Appendix B: Option Agreement with Green Bloom MV Park LLC and Green Bloom MV Development, LLC

DRAFT

Permanent Easement Option Contract
with the
State Highway Administration
of the
Maryland Department of Transportation

R/W Contract No.
AZ0485172-0002
Item No.

THIS OPTION, granted this of in the year **20** ,

BY:

Name:
Green Bloom MV Park, LLC

Address:
19550 Montgomery Village Avenue
Gaithersburg, MD 20886

and the Mortgagees, Trustees and/or Lien Holders listed in the PAYEE CLAUSE who will be contacted by the STATE HIGHWAY ADMINISTRATION for the purpose of agreeing to release the land, easements and/or rights hereinafter described from the operation and effect of any mortgage and/or lien which they may hold upon the property of the above mentioned persons, it being understood and agreed that they retain their rights as mortgagees and/or lienors in and to the remainder of the land of the above mentioned persons not hereby agreed to be conveyed.

All as the parties of the first part, hereinafter called the GRANTORS, to **HGS, LLC, a Virginia limited liability company ("HGS")** on behalf of the STATE OF MARYLAND, party of the second part, hereinafter called the GRANTEE.

A. **WHEREAS,** the said GRANTEE proposes to lay out, open, establish, construct, extend, widen, straighten, grade and improve as a part of the State Highway System of Maryland, a highway and/or bridge, together with the appurtenances thereto belonging, shown on the plans designated as Construction Contract No. **AZ0485172-B** for the improvements to **Cabin Branch Phase I Stream Mitigation** in **Montgomery** County.

B. **WITNESSETH,** that in consideration of the mutual benefits, inuring to each of the parties hereto and the covenants and agreements between them, incorporated herein, beneficial to each of the parties to this agreement, the said GRANTORS do hereby give and grant to the GRANTEE, its successors and assigns, the exclusive right and option to purchase for a period of twelve (12) months from the date hereof, for the sum of **One Hundred Ninety-eight Thousand Eight Hundred Fifty and No/100** Dollars **($198,850.00**) all of the following described land, easements, rights, privileges and controls.

C. **ALL THE EASEMENTS, RIGHTS, PRIVILEGES AND CONTROLS,** as shown and/or indicated, on the **attached preliminary plat** all of which plat are made a part hereof, and which are duly recorded, or intended to be recorded among the Land Records of the aforesaid County.

D. TEMPORARY CONSTRUCTION EASEMENT: TOGETHER with the temporary right during the period of construction to use the area of land shown on the **attached preliminary plat** for the purpose of **construction access, stockpiling materials and haul roads.**

E. **IT IS FURTHER AGREED** that the GRANTORS will **N/A.**

F. **IT IS FURTHER AGREED** that the GRANTEE will **N/A.**

G. **IT IS FURTHER AGREED** that the deed or deeds or other instruments of conveyance executed by the GRANTORS conveying to the GRANTEE all of the land, premises, easements, rights and privileges described in this option must contain covenants (running with and binding the remaining property of the GRANTORS, and binding the GRANTORS, their heirs, successors and assigns) that will perpetuate all of the rights and privileges

agreed to be conveyed to the GRANTEE under the provisions of this option. The terms and conditions of this contract shall survive the execution and delivery of the deed and shall not become merged therein.

H. **IT IS FURTHER AGREED** that the GRANTORS herein do hereby authorize and designate

Name:	Address:
Green Bloom MV Park, LLC	**c/o Monument Realty LLC** **750 17th Street NW Ste. 110** **Washington, DC 20006**

as their specified Agent or the individual Grantor to receive, on their behalf, the official notice of the acceptance of this option by the GRANTEE, said notice to be forwarded by mail to said specified Agent or Grantor. The said GRANTORS do hereby further authorize the GRANTEE, its members, officers, agents or employees to enter in and upon the hereinbefore described premises and proceed with the construction of the said state roads and/or bridge and their appurtenances, immediately upon the mailing by the GRANTEE to said Agent or Grantor, by mail, of the said notice of the acceptance of this option. The taking possession of said land and premises by the GRANTEE, however, shall not be construed as a waiver of any objection to title.

I. **IT IS FURTHER AGREED** that upon acceptance of this option by the GRANTEE, said GRANTORS will, upon demand, convey unto the State of Maryland, to the use of the State Highway Administration of the Department of Transportation (or to such person or persons as may be designated by the GRANTEE), by a special warranty deed, or deeds, a good and marketable fee simple title, the same to be delivered to the office of the GRANTEE at Baltimore, Maryland, or to a duly appointed agent acting for the GRANTEE in this particular instance, within thirty (30) days from the date of said demand, to be made in writing within three (3) months from the date of the acceptance of this option; provided that, GRANTORS and GRANTEE further agree each to employ their best efforts to conform with said time periods except, however, that no cause of action shall lie for the failure of such best efforts to so conform. The deed or deeds, and other instruments of conveyance must meet with the approval of the Office of Counsel of the State Highway Administration and shall contain the covenants set forth in this option.

J. **PAYEE CLAUSE:** Payment shall be made for the land rights herein agreed to be conveyed, upon receipt of the approvals mentioned in this option, by check, from the Treasurer of the State of Maryland, said checks, except as herein otherwise provided, to be made payable to **Green Bloom MV Park, LLC** its heirs and assigns.

K. **IT IS FURTHER AGREED** that the contents of this option and the acceptance thereof, comprise the entire contract and that no verbal representations made before or after the signing hereof, or anything not herein written, shall vary the terms of this option, and that the payment of **One Hundred Ninety-eight Thousand Eight Hundred Fifty and No/100** dollars **($198,850.00)** by the GRANTEE shall constitute full and final payment for the acquisition of the property described in this option, and any damages to the remainder thereof, if any.

Relocation Assistance payments and services, if any, are in addition to, and are not included, as any part of this option contract.

IN WITNESS WHEREOF THE GRANTORS have hereunto set their hands and seals.
SIGNED, SEALED AND DELIVERED IN THE PRESENCE OF:

FOR: Green Bloom MV Park, LLC, a Delaware limited liability company

By: Monument Realty LLC, its authorized agent

WITNESS Valerie Mrayczyj _____ _____**(SEAL)**
BY: F. Russell Hines, Authorized Signatory

HGS, LLC

WITNESS _____ _____**(SEAL)**
BY: Ben Eubanks, General Manager

STATE OF ~~Maryland~~ District of Columbia ~~COUNTY OF~~

I hereby certify that, before me, the subscriber, a NOTARY PUBLIC of the ~~STATE OF~~ District of Columbia, in and for County personally appeared F. Russell Hines and each severally acknowledged the aforegoing option to be his respective act.

AS WITNESS MY HAND AND NOTARY SEAL, this 5th of October in the year 2020

NOTARY PUBLIC Emily M. Lilly

NOTARY SEAL

EMILY M. LILLY
NOTARY PUBLIC
DISTRICT OF COLUMBIA
COMMISSION EXPIRES 11-14-2024

My Commission expires 11/14/2024

IN WITNESS WHEREOF THE GRANTORS have hereunto set their hands and seals.
SIGNED, SEALED AND DELIVERED IN THE PRESENCE OF:

FOR: Green Bloom MV Park, LLC

WITNESS _____ _____**(SEAL)**
BY: F. Russell Hines, President

HGS, LLC

WITNESS _____ _____**(SEAL)**
BY: Ben Eubanks, General Manager

STATE OF **Maryland** COUNTY OF

I hereby certify that, before me, the subscriber, a NOTARY PUBLIC of the STATE OF Virginia, in and for City of Richmond County personally appeared BEN EUBANKS and each severally acknowledged the aforegoing option to be his respective act.

AS WITNESS MY HAND AND NOTARY SEAL, this 28th of September in the year 2020

NOTARY PUBLIC Ronda LaFern Gooden

NOTARY SEAL

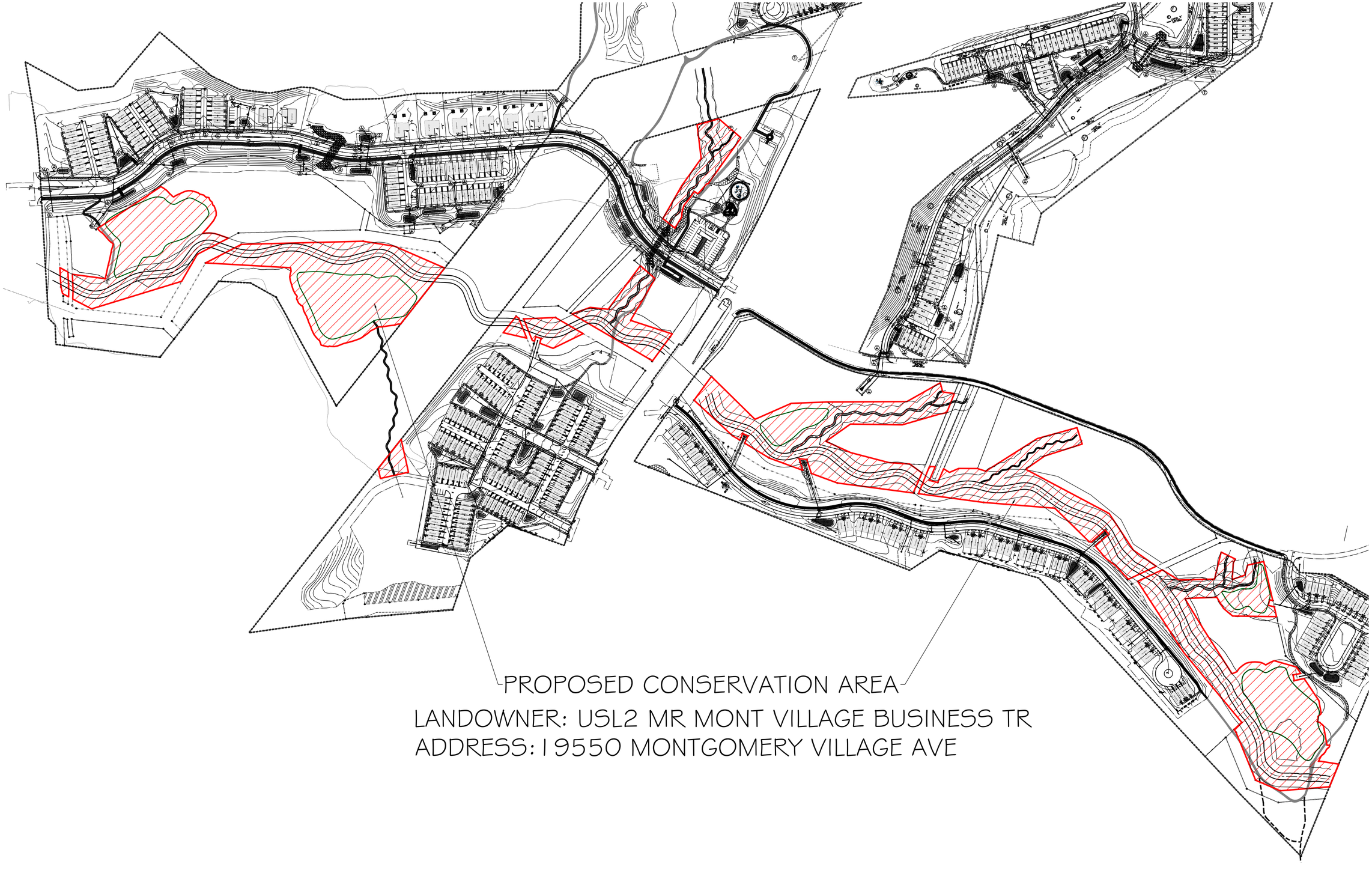
RONDA LaFERN GOODEN
NOTARY PUBLIC
REG. # 7747374
MY COMMISSION EXPIRES
10/31/2021
COMMONWEALTH OF VIRGINIA

My Commission expires 10/31/2021

The aforegoing option is hereby accepted this of in the year .

STATE HIGHWAY ADMINISTRATION
of the
DEPARTMENT OF TRANSPORTATION OF MARYLAND

by: _____



PROPOSED CONSERVATION AREA

LANDOWNER: USL2 MR MONT VILLAGE BUSINESS TR

ADDRESS: 19550 MONTGOMERY VILLAGE AVE

GRAPHIC SCALE: 1" = 150'
0 150' 300' 450'

LEGEND:
- EX. PROPERTY LINE
- EX. PROPERTY ADJACENT
- OHE — EX. OVERHEAD ELECTRIC
- SAN — EX. SANITARY SEWER
- EX. STORM UTILITY
- GAS — EX. GAS
- EX. POND
- EX. STREAM
- EX. WETLAND
- LOS — SURVEY LIMTS
- PR. BANKFULL
- PR. FORESTED WETLAND

WATKINS MILL RD

MONTGOMERY VILLAGE AVE

proposed construction access

proposed construction access

THIS SHEET FOR REFERENCE ONLY

res
HGS, LLC - A RES COMPANY
5367 TELEPHONE ROAD, WARRENTON, VIRGINIA 20187
P: 703.393.4044 F: 703.393.2934
WWW.RES.US

PROJECT: RFP-2 CABIN BRANCH
CLIENT: MARYLAND STATE HIGHWAY ADMINISTRATION

MONTGOMERY COUNTY, MARYLAND

PROFESSIONAL CERTIFICATION
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.
LICENSE#: 52852
EXP. DATE: 6/14/2022

NOT FOR CONSTRUCTION

REVISIONS:
1

PROJECT STATUS:

6/26/2020	CONCEPT PLAN
9/25/2020	65% MIT. PLAN

PROJECT MANAGER:	RC
DESIGNED:	BW/JC
DRAWN:	JC
JOB NUMBER:	102054
DESIGN TYPE:	STREAM
DATE:	9/25/2020
SHEET NO:	4 OF 48

R:\Rescad\Projects\102054-MDSHA Cabin Branch\STREAM DESIGN\Plan Sheets\102054-VIKA COORDINATION.dwg, 10/1/2020 8:52:10 AM, bwilfong, DWG To PDF.pc3, 1:1

Appendix C: Cabin Branch Function Based Rapid Stream Assessment

DRAFT

FINAL DRAFT
FUNCTION-BASED RAPID STREAM ASSESSMENT METHODOLOGY

METHODOLOGY SEQUENCE

A report has been completed that provides detailed guidance on how this assessment is to be conducted (Starr et al, 2015). It can be located on the USFWS Chesapeake Bay Field Office website under Stream Restoration Protocol Publications. The methodology report in written based on the sequence in how the assessment should be conducted, as much as possible. However, there are some sections in the report that are out of sequence based on where that information is recorded on the data sheets. Therefore, this section lists the order of how the assessment should be conducted. The following is the rapid function-based assessment stepwise procedure:

1. Office Pre Site Visit Tasks
2. Rapid Watershed Assessment Form
3. Rapid Assessment Summary Form – Bankfull Determination
4. Rapid Assessment Summary Form – Rosgen Classification
5. Existing and Proposed Function-based Rapid Reach Level Stream Assessment Form – Only the existing conditions
6. Rapid Assessment Summary Form - Overall Existing Function-based Rapid Stream Assessment
7. Rapid Assessment Summary Form – Channel Evolution Trend
8. Rapid Assessment Summary Form - Restoration Potential
9. Existing and Proposed Function-based Rapid Reach Level Stream Assessment Form - proposed conditions
10. Rapid Assessment Summary Form – Overall Proposed Function-based Rapid Stream Assessment
11. Overall Project Evaluation

EXISTING and PROPOSED REACH LEVEL STREAM FUNCTION-BASED RAPID ASSESSMENT FIELD DATA SHEET

Watershed:	Middle Potomac - Catoctin	Rater(s):	RC/BW
Stream:	Cabin Branch	Date:	3/10/2022
Reach Length:	5008 linear feet	Latitude:	39.177353
Photo(s):	See Attached	Longitude:	-77.199137
Reach ID:	Cabin Branch	**Reach Score/Reach Total**	**Ex. 60/170 Prop.: 134/170**

Quality: Ex: 0.35 Prop:0.79

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 1 Hydrology											
Runoff	1. Concentrated Flow	No potential for concentrated flow/impairments from adjacent land use			Some potential for concentrated flow/impairments to reach restoration site, however, measures are in place to protect resources				Potential for concentrated flow/impairments to reach restoration site and no treatments are in place		
	Existing Condition	10	9	8	7	6	5	4	**3**	2	1
	Proposed Condition	10	9	**8**	7	6	5	4	3	2	1
	2. Flashiness	Non-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover less than 6%			Semi-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover 7 - 15%				Flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover greater than 15%		
	Existing Condition	10	9	8	7	6	5	**4**	3	2	1
	Proposed Condition	10	9	8	7	**6**	5	4	3	2	1

Stream Function Pyramid Level 1 Hydrology Overall EXISTING Condition F **FAR** NF **Score:7**

Stream Function Pyramid Level 1 Hydrology Overall PROPOSED Condition F **FAR** NF **Score:14**

Stream Function Pyramid Level 2 Hydraulics											
Floodplain Connectivity (Vertical Stability)	3. Bank Height Ratio (BHR)	<1.20			1.21 - 1.50				>1.50		
	Existing Condition	10	9	8	7	6	5	4	3	**2**	1
	Proposed Condition	10	**9**	8	7	6	5	4	3	2	1
	4a. Entrenchment (Meandering streams in alluvial valleys or Rosgen C, E, DA Streams)	>2.2			2.1 - 1.4				<1.4		
	Existing Condition	10	9	8	7	6	**5**	4	3	2	1
	Proposed Condition	10	**9**	8	7	6	5	4	3	2	1
	4b. Entrenchment (Non meandering streams in colluvial valleys or Rosgen B Streams)	>1.4			1.3 - 1.1				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	5. Floodplain Drainage	no concentrated flow; runoff is primarily sheet flow; hillslopes < 10%; hillslopes >200 ft from stream; ponding or wetland areas and litter or debris jams are well represented			runoff is equally sheet and concentrated flow (minor gully and rill erosion occurring); hillslopes 10 - 40%; hillslopes 50 - 200 ft from stream; ponding or wetland areas and litter or debris jams are minimally represented				concentrated flows present (extensive gully and rill erosion); hillslopes >40%; hillslopes <50 ft from stream; ponding or wetland areas and litter or debris jams are not well represented or absent		
	Existing Condition	10	9	8	7	6	5	4	**3**	2	1
	Proposed Condition	10	**9**	8	7	6	5	4	3	2	1
	6. Vertical Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	**4**	3	2	1
	Proposed Condition	10	**9**	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 2 Hydraulics Overall EXISTING Condition F **FAR** NF **Score:14**

Stream Function Pyramid Level 2 Hydraulics Overall PROPOSED Condition F **FAR** NF **Score:36**

Reach ID:	Cabin Branch	Reach Score/Reach Total Ex. 60/170 Prop.: 134/170	Quality: Ex: 0.35 Prop:0.79

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 3 Geomorphology											
Riparian Vegetation (Score = Average of Left and Right bank, max score of 10)	7. Riparian Vegetation Zone (EPA, 1999, modified)	Riparian zone extends to a width of >100 feet; good vegetation community diversity and density; human activities do not impact zone; invasive species not present or sparse			Riparian zone extends to a width of 25-100 feet; species composition is dominated by 2 or 3 species; human activities greatly impact zone; invasive species well represented and alter the community				Riparian zone extends to a width of <25 feet; little or no riparian vegetation due to human activities; majority of vegetation is invasive		
	Left Bank Existing	10	9	8	7	6	5	4	3	2	1
	Left Bank Proposed	10	9	8	7	6	5	4	3	2	1
	Right Bank Existing	10	9	8	7	6	5	4	3	2	1
	Right Bank Proposed	10	9	8	7	6	5	4	3	2	1
Lateral Stability (Score =Average of Left and right bank, max score of 10)	8. Dominant Bank Erosion Rate Potential	Dominate bank erosion rate potential is low or BEHI/NBS Rating: L/VL, L/L, L/M, L/H, L/VH, M/VL			Dominate bank erosion rate potential is moderate or BEHI/NBS Rating: M/L, M/M, M/H, L/Ex, H/L, M/VH, M/Ex, H/L, H/M, VH/VL, Ex/VL				Dominate bank erosion rate potential is high or BEHI/NBS Rating: H/H, H/Ex, VH/H, Ex/M, Ex/H, Ex/VH, VH/VH, Ex/Ex		
	Existing Condition (Right bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Right Bank)	10	9	8	7	6	5	4	3	2	1
	Existing Condition (Left bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Left Bank)	10	9	8	7	6	5	4	3	2	1
	9. Lateral Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Bedform Diversity (Do not complete if stream is ephemeral)	10. Shelter for Fish and Macroinvertebrates (EPA 1999)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, rubble, gravel, cobble and large rocks, or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)			20-70% mix of stable habitat; suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale)				Less than 20% mix of stable habitat; lack of habitat availability less than desirables obvious; substrate unstable or lacking		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11a. Pool-to-Pool Spacing Ratio (Watersheds < 10 mi^2)	4.0 - 5.0			3.0 - 4.0 ***or*** 5.0 - 7.0				< 3.0 ***or*** >7.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11b. Pool-to-Pool Spacing Ratio (Watersheds > 10 mi^2)	5.0 - 7.0			3.5 - 5.0 ***or*** 7.0 - 8.0				<3.5 ***or*** >8.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12a. Pool Max Depth Ratio/Depth Variability (Gravel Bed Streams)	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12b. Pool Max Depth Ratio/Depth Variability (Sand Bed Streams)	>1.2			1.1 - 1.2				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Moderate Gradient Perennial Streams in Colluvial Valleys											
Bedform Diversity (Do not complete if stream is ephemeral)	11. Pool-to-Pool Spacing Ratio (3-5% Slope)	2.0 - 4.0			4.0 - 6.0				>6.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12. Pool Max Depth Ratio/Depth Variability	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 3 Geomorphology Overall EXISTING Condition F FAR NF **Score:17**

Stream Function Pyramid Level 3 Geomorphology Overall PROPOSED Condition F FAR NF **Score:53**

Reach ID:	Cabin Branch	Reach Score/Reach Total Ex. 60/170 Prop.: 134/170	Quality: Ex: 0.35 Prop:0.79

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 4 Physicochemical											
Water Quality and Nutrients (Do not complete if stream is ephemeral)	13. Water Appearance and Nutrient Enrichment (USDA 1999)	Very clear, or clear but tea-colored; objects visible at depth 3 to 6 ft (less if slightly colored); no oil sheen on surface; no noticeable film on submerged objects or rocks. Clear water along entire reach; diverse aquatic plant community includes low quantities of many species of macrophytes; little algal growth present			Frequent cloudiness especially after storm events; objects visible to depth 0.5 to 3.0 ft; may have slight green color; no oil sheen on water surface. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrate				Very turbid or muddy appearance most of the time; objects visible at depth< 0.5 ft; slow moving water maybe bright green; other obvious water pollutants; floating algal mats, surface scum, sheen or heavy coat of foam on surface; or strong odor of chemicals, oil, sewage, or other pollutants. Pea-green, gray, or brown water along entire reach; dense stands of macrophytes clogging stream; severe algal blooms creating thick algal		
	Existing Condition	10	9	8	7	6	5	4	**3**	2	1
	Proposed Condition	10	9	8	7	6	**5**	4	3	2	1
	14. Detritus (Petersen, 1992)	Mainly consisting of leaves and wood without sediment covering it			Leaves and wood scarce; fine organic debris without sediment				Fine organic sediment - black in color and foul odor (anaerobic) or detritus absent		
	Existing Condition	10	9	8	7	6	5	**4**	3	2	1
	Proposed Condition	10	9	8	7	**6**	5	4	3	2	1

Stream Function Pyramid Level 4 Physicochemical Overall EXISTING Condition F **FAR** **NF** **Score:7**

Stream Function Pyramid Level 4 Physicochemical Overall PROPOSED Condition F **FAR** **NF** **Score:11**

Stream Function Pyramid Level 5 Biology											
Biology (Do not complete if stream is ephemeral)	15. Macroinvertebrate	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	**5**	4	3	2	1
	Proposed Condition	10	9	8	7	**6**	5	4	3	2	1
	16. Macroinvertebrate Tolerance	Abundant intolerant species			Limited intolerant species				Only tolerant species		
	Existing Condition	10	9	8	7	6	**5**	4	3	2	1
	Proposed Condition	10	9	8	7	**6**	5	4	3	2	1
	17. Fish Presence	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	**5**	4	3	2	1
	Proposed Condition	10	9	**8**	7	6	5	4	3	2	1
	If existing biology is FAR or NF, provide description of cause(s)										

Stream Function Pyramid Level 5 Biology Overall EXISTING Condition F **FAR** **NF** **Score: 15**

Stream Function Pyramid Level 5 Biology Overall PROPOSED Condition F **FAR** **NF** **Score: 20**

Reach ID:	Cabin Branch	Reach Score/Reach Total Ex. 60/170 Prop.: 134/170	Quality: Ex: 0.35 Prop:0.79

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category		
		Functioning	Functioning-at-Risk	Not Functioning

Bankfull Determination and Rosgen Stream Classification

Rosgen Stream Type (Observation): EX - F PRO - C/Bc			
Regional Curve (circle one):	**Piedmont** Coastal Plain Allegheny Plateau/Ridge and Valley Urban Karst		
DA (sqmi)	4.32		
BF Width (ft)	26.2-27.0	BF Area (sqft)	40.6-50.7
BF Depth (ft)	1.5-1.94	Percent Impervious (%)	21.3

Field Measurements

Parameter	Measurements and Ratios			
Water surface to geomorphic feature elevation difference	Existing Min:1.6, Max: 2.5, Avg.:2.0			
Riffle Mean Depth at Bankfull Stage (dbkf)	Existing Min:1.7, Max: 2.29, Avg.:2.09	Proposed: 1.73 & 1.84		
Riffle Width at Bankfull Stage (Wbkf)	Existing Min:17.1, Max:22.5, Avg.:20.2	Proposed: 23.2 & 25.6		
Riffle XS Area at Bankfull Stage (Abkf = dbkf*Wbkf)	Existing Min: 34.4, Max: 45.8, Avg.:40.3	Proposed: 40.18 & 41.12		
Floodprone Area Width (Wfpa) (Wfpa=Width at elevation determined by 2xDmax)	Existing Not calculated at all XS Minimum 28.23	Target: 92.8 & 102.4		
Entrenchment Ratio (ER) (ER=Wfpa/Wbkf)	Existing Min: 1.4, Max: 1.93 Avg: 1.6	Target 4.0		
Low Bank Height (LBH)	Existing Min: 4.09, Max: 5.52, Avg.:4.53	Proposed: 2.3 & 2.4		
Riffle Maximum Depth at Bankfull Stage (Dmax)	Existing Min: 1.95, Max: 3.35, Avg.:2.56	Proposed: 2.3 & 2.4		
Bank Height Ratio (BHR) (BHR=LBH/Dmax)	Existing Min: 1.46, Max: 2.24, Avg.:1.79	Proposed: 1.0		
BEHI/NBS Ratings and Lengths	H/M, H/L, M/M, M/L, L/L	L/L		
Pool to Pool Spacing (P-P)	Ranges from 47-168	Proposed: Min:104, Max:168, Avg.:136.6		
Pool to Pool Spacing Ratio (P-P Ratio) (P-P Ratio=P-P/Wbkf)	Range from 2.4-8.4	Proposed: Min:4.4, Max:7.0, Avg.:5.7		
Pool Maximum Depth at Bankfull Stage (Dmbkfp)	n/a	Proposed: 4.3 & 4.6		
Pool Depth Ratio (Dmbkfp Ratio) (Dmbkfp Ratio=Dmbkfp/dbkf)	n/a	Proposed: 2.5		
Macroinvertebrate Taxa Observed	n/a	n/a		

EXISTING and PROPOSED REACH LEVEL STREAM FUNCTION-BASED RAPID ASSESSMENT FIELD DATA SHEET

Watershed:	Middle Potomac - Catoctin	Rater(s):	RC/BW
Stream:	Un -Named Tributary to Cabin Branch	Date:	3/10/2022
Reach Length:	542 linear feet	Latitude:	39.177353
Photo(s):	See Attached	Longitude:	-77.199137
Reach ID:	Trib 1	**Reach Score/Reach Total**	**Ex. 24/170 Prop.: 136/170**
			Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 1 Hydrology											
Runoff	1. Concentrated Flow	No potential for concentrated flow/impairments from adjacent land use			Some potential for concentrated flow/impairments to reach restoration site, however, measures are in place to protect resources				Potential for concentrated flow/impairments to reach restoration site and no treatments are in place		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	2. Flashiness	Non-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover less than 6%			Semi-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover 7 - 15%				Flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover greater than 15%		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 1 Hydrology Overall EXISTING Condition F FAR NF **Score:5**

Stream Function Pyramid Level 1 Hydrology Overall PROPOSED Condition F FAR NF **Score:11**

Stream Function Pyramid Level 2 Hydraulics											
Floodplain Connectivity (Vertical Stability)	3. Bank Height Ratio (BHR)	<1.20			1.21 - 1.50				>1.50		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	4a. Entrenchment (Meandering streams in alluvial valleys or Rosgen C, E, DA Streams)	>2.2			2.1 - 1.4				<1.4		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	4b. Entrenchment (Non meandering streams in colluvial valleys or Rosgen B Streams)	>1.4			1.3 - 1.1				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	5. Floodplain Drainage	no concentrated flow; runoff is primarily sheet flow; hillslopes < 10%; hillslopes >200 ft from stream; ponding or wetland areas and litter or debris jams are well represented			runoff is equally sheet and concentrated flow (minor gully and rill erosion occurring); hillslopes 10 - 40%; hillslopes 50 - 200 ft from stream; ponding or wetland areas and litter or debris jams are minimally represented				concentrated flows present (extensive gully and rill erosion); hillslopes >40%; hillslopes <50 ft from stream; ponding or wetland areas and litter or debris jams are not well represented or absent		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	6. Vertical Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 2 Hydraulics Overall EXISTING Condition F FAR NF **Score:4**

Stream Function Pyramid Level 2 Hydraulics Overall PROPOSED Condition F FAR NF **Score:26**

Reach ID:	Trib 1	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 3 Geomorphology											
Riparian Vegetation (Score = Average of Left and Right bank, max score of 10)	7. Riparian Vegetation Zone (EPA, 1999, modified)	Riparian zone extends to a width of >100 feet; good vegetation community diversity and density; human activities do not impact zone; invasive species not present or sparse			Riparian zone extends to a width of 25-100 feet; species composition is dominated by 2 or 3 species; human activities greatly impact zone; invasive species well represented and alter the community				Riparian zone extends to a width of <25 feet; little or no riparian vegetation due to human activities; majority of vegetation is invasive		
	Left Bank Existing	10	9	8	7	6	5	4	3	2	1
	Left Bank Proposed	10	9	8	7	6	5	4	3	2	1
	Right Bank Existing	10	9	8	7	6	5	4	3	2	1
	Right Bank Proposed	10	9	8	7	6	5	4	3	2	1
Lateral Stability (Score =Average of Left and right bank, max score of 10)	8. Dominant Bank Erosion Rate Potential	Dominate bank erosion rate potential is low or BEHI/NBS Rating: L/VL, L/L, L/M, L/H, L/VH, M/VL			Dominate bank erosion rate potential is moderate or BEHI/NBS Rating: M/L, M/M, M/H, L/Ex, H/L, M/VH, M/Ex, H/L, H/M, VH/VL, Ex/VL				Dominate bank erosion rate potential is high or BEHI/NBS Rating: H/H, H/Ex, VH/H, Ex/M, Ex/H, Ex/VH, VH/VH, Ex/Ex		
	Existing Condition (Right bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Right Bank)	10	9	8	7	6	5	4	3	2	1
	Existing Condition (Left bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Left Bank)	10	9	8	7	6	5	4	3	2	1
	9. Lateral Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Bedform Diversity (Do not complete if stream is ephemeral)	10. Shelter for Fish and Macroinvertebrates (EPA 1999)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, rubble, gravel, cobble and large rocks, or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)			20-70% mix of stable habitat; suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale)				Less than 20% mix of stable habitat; lack of habitat availability less than desirables obvious; substrate unstable or lacking		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11a. Pool-to-Pool Spacing Ratio (Watersheds < 10 mi^2)	4.0 - 5.0			3.0 - 4.0 ***or*** 5.0 - 7.0				< 3.0 ***or*** >7.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11b. Pool-to-Pool Spacing Ratio (Watersheds > 10 mi^2)	5.0 - 7.0			3.5 - 5.0 ***or*** 7.0 - 8.0				<3.5 ***or*** >8.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12a. Pool Max Depth Ratio/Depth Variability (Gravel Bed Streams)	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12b. Pool Max Depth Ratio/Depth Variability (Sand Bed Streams)	>1.2			1.1 - 1.2				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Moderate Gradient Perennial Streams in Colluvial Valleys											
Bedform Diversity (Do not complete if stream is ephemeral)	11. Pool-to-Pool Spacing Ratio (3-5% Slope)	2.0 - 4.0			4.0 - 6.0				>6.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12. Pool Max Depth Ratio/Depth Variability	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 3 Geomorphology Overall EXISTING Condition F FAR NF Score:8

Stream Function Pyramid Level 3 Geomorphology Overall PROPOSED Condition F FAR NF Score:51

Reach ID:	Trib 1	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 4 Physicochemical											
Water Quality and Nutrients (Do not complete if stream is ephemeral)	13. Water Appearance and Nutrient Enrichment (USDA 1999)	Very clear, or clear but tea-colored; objects visible at depth 3 to 6 ft (less if slightly colored); no oil sheen on surface; no noticeable film on submerged objects or rocks. Clear water along entire reach; diverse aquatic plant community includes low quantities of many species of macrophytes; little algal growth present			Frequent cloudiness especially after storm events; objects visible to depth 0.5 to 3.0 ft; may have slight green color; no oil sheen on water surface. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrate				Very turbid or muddy appearance most of the time; objects visible at depth< 0.5 ft; slow moving water maybe bright green; other obvious water pollutants; floating algal mats, surface scum, sheen or heavy coat of foam on surface; or strong odor of chemicals, oil, sewage, or other pollutants. Pea-green, gray, or brown water along entire reach; dense stands of macrophytes clogging stream; severe algal blooms creating thick algal		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	14. Detritus (Petersen, 1992)	Mainly consisting of leaves and wood without sediment covering it			Leaves and wood scarce; fine organic debris without sediment				Fine organic sediment - black in color and foul odor (anaerobic) or detritus absent		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 4 Physicochemical Overall EXISTING Condition F FAR NF Score:4

Stream Function Pyramid Level 4 Physicochemical Overall PROPOSED Condition F FAR NF Score:16

Stream Function Pyramid Level 5 Biology											
Biology (Do not complete if stream is ephemeral)	15. Macroinvertebrate	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	16. Macroinvertebrate Tolerance	Abundant intolerant species			Limited intolerant species				Only tolerant species		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	17. Fish Presence	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	4	2	1
	If existing biology is FAR or NF, provide description of cause(s)	Stream is currently piped.									

Stream Function Pyramid Level 5 Biology Overall EXISTING Condition F FAR NF Score: 3

Stream Function Pyramid Level 5 Biology Overall PROPOSED Condition F FAR NF Score:24

Reach ID:	Trib 1	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category		
		Functioning	Functioning-at-Risk	Not Functioning

Bankfull Determination and Rosgen Stream Classification

Rosgen Stream Type (Observation) EX - Stream is currently piped PRO - C

Regional Curve (circle one): **Piedmont** Coastal Plain Allegheny Plateau/Ridge and Valley Urban Karst

DA (sqmi)	0.15		
BF Width (ft)	5.6-7.1	BF Area (sqft)	2.7-4.4
BF Depth (ft)	0.48-0.62	Percent Impervious (%)	21.3

Field Measurements

Parameter	Measurements and Ratios			
Water surface to geomorphic feature elevation difference	Ex- Channel is piped Upstream Reference: 0.3-0.7; avg: 0.51			
Riffle Mean Depth at Bankfull Stage (dbkf)	Ex- Channel is piped Upstream Reference: 0.32-0.65; avg.: 0.54	Proposed: 0.39 & 0.49		
Riffle Width at Bankfull Stage (Wbkf)	Ex- Channel is piped Upstream Reference: 4.7-8.1; avg.: 6.48	Proposed: 5.0 & 6.6		
Riffle XS Area at Bankfull Stage (Abkf = dbkf*Wbkf)	Ex- Channel is piped Upstream Reference: 2.5-4.3; avg.: 3.40	Proposed: 1.95 & 3.24		
Floodprone Area Width (Wfpa) (Wfpa=Width at elevation determined by 2xDmax)	Ex- Channel is piped Upstream Reference: 6.0-9.1; avg.: 8.4	Target: 20 & 26.4		
Entrenchment Ratio (ER) (ER=Wfpa/Wbkf)	Ex- Channel is piped Upstream Reference: 1.12-1.45; avg.: 1.31	Target 4.0		
Low Bank Height (LBH)	Ex- Channel is piped Upstream Reference: 0.96-3.75; avg.: 2.51	Proposed: 2.3 & 2.4		
Riffle Maximum Depth at Bankfull Stage (Dmax)	Ex- Channel is piped Upstream Reference: 0.42-1.10; avg.: 0.82	Proposed: 0.5 & 0.6		
Bank Height Ratio (BHR) (BHR=LBH/Dmax)	Ex- Channel is piped Upstream Reference: 2.3-3.6; avg.: 2.9	Proposed: 1.0		
BEHI/NBS Ratings and Lengths	Ex- Channel is piped	L/L		
Pool to Pool Spacing (P-P)	Ex- Channel is piped	Proposed: Min: 21, Max: 46, Avg.: 34		
Pool to Pool Spacing Ratio (P-P Ratio) (P-P Ratio=P-P/Wbkf)	Ex- Channel is piped	Proposed: Min:3.2, Max:7.3, Avg.:5.6		
Pool Maximum Depth at Bankfull Stage (Dmbkfp)	Ex- Channel is piped	Proposed: 1.0 & 1.2		
Pool Depth Ratio (Dmbkfp Ratio) (Dmbkfp Ratio=Dmbkfp/dbkf)	Ex- Channel is piped	Proposed: 2.5		
Macroinvertebrate Taxa Observed	Ex- Channel is piped	n/a		

EXISTING and PROPOSED REACH LEVEL STREAM FUNCTION-BASED RAPID ASSESSMENT FIELD DATA SHEET

Watershed:	Middle Potomac - Catoctin	Rater(s):	RC/BW
Stream:	Un -Named Tributary to Cabin Branch	Date:	3/10/2022
Reach Length:	421 linear feet	Latitude:	39.177353
Photo(s):	See Attached	Longitude:	-77.199137
Reach ID:	Trib 2	**Reach Score/Reach Total**	**Ex. 24/170 Prop.: 136/170**

Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 1 Hydrology											
Runoff	1. Concentrated Flow	No potential for concentrated flow/impairments from adjacent land use			Some potential for concentrated flow/impairments to reach restoration site, however, measures are in place to protect resources				Potential for concentrated flow/impairments to reach restoration site and no treatments are in place		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	2. Flashiness	Non-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover less than 6%			Semi-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover 7 - 15%				Flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover greater than 15%		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 1 Hydrology Overall EXISTING Condition F FAR NF Score:5

Stream Function Pyramid Level 1 Hydrology Overall PROPOSED Condition F FAR NF Score:11

Stream Function Pyramid Level 2 Hydraulics											
Floodplain Connectivity (Vertical Stability)	3. Bank Height Ratio (BHR)	<1.20			1.21 - 1.50				>1.50		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	4a. Entrenchment (Meandering streams in alluvial valleys or Rosgen C, E, DA Streams)	>2.2			2.1 - 1.4				<1.4		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	4b. Entrenchment (Non meandering streams in colluvial valleys or Rosgen B Streams)	>1.4			1.3 - 1.1				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	5. Floodplain Drainage	no concentrated flow; runoff is primarily sheet flow; hillslopes < 10%; hillslopes >200 ft from stream; ponding or wetland areas and litter or debris jams are well represented			runoff is equally sheet and concentrated flow (minor gully and rill erosion occurring); hillslopes 10 - 40%; hillslopes 50 - 200 ft from stream; ponding or wetland areas and litter or debris jams are minimally represented				concentrated flows present (extensive gully and rill erosion); hillslopes >40%; hillslopes <50 ft from stream; ponding or wetland areas and litter or debris jams are not well represented or absent		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	6. Vertical Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 2 Hydraulics Overall EXISTING Condition F FAR NF Score:4

Stream Function Pyramid Level 2 Hydraulics Overall PROPOSED Condition F FAR NF Score:26

Reach ID:	Trib 2	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 3 Geomorphology											
Riparian Vegetation (Score = Average of Left and Right bank, max score of 10)	7. Riparian Vegetation Zone (EPA, 1999, modified)	Riparian zone extends to a width of >100 feet; good vegetation community diversity and density; human activities do not impact zone; invasive species not present or sparse			Riparian zone extends to a width of 25-100 feet; species composition is dominated by 2 or 3 species; human activities greatly impact zone; invasive species well represented and alter the community				Riparian zone extends to a width of <25 feet; little or no riparian vegetation due to human activities; majority of vegetation is invasive		
	Left Bank Existing	10	9	8	7	6	5	4	3	2	1
	Left Bank Proposed	10	9	8	7	6	5	4	3	2	1
	Right Bank Existing	10	9	8	7	6	5	4	3	2	1
	Right Bank Proposed	10	9	8	7	6	5	4	3	2	1
Lateral Stability (Score =Average of Left and right bank, max score of 10)	8. Dominant Bank Erosion Rate Potential	Dominate bank erosion rate potential is low or BEHI/NBS Rating: L/VL, L/L, L/M, L/H, L/VH, M/VL			Dominate bank erosion rate potential is moderate or BEHI/NBS Rating: M/L, M/M, M/H, L/Ex, H/L, M/VH, M/Ex, H/L, H/M, VH/VL, Ex/VL				Dominate bank erosion rate potential is high or BEHI/NBS Rating: H/H, H/Ex, VH/H, Ex/M, Ex/H, Ex/VH, VH/VH, Ex/Ex		
	Existing Condition (Right bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Right Bank)	10	9	8	7	6	5	4	3	2	1
	Existing Condition (Left bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Left Bank)	10	9	8	7	6	5	4	3	2	1
	9. Lateral Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Bedform Diversity (Do not complete if stream is ephemeral)	10. Shelter for Fish and Macroinvertebrates (EPA 1999)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, rubble, gravel, cobble and large rocks, or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)			20-70% mix of stable habitat; suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale)				Less than 20% mix of stable habitat; lack of habitat availability less than desirables obvious; substrate unstable or lacking		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11a. Pool-to-Pool Spacing Ratio (Watersheds < 10 mi^2)	4.0 - 5.0			3.0 - 4.0 ***or*** 5.0 - 7.0				< 3.0 ***or*** >7.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11b. Pool-to-Pool Spacing Ratio (Watersheds > 10 mi^2)	5.0 - 7.0			3.5 - 5.0 ***or*** 7.0 - 8.0				<3.5 ***or*** >8.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12a. Pool Max Depth Ratio/Depth Variability (Gravel Bed Streams)	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12b. Pool Max Depth Ratio/Depth Variability (Sand Bed Streams)	>1.2			1.1 - 1.2				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Moderate Gradient Perennial Streams in Colluvial Valleys											
Bedform Diversity (Do not complete if stream is ephemeral)	11. Pool-to-Pool Spacing Ratio (3-5% Slope)	2.0 - 4.0			4.0 - 6.0				>6.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12. Pool Max Depth Ratio/Depth Variability	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 3 Geomorphology Overall EXISTING Condition F FAR NF Score:8

Stream Function Pyramid Level 3 Geomorphology Overall PROPOSED Condition F FAR NF Score:51

Reach ID:	Trib 2	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 4 Physicochemical											
Water Quality and Nutrients (Do not complete if stream is ephemeral)	13. Water Appearance and Nutrient Enrichment (USDA 1999)	Very clear, or clear but tea-colored; objects visible at depth 3 to 6 ft (less if slightly colored); no oil sheen on surface; no noticeable film on submerged objects or rocks. Clear water along entire reach; diverse aquatic plant community includes low quantities of many species of macrophytes; little algal growth present			Frequent cloudiness especially after storm events; objects visible to depth 0.5 to 3.0 ft; may have slight green color; no oil sheen on water surface. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrate				Very turbid or muddy appearance most of the time; objects visible at depth< 0.5 ft; slow moving water maybe bright green; other obvious water pollutants; floating algal mats, surface scum, sheen or heavy coat of foam on surface; or strong odor of chemicals, oil, sewage, or other pollutants. Pea-green, gray, or brown water along entire reach; dense stands of macrophytes clogging stream; severe algal blooms creating thick algal		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	14. Detritus (Petersen, 1992)	Mainly consisting of leaves and wood without sediment covering it			Leaves and wood scarce; fine organic debris without sediment				Fine organic sediment - black in color and foul odor (anaerobic) or detritus absent		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 4 Physicochemical Overall EXISTING Condition F FAR NF Score:4

Stream Function Pyramid Level 4 Physicochemical Overall PROPOSED Condition F FAR NF Score:16

Stream Function Pyramid Level 5 Biology											
Biology (Do not complete if stream is ephemeral)	15. Macroinvertebrate	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	16. Macroinvertebrate Tolerance	Abundant intolerant species			Limited intolerant species				Only tolerant species		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	17. Fish Presence	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	4	2	1
	If existing biology is FAR or NF, provide description of cause(s)	Stream is currently piped.									

Stream Function Pyramid Level 5 Biology Overall EXISTING Condition F FAR NF Score: 3

Stream Function Pyramid Level 5 Biology Overall PROPOSED Condition F FAR NF Score:24

Reach ID:	Trib 2	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category		
		Functioning	Functioning-at-Risk	Not Functioning

Bankfull Determination and Rosgen Stream Classification

Rosgen Stream Type (Observation) EX - Stream is currently piped PRO - C

Regional Curve (circle one): **Piedmont** Coastal Plain Allegheny Plateau/Ridge and Valley Urban Karst

DA (sqmi)	0.02		
BF Width (ft)	2.3-3.3	BF Area (sqft)	0.6-1.1
BF Depth (ft)	0.25-0.32	Percent Impervious (%)	21.3

Field Measurements

Parameter	Measurements and Ratios			
Water surface to geomorphic feature elevation difference	Ex- Channel is piped			
Riffle Mean Depth at Bankfull Stage (dbkf)	Ex- Channel is piped	Proposed: 0.24		
Riffle Width at Bankfull Stage (Wbkf)	Ex- Channel is piped	Proposed: 3.2		
Riffle XS Area at Bankfull Stage (Abkf = dbkf*Wbkf)	Ex- Channel is piped	Proposed: 0.78		
Floodprone Area Width (Wfpa) (Wfpa=Width at elevation determined by 2xDmax)	Ex- Channel is piped	Target: 12.8		
Entrenchment Ratio (ER) (ER=Wfpa/Wbkf)	Ex- Channel is piped	Target 4.0		
Low Bank Height (LBH)	Ex- Channel is piped	Proposed: 0.35		
Riffle Maximum Depth at Bankfull Stage (Dmax)	Ex- Channel is piped	Proposed: 0.35		
Bank Height Ratio (BHR) (BHR=LBH/Dmax)	Ex- Channel is piped	Proposed:1.0		
BEHI/NBS Ratings and Lengths	Ex- Channel is piped	L/L		
Pool to Pool Spacing (P-P)	Ex- Channel is piped	Proposed: Min: 16, Max: 24, Avg.: 20		
Pool to Pool Spacing Ratio (P-P Ratio) (P-P Ratio=P-P/Wbkf)	Ex- Channel is piped	Proposed: Min:5, Max:7.5, Avg.:6.3		
Pool Maximum Depth at Bankfull Stage (Dmbkfp)	Ex- Channel is piped	Proposed: 0.6		
Pool Depth Ratio (Dmbkfp Ratio) (Dmbkfp Ratio=Dmbkfp/dbkf)	Ex- Channel is piped	Proposed:2.5		
Macroinvertebrate Taxa Observed	Ex- Channel is piped	n/a		

EXISTING and PROPOSED REACH LEVEL STREAM FUNCTION-BASED RAPID ASSESSMENT FIELD DATA SHEET

Watershed:	Middle Potomac - Catoctin	Rater(s):	RC/BW
Stream:	Un -Named Tributary to Cabin Branch	Date:	3/10/2022
Reach Length:	8016 linear feet	Latitude:	39.177353
Photo(s):	See Attached	Longitude:	-77.199137
Reach ID:	Trib 3	**Reach Score/Reach Total**	**Ex. 24/170 Prop.: 136/170**

Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 1 Hydrology											
Runoff	1. Concentrated Flow	No potential for concentrated flow/impairments from adjacent land use			Some potential for concentrated flow/impairments to reach restoration site, however, measures are in place to protect resources				Potential for concentrated flow/impairments to reach restoration site and no treatments are in place		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	2. Flashiness	Non-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover less than 6%			Semi-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover 7 - 15%				Flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover greater than 15%		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 1 Hydrology Overall EXISTING Condition F FAR NF Score:5

Stream Function Pyramid Level 1 Hydrology Overall PROPOSED Condition F FAR NF Score:11

Stream Function Pyramid Level 2 Hydraulics											
Floodplain Connectivity (Vertical Stability)	3. Bank Height Ratio (BHR)	<1.20			1.21 - 1.50				>1.50		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	4a. Entrenchment (Meandering streams in alluvial valleys or Rosgen C, E, DA Streams)	>2.2			2.1 - 1.4				<1.4		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	4b. Entrenchment (Non meandering streams in colluvial valleys or Rosgen B Streams)	>1.4			1.3 - 1.1				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	5. Floodplain Drainage	no concentrated flow; runoff is primarily sheet flow; hillslopes < 10%; hillslopes >200 ft from stream; ponding or wetland areas and litter or debris jams are well represented			runoff is equally sheet and concentrated flow (minor gully and rill erosion occurring); hillslopes 10 - 40%; hillslopes 50 - 200 ft from stream; ponding or wetland areas and litter or debris jams are minimally represented				concentrated flows present (extensive gully and rill erosion); hillslopes >40%; hillslopes <50 ft from stream; ponding or wetland areas and litter or debris jams are not well represented or absent		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	6. Vertical Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 2 Hydraulics Overall EXISTING Condition F FAR NF Score:4

Stream Function Pyramid Level 2 Hydraulics Overall PROPOSED Condition F FAR NF Score:26

Reach ID:	Trib 3	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 3 Geomorphology											
Riparian Vegetation (Score = Average of Left and Right bank, max score of 10)	7. Riparian Vegetation Zone (EPA, 1999, modified)	Riparian zone extends to a width of >100 feet; good vegetation community diversity and density; human activities do not impact zone; invasive species not present or sparse			Riparian zone extends to a width of 25-100 feet; species composition is dominated by 2 or 3 species; human activities greatly impact zone; invasive species well represented and alter the community				Riparian zone extends to a width of <25 feet; little or no riparian vegetation due to human activities; majority of vegetation is invasive		
	Left Bank Existing	10	9	8	7	6	5	4	3	2	1
	Left Bank Proposed	10	9	8	7	6	5	4	3	2	1
	Right Bank Existing	10	9	8	7	6	5	4	3	2	1
	Right Bank Proposed	10	9	8	7	6	5	4	3	2	1
Lateral Stability (Score =Average of Left and right bank, max score of 10)	8. Dominant Bank Erosion Rate Potential	Dominate bank erosion rate potential is low or BEHI/NBS Rating: L/VL, L/L, L/M, L/H, L/VH, M/VL			Dominate bank erosion rate potential is moderate or BEHI/NBS Rating: M/L, M/M, M/H, L/Ex, H/L, M/VH, M/Ex, H/L, H/M, VH/VL, Ex/VL				Dominate bank erosion rate potential is high or BEHI/NBS Rating: H/H, H/Ex, VH/H, Ex/M, Ex/H, Ex/VH, VH/VH, Ex/Ex		
	Existing Condition (Right bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Right Bank)	10	9	8	7	6	5	4	3	2	1
	Existing Condition (Left bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Left Bank)	10	9	8	7	6	5	4	3	2	1
	9. Lateral Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Bedform Diversity (Do not complete if stream is ephemeral)	10. Shelter for Fish and Macroinvertebrates (EPA 1999)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, rubble, gravel, cobble and large rocks, or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)			20-70% mix of stable habitat; suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale)				Less than 20% mix of stable habitat; lack of habitat availability less than desirables obvious; substrate unstable or lacking		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11a. Pool-to-Pool Spacing Ratio (Watersheds < 10 mi^2)	4.0 - 5.0			3.0 - 4.0 ***or*** 5.0 - 7.0				< 3.0 ***or*** >7.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11b. Pool-to-Pool Spacing Ratio (Watersheds > 10 mi^2)	5.0 - 7.0			3.5 - 5.0 ***or*** 7.0 - 8.0				<3.5 ***or*** >8.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12a. Pool Max Depth Ratio/Depth Variability (Gravel Bed Streams)	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12b. Pool Max Depth Ratio/Depth Variability (Sand Bed Streams)	>1.2			1.1 - 1.2				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Moderate Gradient Perennial Streams in Colluvial Valleys											
Bedform Diversity (Do not complete if stream is ephemeral)	11. Pool-to-Pool Spacing Ratio (3-5% Slope)	2.0 - 4.0			4.0 - 6.0				>6.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12. Pool Max Depth Ratio/Depth Variability	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 3 Geomorphology Overall EXISTING Condition F FAR NF Score:8

Stream Function Pyramid Level 3 Geomorphology Overall PROPOSED Condition F FAR NF Score:51

Reach ID:	Trib 3	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 4 Physicochemical											
Water Quality and Nutrients (Do not complete if stream is ephemeral)	13. Water Appearance and Nutrient Enrichment (USDA 1999)	Very clear, or clear but tea-colored; objects visible at depth 3 to 6 ft (less if slightly colored); no oil sheen on surface; no noticeable film on submerged objects or rocks. Clear water along entire reach; diverse aquatic plant community includes low quantities of many species of macrophytes; little algal growth present			Frequent cloudiness especially after storm events; objects visible to depth 0.5 to 3.0 ft; may have slight green color; no oil sheen on water surface. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrate				Very turbid or muddy appearance most of the time; objects visible at depth< 0.5 ft; slow moving water maybe bright green; other obvious water pollutants; floating algal mats, surface scum, sheen or heavy coat of foam on surface; or strong odor of chemicals, oil, sewage, or other pollutants. Pea-green, gray, or brown water along entire reach; dense stands of macrophytes clogging stream; severe algal blooms creating thick algal		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	14. Detritus (Petersen, 1992)	Mainly consisting of leaves and wood without sediment covering it			Leaves and wood scarce; fine organic debris without sediment				Fine organic sediment - black in color and foul odor (anaerobic) or detritus absent		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 4 Physicochemical Overall EXISTING Condition F FAR NF **Score:4**

Stream Function Pyramid Level 4 Physicochemical Overall PROPOSED Condition F FAR NF **Score:16**

Stream Function Pyramid Level 5 Biology											
Biology (Do not complete if stream is ephemeral)	15. Macroinvertebrate	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	16. Macroinvertebrate Tolerance	Abundant intolerant species			Limited intolerant species				Only tolerant species		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	17. Fish Presence	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	4	2	1
	If existing biology is FAR or NF, provide description of cause(s)	Stream is currently piped.									

Stream Function Pyramid Level 5 Biology Overall EXISTING Condition F FAR NF **Score: 3**

Stream Function Pyramid Level 5 Biology Overall PROPOSED Condition F FAR NF **Score:24**

Reach ID:	Trib 3	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category		
		Functioning	Functioning-at-Risk	Not Functioning

Bankfull Determination and Rosgen Stream Classification

Rosgen Stream Type (Observation) EX - Stream is currently piped PRO - C

Regional Curve (circle one): **Piedmont** Coastal Plain Allegheny Plateau/Ridge and Valley Urban Karst

DA (sqmi)	0.13		
BF Width (ft)	5.2-6.6	BF Area (sqft)	2.3-3.9
BF Depth (ft)	0.45-0.58	Percent Impervious (%)	21.3

Field Measurements

Parameter	Measurements and Ratios			
Water surface to geomorphic feature elevation difference	Ex- Channel is piped Upstream Reference: 0.57			
Riffle Mean Depth at Bankfull Stage (dbkf)	Ex- Channel is piped Upstream Reference: 0.5	Proposed: 0.36 & 0.48		
Riffle Width at Bankfull Stage (Wbkf)	Ex- Channel is piped Upstream Reference: 5.52	Proposed: 4.6 & 6.2		
Riffle XS Area at Bankfull Stage (Abkf = dbkf*Wbkf)	Ex- Channel is piped Upstream Reference: 2.8	Proposed: 1.65 & 2.97		
Floodprone Area Width (Wfpa) (Wfpa=Width at elevation determined by 2xDmax)	Ex- Channel is piped Upstream Reference: 5.9	Target: 18.4 & 24.8		
Entrenchment Ratio (ER) (ER=Wfpa/Wbkf)	Ex- Channel is piped Upstream Reference: 1.1	Target 4.0		
Low Bank Height (LBH)	Ex- Channel is piped Upstream Reference: 2.7	Proposed: 0.5 & 0.66		
Riffle Maximum Depth at Bankfull Stage (Dmax)	Ex- Channel is piped Upstream Reference: 0.7	Proposed: 0.5 & 0.66		
Bank Height Ratio (BHR) (BHR=LBH/Dmax)	Ex- Channel is piped Upstream Reference: 3.9	Proposed: 1.0		
BEHI/NBS Ratings and Lengths	Ex- Channel is piped	L/L		
Pool to Pool Spacing (P-P)	Ex- Channel is piped	Proposed: Min: 20, Max: 40, Avg.: 30		
Pool to Pool Spacing Ratio (P-P Ratio) (P-P Ratio=P-P/Wbkf)	Ex- Channel is piped	Proposed: Min:4.3, Max:8.3, Avg.:5.4		
Pool Maximum Depth at Bankfull Stage (Dmbkfp)	Ex- Channel is piped	Proposed: 0.9 & 1.2		
Pool Depth Ratio (Dmbkfp Ratio) (Dmbkfp Ratio=Dmbkfp/dbkf)	Ex- Channel is piped	Proposed: 2.5		
Macroinvertebrate Taxa Observed	Ex- Channel is piped	n/a		

EXISTING and PROPOSED REACH LEVEL STREAM FUNCTION-BASED RAPID ASSESSMENT FIELD DATA SHEET

Watershed:	Middle Potomac - Catoctin	Rater(s):	RC/BW
Stream:	Un -Named Tributary to Cabin Branch	Date:	3/10/2022
Reach Length:	1033 linear feet	Latitude:	39.177353
Photo(s):	See Attached	Longitude:	-77.199137
Reach ID:	Trib 4	**Reach Score/Reach Total**	**Ex. 66/170 Prop.: 136/170**

Quality: Ex: 0.39 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 1 Hydrology											
Runoff	1. Concentrated Flow	No potential for concentrated flow/impairments from adjacent land use			Some potential for concentrated flow/impairments to reach restoration site, however, measures are in place to protect resources				Potential for concentrated flow/impairments to reach restoration site and no treatments are in place		
	Existing Condition	10	9	8	7	6	5	**4**	3	2	1
	Proposed Condition	10	9	8	7	6	**5**	4	3	2	1
	2. Flashiness	Non-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover less than 6%			Semi-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover 7 - 15%				Flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover greater than 15%		
	Existing Condition	10	9	8	7	6	**5**	4	3	2	1
	Proposed Condition	10	9	8	7	**6**	5	4	3	2	1

Stream Function Pyramid Level 1 Hydrology Overall EXISTING Condition F **FAR** NF **Score:9**

Stream Function Pyramid Level 1 Hydrology Overall PROPOSED Condition F **FAR** NF **Score:11**

Stream Function Pyramid Level 2 Hydraulics											
Floodplain Connectivity (Vertical Stability)	3. Bank Height Ratio (BHR)	<1.20			1.21 - 1.50				>1.50		
	Existing Condition	10	9	8	7	6	5	4	**3**	2	1
	Proposed Condition	10	**9**	8	7	6	5	4	3	2	1
	4a. Entrenchment (Meandering streams in alluvial valleys or Rosgen C, E, DA Streams)	>2.2			2.1 - 1.4				<1.4		
	Existing Condition	10	9	8	7	6	5	**4**	3	2	1
	Proposed Condition	10	**9**	8	7	6	5	4	3	2	1
	4b. Entrenchment (Non meandering streams in colluvial valleys or Rosgen B Streams)	>1.4			1.3 - 1.1				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	5. Floodplain Drainage	no concentrated flow; runoff is primarily sheet flow; hillslopes < 10%; hillslopes >200 ft from stream; ponding or wetland areas and litter or debris jams are well represented			runoff is equally sheet and concentrated flow (minor gully and rill erosion occurring); hillslopes 10 - 40%; hillslopes 50 - 200 ft from stream; ponding or wetland areas and litter or debris jams are minimally represented				concentrated flows present (extensive gully and rill erosion); hillslopes >40%; hillslopes <50 ft from stream; ponding or wetland areas and litter or debris jams are not well represented or absent		
	Existing Condition	10	9	8	7	6	5	**4**	3	2	1
	Proposed Condition	10	9	**8**	7	6	5	4	3	2	1
	6. Vertical Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	**4**	3	2	1
	Proposed Condition	10	9	**8**	7	6	5	4	3	2	1

Stream Function Pyramid Level 2 Hydraulics Overall EXISTING Condition F **FAR** NF **Score:15**

Stream Function Pyramid Level 2 Hydraulics Overall PROPOSED Condition F **FAR** NF **Score:34**

Reach ID:	Trib 4	Reach Score/Reach Total Ex. 66/170 Prop.: 136/170	Quality: Ex: 0.39 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Category: Functioning-at-Risk				Category: Not Functioning		
Stream Function Pyramid Level 3 Geomorphology											
Riparian Vegetation (Score = Average of Left and Right bank, max score of 10)	7. Riparian Vegetation Zone (EPA, 1999, modified)	Riparian zone extends to a width of >100 feet; good vegetation community diversity and density; human activities do not impact zone; invasive species not present or sparse			Riparian zone extends to a width of 25-100 feet; species composition is dominated by 2 or 3 species; human activities greatly impact zone; invasive species well represented and alter the community				Riparian zone extends to a width of <25 feet; little or no riparian vegetation due to human activities; majority of vegetation is invasive		
	Left Bank Existing	10	9	8	7	6	5	4	3	2	1
	Left Bank Proposed	10	9	8	7	6	5	4	3	2	1
	Right Bank Existing	10	9	8	7	6	5	4	3	2	1
	Right Bank Proposed	10	9	8	7	6	5	4	3	2	1
Lateral Stability (Score =Average of Left and right bank, max score of 10)	8. Dominant Bank Erosion Rate Potential	Dominate bank erosion rate potential is low or BEHI/NBS Rating: L/VL, L/L, L/M, L/H, L/VH, M/VL			Dominate bank erosion rate potential is moderate or BEHI/NBS Rating: M/L, M/M, M/H, L/Ex, H/L, M/VH, M/Ex, H/L, H/M, VH/VL, Ex/VL				Dominate bank erosion rate potential is high or BEHI/NBS Rating: H/H, H/Ex, VH/H, Ex/M, Ex/H, Ex/VH, VH/VH, Ex/Ex		
	Existing Condition (Right bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Right Bank)	10	9	8	7	6	5	4	3	2	1
	Existing Condition (Left bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Left Bank)	10	9	8	7	6	5	4	3	2	1
	9. Lateral Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Bedform Diversity (Do not complete if stream is ephemeral)	10. Shelter for Fish and Macroinvertebrates (EPA 1999)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, rubble, gravel, cobble and large rocks, or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)			20-70% mix of stable habitat; suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale)				Less than 20% mix of stable habitat; lack of habitat availability less than desirables obvious; substrate unstable or lacking		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11a. Pool-to-Pool Spacing Ratio (Watersheds < 10 mi^2)	4.0 - 5.0			3.0 - 4.0 ***or*** 5.0 - 7.0				< 3.0 ***or*** >7.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11b. Pool-to-Pool Spacing Ratio (Watersheds > 10 mi^2)	5.0 - 7.0			3.5 - 5.0 ***or*** 7.0 - 8.0				<3.5 ***or*** >8.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12a. Pool Max Depth Ratio/Depth Variability (Gravel Bed Streams)	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12b. Pool Max Depth Ratio/Depth Variability (Sand Bed Streams)	>1.2			1.1 - 1.2				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Moderate Gradient Perennial Streams in Colluvial Valleys											
Bedform Diversity (Do not complete if stream is ephemeral)	11. Pool-to-Pool Spacing Ratio (3-5% Slope)	2.0 - 4.0			4.0 - 6.0				>6.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12. Pool Max Depth Ratio/Depth Variability	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 3 Geomorphology Overall EXISTING Condition	**F**	**FAR**	**NF**	**Score:22**
Stream Function Pyramid Level 3 Geomorphology Overall PROPOSED Condition	**F**	**FAR**	**NF**	**Score:51**

Reach ID:	Trib 4	Reach Score/Reach Total Ex. 66/170 Prop.: 136/170	Quality: Ex: 0.39 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 4 Physicochemical											
Water Quality and Nutrients (Do not complete if stream is ephemeral)	13. Water Appearance and Nutrient Enrichment (USDA 1999)	Very clear, or clear but tea-colored; objects visible at depth 3 to 6 ft (less if slightly colored); no oil sheen on surface; no noticeable film on submerged objects or rocks. Clear water along entire reach; diverse aquatic plant community includes low quantities of many species of macrophytes; little algal growth present			Frequent cloudiness especially after storm events; objects visible to depth 0.5 to 3.0 ft; may have slight green color; no oil sheen on water surface. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrate				Very turbid or muddy appearance most of the time; objects visible at depth< 0.5 ft; slow moving water maybe bright green; other obvious water pollutants; floating algal mats, surface scum, sheen or heavy coat of foam on surface; or strong odor of chemicals, oil, sewage, or other pollutants. Pea-green, gray, or brown water along entire reach; dense stands of macrophytes clogging stream; severe algal blooms creating thick algal		
	Existing Condition	10	9	8	7	6	5	**4**	3	2	1
	Proposed Condition	10	9	**8**	7	6	5	4	3	2	1
	14. Detritus (Petersen, 1992)	Mainly consisting of leaves and wood without sediment covering it			Leaves and wood scarce; fine organic debris without sediment				Fine organic sediment - black in color and foul odor (anaerobic) or detritus absent		
	Existing Condition	10	9	8	7	6	5	**4**	3	2	1
	Proposed Condition	10	9	**8**	7	6	5	4	3	2	1

Stream Function Pyramid Level 4 Physicochemical Overall EXISTING Condition F FAR NF Score:8

Stream Function Pyramid Level 4 Physicochemical Overall PROPOSED Condition F FAR NF Score:16

Stream Function Pyramid Level 5 Biology											
Biology (Do not complete if stream is ephemeral)	15. Macroinvertebrate	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	5	**4**	3	2	1
	Proposed Condition	10	9	**8**	7	6	5	4	3	2	1
	16. Macroinvertebrate Tolerance	Abundant intolerant species			Limited intolerant species				Only tolerant species		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	**8**	7	6	5	**4**	3	2	1
	17. Fish Presence	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	**8**	7	6	5	**4**	3	2	1
	If existing biology is FAR or NF, provide description of cause(s)										

Stream Function Pyramid Level 5 Biology Overall EXISTING Condition F FAR NF Score: 12

Stream Function Pyramid Level 5 Biology Overall PROPOSED Condition F FAR NF Score:24

Reach ID:	Trib 4	Reach Score/Reach Total Ex. 66/170 Prop.: 136/170	Quality: Ex: 0.39 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category		
		Functioning	Functioning-at-Risk	Not Functioning

Bankfull Determination and Rosgen Stream Classification

Rosgen Stream Type (Observation): EX - C/F PRO - C

Regional Curve (circle one): **Piedmont** Coastal Plain Allegheny Plateau/Ridge and Valley Urban Karst

DA (sqmi)	0.13		
BF Width (ft)	5.3-6.7	BF Area (sqft)	2.4-4.0
BF Depth (ft)	0.46-0.59	Percent Impervious (%)	21.3

Field Measurements

Parameter	Measurements and Ratios			
Water surface to geomorphic feature elevation difference	Existing Min:0.39, Max: 0.55, Avg.: 0.48			
Riffle Mean Depth at Bankfull Stage (dbkf)	Existing Min:0.44, Max: 0.55, Avg.: 0.48	Proposed: 0.31, 0.47 & 0.39		
Riffle Width at Bankfull Stage (Wbkf)	Existing Min:2.93, Max: 4.59, Avg.: 3.82	3.8, 5.0 & 6.0		
Riffle XS Area at Bankfull Stage (Abkf = dbkf*Wbkf)	Existing Min:1.53, Max: 2.18, Avg.: 1.83	Proposed: 1.18, 1.95 & 2.82		
Floodprone Area Width (Wfpa) (Wfpa=Width at elevation determined by 2xDmax)	Existing Min:4.44, Max: 7.80, Avg.: 5.56	Target: 8.4, 20 & 24		
Entrenchment Ratio (ER) (ER=Wfpa/Wbkf)	Existing Min:1.10, Max: 1.84, Avg.: 1.47	Target 2.2 / 4.0		
Low Bank Height (LBH)	Existing Min:1.0, Max: 1.95, Avg.: 1.29	Proposed: 0.42, 0.5 & 0.6		
Riffle Maximum Depth at Bankfull Stage (Dmax)	Existing Min:0.56, Max: 0.72, Avg.: 0.63	Proposed: 0.42, 0.5 & 0.6		
Bank Height Ratio (BHR) (BHR=LBH/Dmax)	Existing Min:1.38, Max:2.86, Avg.: 1.98	Proposed: 1.0		
BEHI/NBS Ratings and Lengths	H/M, H/L, M/M, M/L, L/L	L/L		
Pool to Pool Spacing (P-P)	Existing Avg.: 39.4	Proposed: Min: 12, Max: 49, Avg.: 25		
Pool to Pool Spacing Ratio (P-P Ratio) (P-P Ratio=P-P/Wbkf)	Existing Avg.: 10.32	Proposed: Min:2.3, Max:5.1, Avg.:5.0		
Pool Maximum Depth at Bankfull Stage (Dmbkfp)	Existing Avg.: 1.29	Proposed: 0.8, 1.0 & 1.2		
Pool Depth Ratio (Dmbkfp Ratio) (Dmbkfp Ratio=Dmbkfp/dbkf)	Existing Avg.: 2.7	Proposed: 2.5		
Macroinvertebrate Taxa Observed	n/a	n/a		

EXISTING and PROPOSED REACH LEVEL STREAM FUNCTION-BASED RAPID ASSESSMENT FIELD DATA SHEET

Watershed:	Middle Potomac - Catoctin	Rater(s):	RC/BW
Stream:	Un -Named Tributary to Cabin Branch	Date:	3/10/2022
Reach Length:	554 linear feet	Latitude:	39.177353
Photo(s):	See Attached	Longitude:	-77.199137
Reach ID:	Trib 5	**Reach Score/Reach Total**	**Ex. 24/170 Prop.: 136/170**

Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 1 Hydrology											
Runoff	1. Concentrated Flow	No potential for concentrated flow/impairments from adjacent land use			Some potential for concentrated flow/impairments to reach restoration site, however, measures are in place to protect resources				Potential for concentrated flow/impairments to reach restoration site and no treatments are in place		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	2. Flashiness	Non-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover less than 6%			Semi-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover 7 - 15%				Flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover greater than 15%		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 1 Hydrology Overall EXISTING Condition F FAR NF Score:5

Stream Function Pyramid Level 1 Hydrology Overall PROPOSED Condition F FAR NF Score:11

Stream Function Pyramid Level 2 Hydraulics											
Floodplain Connectivity (Vertical Stability)	3. Bank Height Ratio (BHR)	<1.20			1.21 - 1.50				>1.50		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	4a. Entrenchment (Meandering streams in alluvial valleys or Rosgen C, E, DA Streams)	>2.2			2.1 - 1.4				<1.4		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	4b. Entrenchment (Non meandering streams in colluvial valleys or Rosgen B Streams)	>1.4			1.3 - 1.1				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	5. Floodplain Drainage	no concentrated flow; runoff is primarily sheet flow; hillslopes < 10%; hillslopes >200 ft from stream; ponding or wetland areas and litter or debris jams are well represented			runoff is equally sheet and concentrated flow (minor gully and rill erosion occurring); hillslopes 10 - 40%; hillslopes 50 - 200 ft from stream; ponding or wetland areas and litter or debris jams are minimally represented				concentrated flows present (extensive gully and rill erosion); hillslopes >40%; hillslopes <50 ft from stream; ponding or wetland areas and litter or debris jams are not well represented or absent		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	6. Vertical Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 2 Hydraulics Overall EXISTING Condition F FAR NF Score:4

Stream Function Pyramid Level 2 Hydraulics Overall PROPOSED Condition F FAR NF Score:26

Reach ID:	Trib 5	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 3 Geomorphology											
Riparian Vegetation (Score = Average of Left and Right bank, max score of 10)	7. Riparian Vegetation Zone (EPA, 1999, modified)	Riparian zone extends to a width of >100 feet; good vegetation community diversity and density; human activities do not impact zone; invasive species not present or sparse			Riparian zone extends to a width of 25-100 feet; species composition is dominated by 2 or 3 species; human activities greatly impact zone; invasive species well represented and alter the community				Riparian zone extends to a width of <25 feet; little or no riparian vegetation due to human activities; majority of vegetation is invasive		
	Left Bank Existing	10	9	8	7	6	5	4	3	2	1
	Left Bank Proposed	10	9	8	7	6	5	4	3	2	1
	Right Bank Existing	10	9	8	7	6	5	4	3	2	1
	Right Bank Proposed	10	9	8	7	6	5	4	3	2	1
Lateral Stability (Score =Average of Left and right bank, max score of 10)	8. Dominant Bank Erosion Rate Potential	Dominate bank erosion rate potential is low or BEHI/NBS Rating: L/VL, L/L, L/M, L/H, L/VH, M/VL			Dominate bank erosion rate potential is moderate or BEHI/NBS Rating: M/L, M/M, M/H, L/Ex, H/L, M/VH, M/Ex, H/L, H/M, VH/VL, Ex/VL				Dominate bank erosion rate potential is high or BEHI/NBS Rating: H/H, H/Ex, VH/H, Ex/M, Ex/H, Ex/VH, VH/VH, Ex/Ex		
	Existing Condition (Right bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Right Bank)	10	9	8	7	6	5	4	3	2	1
	Existing Condition (Left bank)	10	9	8	7	6	5	4	3	2	1
	Proposed Condition (Left Bank)	10	9	8	7	6	5	4	3	2	1
	9. Lateral Stability Extent	Stable			Localized Instability				Widespread Instability		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Bedform Diversity (Do not complete if stream is ephemeral)	10. Shelter for Fish and Macroinvertebrates (EPA 1999)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, rubble, gravel, cobble and large rocks, or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient)			20-70% mix of stable habitat; suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale)				Less than 20% mix of stable habitat; lack of habitat availability less than desirables obvious; substrate unstable or lacking		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11a. Pool-to-Pool Spacing Ratio (Watersheds < 10 mi^2)	4.0 - 5.0			3.0 - 4.0 ***or*** 5.0 - 7.0				< 3.0 ***or*** >7.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	11b. Pool-to-Pool Spacing Ratio (Watersheds > 10 mi^2)	5.0 - 7.0			3.5 - 5.0 ***or*** 7.0 - 8.0				<3.5 ***or*** >8.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12a. Pool Max Depth Ratio/Depth Variability (Gravel Bed Streams)	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12b. Pool Max Depth Ratio/Depth Variability (Sand Bed Streams)	>1.2			1.1 - 1.2				<1.1		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
Moderate Gradient Perennial Streams in Colluvial Valleys											
Bedform Diversity (Do not complete if stream is ephemeral)	11. Pool-to-Pool Spacing Ratio (3-5% Slope)	2.0 - 4.0			4.0 - 6.0				>6.0		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	12. Pool Max Depth Ratio/Depth Variability	>1.5			1.2 - 1.5				<1.2		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 3 Geomorphology Overall EXISTING Condition F FAR NF Score:8

Stream Function Pyramid Level 3 Geomorphology Overall PROPOSED Condition F FAR NF Score:51

Reach ID:	Trib 5	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning			Functioning-at-Risk				Not Functioning		
Stream Function Pyramid Level 4 Physicochemical											
Water Quality and Nutrients (Do not complete if stream is ephemeral)	13. Water Appearance and Nutrient Enrichment (USDA 1999)	Very clear, or clear but tea-colored; objects visible at depth 3 to 6 ft (less if slightly colored); no oil sheen on surface; no noticeable film on submerged objects or rocks. Clear water along entire reach; diverse aquatic plant community includes low quantities of many species of macrophytes; little algal growth present			Frequent cloudiness especially after storm events; objects visible to depth 0.5 to 3.0 ft; may have slight green color; no oil sheen on water surface. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrate				Very turbid or muddy appearance most of the time; objects visible at depth< 0.5 ft; slow moving water maybe bright green; other obvious water pollutants; floating algal mats, surface scum, sheen or heavy coat of foam on surface; or strong odor of chemicals, oil, sewage, or other pollutants. Pea-green, gray, or brown water along entire reach; dense stands of macrophytes clogging stream; severe algal blooms creating thick algal		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	14. Detritus (Petersen, 1992)	Mainly consisting of leaves and wood without sediment covering it			Leaves and wood scarce; fine organic debris without sediment				Fine organic sediment - black in color and foul odor (anaerobic) or detritus absent		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1

Stream Function Pyramid Level 4 Physicochemical Overall EXISTING Condition F FAR NF Score:4

Stream Function Pyramid Level 4 Physicochemical Overall PROPOSED Condition F FAR NF Score:16

Stream Function Pyramid Level 5 Biology											
Biology (Do not complete if stream is ephemeral)	15. Macroinvertebrate	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	16. Macroinvertebrate Tolerance	Abundant intolerant species			Limited intolerant species				Only tolerant species		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	3	2	1
	17. Fish Presence	Abundant			Rare				Not present		
	Existing Condition	10	9	8	7	6	5	4	3	2	1
	Proposed Condition	10	9	8	7	6	5	4	4	2	1
	If existing biology is FAR or NF, provide description of cause(s)	Stream is currently a concrete channel.									

Stream Function Pyramid Level 5 Biology Overall EXISTING Condition F FAR NF Score: 3

Stream Function Pyramid Level 5 Biology Overall PROPOSED Condition F FAR NF Score:24

Reach ID:	Trib 5	Reach Score/Reach Total Ex. 24/170 Prop.: 136/170	Quality: Ex: 0.14 Prop:0.8

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category		
		Functioning	Functioning-at-Risk	Not Functioning

Bankfull Determination and Rosgen Stream Classification

Rosgen Stream Type (Observation) EX - Stream is currently concrete channel PRO - C			
Regional Curve (circle one):	**Piedmont** Coastal Plain Allegheny Plateau/Ridge and Valley Urban Karst		
DA (sqmi)	0.06		
BF Width (ft)	3.6-4.9	BF Area (sqft)	1.3-2.2
BF Depth (ft)	0.35-0.45	Percent Impervious (%)	21.3

Field Measurements

Parameter	Measurements and Ratios			
Water surface to geomorphic feature elevation difference	Ex- Channel is in concrete channel			
Riffle Mean Depth at Bankfull Stage (dbkf)	Ex- Channel is in concrete channel	Proposed: 0.36		
Riffle Width at Bankfull Stage (Wbkf)	Ex- Channel is in concrete channel	Proposed: 4.6		
Riffle XS Area at Bankfull Stage (Abkf = dbkf*Wbkf)	Ex- Channel is in concrete channel	Proposed: 1.65		
Floodprone Area Width (Wfpa) (Wfpa=Width at elevation determined by 2xDmax)	Ex- Channel is in concrete channel	Target: 18.4		
Entrenchment Ratio (ER) (ER=Wfpa/Wbkf)	Ex- Channel is in concrete channel	Target 4.0		
Low Bank Height (LBH)	Ex- Channel is in concrete channel	Proposed: 0.5		
Riffle Maximum Depth at Bankfull Stage (Dmax)	Ex- Channel is in concrete channel	Proposed: 0.5		
Bank Height Ratio (BHR) (BHR=LBH/Dmax)	Ex- Channel is in concrete channel	Proposed: 1.0		
BEHI/NBS Ratings and Lengths	Ex- Channel is in concrete channel	L/L		
Pool to Pool Spacing (P-P)	Ex- Channel is in concrete channel	Proposed: Min: 21, Max: 30, Avg.: 26		
Pool to Pool Spacing Ratio (P-P Ratio) (P-P Ratio=P-P/Wbkf)	Ex- Channel is in concrete channel	Proposed: Min:4.6, Max:6.5, Avg.:5.7		
Pool Maximum Depth at Bankfull Stage (Dmbkfp)	Ex- Channel is in concrete channel	Proposed: 0.9		
Pool Depth Ratio (Dmbkfp Ratio) (Dmbkfp Ratio=Dmbkfp/dbkf)	Ex- Channel is in concrete channel	Proposed: 2.5		
Macroinvertebrate Taxa Observed	Ex- Channel is in concrete channel	n/a		

Cabin Branch

Cabin Branch

Tributary 1, 2, and 3 (general riparian conditions)

Tributary 4

Tributary 5

Appendix D: Maryland Stream Mitigation Framework (MSMF) Stream Mitigation Calculator

DRAFT

STREAM MITIGATION CALCULATOR

BACKGROUND INFORMATION

Corps Project ID #:		Corps PM:	
Project Name:	RFP-2 Cabin Branch	Date:	3/10/2022
Lat/Long:	N 39D 10' 43", W 77D 12' 08"	Sponsor:	MDOT SHA
County:	Montgomery	Collaborators:	HGS, LLC/MLA

Total Stream Gains (Functional Feet) **5583**

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				
Cabin Branch	Piedmont	Existing	Preliminary Resource Evaluation	Perennial Wadeable	4670	35%	Primary	4.33	2895	3653	1	Easement	Evaluation	Buffer Area (Acres)	Buffer Quality	4236	
							1	1.77			0.1	0.03	Existing Buffer	6.08	63%		
	Piedmont	Proposed	Restoration/Enhancement	Perennial Wadeable	4680	79%	Primary	4.33	6548		374	123	Proposed Buffer	6.08	94%		
							1	1.77					Functional Feet		86		
Tributary 1	Piedmont	Existing	Preliminary Resource Evaluation	Intermittent	0	14%	Primary	0.15	0	190	1	Easement	Evaluation	Buffer Area (Acres)	Buffer Quality	225	
							1	0.48			0.1	0.03	Existing Buffer	0.58	60%		
	Piedmont	Proposed	Restoration/Enhancement	Intermittent	497.5	80%	Primary	0.15	190		20	7	Proposed Buffer	0.58	94%		
							1	0.48					Functional Feet		9		
Tributary 2	Piedmont	Existing	Preliminary Resource Evaluation	Intermittent	0	14%	Primary	0.02	0	154	1	Easement	Evaluation	Buffer Area (Acres)	Buffer Quality	184	
							1	0.41			0.1	0.03	Existing Buffer	0.54	60%		
	Piedmont	Proposed	Restoration/Enhancement	Intermittent	471	80%	Primary	0.02	154		16	5	Proposed Buffer	0.54	94%		
							1	0.41					Functional Feet		8		
Tributary 3	Piedmont	Existing	Preliminary Resource Evaluation	Intermittent	0	14%	Primary	0.08	0	237	1	Easement	Evaluation	Buffer Area (Acres)	Buffer Quality	283	
							1	0.41			0.1	0.03	Existing Buffer	0.83	60%		
	Piedmont	Proposed	Restoration/Enhancement	Intermittent	723.6	80%	Primary	0.08	237		25	8	Proposed Buffer	0.83	94%		
							1	0.41					Functional Feet		13		
Tributary 4	Piedmont	Existing	Preliminary Resource Evaluation	Intermittent	713	39%	Primary	0.13	125	168	1	Easement	Evaluation	Buffer Area (Acres)	Buffer Quality	206	
							1	0.45			0.1	0.03	Existing Buffer	0.93	60%		
	Piedmont	Proposed	Restoration/Enhancement	Intermittent	812.6	80%	Primary	0.13	293		18	6	Proposed Buffer	0.93	94%		
							1	0.45					Functional Feet		14		
Tributary 5	Piedmont	Existing	Preliminary Resource Evaluation	Intermittent	0	14%	Primary	0.06	0	13	1	Easement	Evaluation	Buffer Area (Acres)	Buffer Quality	15	
							1	0.41			0.1	0.03	Existing Buffer	0.04	60%		
	Piedmont	Proposed	Restoration/Enhancement	Intermittent	38.6	80%	Primary	0.06	13		1	0	Proposed Buffer	0.04	94%		
							1	0.41					Functional Feet		1		
Cabin Branch (PEPCO)	Piedmont	Existing	Preliminary Resource Evaluation	Perennial Wadeable	252	35%	Primary	4.3	156	235	1	Improved Protection	Evaluation	Buffer Area (Acres)	Buffer Quality	256	
							1	1.77			0.1	-0.03	Existing Buffer	0.33	63%		
	Piedmont	Proposed	Restoration/Enhancement	Perennial Wadeable	280	79%	Primary	4.3	391		24	-8	Proposed Buffer	0.33	94%		
							1	1.77					Functional Feet		5		
Trib 4 (PEPCO)	Piedmont	Existing	Preliminary Resource Evaluation	Intermittent	122	39%	Primary	0.13	21	23	1	Improved Protection	Evaluation	Buffer Area (Acres)	Buffer Quality	27	
							1	0.45			0.1	-0.03	Existing Buffer	0.16	60%		
	Piedmont	Proposed	Restoration/Enhancement	Intermittent	123	80%	Primary	0.13	44		3	-1	Proposed Buffer	0.16	94%		
							1	0.45					Functional Feet		2		
Trib 5 (PEPCO)	Piedmont	Existing	Preliminary Resource Evaluation	Intermittent	0	14%	Primary	0.06	0	133	1	Improved Protection	Evaluation	Buffer Area (Acres)	Buffer Quality	150	
							1	0.41			0.1	-0.03	Existing Buffer	0.46	60%		
	Piedmont	Proposed	Restoration/Enhancement	Intermittent	407	80%	Primary	0.06	133		14	-5	Proposed Buffer	0.46	94%		
							1	0.41					Functional Feet		7		
	Not Selected	Existing	Preliminary Resource Evaluation	NA	0	0%	NA	0	0	0	0	Select From List	Evaluation	Buffer Area (Acres)	Buffer Quality	NA	
							0	FALSE			0	0	Existing Buffer				
	Not Selected	Proposed	NA	NA	0		NA	0	0		0	NA	Proposed Buffer				

Maryland Stream Mitigation Framework Version 1:
Stream Buffer Quality Assessment

Project Name:	RFP-2 Cabin Branch	**SBAA (Acres):**	6.08
CSBA Name:	Cabin Branch	*Infrastructure Area (Acres):*	0
Assessor(s):	RC	*Wetland Area (Acres):*	0
Date:	3/10/2022	*Area Credited By Other Prog:*	0
Latitude(*dec. deg*):	39.177353	**CSBA (Acres):**	6.08
Longitude (*dec. deg*):	-77.199137	**Existing Buffer Quality (%)*:**	*62.9*
Corps Permit Number:		**Proposed Buffer Quality (%)*:**	*94.3*

General Notes: Cabin Branch riparian conditions are similar throughout the project site so were scored with a composite score for the entire reach.

General Instructions: Identify your ***Stream Buffer Assessment Area*** *(* ***SBAA*** *). The Stream Buffer Assessment Area is the area where the Stream Buffer Quality Assessment Metrics 1 and 2 will occur. The SBAA includes the project area (future conservation easement area) for a given stream reach and any inholdings (Easements/infrastructure, credited wetlands, etc between the SBAA boundary and the stream). The SBAA may not exceed 200 feet from the baseflow channel edge. To determine the* ***Credited Stream Buffer Area (CSBA)****, subtract the Infrastructure Area and Area Credited by other Programs (TMDL, Wetland Credits, Forest Conservation, etc.) from the SBAA. A CSBA should be selected where vegetation or topography changes significantly. Please use the Wetland Delineation Forms applying the appropriate regional supplement to determine the extent of wetlands in the SBAA and to collect vegetation data. In the metrics below, circle the most applicable metric for your assessed area. Please use the comments box below each metric for any discussion items. Mapping is required showing landscape and project context for the SBAA and CSBA. More information can be found in the* ***MSMF Version 1: Stream Buffer Assessment Detailed Instructions*** *.*
Highlighted cells above are MSMF V.1. Mitigation Calculator input values.

Metrics Applied to Stream Buffer Assessment Area (SBAA)

Metric 1: % SBAA as wetlands					
Ranges	50%+	30-49%	15-30%	5-15%	0%
Existing	4	3	2	1	0
Proposed	4	3	2	1	0

Notes: Only POW within the existing buffer. Areas will be converted to PFO to increase wetlands within the buffer area.

Metric 2: % of SBAA as Utilities/Infrastructure					
Ranges	0	1-5%	5-10%	10-15%	>15%
Existing	4	3	2	1	0
Proposed	4	3	2	1	0

Notes: All utilities have been removed from the credit calculations and buffer scores.

Metrics Applied to Credited Stream Buffer Area (CSBA)

Metric 3: Plant Species Richness in CSBA (MDWAM 2022)					
Ranges	11+	9-10	6-8	2-5	2 or less

Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes: Historic golf course with limited existing plant species.					
Metric 4: % Canopy Cover in the CSBA3 (VA Unified 2008)					
Ranges	>60%	30-60%	10%-29%	1-9%	0%
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes: Very limited existing trees on the site and are situated primarily along Cabin Branch and randomly throughout the historic fairways.					
Metric 5: # of Strata in CSBA1 (MDWAM 2022)					
Ranges	4+	3	2	1	0
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					
Metric 6: Total Cover of herbaceous, emergent, and submergent plants in CSBA1 (MDWAM 2022)					
Ranges	>75%	51-74%	26-50%	<25%	NA
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes: Since the golf course has been out of operation for several years there is very little bare areas outside of the eroding stream banks.					
Metric 7: Invasive Plant Species (Total Relative % Cover) in CSBA1 (MDWAM 2022)					
Ranges	<1%	1-10%	11-25%	26-50%	51-100%
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes: Typical invasive species found throughout the region. Due to the large watershed of Cabin Branch it will be very difficult to maintain invasive species cover below 1%.					
Metric 8: Mircotopgraphy and Woody Debris in CSBA 1,2 (MDWAM 2022 & MDE 2021)					
Description	Woody debris and topographic deviations widespread, covering >15% of the CSBA. Multiple types of woody debris (Snags, downed wood, etc)	Woody debris and topographic deviations common, covering 10-15% of CSBA. Woody debris may lack diversity.	Occasional woody debris and topographic deviations present (Covering 5-9% CSBA) and/or woody debris lacking diversity.	Woody debris and topographic deviations very limited (<5% CSBA coverage) and/or Either woody debris or topographic deviations absent or scarce.	Woody debris and deviations in topography very scarce or not present
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes: Limited diversity in the riparian condition due to the historic land use as a golf course and the area being maintained over those years.					
Metric 9: Height Above Nearest Drainage in CSBA4 (Nobre et al. 2011)					
Ranges	0-2 ft	2.1-3 ft	3.1-4 ft	4.1-6 ft	>6 ft
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					

Maryland Stream Mitigation Framework Version 1:
Stream Buffer Quality Assessment

Project Name:	RFP-2 Cabin Branch	**SBAA (Acres):**	2.8
CSBA Name:	Tributaries	*Infrastructure Area (Acres):*	0
Assessor(s):	RC	*Wetland Area (Acres):*	0
Date:	3/10/2022	*Area Credited By Other Prog:*	0
Latitude(*dec. deg*):	39.177353	**CSBA (Acres):**	2.8
Longitude (*dec. deg*):	-77.199137	**Existing Buffer Quality (%)*:**	*60*
Corps Permit Number:		**Proposed Buffer Quality (%)*:**	*94.3*

General Notes: Tributaries are primarily piped so scored the surrounding buffer in the vicinity of the piped channel.

General Instructions: Identify your ***Stream Buffer Assessment Area*** *(* ***SBAA*** *). The Stream Buffer Assessment Area is the area where the Stream Buffer Quality Assessment Metrics 1 and 2 will occur. The SBAA includes the project area (future conservation easement area) for a given stream reach and any inholdings (Easements/infrastructure, credited wetlands, etc between the SBAA boundary and the stream). The SBAA may not exceed 200 feet from the baseflow channel edge. To determine the* ***Credited Stream Buffer Area (CSBA)****, subtract the Infrastructure Area and Area Credited by other Programs (TMDL, Wetland Credits, Forest Conservation, etc.) from the SBAA. A CSBA should be selected where vegetation or topography changes significantly. Please use the Wetland Delineation Forms applying the appropriate regional supplement to determine the extent of wetlands in the SBAA and to collect vegetation data. In the metrics below, circle the most applicable metric for your assessed area. Please use the comments box below each metric for any discussion items. Mapping is required showing landscape and project context for the SBAA and CSBA. More information can be found in the* ***MSMF Version 1: Stream Buffer Assessment Detailed Instructions*** *.*
Highlighted cells above are MSMF V.1. Mitigation Calculator input values.

Metrics Applied to Stream Buffer Assessment Area (SBAA)

Metric 1: % SBAA as wetlands					
Ranges	50%+	30-49%	15-30%	5-15%	0%
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					

Metric 2: % of SBAA as Utilities/Infrastructure					
Ranges	0	1-5%	5-10%	10-15%	>15%
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					

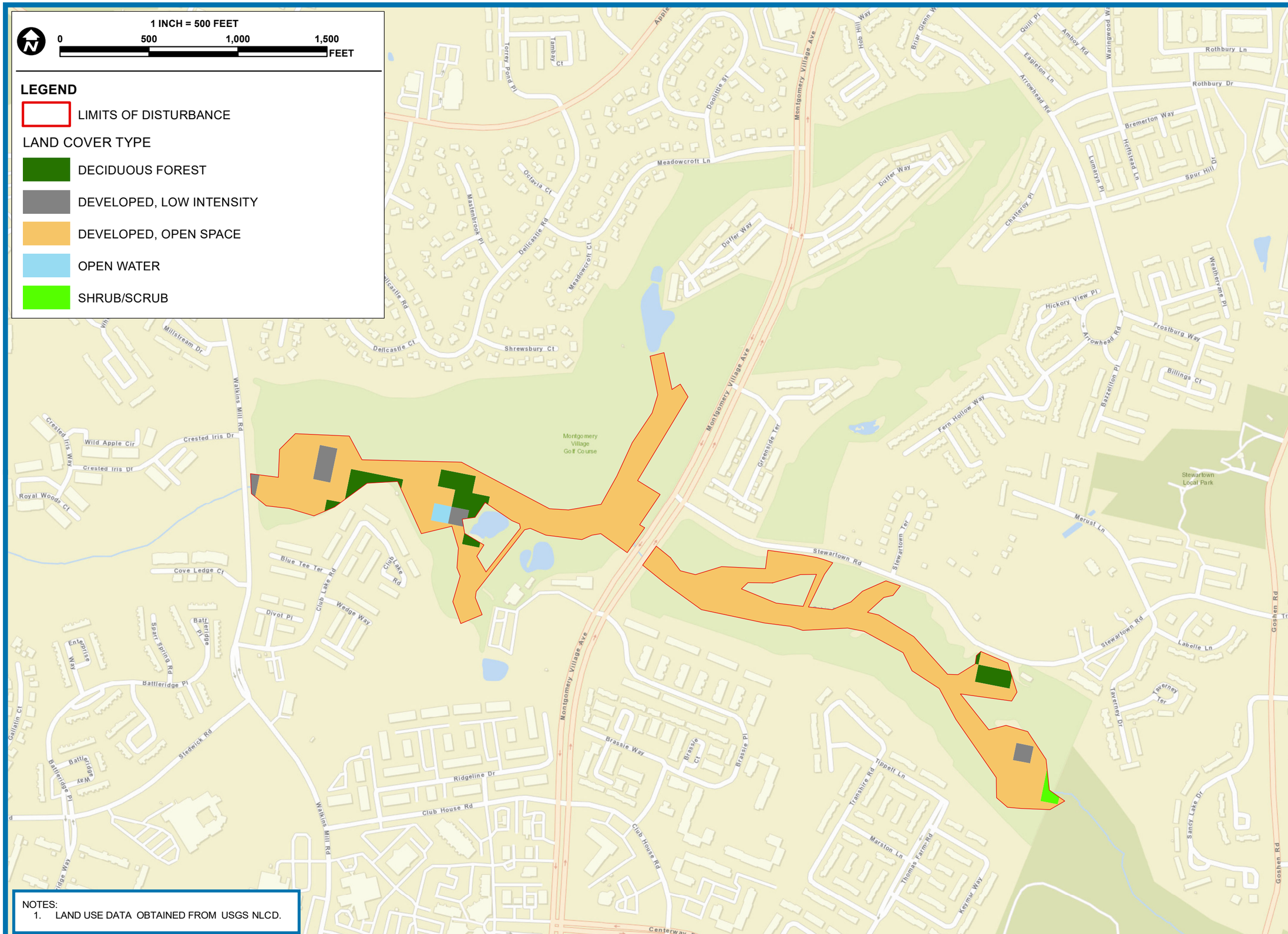
Metrics Applied to Credited Stream Buffer Area (CSBA)

Metric 3: Plant Species Richness in CSBA (MDWAM 2022)					
Ranges	11+	9-10	6-8	2-5	2 or less

Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					
Metric 4: % Canopy Cover in the CSBA3 (VA Unified 2008)					
Ranges	>60%	30-60%	10%-29%	1-9%	0%
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					
Metric 5: # of Strata in CSBA1 (MDWAM 2022)					
Ranges	4+	3	2	1	0
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					
Metric 6: Total Cover of herbaceous, emergent, and submergent plants in CSBA1 (MDWAM 2022)					
Ranges	>75%	51-74%	26-50%	<25%	NA
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					
Metric 7: Invasive Plant Species (Total Relative % Cover) in CSBA1 (MDWAM 2022)					
Ranges	<1%	1-10%	11-25%	26-50%	51-100%
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					
Metric 8: Mircotopgraphy and Woody Debris in CSBA 1,2 (MDWAM 2022 & MDE 2021)					
Description	Woody debris and topographic deviations widespread, covering >15% of the CSBA. Multiple types of woody debris (Snags, downed wood, etc)	Woody debris and topographic deviations common, covering 10-15% of CSBA. Woody debris may lack diversity.	Occasional woody debris and topographic deviations present (Covering 5-9% CSBA) and/or woody debris lacking diversity.	Woody debris and topographic deviations very limited (<5% CSBA coverage) and/or Either woody debris or topographic deviations absent or scarce.	Woody debris and deviations in topography very scarce or not present
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					
Metric 9: Height Above Nearest Drainage in CSBA4 (Nobre et al. 2011)					
Ranges	0-2 ft	2.1-3 ft	3.1-4 ft	4.1-6 ft	>6 ft
Existing	4	3	2	1	0
Proposed	4	3	2	1	0
Notes:					

Appendix E: Cabin Branch Land Use Vicinity Map

DRAFT



NOTES:
1. LAND USE DATA OBTAINED FROM USGS NLCD.

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PROJECT: CABIN BRANCH

LAND USE VICINITY MAP

MONTGOMERY COUNTY, MARYLAND

PROJECT MANAGER:	RC
DRAWN:	TB
JOB NUMBER:	102054
DATE:	01/29/2021
REVISIONS:	NONE

Document Path: R:\Resgis\entgis\Projects_OldProjects\Richmond_Active_Jobs\102054_Cabin_Branch\maps\102054_Land_Use_11x17.mxd - Date Saved: 1/29/2021