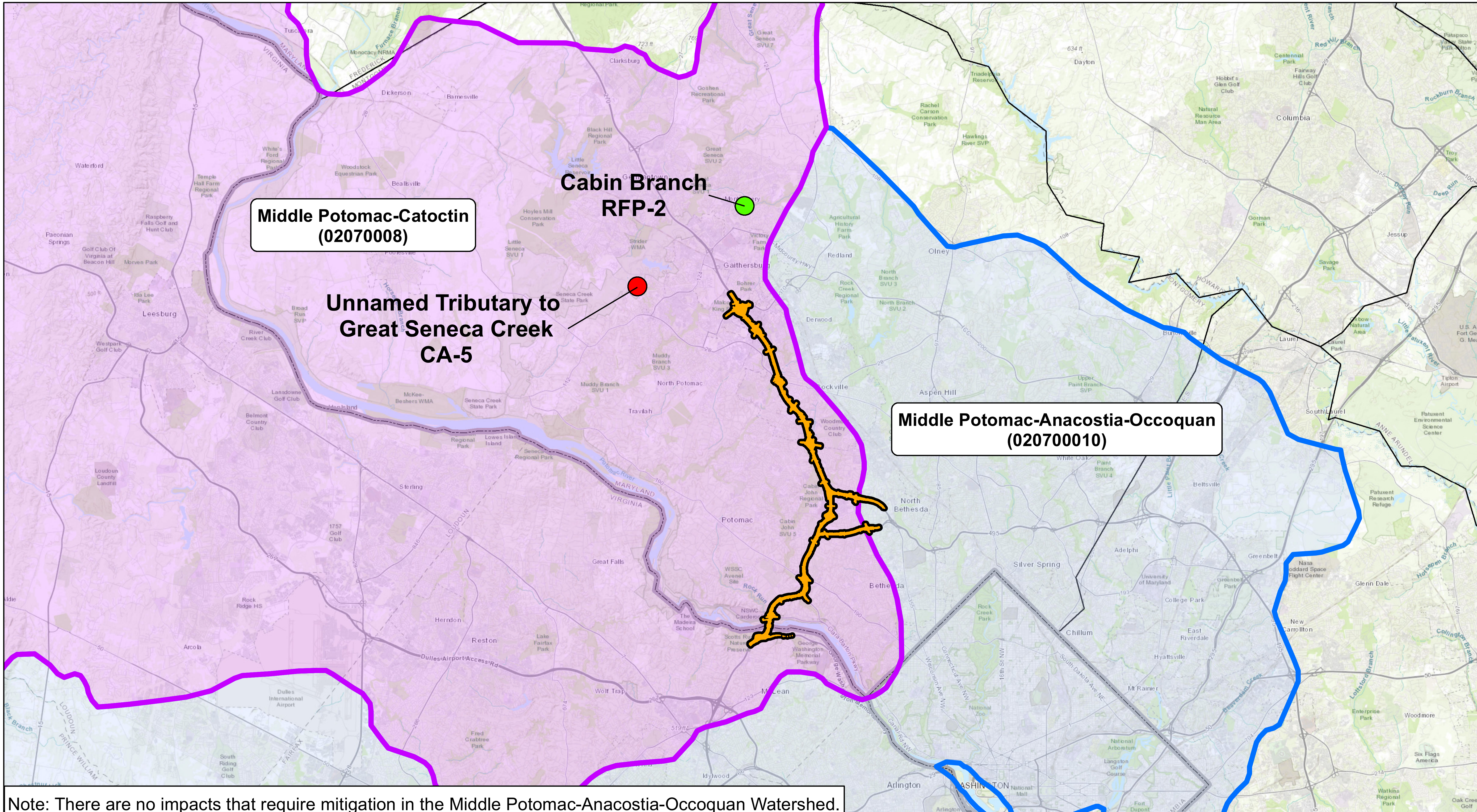
Action Items:

1) The PEM wetland change has been made to POW-3 location.

Attachment:

1) Updated *Waters of the US Delineation Map*

APPENDIX O: PHASE II MITIGATION SITE VICINITY MAP



Phase 1 South - Preferred Alternative

State Boundary

County Boundary

Targeted HUC-8 Watershed

Middle Potomac-Catoctin

Non-Targeted HUC-8 Watersheds

Middle Potomac-Anacostia-Occoquan

Stream Sites

Wetland/Stream Sites

0 1.5 3 4.5 6 Miles

1 in = 3 Miles

Figure O
Phase II Mitigation Sites
Vicinity Map

495 270 MANAGED LANES STUDY

APPENDIX P: PHASE II MITIGATION PLANS

Comprised of 4 separate pdf files:

- **MLS_FEIS_APPO_FinalCMP_AppP_01_CA5PhaseIIReport& Design Plans - June 2022**
- **MLS_FEIS_APPO_FinalCMP_AppP_02_CA5SemiFinalDesignReport - June 2022**
- **MLS_FEIS_APPO_FinalCMP_AppP_03_RFP2FinalMitPlan - June 2022**
- **MLS_FEIS_APPO_FinalCMP_AppP_04_RFP2ESCPlan - June 2022**