ANNE ARUNDEL COUNTY
MARYLAND

Prepared For:

Anne Arundel County
Department of Public Works

ROCK CREEK
STREAM RESTORATION
FINAL DESIGN REPORT

AUGUST 2025

Contract No. B553802

Prepared by:

BayLand Consultants & Designers, Inc.

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1. INTRODUCTION

1.1. Overview

The Anne Arundel County Department of Public Works (DPW) Bureau of Watershed Protection and Restoration (BWPR) has contracted BayLand Consultants & Designers, Inc. (BayLand) to provide engineering analysis and design services for the Rock Creek Stream Restoration Project (hereafter referred to as the Project). The Project is intended to provide stream stabilization in actively eroding channels, riparian wetland establishment, and reconnection with riparian wetlands wherever feasible to maximize water quality credit for the Anne Arundel County (the County) municipal separate storm sewer systems (MS4) permit.

The Study Area is located in the Rock Creek sub-watershed, which drains to the Patapsco River. The stream reaches that compose the Study Area are generally located north of Hog Neck Road and west of Fort Smallwood Road in Pasadena, Maryland. The Study Area includes the adjacent floodplain, floodplain terrace areas, and adjacent outfalls (Figure 1). The downstream portion of the Study Area is in the Chesapeake and Atlantic Coastal Bays Critical Area (Critical Area).

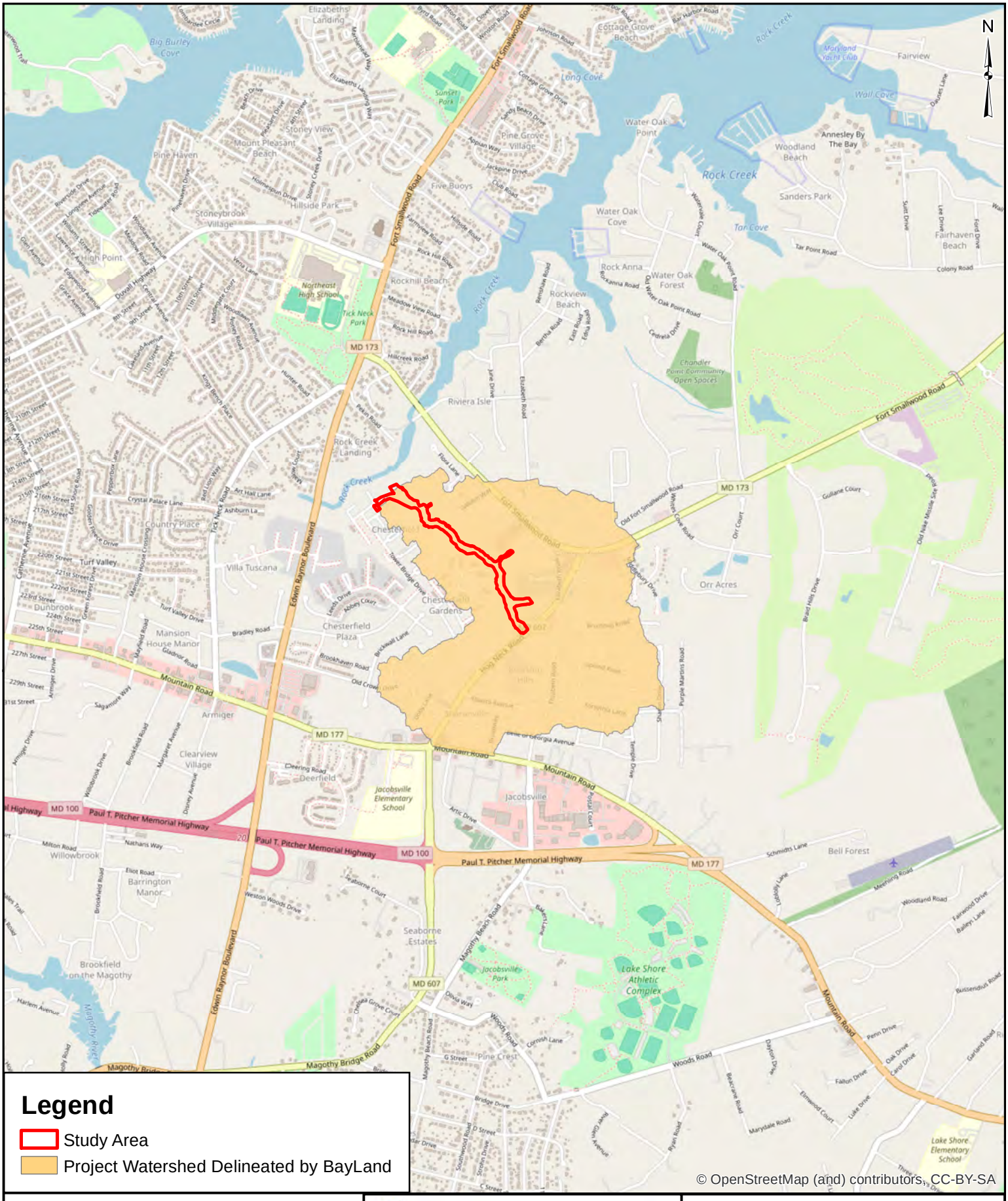
The Study Area includes four project reaches, RC-1, RC-2, RC-3, and RC-4. The total length of restoration including the project reaches and adjacent channels is 3,455 LF. Details of the Study Area and reaches can be found in Section 3 and Figure 6. Overall, the Study Area covers 10.7 acres.

Preliminary data collection for the Project involved review of past watershed studies, land use, property information, utilities, topography, geology, and soils. A historical analysis of the watershed was also performed using historic aerials, and hydrologic calculations were performed to describe the current discharge regime.

A Natural Resources Inventory (NRI) was conducted in April 2023. As part of the NRI assessment, a wetland delineation and forest stand delineation (FSD) assessment were completed. All trees with a diameter at breast height (DBH) of 30 inches or greater within the Study Area were located, identified, and rated as being in “good,” “fair,” or “poor” condition. A limited desktop environmental due diligence review was also completed in April 2023.

Geomorphic assessments were conducted in June 2023, including bank erosion assessments for each stream reach. Measurements were evaluated to characterize current conditions and provide validation of the estimates of the extent, magnitude, and rate of instability throughout the reaches.

Results of all data analysis efforts are presented in this report and were used to develop design parameters and support the development of design alternatives for each degraded reach. *A Function-Based Framework for Stream Assessment and Restoration Projects* (Harman et al., 2012) was utilized throughout the entire Project process to ensure that the most appropriate design approach would ultimately be selected.



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Rock Creek Stream Restoration
Figure 1- Vicinity Map

P:\5_20201_Rock Creek Stream Restoration\GIS\Figures for Report\Figure 1 - RockCreek_VicinityMap.mxd

1.2. Background

The cumulative effects of development patterns are pervasive within the Project watershed. Urban development coupled with insufficient stormwater management (SWM) control infrastructure and channel alteration for the construction of roads and utilities has resulted in degraded habitat, channel incision, bank erosion, and irregular planform geometry among other signs of instability. The Project is also intended to provide protection of sanitary sewer infrastructure.

1.3. Programmatic Goals

The programmatic goals for the Project are to:

- Provide stream valley restoration, including the establishment or reconnection with riparian wetlands and optimizing floodplain reconnection volume where appropriate.
- Provide design features that promote denitrification during base flow.
- Provide significant reduction in annual mass of sediment and attached nutrients originating from on-site channel degradation (i.e., “Prevented Sediment”) and upstream loss being delivered to downstream receiving waters.
- Enhance stream and riparian ecological functions.
- Provide an integrated stabilization approach to storm drain outfalls.
- Document water quality (and/or other) credit towards Anne Arundel County’s National Pollutant Discharge Elimination System (NPDES) MS4 permit watershed restoration requirement and assist in meeting Anne Arundel County’s wasteload allocation (WLA) towards the Chesapeake Bay Total Maximum Daily Load (TMDL).

2. WATERSHED ASSESSMENT

2.1. Watershed

The overall project drainage area is approximately 0.52 square miles (330 acres) and is composed of approximately 28 percent impervious area. The project drainage area is located within the Baltimore Harbor Watershed (02-13-09-03) (Figure 2). The Baltimore Harbor Watershed is approximately 117.1 square miles (74,900 acres) and is a mix of urban residential, commercial, and forested land uses (Anne Arundel County, 2016).

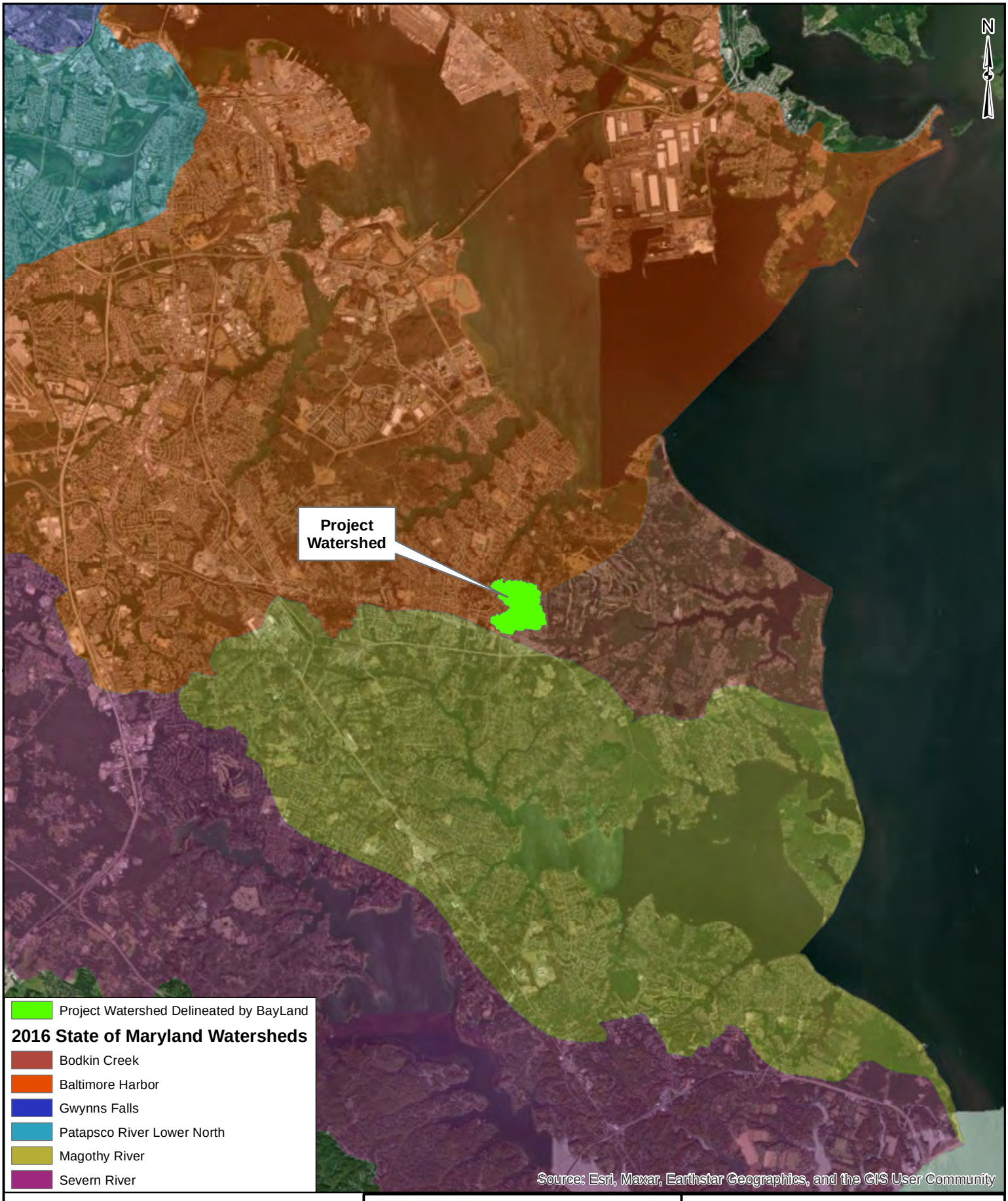
The Baltimore Harbor watershed was first identified on the 1998 303(d) List submitted to United States Environmental Protection Agency (EPA) by the Maryland Department of the Environment (MDE) as impaired by Chlordane and polychlorinated biphenyls (PCBs) in fish tissue (MDE, 1998). The PCBs in fish tissue impairment were also added to the impoundment known as Stansbury Pond in 2012 (MDE, 2012). On the 2014 303(d) List, as a result of a Biostressor analysis, several impairments were added and are as follows: lack of riparian buffer, habitat alterations (stream channelization), sulfate, and chloride, and total suspended solids (TSS).

As a result of the 303(d) Listings, several TMDLs have been established and approved for the Baltimore Harbor watershed. On March 23, 2001, a Chlordane TMDL was approved by the EPA (EPA, 2001). On December 17, 2007, nitrogen and phosphorus TMDLs were approved by the EPA (EPA, 2007). On December 29, 2010, the Chesapeake Bay TMDL was approved by the EPA (EPA, 2011). On March 10, 2011, an enterococci TMDL was approved by the EPA for Furnace Creek and Marley Creek (EPA, 2011). On October 1, 2012, a PCBs TMDL was approved by the EPA including loads from Bear Creek and Curtis Creek (EPA, 2012). On January 5, 2015, a trash TMDL was approved by the EPA (EPA, 2015). On January 27, 2022, a TSS TMDL was approved by the EPA for non-tidal sediment (EPA, 2022).

The Project is intended to address WLAs to meet TMDLs for the Chesapeake Bay as mandated by the EPA under section 402(p) of the Clean Water Act. The Chesapeake Bay TMDL sets watershed limits for nitrogen, phosphorus, and sediment, and the Project will provide reduction of these pollutants.

2.2. Physiography

The Project is in the Glen Burnie Rolling Upland District (511300) of the Western Shore Uplands Region, within the greater Atlantic Coastal Plain Physiographic Province (Maryland Geologic Survey, 2008). The Glen Burnie Rolling Upland District is an undulating upland. Lithologies for this landform are mainly quartzitic sands, gravels, silts, and clays, often micaceous (Potomac Group). Geologic structure is essentially flat-lying to gently southeast-dipping sedimentary beds. Drainage patterns are dendritic.



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Rock Creek Stream Restoration
Figure 2 - Watershed Map

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2.3. Soils

Soil types and boundaries identified within the Project drainage area are from the United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) Web Soil Survey (2023). The soils are listed in Table 1 and the Web Soil Survey report for the Project drainage area is included in Appendix F.

Table 1 – USDA-NRCS Soils within Project Drainage Area

Map Unit Symbol	Map Unit Name	Hydrologic Soil Type	Acres in Drainage Area	Percent of Drainage Area
DwB	Downer-Hammonton-Urban land complex, 0 to 5 percent slopes	A	63.4	19.2
DwD	Downer-Hammonton-Urban land complex, 5 to 15 percent slopes	A	14.1	4.3
DxB	Downer-Phalanx complex, 2 to 5 percent slopes	A	4.0	1.2
EuD	Evesboro-Galestown-Urban land complex, 5 to 15 percent slopes	A	19.2	5.8
EVC	Evesboro and Galestown soils, 5 to 10 percent slopes	A	10.9	3.3
FrA	Fallsington-Urban land complex, 0 to 2 percent slopes	D	2.4	0.7
PeB	Patapsco-Evesboro-Fort Mott complex, 0 to 5 percent slopes	A	24.1	7.3
PfB	Patapsco-Fort Mott complex, 0 to 5 percent slopes	A	42.5	12.9
PfC	Patapsco-Fort Mott complex, 5 to 10 percent slopes	A	2.4	0.7
PgB	Patapsco-Fort Mott-Urban land complex, 0 to 5 percent slopes	A	76.4	23.2
RhB	Russett-Christiana-Hambrook complex, 0 to 5 percent slopes	C	0.1	0.0
SME	Sassafras and Croom soils, 15 to 25 percent slopes	C	25.2	7.6
WdaA	Woodstown sandy loam, 0 to 2 percent slopes, Northern Coastal Plain	C	7.5	2.3
WdaB	Woodstown sandy loam, 2 to 5 percent slopes, Northern Coastal Plain	C	13.6	4.1
WrB	Woodstown-Urban land complex, 0 to 5 percent slopes	C	22.5	6.8
ZBA	Zekiah and Issue soils, 0 to 2 percent slopes, frequently flooded	D	1.7	0.5

USDA-NRCS Official Soils Series Descriptions (OSD), available online, were utilized to obtain additional information regarding each soil series (USDA-NRCS, 2023). A summary of pertinent information associated with each soil series is provided in Table 2, including: depth, agricultural drainage class, and parent material.

Table 2 – USDA-NRCS Official Soil Series Descriptions			
Soil Series Description Name	**Depth**	**Agricultural Drainage Class**	**Parent Material**
Christiana	Very deep	Moderately well drained	Clayey fluviomarine deposits
Croom	Very deep	Well drained	Gravelly fluvial deposits
Downer	Very deep	Well drained	Loamy fluviomarine deposits
Evesboro	Very deep	Excessively drained	Sandy marine and eolian deposits
Fallsington	Very deep	Poorly drained	Loamy fluviomarine sediments
Fort Mott	Very Deep	Well drained	Sandy eolian deposits and/or fluviomarine deposits
Galestown	Very deep	Somewhat excessively drained	Sandy eolian deposits and/or fluviomarine sediments
Hambrook	Very deep	Well drained	Stratified alluvial and marine sediments
Hammonton	Very deep	Moderately well drained	Loamy fluviomarine sediments
Issue	Very deep	Somewhat poorly drained	Loamy and sandy alluvium
Patapsco	Very deep	Somewhat excessively drained	Sandy eolian deposits over fluviomarine deposits
Phalanx	Very Deep	Well drained	Sandy and loamy fluviomarine deposits
Russett	Very deep	Moderately well drained	Mixed sandy and loamy fluviomarine deposits
Sassafras	Very deep	Well drained	Loamy fluviomarine sediments
Woodstown	Very deep	Moderately well drained	Sandy marine and old alluvial sediments
Zekiah	Very deep	Poorly drained	Loamy alluvium

2.4. Climate

The County climate is largely influenced by its location in the warm temperate zone of the Eastern United States. The County typically experiences generally mild winters and hot, humid summers. This region is dominated for most of the year by a broad band of eastward-moving air that encircles the globe throughout the latitudes 30 to 60 degrees north. The general flow is characterized by waves of air currents responsible for the movement of rain-bearing atmospheric depressions. In summer, weather is dominated by air masses that originate over the Gulf of Mexico, drifting in from a southerly direction. These warm, moist air masses bring hot, humid, and hazy conditions with afternoon thunderstorms, which are typical of summer. These thunderstorms produce intense, short duration rain events that are highly localized and often widely scattered. Occasionally during summer, easterly winds bring cooler air from the Atlantic Ocean. Although winters are dominated by cold, dry air from Central Canada, several depressions moving northeast along the coast pass over the region in any winter. Moisture from such depressions is commonly widespread, prolonged, and fairly gentle, giving soaking rain that fills reservoirs and recharges groundwater supplies. Drought may occur in any month or any season, but serious drought is most likely to occur in summer.

As shown in Table 3, the mean annual temperature is 56.2 degrees Fahrenheit (F) with an average summer (June to August) temperature of 76.0 degrees F and an average winter temperature (December to March) of 38.5 degrees F. Mean monthly high and low temperatures range from 25.4 degrees F to 43.2 degrees F for January, and 88.8 degrees F to 67.7 degrees F in July (National Weather Service Forecast Office, 2024).

Precipitation is uniformly distributed during the year. In the winter, precipitation is generally in the form of light snows and showers, and in other seasons it comes as light prolonged rains or quick hard showers. Most of the rainfall during the growing season comes from summer thunderstorms but may vary widely from place to place and from season to season. Winter rainfall results mostly from low pressure storms moving through the area and is less variable than summer rainfall. Mean annual total precipitation is 45.0 inches, with mean monthly precipitation varying from a low of 2.9 inches in February to a high of 4.5 inches in July. Some snow falls every winter, with average amounts ranging from 0.1 to 7.5 inches. Mean annual total snowfall is 19.3 inches (National Weather Service Forecast Office, 2024).

Table 3 – Average Daily and Annual Values for Temperature and Precipitation at the Baltimore-Washington International Airport in Hanover, Maryland*

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Temperature (°F)	34.3	36.6	44.3	55.0	64.4	73.5	78.3	76.2	69.2	57.4	46.9	38.6	56.2
Precipitation (Inches)	3.1	2.9	4.0	3.4	3.9	4.0	4.5	4.1	4.4	3.9	3.1	3.7	45.0
Snowfall (Inches)	6.4	7.5	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.5	19.3

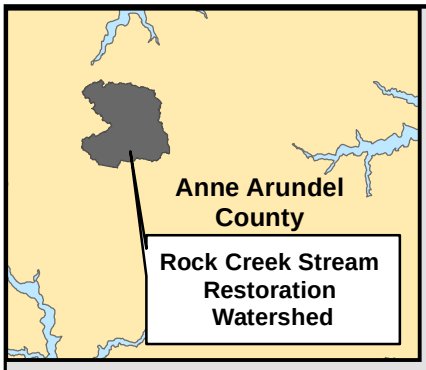
**Source: National Weather Service Forecast Office, 2024*

2.5. Land Use and Land Cover

2.5.1. Existing & Ultimate Land Use

The Project watershed occupies approximately 0.52 square miles (329.9 acres) with 28 percent impervious area. Existing land use cover was derived from 2017 Anne Arundel County Land Use Cover (Anne Arundel County, 2017). Ultimate Land Use on undeveloped land was derived from Anne Arundel County Zoning data (Anne Arundel County, 2019). The Existing and Ultimate Land Use data is depicted in Table 4 and Figures 3 and 4. The watershed is considered built-out.

Table 4 – Land Use		
Parameter	**Acres**	**Percentage of Drainage Area**
Existing Land Use		
Commercial	27.8	8.4
Industrial	3.1	0.9
Open Space	2.0	0.6
Residential 1-acre	105.4	32.0
Residential 1/2-acre	17.9	5.4
Residential 1/4-acre	49.2	14.9
Residential 1/8-acre	17.4	5.3
Residential 2-acre	7.3	2.2
Transportation	29.5	9.0
Open Water	0.8	0.2
Woods-Mixed	69.5	21.1
Ultimate Land Use		
Commercial	26.0	7.9
Open Space	4.4	1.3
Residential 1-acre	8.4	2.5
Residential 1/2-acre	127.9	38.8
Residential 1/4-acre	124.0	37.6
Residential 1/8-acre	9.6	2.9
Transportation	29.5	9.0



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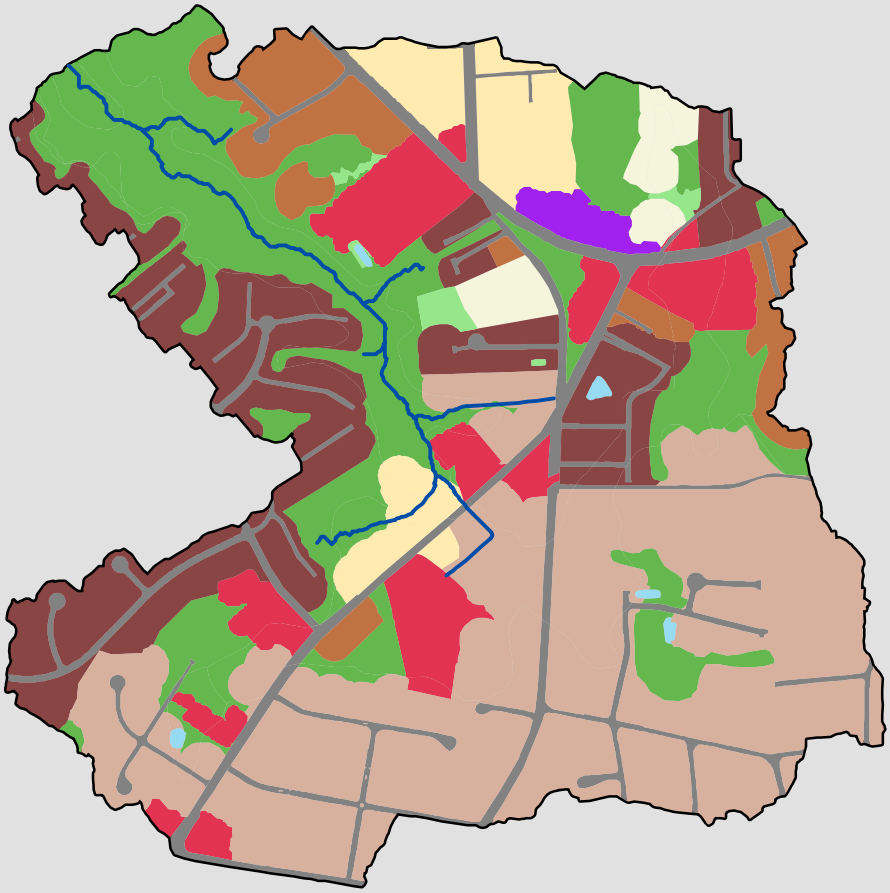

Legend

- 2011 AA County Streams Modified by BayLand
- Project Watershed Delineated by BayLand

2020 Land Cover

- Commercial
- Industrial
- Open Space
- Residential 2-acre
- Residential 1-acre
- Residential 1/2-acre
- Residential 1/4-acre
- Residential 1/8-acre
- Transportation
- Water
- Woods-Mixed

1,000 500 0 1,000 Feet

1" = 1000'

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Rock Creek Stream Restoration
Figure 3 - Existing Land Use

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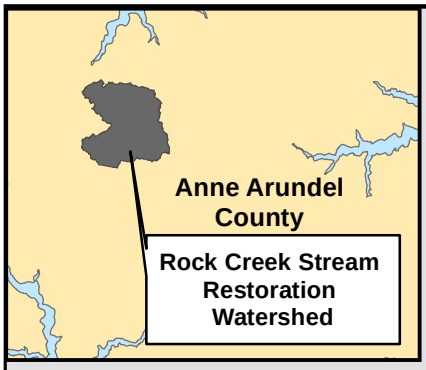

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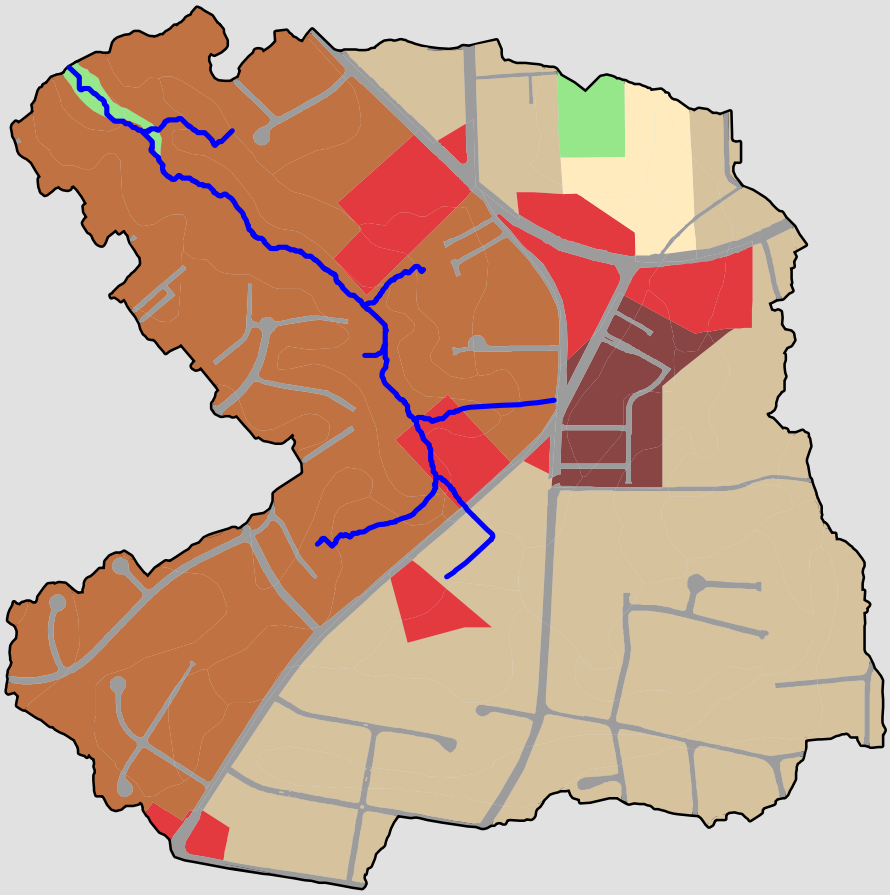

Project Watershed
Delineated by BayLand

2011 AA County Streams
Modified by BayLand

**Ultimate Land Use
(2020 Zoning)**

- Commercial
- Open Space
- Residential 1-acre
- Residential 1/2-acre
- Residential 1/4-acre
- Residential 1/8-acre
- Transportation

1,000 500 0 1,000
Feet

1" = 1000'

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Rock Creek Stream Restoration
Figure 4 - Ultimate Land Use

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2.5.2. Historical Land Use

Land use changes in a watershed can have large impacts on watershed hydrology and channel morphology in stream networks (Bierman, 2005; Miller et al., 1993; Costa, 1975; Knox, 1977; Wolman and Schick, 1967). To develop a broader understanding of former land use influences on the past and ongoing evolution of the Rock Creek channel morphology, a brief investigation of land use history in the vicinity of the Project was conducted.

Agricultural expansion in Anne Arundel County during the 18th century led to deforestation. The absence of soil conservation and management practices led to rapid degradation of agricultural fields due to intensive tobacco farming (Anne Arundel County, 2016). This resulted in significant sedimentation of the local stream channels and floodplains. The later shift to less intensive 'truck farming' coupled with the eventual implementation of soil conservation techniques led to reduced agricultural deposition.

A Maryland Forestry Service map from 1913 shows that Study Area had a predominately forested riparian buffer, inhabited by 3rd class Culled Hardwoods (Baltimore Maryland Geological Survey, 1913). Historic aerial photographs from 1943 and 1952 depict the stream corridor as primarily forested with little residential development within the vicinity of the Study Area, though there were several farms along both Hog Neck Road and Ft. Smallwood Rd to the southeast and northeast, respectively. Housing and development appear in a 1974 photo to the northern, northwestern and southeastern sides of the site though the western side shows little more than small roads through the forested area in the vicinity of what is now Tower Bridge Drive. This condition remains in the 1981 photo, however, dense housing along Tower Bridge Drive appears in the 1994 photo where conditions currently remain similar.

The majority of the development in both of the Project watersheds occurred prior to the implementation of Maryland's SWM Regulations in 1983. Increasing impervious surface in a watershed has been shown to reduce infiltration and evapotranspiration and increase runoff into stream networks (MDE, 2000). The Project has a flashy flow regime due to development occurring prior to modern SWM regulations. The effects of the aforementioned human-induced disturbances including vegetation clearance, logging, agriculture, and urbanization are evident across the Project watersheds.

No evidence of past beaver activity is visible on aerial photography and no narrative accounts of beaver activity were found for the Study Area. Additionally, no beaver activity was noted during field investigations, so it is assumed that beaver damming has had little current impact on the Study Area.

A review of the 1860 Martenet Map of Anne Arundel County and aerial photography dating back to 1943 revealed no evidence of mills or mill dams present along or up gradient of the Study Area. Copies of historic aerial photographs are enclosed in Appendix B.

2.6. Jurisdictional Wetlands and Streams

A wetland delineation was conducted pursuant to the U.S. Army Corps of Engineers (USACE) *1987 Federal Manual for Identifying and Delineating Jurisdictional Wetland* and the *Regional Supplemental to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region, Version 2*, *November 2010*. Delineation field work for the project was completed during April 2023.

Most wetlands delineated for the Project classify as palustrine forested (PFO), although there is some palustrine emergent (PEM) wetland area as well. Most wetlands appear to be the result of groundwater seepage along the valley edges. The total wetland area delineated for the Study Area is summarized in Table 5 and a comprehensive discussion of wetland conditions is included in the Rock Creek Wetland Delineation Report (Appendix C).

Table 5 – Rock Creek Wetland and Stream Delineation Summary	
Wetland Area (ft^2)	38,175
Wetland Area (acres)	0.88
Perennial Stream Length (LF)	3,035
Perennial Stream Area (ft^2)	26,935
Intermittent Stream Length (LF)	641
Intermittent Stream Area (ft^2)	6,566
Ephemeral Stream Length (LF, not regulated)	1,803
Ephemeral Stream Area (ft^2, not regulated)	11,394

Jurisdictional stream limits generally include channels that contain intermittent to perennial flow. From a regulatory perspective, the USACE regulates the lateral extent of stream channels to the 'Ordinary High Water Mark' (33 CFR 328.3(e)). In this region, the 'Ordinary High Water Mark' typically approximates bankfull conditions. Jurisdictional stream limits for the Study Area are based on a combination of detailed geomorphic assessment data as discussed below, topographic survey information and assessment completed during wetland investigations.

2.7. Plant Community Descriptions

Vegetation within the Study Area was broadly characterized for the stream valley and summarized in Table 6. A Forest Stand Delineation was performed to provide consistent assessment and characterization of onsite vegetative communities. Forest plot data is included in Appendix D.

Forests are composed of Piedmont Bottomland Forests in the narrower, upper reaches of the stream valleys within the Study Area. Successional/Modified Palustrine forested areas are generally located along the broader floodplain/terrace areas. The remainder of the Study Area is composed of shrubs and sporadic tree growth with a few areas of intense invasive plant growth dominated by *Alliaria petiolata* (garlic mustard), *Celastrus*

orbiculatus (oriental bittersweet), *Ficaria verna* (lesser celandine) *Microstegium vimineum* (Japanese stiltgrass), *Phragmites australis* (common reed), and *Rosa multiflora* (multiflora rose). Invasive species were also noted in the herbaceous layer of the forest communities. Common invasive species noted include *Alliaria petiolate*, *Berberis thunbergii* (Japanese barberry), *Celastrus orbiculatus, Ficaria verna*, *Hedera helix (*English ivy) and *Lonicera japonica* (Japanese honeysuckle), *Microstegium vimineum*, *Rosa multiflora*.

Table 6 – General Vegetation Summary

Tributary/ Valley Segment	Vegetation Summary
Coastal Plain – Piedmont Bottomland Forest CEGL004418 (F1)	• Area: 4.07 acres Forest density: 180 trees/acre • Coastal Plain – Piedmont Bottomland Forest along the upper ½ of the valley (this stand is entirely outside of the Critical Area) • Mixed forested and no wetland areas; many areas contain ruderal species • Dominant trees include *Platanus occidentalis* (American sycamore), *Juglans nigra* (black walnut), *Nyssa sylvatica* (black gum), *Liriodendron tulipifera* (tulip poplar) and *Liquidambar styraciflua* (sweetgum) • Understory species include *Carya tomentosa* (mockernut hickory), *Cercis canadensis* (eastern redbud) and *Lindera benzoin* (spicebush) • Herbaceous species include *Lorinseria areolata* (netted chainfern), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (poison ivy) and *Viola sororia* (common blue violet) • Invasive and non-native species are denser than in F2, especially in the upper portions and tributaries • Invasive species include *Pyrus calleryana* (bradford pear), *Alliaria petiolata* (garlic mustard), *Celastrus orbiculatus* (oriental bittersweet), *Cerastium fontanum* (mouse-eared chickweed), *Hedera helix* (English ivy), *Hemerocallis fulva* (orange day lily), *Lonicera japonica* (Japanese honeysuckle), *Microstegium vimineum* (Japanese stiltgrass) and *Rosa multiflora* (multiflora rose)
Successional / Modified Palustrine Forest CEGL006832 (F2)	• Area: 4.39 acres • Forest density: 345 trees/acre • Successional / Modified Palustrine Forest along the lower ½ of the valley; about ½ of this stand lies within the Critical Area • Dominant tree species include *Nyssa sylvatica* and *Acer rubrum* (red maple) • Understory species include *Ilex opaca* (American holly) and *Magnolia virginiana* (sweetbay), *Catalpa speciosa* (northern catalpa), *Clethra alnifolia* (coastal sweet

Table 6 – General Vegetation Summary	
Tributary/ Valley Segment	**Vegetation Summary**
	pepperbush), *Lindera benzoin*, *Liriodendron tulipfiera*, *Smilax rotundifolia* (common greenbrier), *Toxicodendron radicans* and *Viburnum prunifolium* (blackhaw) • Herbaceous species include *Boehmeria cylindrica* (small-spiked false nettle), *Carex intumescens* (greater bladder sedge), *Carex stipata* (awlfruit sedge), *Cinna arundinacea* (sweet woodreed), *Dichanthelium clandestinum* (deertongue), *Galium tinctorium* (stiff marsh bedstraw), *Glyceria striata* (fowl managrass), *Geranium maculatum* (wild geranium), *Juncus effusus* (soft rush), *Parthenocissus quinquefolia*, *Persicaria hydropiperoides* (swamp smartweed) and *Viola sororia* • Although present, invasive species are less common than in F1; invasive species include *Berberis thunbergia* (Japanese barberry), *Celastrus orbiculatus*, *Ficaria verna* (lesser celandine), *Lonicera japonica*, *Microstegium vimineum*, *Pyrus calleryana* and *Rosa multiflora*
Mesic Mixed Hardwood Forest CEGL006075 (F3)	• Area 0.33 acres • Recent access addition entirely within the Critical Area • This area is largely a hillslope access area from a neighborhood road • The dominant trees are Quercus falcata (southern red oak) • The understory trees are predominantly *Ilex opaca* • Also present are *Kalmia latifolia* (mountain laurel) and *Vaccinium pallidum* (early lowbush blueberry) • The stand is notable for the relative lack of invasive species and for very little herbaceous ground cover
Brush	• Area: 1.47 acres • As noted above, most brush stands are in the upper and middle portions of the Study Area • These areas are noted for their lack of large trees and the presence of small trees, shrubs, and many ruderal species, such as those mentioned above as well a stand of *Phragmites australis* (common reed)
Maintained Land	• Area: 0.41 acres • Maintained land consists of regularly mown lawn, sidewalks and streets along the access points at Hog Neck Road and Saltwood Glen

Approximately two thirds of the Project is located outside of the Critical Area and one third of the project is located inside of the Critical Area. Vegetative disturbance outside of the Critical Area is subject to the County's Forest Conservation Ordinance and the *Maryland Forest Conservation Technical Manual, Third Edition, 1997*, which will require a 1:1 replacement of all forest impacts. The Project is expected to comply with Forest

Conservation requirements, and a Simplified Forest Stand Delineation (FSD) was completed as part of the schematic design phase of the project. Vegetative disturbance in the Critical Area must comply with State Critical Area Buffer Management regulations. Critical Area compliance will necessitate 1:1 mitigation for disturbance in the Critical Area Buffer and for tree canopy removal. Although 1:1 mitigation for both does result in a net requirement greater than 1:1, it is expected that the Project will comply with Critical Area mitigation regulations.

The FSD was completed in accordance with the *State Forest Conservation Technical Manual, Third Edition* (DNR, 1997). Four communities were identified, two of which are forested. The total forested area is 8.32 acres. A summary of the vegetative areas is provided in Table 7.

Table 7 – Vegetative Areas Summary	
Coastal Plain – Piedmont Bottomland Forest (F1)	4.07 acres
Successional / Modified Palustrine Forest (F2)	4.39 acres
Mesic Mixed Hardwood Forest (F3)	0.33 acres
Brush	1.47 acres
Maintained Land	0.41 acres

Legend

- Study_Area
- Critical Area Boundary
- FSD Plots

Vegetative Communities

- Coastal Plain - Piedmont Small Stream Floodplain Forest (4.07 Ac)
- Coastal Plain Streamside Forest (4.39 Ac)
- Northern Coastal Plain Piedmont/Mesic Forest (0.33 Ac)
- Brush (1.47 Ac)
- Maintained Land (0.41 Ac)

N

Matchline Refer to Figure 5b

PLOT 3

PLOT 4

NEWCOMB COURT

HANDEL CT

WOLSEY COURT

HOG NECK ROAD

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Note: All area is outside of Critical Area on this sheet.

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1" = 100'

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Figure 5a
Rock Creek
Stream Restoration
Vegetative Communities

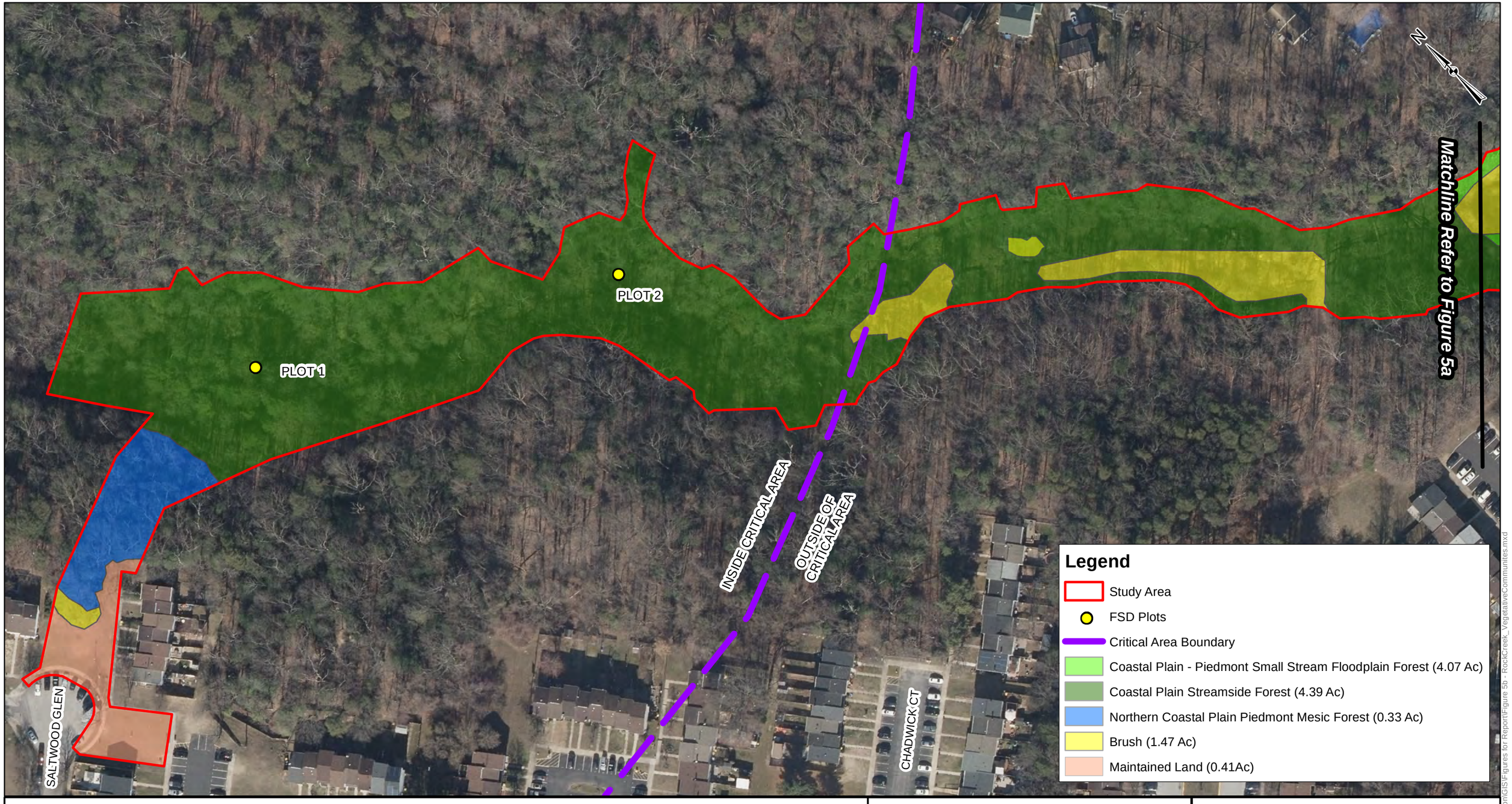

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Figure 5b
Rock Creek
Stream Restoration
Vegetative Communities

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2.8. Rare, Threatened and Endangered Species

Rare, Threatened and Endangered (RTE) species are protected in Maryland by the U.S. Fish and Wildlife Service (USFWS) and the Maryland Department of Natural Resources (DNR). The DNR list of protected species is generally more comprehensive and includes both state and federally protected species. The current DNR list of RTE species identifies 519 protected animal species and 741 protected plant species in Maryland (DNR, 2021). For reviews of RTE records in the project vicinity, inquiries were submitted to USFWS in June 2023 and DNR in May 2023. Inquiries were updated in April 2025 for a review of RTE records for the Study Area.

USFWS maintains the Information for Planning and Conservation (IPaC) website for federal RTE queries. The IPaC inquiries did not return any known RTE records or critical habitats expected to be impacted by the project, however, the inquiry identified *Myotis septentrionalis* (Northern Long-Eared Bat) as a federally endangered species. USFWS also lists *Perimyotis subflavus* (Tricolored Bat) as proposed endangered and *Danaus plexippus* (Monarch Butterfly) as proposed threatened.

The Determination Key for Northern Long-Eared Bats and Tricolored Bats was completed for the Project on May 16, 2025. The Determination Key results showed a "may affect - not likely to adversely affect" determination for *M. septentrionalis*. The result does require further coordination between USFWS and USACE, which will be completed as part of the Joint Permit Application review when a USACE project reviewer is assigned. The agency representative can log into IPaC and enter the record locator 872-162162435 for concurrence verification. The Determination Key results for *P. subflavus* return a "No effect" determination. As such no further *P. subflavus* review is required at this time. Since *D. plexippus* is listed as a candidate species, there are currently no section 7 requirements. A copy of the IPaC consultation documents dated April 16, 2025 and May 16, 2025 are enclosed in Appendix D.

A written inquiry was submitted to the DNR Wildlife and Heritage Service requesting information on records of RTE species in the project vicinity. DNR's review determined that they have no records of protected plant or animal species within the Study Area. DNR GIS data indicates that the Study Area contains habitat for Forest Interior Dwelling Species (FIDS). FIDS are bird species that require large, forested areas and riparian corridors for breeding success. Many FIDS populations are in decline and are thus in need of conservation. FIDS generally breed during spring and summer. Along the lower reach of the project in the Critical Area, FIDS impacts are regulated and require time of year construction restrictions to minimize direct impact to nesting FIDS. The upper reach of the project is located outside of the Critical Area; and therefore, time of year restrictions are not required in this area.

The Project will incorporate post-construction reforestation and improved habitat diversity. As a result, there should be net improvement in FIDS habitat. A copy of the DNR review response dated May 13, 2025, is enclosed in Appendix D.

2.9. Cultural Resources

The Maryland Historical Trust (MHT) serves as the state level agency responsible for the preservation of historic and cultural resources. Federal and state permit reviews require consultation with MHT to ensure that proposed projects will not have an adverse effect on historic sites and/or cultural resources. Therefore, a project review request was submitted to MHT in May 2023. A review of the Maryland Inventory of Historic Properties, National Register of Historic Properties, and MHT Preservation Easements GIS data layers was completed in preparation of the request. These data layers are maintained by the Maryland Environmental Resource and Land Information Network (MERLIN, 2023). This preliminary review did not identify any project specific conflicts, although one Maryland historic site does exist in the vicinity of the Study Area and this site was noted on the review request form. The MHT review response dated May 25, 2023, determined that the Project will not have an adverse effect on historic properties or cultural resources (Appendix D).

3. REACH DESCRIPTION

On June 7, 2023, an initial site walk and visual assessment was completed to identify specific areas of concern and determine distinct project reaches. The individual reach breaks were based primarily on Rosgen Stream Classification, though significant changes in hydrology, changes in channel slope, connection to the floodplain, channel width, bed material, sinuosity, and riparian vegetation were also considered. Four project reaches were identified for assessment and design efforts, RC-1 through RC-4. The project reaches are shown in Figure 6. Brief descriptions with photographs of each project reach are provided below and additional photographs of each reach are provided in Appendix E.

3.1. Rock Creek Upstream Conditions

Upstream of the Study Area, there are approximately 500 linear feet (LF) of stream that receives discharge via storm drain infrastructure from the surrounding residential and commercial development and roadways. The upstream conditions are highly confined and surrounded by private property. The upstream extents are discharged to the Study Area via a culvert under Hog Neck Road

3.2. Rock Creek Project Reaches

3.2.1. Rock Creek Reach 1 – RC-1

RC-1 is a single-thread, ephemeral channel (Rosgen Stream Classification E5; for more information, see Section 9.5) that originates at a culvert at Hog Neck Road that consists of an 8-foot by 3-foot reinforced concrete pipe (RCP) and a 36-inch RCP (Photo 1). RC-1 extends downstream approximately 640 LF.

RC-1 does not exhibit high amounts of incision compared to the other Project reaches but has evidence of instability including two headcuts and minor erosion. There is previously placed large riprap at the headcut locations (Photo 2). The banks range from 0.5 to 2.5 feet high and are predominately composed of sandy material (Photo 3).

Approximately 220 LF downstream, an ephemeral channel from a 53-inch by 34-inch RCP storm drain discharges on the left bank (Photo 4). A second ephemeral channel from twin 53-inch by 34-inch RPC storm drain discharges on the right bank approximately 555 LF downstream (Photo 5).

Photo 1 – Culvert at Hog Neck Road

Photo 2 – Riprap placed in headcuts

Photo 3 – RC-1 facing downstream

Photo 4 – 53” x 34” RCP Storm Drain

Photo 5 – Twin 53” x 34” RCP Storm Drain

3.2.2. Rock Creek Reach 2 – RC-2

RC-2 is a single-thread ephemeral, intermittent and perennial channel (Rosgen Stream Classification F5; for more information, see Section 9.5) that originates at the downstream end of RC-1 and extends downstream approximately 1,390 LF. The upstream end of RC-2 is ephemeral for approximately 65 LF and then is intermittent for approximately 575 LF to the confluence with RC-4 at which it becomes perennial for the remainder of the reach. RC-2 is incised with raw, actively eroding banks (Photos 6 and 7). Bank heights range from three to 10 feet, and the banks are primarily composed of sandy soil.

An ephemeral channel, originating at 18-inch and 21-inch corrugated metal pipe (CMP) storm drain pipes, discharges into RC-2 approximately 365 LF downstream on the left bank (Photo 8). An outfall channel from an existing stormwater facility discharges on the right bank approximately 895 LF downstream. The stormwater pond and outfall are scheduled to be repaired by others. A 12-inch CMP storm drainpipe discharges on the left bank at the very downstream limits of RC-2 (Photo 9).

There are multiple instances along RC-2 where the sanitary sewer line and manholes are exposed (Photos 10 and 11).

Photo 6 – Typical channel section along RC-2

Photo 7 – Eroding banks along RC-2

Photo 8 – 18" CMP storm drains

Photo 9 – 12" CMP storm drain

Photo 10 – Exposed sanitary sewer manhole

Photo 11 – Exposed sanitary sewer manhole

3.2.3. Rock Creek Reach 3 – RC-3

RC-3 is a single-thread, perennial channel (Rosgen Stream Classification E5; for more information, see Section 9.5) that originates immediately downstream of RC-2 and extends approximately 1,675 LF downstream to the Study Area limits. Although RC-3 exhibits less incision than the other Project Reaches, there is still evidence of instability throughout the reach including bank erosion, downed trees, irregular planform geometry and knickpoints (Photos 12 and 13). Bank heights range from one to three feet and are predominately composed of sand.

A stable tributary, that originates from a private SWM pond off Gallatin Way, discharges on the right bank of RC-3 approximately 1,000 LF downstream (Photo 14).

Photo 12 – Typical section at RC-3

Photo 13 – Irregular planform at RC-3

Photo 14 – Stable tributary

3.2.4. Rock Creek Reach 4 – RC-4

RC-4 is a single-thread, ephemeral channel (Rosgen Stream Classification F5; for more information, see Section 9.5) that originates at a 27-inch RCP outfall (Photo 15) west of Ward Road and extends 370 LF to the confluence with RC-2. RC-4 is highly incised with excessive bank erosion (Photos 16 and 17). The bank height ranges between six and 12 feet and is primarily composed of sand.

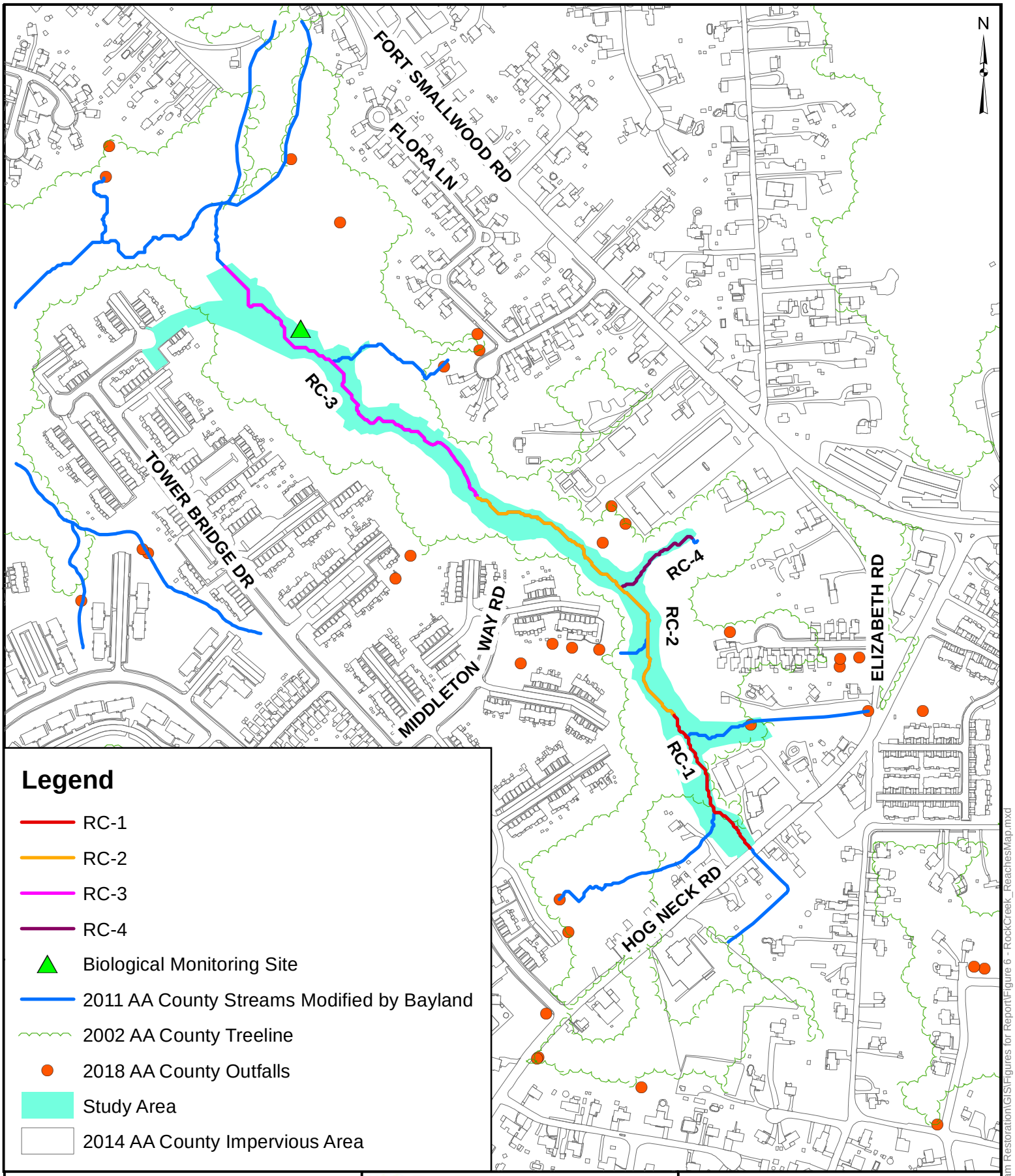
There is a sanitary sewer line that runs perpendicular to the channel at the downstream end that is exposed (Photo 18).

Photo 15 – Upstream limits of RC-4

Photo 16 – Eroding banks along RC-4

Photo 17 – Torteous meander at downstream end of RC-4

Photo 18 – Exposed sanitary sewer line



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Rock Creek Stream Restoration
Figure 6 - Reaches Map

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4. CONSTRAINTS ANALYSIS

4.1. Environmental Screening Results

A limited environmental due diligence review was completed for the Project. The review included an American Society of Testing and Material (ASTM E-1527-13) compliant radius search through Environmental Data Resources Incorporated (EDR) to access readily available government database records and mapping sources to determine the likelihood for potential environmental conditions resulting from the presence and/or release of regulated substances. Examples of regulated substances include petroleum-based products, lead-based paints, products containing volatile organic compounds, and asbestos. A typical non-exhaustive list of records included in this review are summarized in Table 8. This review also included a review of Sanborn Fire Insurance Maps, and historic aerial photography. These records were reviewed in conjunction with a field assessment to review site conditions to determine if any Recognized Environmental Conditions (REC) are present. REC's are defined in ASTM E-1527-13 as:

"The presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment."

Table 8 – Typical Databases with Sites Identified in the Maryland Area

Federal/State	List Acronym	Database Description
Federal	NPL	National Priority List (Superfund)
	CERCLIS	Comprehensive Environmental Response, Compensation & Liability Information System
	RCRA	Resource Conservation and Recovery Act
	ERNS	Emergency Response Notification System
	BROWNFIELDS	Local Brownfields site
State	SHWS	Notice of Potential Hazardous Waste Sites
	SWF/LF	Permitted Solid Waste Disposal Facilities
	OCPCASES	MDE Oil Control Program Cases
	HIST LUST	MDE Leaking Underground Tank Recovery sites prior to 1999
	UST	Registered Underground Storage Tanks
	AST	Permitted Aboveground Storage Tanks
	ENG CONTROLS	Sites with caps, liners, etc. implemented to eliminate substances from impacting the environment or human health
	MD Lead	Maryland Lead Testing database

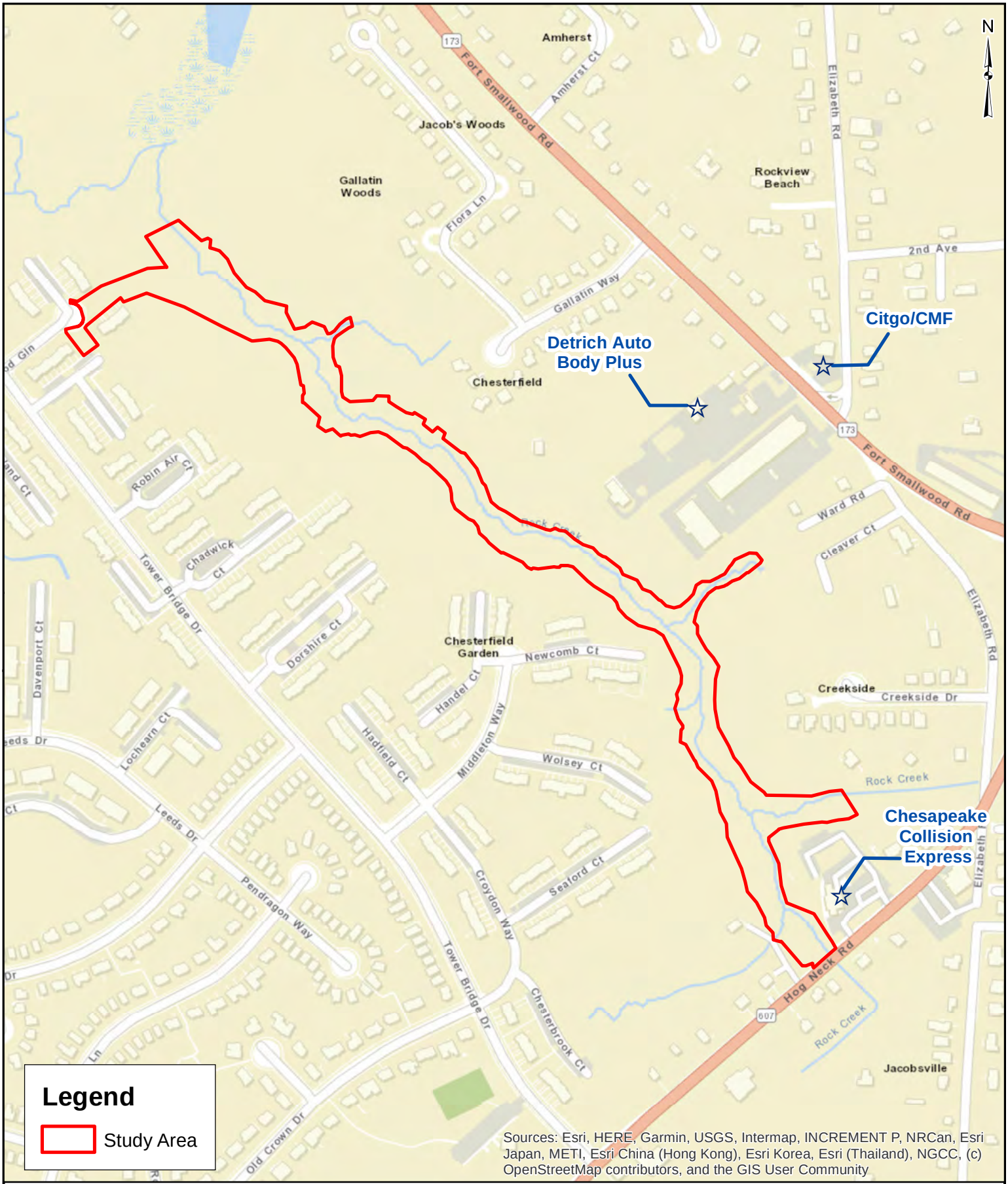
The Study Area was defined with a spatially referenced polygon of the stream valleys. Upon submittal, several offset radii were generated for records search criteria. Records with the applicable search criteria were then mapped relative to the Study Area and

summarized in report form. The report includes both the mapping and text summaries of each site, its distance from the subject area and information regarding the specific database or incident. Particular attention was given to the Study Area, properties immediately adjacent to it, and key properties such as gas stations that exist in the drainage area to the Project.

The Project site is surrounded by mixed residential, forest, and commercial areas. No records or field evidence of potential environmental conditions were identified within the Study Area. Three property citations were identified in proximity to the Study Area (Figure 7). The nearest citation is Chesapeake Collision Express located at 8110 Hog Neck Road, which is directly adjacent to the Rock Creek Study Area. The facility is listed on two databases. The first listing is on the RCRA database as a Small Quantity Generator of hazardous waste. No violations or evaluation actions are identified in the report. The OCPCASES database also lists the Chesapeake Collision Express for a surface spill case in 2021. This listing is identified as 'Closed' with no reported release or cleanup. The next listing is identified as Detrich Auto Body Plus, located at 8886 Fort Smallwood Road. This location is approximately 480 feet from the project limit but within the drainage area to the Project site. This site is also on the RCRA database as a former Small Generator Quantity of hazardous waste. Dates are not identified when waste was generated, but the report does state that no violations or evaluation actions were found. Several citations are listed under Citgo and one at Carroll Motor Fuels (CMF) that is located at 8845 Fort Smallwood Road which is approximately 620 feet from the project limits but also within the project drainage area. Under the UST database, Citgo/CMF is identified as having four 'Currently In Use' tanks and six 'Permanently Out Of Use' underground storage tanks. Citgo/CMF is also listed four times under the OCPCASES database. All four cases are 'Closed' with two having no releases or required cleanups, and the other two did not have any releases or cleanups reported. All OCPCASES are at least 18 years old and have no stated monitoring or remediation requirements. Given this review, these facilities are considered *de-minimis* environmental conditions for the proposed Project.

No Sanborn Maps exist for the Project area. The historic aerial photography review included the following years: 1943, 1952, 1974, 1981, 1994, 2007, 2011, and 2018. Select years are provided in Appendix B. As discussed in Section 2.5.2, the site has been forested since at least the early 1940s. Land to the west of the site was previously forested but was developed in the 1980s for residential use. Land to the northeast of the site was agricultural into the 1960s when it was developed for residential use as well. No discernible features that would indicate RECs were noted on aerial photography. Field investigations yielded no evidence of large debris piles, drums, or other indicators of hazardous material presence.

Based on this review, no RECS were identified within the Study Area. Given the status of the above listings and their offsite locations, they are not anticipated to negatively impact the subject site. If additional investigation is necessary, a full Phase I Environmental Site Assessment should be conducted.



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Rock Creek Stream Restoration Figure 7 - Due Diligence Sites

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4.2. Utilities and Infrastructure

BayLand utilized Anne Arundel County's online watershed application and engineering record drawings to review existing utilities and infrastructure within the Study Area that have the potential to influence the design approach and implementation cost. BayLand completed a topographic survey from April to May 2023 and January 2025 that included all utilities/infrastructure within the Study Area such as roadways, ditches, storm drains, storm outfalls, stream channel systems, septic systems, wells or gauges, etc., in order to identify potential conflicts early and avoid delays during construction.

4.2.1. Sanitary Sewer Infrastructure

There is sanitary sewer (SS) infrastructure throughout the stream valley that runs adjacent to and crosses the Project reaches. A sanitary sewer system runs parallel to RC-1, RC-2 and RC-3, crossing the stream in multiple locations. According to as-built plans, Record Drawing 17-030-D, the sewer line was constructed in 1984 and consists of 10- and 12-inch sewer lines. According to as-built plans, Record Drawing No 26-781, a sanitary sewer system was added to the main line and installed in 1997 and consists of eight-inch sewer lines. In some instances, the limits of earthwork operations may need to be restricted to avoid impacting the sanitary sewer infrastructure.

BayLand observed and surveyed multiple locations within the Study Area where SS pipes and manholes are exposed. These locations are depicted on the Existing Conditions and Demolition Sheets in the Construction Drawings (Appendix A). Considering the observations and surveys, loading computations will be performed during a later design phase to ensure there is adequate cover overtop of SS pipe crossings during construction, and if needed, specify a maximum loading rate over top of the crossings. Additionally, the proposed design will address areas with exposed SS pipes and manholes by proposing backfill in accordance with the County's standard specifications.

The proposed design also includes increasing the 100-year water surface elevation and as a result, SS manholes may require riser structures to increase top elevations above the proposed 100-year water surface elevations. It is recommended that Anne Arundel County Bureau of Utility Operations (BUO) perform field inspection of the manholes and provide recommendations.

4.2.2. Storm Drain Outfalls

As described in Section 3, there are five storm drain outfalls within the Study Area. Most of which are in good to fair condition with stable outfall channels. However, each storm drain outfall will be stabilized and modified as needed to safely convey flows to the Project reaches and reduce erosion.

4.3. Property Ownership/Easements & Site Access

A desktop and field investigation were conducted to determine current property ownership and identify potential access routes in areas where restoration work is proposed. Existing property boundaries and easements were delineated using best available plat and deed records, and property corner survey conducted by BayLand in 2023. Since most of the restoration work will occur on private property, a temporary construction easement and permanent drainage easements will be required.

Access for the project is proposed from Hog Neck Road and Saltwood Glen.

4.4. FEMA Floodplain/Hydrologic Trespass

Per the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) map number 24003C0069F (effective February 18, 2015) the Project limits are not mapped within a special flood hazard area (SFHA) subject to inundation by the one percent annual chance flood.

4.5. Forest Conservation Priority Areas

The Maryland State Forest Conservation Manual (DNR, 1997) and Anne Arundel County Forest Conservation Code identify priority retention areas as forests that contain sensitive features or species that provide significant ecological or historical value. Specific priority retentions areas are forests that contain:

- 100-year nontidal floodplains
- Intermittent and perennial stream channels
- Stream buffers
- Wetlands
- Slopes greater than 15 percent
- Forests connecting greenway corridors
- RTEs and FIDS habitat
- Historic or cultural resources
- Specimen trees (trees having a diameter DBH of 30 inches or greater)

The Study Area varies from approximately 18 to 178 feet wide on either side of the stream channels. At a minimum, Anne Arundel County stream buffers are 100 feet. The Study Area also contains wetland areas along the path. As noted in Section 2.8, no critical RTE habitat and historic/cultural resources were identified by DNR or MHT. However, the project area is located within a +75-acre forested area, which DNR has identified as potential FIDS habitat. As a result, forested areas within the Study Area should be designated as a forest conservation priority area. The Project is anticipated to be eligible for the forest conservation exemption for stream restorations, which will not require code modifications for disturbance to priority retention areas. However, it should be noted that any tree clearing resulting from the proposed restoration is anticipated to be replanted for the benefit of environmental resources and ecological uplift.

4.6. RTE and In-Stream Work Restrictions

As discussed in Section 2.8, RTE review results did not identify any known occurrences of critical habitat in the vicinity of the Study Area, but DNR review suggests that the study area may contain FIDS habitat. FIDS breeding and rearing of young generally occurs from April through August. Should the County decide to voluntarily conform to FIDS conservation recommendations, avoiding construction during this timeframe will minimize direct disturbance to any FIDS species.

MDE classifies all streams into one of eight stream “Uses.” Stream use designations are defined based on known and expected aquatic life habitat requirements as well as public water withdrawal sources. Each classification has an annual closure period where in-stream activity is prohibited to minimize potential impact on aquatic life movements and spawning.

According to the Maryland Department of Environment Designated Uses Maps, all reaches within the Study Area are designated as “Use I” waters (MDE, 2023). “Use I” designated streams are described as Water Contact Recreation and Protection of Nontidal Warmwater Aquatic Life. The closure period for “Use I” designated waters is March 1 through June 15, inclusive of any year.

5. HABITAT AND BIOLOGICAL ASSESSMENT

5.1. Methodology

The County contracted Versar, Inc., in 2009 to conduct baseline biological and habitat assessments at a site within the Study Area, PTB-909-T-2009, (Figure 6) (AACO, 2009. The monitoring was conducted before restoration work commences to provide a baseline of biological conditions, to evaluate habitat conditions, and to understand potential geomorphic instability within each reach of interest (AACO, 2009).

Biological monitoring was conducted in accordance with Maryland Department of Biological Stream Survey (MBSS) protocols for spring sampling. Aquatic habitat was evaluated using the EPA Rapid Bio Assessment Protocol (RBP) for low-gradient streams and parameters assessed in the Maryland DNR Physical Habitat Index (MPHI) for Coastal Plain streams.

5.2. Results

Table 9 – Habitat and Biological Assessments

Site	MPHI		RBP		BIBI	
PTB-909-T-2009	79.24	Partially Degraded	105	Partially Supporting	2.14	Poor

Results from the sampling are found in Table 9. The MPHI score is based on remoteness, percent shading, epifaunal substrate, instream habitat quality, number of instream woody debris and rootwads, and bank stability (Paul et. al., 2003). The sample site within the Study Area (PTB-909-T-2009) had a score corresponding to partially degraded, receiving low scores in epifaunal substrate, bank stability, and instream habitat quality.

The RBP score was determined from a variety of parameters including epifaunal substrate/available cover, pool substrate characterization, pool variability, sediment deposition, channel flow status, channel alteration, channel sinuosity, bank stability, vegetative protection, and riparian zone width (Barbour et. al., 1999). The sample site within the Study Area had a RBP score corresponding to partially supporting, receiving low scores in sediment deposition, pool substrate characterization, and pool variability.

The benthic index of biological integrity (BIBI) score was poor at the sample site within the Study Area. The sample is dominated by worms (*nais*) and received low scores in EPT taxa and number of ephemeroptera.

The results of the assessments support the need for a restoration project that could benefit aquatic habitat, increase biodiversity, and improve water quality.

6. HYDROLOGIC ANALYSIS

6.1. Methodology

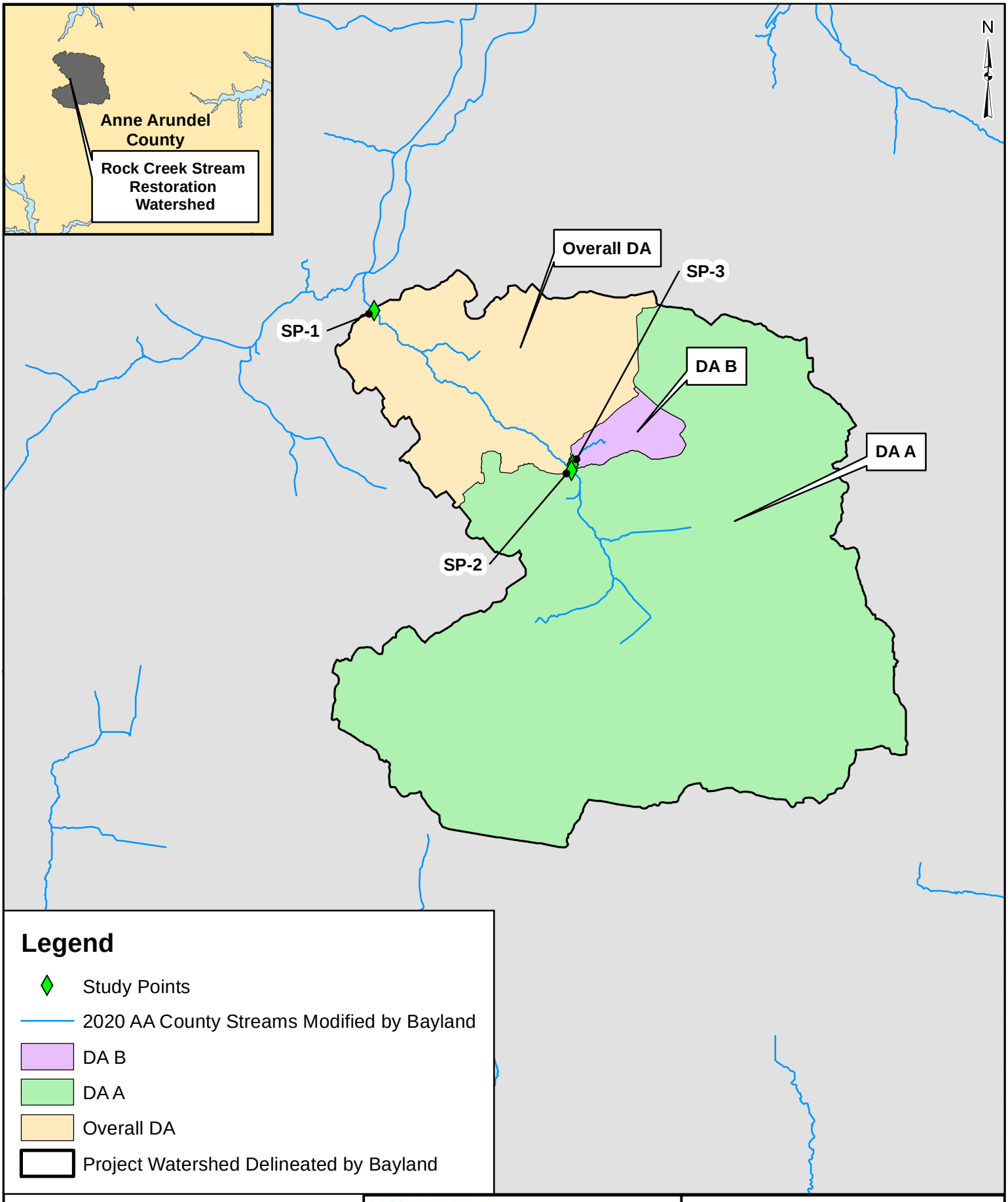
In order to assess the existing morphological state of a stream, it is essential to determine the current discharge regime. Estimates of volume of various frequency flood discharges, as well as the horizontal and vertical extent of flood prone areas are an essential part of restoring stream stability. For the Project, estimates of hydrology were based largely upon hydrologic modeling.

The estimation of the hydrologic parameters required for analysis of rainfall simulations was based upon National Resource Conservation Services' (NRCS) methodologies. There are three primary hydrologic parameters required to describe the runoff characteristics including: drainage area size (DA), runoff curve number (RCN), and the time of concentration (Tc). The methodology used to develop these parameters was NRCS's Urban Hydrology for Small Watersheds, Technical Release No. 55, 2nd Edition (TR-55). The estimation of stormwater runoff resulting from a simulated rainfall event is based upon NRCS's Project Formulation - Hydrology, Technical Release No. 20 (TR-20).

6.2. Development of Hydrologic Inputs

The Project watershed was divided into two subdrainage areas using two study points (Figure 8). The study points correspond with hydrologically significant areas, such as junctions and outlets, and were selected to sufficiently characterize the hydrologic regime at the project reaches. A study point was also placed at the downstream project limits for the Overall Project watershed.

GISHydro NXT software (UMD, 2018) was initially utilized to delineate the overall project watershed. Since GISHydro NXT is based on 30-meter resolution digital elevation models, the drainage area was manually verified using Anne Arundel County 2020 topography (1:2400) and edited as appropriate.



Legend

- Study Points
- 2020 AA County Streams Modified by Bayland
- DA B
- DA A
- Overall DA
- Project Watershed Delineated by Bayland

1,000 500 0 1,000 Feet

1" = 1,000'

Bay Land Consultants & Designers, Inc.
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Rock Creek Stream Restoration
Figure 8 - Drainage Areas Map

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A RCN was developed for each drainage area. The RCN reflects the runoff potential for each sub-drainage area and is developed from cover (i.e. land use) and soil type. Since the watershed is built-out, existing land use conditions were utilized. Existing land use data was compiled from published data including 2017 GIS layers from Anne Arundel County's GIS Office, and manually updated by BayLand to more accurately reflect current land use based on 2020 Anne Arundel County aerial imagery. The land use matrix was broken down into 10 land use categories which yield specific ratings for percentage of impervious cover when paired with hydrologic soil group (HSG) classifications. Soils data was obtained from the USDA-NRCS Web Soil Survey which classifies soils according to the four hydrologic soil groups that range from type "A" (high infiltration rates, low runoff) to type "D" (low infiltration rates, high runoff). The HSGs that comprise the sub-drainage areas are listed in Table 10 and shown in Figure 9.

Table 10 – HSG Coverage

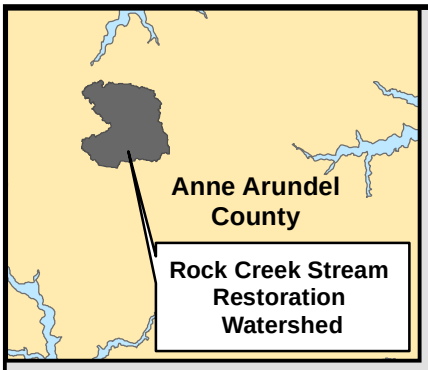
Drainage Area	A (Acres)	A (%)	B (Acres)	B (%)	C (Acres)	C (%)	D (Acres)	D (%)
A	203.9	78.8	0.0	0.0	52.5	20.3	2.4	0.9
B	7.0	96.5	0.0	0.0	0.3	3.5	0.0	0.0
Overall	256.9	77.9	0.0	0.0	68.9	20.9	4.1	1.2

Additionally, a time of concentration (Tc) was developed for each drainage area. The Tc is the time needed for water to flow from the hydrologically most remote point in a watershed to the watershed outlet. It is a function of topography, geology, and land use within the watershed.

The drainage areas, along with the corresponding RCN and Tc, are shown below in Table 11. Supporting computations for the development of the RCN and Tc can be found in Appendix F.

Table 11 – Drainage Area Characteristics

Drainage Area	Area (Acres)	Area (Square Miles)	RCN	Tc (Hours)
A	258.8	0.404	66	1.092
B	7.3	0.011	58	0.341
Overall	329.9	0.515	66	1.123



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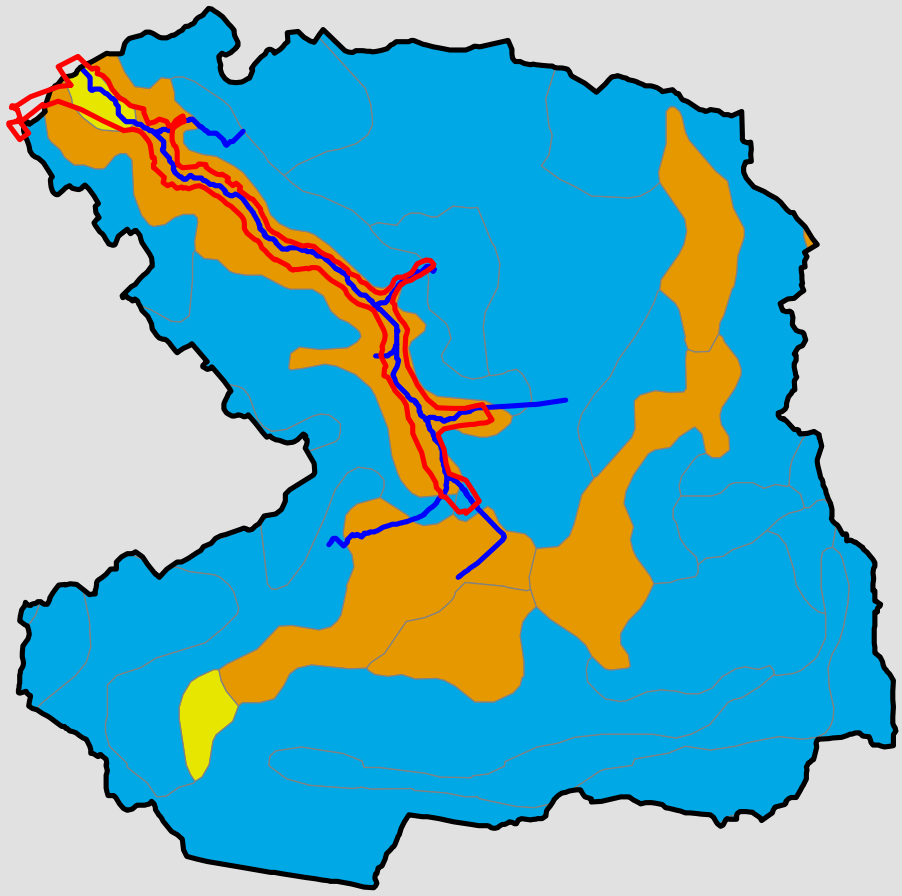

Study Area

Project Watershed Delineated by BayLand

2011 AA County Streams Modified by BayLand

2022 NRCS SSURGO Hydrologic Soil Group

A

C

D

1,000 500 0 1,000 Feet

1" = 1,000'

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Rock Creek Stream Restoration
Figure 9 - Soils Map

P:\5_20201_Rock Creek Stream Restoration\GIS\Figures for Report\Figure 9 - RockCreek_SoilsMap.mxd

6.3. Hydrologic Analysis

WinTR-20 modeling was used to determine direct runoff to each study point. The Maryland Hydrology Panel (2020) recommends that if the total Tc is less than six hours then the six-hour or 12-hour storm may be used for the 1-, 2-, 5-, and 10-year storm events. Since the total Tc for the overall drainage area is less than 6-hours, the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 12-hour rainfall distribution was used to model the 1-year through 10-year storm events. The 25-year through 100-year used the 24-hour rainfall distribution. An antecedent runoff condition (ARC) of two was used to represent average surface moisture prior to the rainfall event. The resulting peak discharges predicted by WinTR-20 are provided in Table 12.

Table 12 – WinTR-20 Peak Discharges Existing Conditions

Study Point	1-YR (cfs)	2-YR (cfs)	5-YR (cfs)	10-YR (cfs)	25-YR (cfs)	50-YR (cfs)	100-YR (cfs)
SP-1 (Overall DA)	16.5	34.6	71.8	107.8	213.7	279.6	351.1
SP-2 (DA-A)	13.0	27.4	56.8	85.2	169.7	221.2	277.9
SP-3 (DA-B)	0.1	0.5	1.5	2.7	6.6	9.1	11.7

6.4. Calibration

Standard hydrologic practice dictates that deterministic models, including WinTR-20, be calibrated where sufficient actual, and measured rainfall and runoff data are locally available. When data is not available, regional regression equations derived from USGS stream flow data may be used as a basis to calibrate the model (MD Hydrology Panel report, 2020).

A search of USGS stream gages within the Project vicinity did not reveal any active stream gages. The 2020 Maryland Hydrology Panel Report Appendix 3 (2022) Western Coastal Plain Fix Regional Regression (FRR equations) were developed from 23 USGS gage stations with drainage areas ranging from 0.96 to 350.21 square miles, impervious area ranging from 0.0 to 36.8 percent, and percent A soils ranging from 1.7 to 85.2 percent. Considering that the 0.515 square mile Project drainage area is outside of the lower limit of drainage areas used to develop the FRRs, it was determined that the FRRs are not suitable to calibrate the model.

7. BANKFULL DISCHARGE

7.1. Methods

Channel forming or dominant discharge is the discharge that transports the greatest quantity of sediment over time and results in the average morphological characteristics of the channel. Bankfull discharge (Q_{bf}) is utilized in the Rosgen stream classification system as a surrogate for dominant discharge, and its calculation is critical to accurately determine the Rosgen stream type. Dominant discharge or Q_{bf} can be determined from the following four methods: effective discharge (Q_{eff}), bankfull field indicator discharge (Q_{fi}), discharge of a certain recurrence interval (Q_{ri}), typically the 1- to 2-year event, and regional curves relating bankfull discharge to drainage area (Q_{rc}). Each of the four methods was considered, and those applicable to the project reaches were utilized to estimate Q_{bf}. These estimates were compared and cross-checked against each other to reduce uncertainty in the final Q_{bf} value.

Q_{eff} determination requires a flow duration curve with at least 10 years of data at 15-minute intervals on small, flashy streams (Biedenharn et al., 2000). There are no USGS stream gage stations within the vicinity of the project, therefore, this method was not utilized.

Q_{fi} is determined utilizing field indicators identified during the geomorphic assessment. Field bankfull indicators were not identified in any of the reaches due to the degraded nature of the project reaches.

Recurrence interval discharges (Q_{ri}) for the 1- and 2-year storm events were calculated using the WinTR-20 hydrologic model.

There are several published regional curves relating bankfull discharge to drainage area (Q_{rc}). Curves with drainage area characteristics, such as physiographic region and amount of impervious area, similar to that of the project watershed, were compared to predict bankfull discharge. The USFWS Western Coastal Plain regional curves (McCandless, 2003) were developed using 14 project reaches throughout the Coastal Plain hydro-physiographic province with drainage basin areas ranging from 0.3 to 113.0 square miles and the imperviousness of the watersheds draining to the reaches ranging from 0 to 17.5 percent. The USFWS Western Coastal Plain regional curve was used to determine the bankfull discharges in the project reaches.

A comparison of the methods utilized to determine Q_{bf} is provided in Table 13.

Table 13 – Bankfull Discharge Estimates

Reach	Q_{ri} 1-year/2-year (cfs)	Q_{rc} USFWS Western Coastal Plain Regional Curve (cfs)
RC-1	13.0/27.4	16.2
RC-2	16.5/34.6	19.3
RC-3	16.5/34.6	19.3
RC-4	0.1/0.5	1.2

7.2. Results

There is ample literature suggesting that the recurrence interval of bankfull discharge in the Coastal Plain is less than one year (Sweet and Geratz, 2003; Smoot et al., 2015). Considering that WinTR-20 is not a good predictor of discharges associated with sub annual recurrence intervals, it was determined that the USFWS Western Coastal Plain Regional Curve provides the most accurate estimate of bankfull discharge in the absence of any reliable field bankfull indicators Therefore, Q_{rc} from the USFWS Western Coastal Plain Regional Curve was used as Q_{bf} for all project reaches.

8. GEOTECHNICAL ANALYSIS

8.1. Methods

Nine soil borings, spaced approximately 500 linear feet apart, were obtained along the left and right banks of the project reaches. Soil boring locations are shown on the Existing Conditions and Demolition sheets of the Rock Creek Stream Restoration Construction Drawings (Appendix A).

Manually operated augers were used to collect soil profiles to an average depth of five feet below existing grade where possible. Each soil layer identified in the soil profile and on the soil boring logs was visually classified in the field according to the United Soil Classification System (USCS). Select samples were chosen as representative of recurring layers across the project site and were laboratory tested to confirm field visual classifications. Laboratory analysis included sieve analysis, Atterberg limits tests, and soil moisture content analysis. Bulk density samples were collected in-situ using a density drive sampler and were transported to BayLand in sealed drive rings. Bulk density samples were analyzed in the laboratory for soil moisture content and soil bulk density. Additionally, composite soil borings were sent to a laboratory for nutrient concentration analysis to aid in the determination of pollutant loading rates.

8.2. Results

The results of the soil boring analyses are provided in Table 14 and Appendix G.

Table 14 – Soil Classification

Soil Sample Number	Depth of Sample (ft)	Moisture Content (%)	Bulk Density (lbs/ft^3)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Percent Passing No. 200 Sieve	Classification
B-2	2.0'-7'	N/A	90.52	NV	NP	NP	8.0	Orange poorly-graded sand with silt (SP-SM)
B-4	3.0'-6.0'	N/A	112.99	25	18	7	68.1	White sandy silty clay (CL-ML)
B-7	0.5'-1.5'	N/A	87.40	NV	NP	NP	10.8	Brown poorly-graded sand with silt (SP-SM)
B-8	0.5'-1.5'	N/A	97.39	N/A	N/A	N/A	N/A	Brown/gray poorly-graded sand with clay (SP-SC)
B-9	1'-8'	N/A	92.39	N/A	N/A	N/A	N/A	Tan poorly-graded sand (SP)

Based on the USCS classification, the project area features predominantly sandy soils. The geotechnical investigation suggests that onsite soils are sufficient material/composition to be reused as fill.

9. GEOMORPHOLOGY

A preliminary geomorphic assessment and survey was conducted at the Study Area in June 2023 to document the existing conditions and provide baseline data for the restoration design. The field data collection activities were based on the Rosgen methodologies described in Applied Fluvial Morphology (Rosgen, 1996) and on the data collection methods described in Stream Channel Reference Sites: An Illustrated Guide to Field Technique (Harrelson et al., 1994).

9.1. Longitudinal Profile

Field run topographic data was utilized to determine longitudinal profiles through each reach and characterize the slope and morphology of the stream. The field run topographic survey included recorded bed elevations, water depths, bed features along the thalweg and the top of bank in each reach.

9.2. Cross Sections

Field run topographic data was utilized to determine a representative cross section for each project reach, to determine the channel dimensions and hydraulic characteristics of the stream channel, and for use in Rosgen stream type classification (hereafter referred to as the classification riffle). Data analysis included estimation of bankfull cross-sectional area, width, depths, hydraulic radius, and wetted perimeter.

9.3. Bed Material Characterization

Bed material (substrate) characterization is an important parameter in stream restoration design since the composition of the stream bed influences the character of the bed forms, sediment transport, macroinvertebrate habitat, and fish habitat (Harrelson et al., 1994). For the project reaches, pebble counts were not conducted since the bed substrate was dominated by sand. Considering that the manning's roughness ("n") values for the project reaches are not dominated by grain size, "n" values for use in hydraulic variables, incipient motion, and design discharge calculations were developed using methods detailed in *Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains*, (Arcement, G.J. et al., 1989), which adjusts "n" values to account additional factors that influence roughness including channel shape, obstructions, vegetation and sinuosity.

9.4. At-a-Station Hydraulics

Data collected from riffle cross sections and profiles were used to develop an evaluation of hydraulic variables at classification riffles in the project reach. Hydraulic variables were evaluated for the bankfull and top of bank (TOB) water stages, if different, and compared to the 1- and 2-year peak discharges calculated with the WinTR-20 model.

Hydraulic variables associated with the bankfull discharge for the project reaches are presented in Table 15, along with an estimate of top of bank discharge and top of bank area. Appendix I contains the complete At-a-Station hydraulic analyses for each reach.

Table 15 – At-a-Station Hydraulics

	RC-1	RC-2	RC-3	RC-4
Bankfull Discharge (cfs)	19.3	19.3	19.3	1.2
Slope (%)	1.3*	0.85*	0.68*	1.9*
Cross Sectional Area (ft^2)	4.1	6.5	6.9	0.8
Wetted Perimeter (ft)	6.7	9.9	8.3	5.2
Hydraulic Radius (ft)	0.6	0.7	0.8	0.15
Width (ft)	6.2	9.2	7.3	5.1
Mean Depth (ft)	0.7	0.7	0.9	0.1
Width/Depth Ratio	9.2	13.1	7.7	34.3
Maximum Depth (ft)	0.9	1.1	1.2	0.3
Velocity (ft/s)	4.7	3.0	2.8	1.6
Shear Velocity (ft/s)	0.50	0.42	0.43	0.30
Shear Stress (lbs/ft^2)	0.49	0.35	0.35	0.18
Froude Number	1.06	0.65	0.54	0.76
Threshold Grain Size (mm)	24	17	17	9
Roughness	0.026	0.035	0.039	0.035
Top of Bank Discharge (cfs)	39.0	1004.9	45.5	665.7
Top of Bank Area (ft^2)	8.7	105.5	13.0	57.1

**Local slope utilized*

9.5. Stream Classification

The cross-section data at the classification riffle was used in conjunction with pattern and profile data to determine the Rosgen stream type and to calculate the velocity, discharge, and average boundary shear stress.

Table 16 lists the bankfull dimensions and the Rosgen stream classifications for the classification riffle cross sections in each reach.

The valleys at RC-1, RC-2 and RC-4 are classified as Confined Alluvial Deposition (C-AL-D) valley types. Where the valley opens at RC-3 is classified as Unconfined Alluvial Deposition (U-AL-D) valley type.

RC-2 and RC-4 are Rosgen F5 stream types. F5 streams are sand-dominated, entrenched, meandering channels, deeply incised in gentle terrain. Sediment supply in F5 stream types is moderate to high, depending on stream bank erodibility conditions (Rosgen, 1998).

RC-1 and RC-3 are Rosgen E5 stream types. E5 stream types are sand-dominated and are typically stable unless stream banks are disturbed and significant changes in sediment supply and/or stream flow occur. While they can be considered stable, E

streams can switch to other types quickly if floodplain disturbance and/or the width/depth ratio of the stream channel is disturbed.

Table 16 – Bankfull Channel Dimensions at Classification Riffles				
Bankfull Channel Dimension Parameter	**RC-1**	**RC-2**	**RC-3**	**RC-4**
Drainage Area (mi^2)	0.404	0.515	0.515	0.011
Cross Sectional Area (A_{bkf}) (ft^2)	4.1	6.5	6.9	0.8
Bankfull Width (W_{bkf}) (ft)	6.2	9.2	7.3	5.1
Mean Depth (d_{bkf}) (ft)	0.7	0.7	0.9	0.1
Width to Depth Ratio (W_{bkf}/d_{bkf})	9.2	13.1	7.7	34.3
Width of Flood-prone Area (W_{fpa}) (ft)	26.7	12.3	22.3	5.4
Entrenchment Ratio (ER)	4.3	1.3	3.1	1.1
Median Material Size (D_{50}) (mm)	1	1	1	1
Water Surface Slope (S) (ft/ft)	0.013	0.0085	0.0068	0.019
Channel Sinuosity (K)*	1.1	1.2	1.2	1.2
Rosgen Stream Classification	E5	F5	E5	F5
Valley Type	C-AL-AD	C-AL-AD	U-AL-AD	C-AL-AD
Valley Slope (S_v) (ft/ft)	0.021	0.015	0.012	0.055

**Local slope utilized for hydraulic calculations is shown in Table 16, overall slope was used to calculate channel sinuosity*

9.6. Sediment Supply and Transport

Bedload sediments typically come from eroding channel banks in the Coastal Plain physiographic region (Gellis et al., 2006). Regardless, an investigation was conducted to identify any additional potential sediment supply sources to the project reaches. It is unlikely that the outfalls are providing a significant amount of sediment to the system. Given the high percentage of impervious cover in the drainage area, there are no obvious sources of sediment upstream. The main source of sediment to the project reaches appears to consist of localized bank erosion from the project reaches themselves, particularly in reaches where mass wasting and bank slumping are common.

9.7. Stream Evolution Model (SEM)

Channel Evolution Models (CEMs) have traditionally been used in stream restoration to conceptualize how single-thread alluvial channels may respond to disturbances. The responses occur through a series of morphological adjustments, which can be generalized into an evolutionary sequence common to streams in different physiographic settings. In 1984, Schumm et al. identified a five-stage CEM to demonstrate the process of channel succession in disturbed systems. The process involves the change from a stable channel and floodplain (Stage I) to an incised channel (Stage II), which then widens (Stage III), and undergoes aggradation and planform adjustment (Stage IV), until it forms a stable channel and floodplain at a new elevation (Stage V). Simon and Hupp (1986) developed a six-stage adaptation of the model, which included a construction stage between the pre-modified and degradation stages of the Schumm et al model. The CEMs have been modified since, notably by Thorne

(1999) who proposed that an additional stage, Stage VI/VII be added to existing CEMs to account for late stage incised channel evolution from straight or braided to meandering. Cluer and Thorne (2014) recently further revised CEMs by proposing a Stream Evolution Model (SEM), in order to promote consideration of the links between stream evolution and ecosystem services. The SEM differs from traditional CEMs by recognizing that streams may naturally be multi-threaded prior to disturbance, and representing stream evolution as a cyclical, rather than linear phenomenon. The SEM includes a precursor stage to better represent pre-disturbance conditions as well as two successor stages to cover late-stage evolutionary changes. The Cluer and Thorne (2014) SEM model is shown in Figure 10.

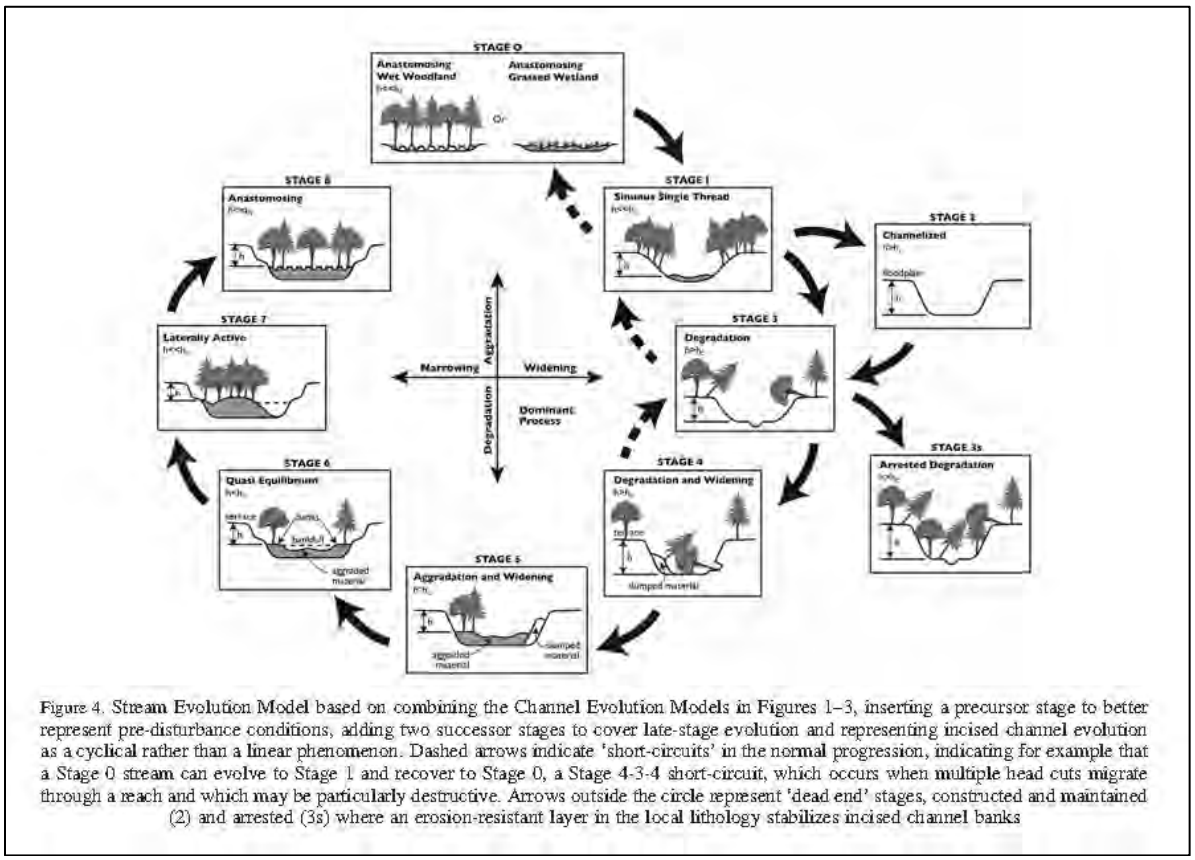


Figure 4. Stream Evolution Model based on combining the Channel Evolution Models in Figures 1–3, inserting a precursor stage to better represent pre-disturbance conditions, adding two successor stages to cover late-stage evolution and representing incised channel evolution as a cyclical rather than a linear phenomenon. Dashed arrows indicate 'short-circuits' in the normal progression, indicating for example that a Stage 0 stream can evolve to Stage 1 and recover to Stage 0, a Stage 4-3-4 short-circuit, which occurs when multiple head cuts migrate through a reach and which may be particularly destructive. Arrows outside the circle represent 'dead end' stages, constructed and maintained (2) and arrested (3s) where an erosion-resistant layer in the local lithology stabilizes incised channel banks

Figure 10 – Stream Evolution Model

The Cluer and Thorne SEM stage was determined for each project reach to inform and support proposed design concepts, as well as provide insight into the physical and vegetative attributes and the habitat and ecosystem benefits associated with each SEM stage. The SEM stage for each project reach is shown in Table 17.

Table 17 – Stream Evolution Model Stage

Reach	Stage
RC-1	Stage 3 – Degradation
RC-2	Stage 4 – Degradation and Widening
RC-3	Stage 5 – Aggradation and Widening
RC-4	Stage 4 – Degradation and Widening

RC-1 is considered to be in Stage 3-Degradation as it is incised with little to no floodplain connectivity. In this stage, the hydrologic regime has been altered so that some flood peaks are completely contained within channel, groundwater recharge is minimal, and the hyporheic zone has been damaged or destroyed by scour at bed and bank toes. Hydraulic diversity has been reduced due to bed lowering, and the capacity to store sediment and wood has been effectively lost. Additionally, aquatic, and most emergent plants have been destroyed, and floodplain vegetation is typically stressed due to a lower water table. The bed scour, vegetation destruction, and reduced groundwater integration weakens functions responsible for water clarity, nutrient cycling, and temperature control. Habitat is destroyed, and species richness and trophic density decrease. Additionally, the ecosystem becomes highly sensitive to disturbance. If there is no intervention, the project reaches will continue to degrade until they progress to Stage 4-Degradation and widening, where retreating banks will lead to increased sediment loading and lateral instabilities.

RC-2 and RC-4 are considered to be in Stage 4-Degradation and widening as they are incising with unstable, retreating banks and no floodplain connectivity. In this stage, an extreme range of flood peaks is contained within the channel, and groundwater recharge and hyporheic connectivity are dysfunctional. Hydraulic diversity remains low due to channel scour, and there is still no capacity to store sediment and wood. Sediment inputs increase from bank retreat and mass failures eliminate stable banks. The aquatic plant community remains dysfunctional due to ongoing bed degradation and riparian plants are destroyed by rapid widening. There is little in-channel habitat and bed degradation creates low levels of biodiversity. Similar to Stage 3-Degradation, water clarity, nutrient cycling, and temperature control remain dysfunctional, and the ecosystem is highly sensitive to disturbance.

RC-3 is considered to be in Stage 5-Aggradation and widening as evidenced by aggradation, increased bed elevation, and some stabilized banks. In this stage, the majority of flood peaks are still contained within the channel and groundwater recharge remains dysfunctional, although some hyporheic connectivity has been recovered. Aggradation renews depth/velocity variability improving hydraulic diversity and generating some bedforms and bars, although wood and sediment can still not be effectivity stored. The development of bars encourages the development of aquatic plants, although floodplain vegetation continues to be physically and hydrologically isolated. The channel is still impoverished with respect to rich and diverse habitat although the creation of in-channel features increases channel resilience and marginally improves nutrient cycling. However, water clarity and temperature control remain dysfunctional.

Overall, the SEM stages of the project reaches are far away from complete recovery in the evolutionary cycle, corroborating the need for the restoration Project.

9.8. Bank Erosion and Lateral Stability

The Bank Assessment for Non-Point Source Consequences of Sediment (BANCS) model developed by Rosgen (2001) was utilized to evaluate stream bank erosion

potential for the reaches and is ultimately utilized to calculate water quality pollutant loadings due to stream bank erosion. The BANCS model encompasses two quantitative tools: Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS) (Rosgen, 2001). These tools involve evaluating the bank slope, rooting depth, floodplain accessibility and flow distribution along the stream edge to determine a bank erosion risk rating.

BEHI measures parameters including bank height, bankfull height, root depth, root density, bank angle, and surface protection to obtain a BEHI that corresponds to ratings ranging from very low to extreme. In the project reaches, the left and right banks were examined and described using a BEHI rating. Using these banks as a reference, BEHI risk ratings were determined for all the actively eroding banks in the project reaches. The length and height of each eroding bank were also measured and recorded.

NBS is the result of turbulent flow occurring at the channel boundary and contributes to bank stability and erosion rates. NBS can be evaluated with a variety of assessment methodologies, ranging from visual estimates to detailed velocity profile measurement techniques. For this study, NBS was generally evaluated using visual assessment and Method 2 (the ratio of radius of curvature to bankfull width). The corresponding rating was determined from these ratios, ranging from very low to extreme.

Bank erosion rates were then combined with the measured bank heights and lengths to estimate sediment loss per year from the stream banks. The sediment loss rates for each bank were summed to calculate the total predicted amount of erosion occurring in the reach per year and converted to tons per year using measured bulk density values (Table 18).

Table 18 – BEHI/NBS Ratings and Total Erosion per year

Reach	Total Sediment Load (tons/year)	Total Erosion per unit stream length (tons/year/foot)
RC-1	26.4	0.07
RC-2	913.6	0.34
RC-3	231.7	0.07
RC-4	932.2	0.80

At all the reaches, channel incision constrains the flood flows to the stream channel, leading to elevated shear stress from higher energy flood flows that have caused lateral instability and bank erosion. The BANCS assessment (Appendix J) indicates that the dominant BEHI/NBS rating for RC-1 and RC-3 is High/Moderate, the dominant rating for RC-2 is Very High/High, and the dominant rating for RC-4 is Very High/Very High. Streambank erosion is apparent because the channels are highly incised and the banks are sparsely vegetated with steep bank angles.

10. PROPOSED DESIGN

10.1. Approach

The proposed design approaches utilize a combination of Regenerative Stormwater Conveyance (RSC) systems and valley restoration with valley wide weirs. The approaches will achieve project goals, limit impacts to the adjacent valley, and enhance stream ecology through improved water quality and habitat. The Project will reduce downstream nutrient and sediment loading and treat impervious area to obtain MS4 credit.

The valley restoration approach involves a combination of raising the elevation of the incised stream bed and excavating existing legacy sediments to increase overbank flow and reconnect the floodplain with the hyporheic aquifer to enhance pollutant uptake and improve stream/valley ecological functions. Valley wide weir structures are placed strategically throughout valley restoration areas to prevent floodplain instabilities. The approach results in increased geomorphic and floodplain complexity and the establishment of wetlands and mature and natural floodplain plant communities.

The RSC approach involves installing in-stream rock weirs with constructed pools to hydrologically reconnect the incised channel with the floodplain, increase groundwater and surface water exchange, re-establish native vegetation, and reduce downstream sediment and nutrient loadings.

10.2. Methodology

As mentioned in Section 9.6., there is a low upstream sediment supply to the project reaches, therefore, sediment transport modeling was not necessary and was not a major component of the design. Instead, a combination of geomorphic principles with hydrologic and hydraulic models was utilized.

10.2.1. SPSC Systems

Step Pool Storm Conveyance Systems (SPSC) consist of a series of open-channel conveyance structures that convert, through attenuation ponds and a sand seepage filter, surface storm flow to shallow groundwater flow. The systems consist of in-stream parabolic rock weirs that are designed to safely convey large flow events followed by constructed pools, which reduce channel velocities including peak flow velocities, native vegetation and an underlying sand/woodchip mix filter bed media.

The parabolic rock weirs, referred to as riffle-weir structures, consist of a well-graded mix of cobble and larger stone to create a tightly interlocking structure with considerable stability. Generally, the riffle-weir structures were designed to carry 100-year recurrence interval storm event.

The SPSC system was developed using guidelines detailed in the *Design Guidelines*

for Step Pool Storm Conveyance Systems developed by Anne Arundel County DPW Bureau of Watershed Protection and Restoration (AACO, 2022). Similar projects that have been successfully constructed in the County were also utilized as a reference for design.

In areas where the existing plan form was sustainable and/or site-specific boundary conditions limited plan form adjustments, the existing alignment was maintained. Where the existing plan form was not sustainable due to tight meander geometry or proximity to infrastructure, a new alignment was proposed.

10.2.2. Valley Wide Weirs

Valley Wide Weir (VWW) structures are typically used in areas where there is potential for floodplain instability due to increases in longitudinal and cross-sectional slopes or areas of valley constriction that cause increased shear stresses. They consist of flat bottom rock structures installed above the floodplain that span the stream valley and taper into the valley wall at approximately a 4H:1V cross sectional slope. The structures are utilized to spread flood flows across the floodplain, promote wetland creation/enhancement upstream and ensure long-term channel and floodplain vertical stability.

10.3. Design Summary

A summary of the proposed design is provided below and the Rock Creek Stream Restoration Construction Drawings are provided in Appendix A.

RC-1 consists of an ephemeral channel beginning at the Hog Neck Road culvert. The existing ephemeral channel is to remain for approximately 475 linear feet, then at which a series of valley wide weirs are proposed. The valley wide weir structures are sized to convey the 100-year storm event. The first valley wide is raised above the existing floodplain and backwaters the existing channel upstream approximately 170 linear feet. A valley wide weir structure is placed downstream strategically of an existing ephemeral channel on the right bank in order to sufficiently backwater the channel.

RC-2 originates at a large headcut and the channel is highly incised throughout. As a result, RC-2 continues utilizing a series of valley wide weirs that are sized to convey the 100-year storm event and reconnect to the existing floodplain/terrace.

To address the failed storm drain outfalls that originates at an 18- and 21-inch CMP (OP-1 and OP-2), the pipe inverts will be backwatered by the downstream valley wide weir.

In the two instances of exposed sanitary sewer pipes, the proposed channel will be raised to provide sufficient cover and sewer pipe protection will be added.

The valley wide weirs continue through Reach 3 and two riffle grade controls will be utilized to tie into the existing stream downstream.

RC-4 begins at a 27-inch storm drain outfall. An RSC system is proposed along the entirety of RC-4. The RSC system will consist of riffle-weir and pools in series.

Along the entire project, pools will have organic shapes and will be no more than two feet deep.

11. HYDRAULIC ANALYSIS

11.1. Hydraulic Analysis Methodology

A hydraulic model was developed using Hydrologic Engineering Center-River Analysis System (HEC-RAS) Version 6.5 River Analysis System, developed by the USACE, to establish the water surface, velocity, and channel shear stresses for existing and proposed conditions.

An existing and a proposed hydraulic model were developed for the Project. Table 19 describes the hydraulic cross sections for the Project. Critical depth was used for the upstream boundary conditions and normal depth was used for the downstream boundary condition of the main stem and tributary 1. The side channel used an upstream boundary condition of critical depth and downstream boundary condition of known water shot elevation. These known water shots came from the main stem model results.

Table 19 – Hydraulic Cross Sections

River Stations		Proposed Alignment Stations	Description
Existing	**Proposed**		
Main Stem			
3701.65 to 3392.25	-99.79 to -410.38	0+99.8 to 4+10.4	Existing: Existing channel upstream of project
3273.37 to 197.96	-514.37 to -3284.76	5+14.4 to 32+84.8	Existing: Unstable channel Proposed: Valley Wide Weirs and Riffle Grade Controls
148.31 to 39.91	-3334.41 to -3442.81	N/A	Existing: Existing channel downstream of project
Tributary 1			
354.96 to 70.58	-5049.6 to -5317.1	50+49.6 to 53+17.1	Existing: Unstable channel Proposed: SPSC Riffle-Weirs
Side Channel			
264.55 to 80.25	264.55 to 80.25	N/A	Existing: Existing channel upstream of project

For the existing conditions hydraulic model, existing condition Manning's "n" values were utilized for the channel and a value of 0.1 was utilized for the floodplain. For proposed conditions, a Manning's "n" value of 0.047 was utilized for the channel and a value of 0.1 was utilized for the floodplain. The Manning's "n" values for proposed conditions structures were derived using methodology detailed in *Lined Waterway or Outlet – Code 468* (USDA NRCS, 2017). Peak discharges determined using WinTR-20 (Section 6) were used for both the existing and proposed models.

11.2. Hydraulic Analysis Results

The results of the hydraulic comparison between existing and proposed conditions for various storm events are provided as Appendix K and in Tables 20 through 25 below. The results highlight the changes in the water surface elevation, channel velocity, and channel shear stresses.

The results are consistent with the goals of the Project, which include stabilizing channel reaches experiencing accelerated lateral and vertical bed and bank erosion and creating a stable channel with planform and dimensional geometries consistent with the hydrological regimes of the watershed.

The proposed design will increase floodplain connectivity, allowing storm flows to be spread laterally across a wider floodplain. The result is achieved through a combination of floodplain berms and grading and raising the existing channel bed elevation. As a result of raising the channel bed elevation to improve floodplain connectivity, water surface elevations (WSE) have increased from existing to proposed conditions for many cross sections of the hydraulic model. This has caused the 100-year floodplain boundary to expand in most areas.

Fluctuations of velocity and shear stress were observed along different reaches of the channel. These fluctuations are attributed to the proposed geomorphological features of the stream bed along with stream meander geometry changes from the existing to the proposed conditions and do not reflect any adverse changes to the proposed reach. The 100-year storm event analysis resulted in occasional areas of channel shear stress values above two pounds per square foot, primarily due to large increases in slope and flow depth from existing conditions. Channel material will be aptly sized to withstand the highest shear stresses and velocities predicted by the hydraulic model, up to the 100-year storm event.

Table 20 – 2 YR Discharge Hydraulic Analysis RC-1, RC-2 & RC-3											
EX. River Station	**PR. River Station**	**PR. Alignment Station**	**EX. WSE**	**PR. WSE**	**Change in WSE**	**EX. Velocity**	**PR. Velocity**	**Percent Change Velocity**	**EX. Channel Shear Stress**	**PR. Channel Shear Stress**	**Percent Change Channel Shear Stress**
			(ft)	**(ft)**	**(ft)**	**(ft/s)**	**(ft/s)**	**(%)**	**(lbs/sq ft)**	**(lbs/sq ft)**	**(%)**
3701.65	-99.79	0+99.8	45.23	45.23	0.00	2.37	2.37	0.00	0.12	0.12	0.00
3606.81	-194.63	1+94.6	44.58	44.58	0.00	3.81	3.81	0.00	0.36	0.36	0.00
3507.6	-293.83	2+93.8	43.51	43.51	0.00	2.59	2.57	-0.77	0.15	0.15	0.00
3440.06	-361.38	3+61.4	42.84	42.83	-0.01	4.37	4.44	1.60	0.43	0.45	4.65
3392.25	-410.38	4+10.4	41.86	42.52	0.66	4.92	1.42	-71.14	0.68	0.04	-94.12
3273.37	-514.37	5+14.4	38.84	42.33	3.49	2.16	1.27	-41.20	0.09	0.15	66.67
3161.78	-622.92	6+22.9	38.15	41.30	3.15	4.94	1.56	-68.42	0.50	0.23	-54.00
3110.53	-667.72	6+67.7	37.69	40.21	2.52	4.64	2.60	-43.97	0.47	0.71	51.06
3057.41	-715.15	7+15.1	30.31	39.40	9.09	18.24	1.57	-91.39	20.49	0.21	-98.98
2987.08	-777.65	7+77.6	29.54	38.22	8.68	3.94	2.67	-32.23	0.59	0.74	25.42
2865.6	-872.18	8+72.2	28.53	37.46	8.93	3.07	1.07	-65.15	0.35	0.09	-74.29
2714.78	-1007.55	10+07.5	27.20	36.20	9.00	3.68	2.54	-30.98	0.52	0.69	32.69
2653.5	-1066.83	10+66.8	26.72	35.44	8.72	3.18	1.39	-56.29	0.37	0.16	-56.76
2560.79	-1147.74	11+47.7	25.88	34.24	8.36	3.47	2.75	-20.75	0.48	0.77	60.42
2504.06	-1200.69	12+00.7	24.84	33.43	8.59	4.58	1.38	-69.87	0.86	0.16	-81.40
2415.02	-1284.68	12+84.7	23.26	32.26	9.00	2.48	2.69	8.47	0.21	0.71	238.10
2373.13	-1326.24	13+26.2	22.87	31.33	8.46	3.67	1.78	-51.50	0.55	0.29	-47.27
2330.83	-1367.8	13+67.8	22.51	30.22	7.71	2.96	2.65	-10.47	0.33	0.73	121.21
2282.49	-1409.38	14+09.4	22.09	29.45	7.36	3.45	1.42	-58.84	0.43	0.17	-60.47
2162.99	-1510.82	15+10.8	21.11	28.29	7.18	3.20	2.20	-31.25	0.40	0.46	15.00
2119.15	-1551.14	15+51.1	20.80	27.31	6.51	3.10	2.16	-30.32	0.34	0.43	26.47
2069.5	-1600.58	16+00.6	20.52	26.40	5.88	2.99	2.09	-30.10	0.32	0.37	15.63
1934.24	-1710.19	17+10.2	19.74	25.33	5.59	3.15	1.25	-60.32	0.35	0.14	-60.00
1873.32	-1779.12	17+79.1	19.28	24.18	4.90	3.54	2.37	-33.05	0.44	0.63	43.18

Table 20 – 2 YR Discharge Hydraulic Analysis RC-1, RC-2 & RC-3											
EX. River Station	**PR. River Station**	**PR. Alignment Station**	**EX. WSE**	**PR. WSE**	**Change in WSE**	**EX. Velocity**	**PR. Velocity**	**Percent Change Velocity**	**EX. Channel Shear Stress**	**PR. Channel Shear Stress**	**Percent Change Channel Shear Stress**
			(ft)	**(ft)**	**(ft)**	**(ft/s)**	**(ft/s)**	**(%)**	**(lbs/sq ft)**	**(lbs/sq ft)**	**(%)**
1832.11	-1821.4	18+21.4	18.98	23.31	4.33	3.43	1.48	-56.85	0.42	0.20	-52.38
1788.49	-1871.75	18+71.7	18.69	22.19	3.50	3.31	2.45	-25.98	0.39	0.65	66.67
1749.95	-1914.74	19+14.7	18.18	21.38	3.20	4.68	1.31	-72.01	0.82	0.15	-81.71
1673.69	-1990.31	19+90.3	17.57	20.24	2.67	3.06	2.73	-10.78	0.40	0.75	87.50
1619.34	-2041.37	20+41.4	17.02	19.34	2.32	3.63	1.50	-58.68	0.61	0.20	-67.21
1550.93	-2095.29	20+95.3	15.88	18.21	2.33	4.54	2.62	-42.29	0.95	0.72	-24.21
1489.01	-2142.27	21+42.3	14.47	17.35	2.88	4.93	1.43	-70.99	1.17	0.18	-84.62
1370.67	-2241	22+41.0	12.86	16.32	3.46	1.04	1.65	58.65	0.05	0.25	400.00
1262.41	-2324.97	23+25.0	12.23	15.36	3.13	4.99	1.59	-68.14	1.14	0.22	-80.70
1168.75	-2425	24+25.0	11.92	14.37	2.45	1.93	1.58	-18.13	0.16	0.22	37.50
1082.61	-2496.87	24+96.9	11.15	13.29	2.14	4.19	2.11	-49.64	0.93	0.42	-54.84
1003.65	-2574.84	25+74.8	9.63	12.42	2.79	3.75	1.43	-61.87	0.62	0.17	-72.58
898.69	-2653.46	26+53.5	8.47	11.18	2.71	3.84	2.42	-36.98	0.65	0.65	0.00
843.07	-2703.16	27+03.2	8.14	10.34	2.20	2.71	1.14	-57.93	0.32	0.12	-62.50
703.67	-2821.09	28+21.1	7.34	9.29	1.95	2.88	1.67	-42.01	0.36	0.27	-25.00
589.35	-2939.46	29+39.5	6.65	8.44	1.79	2.96	1.18	-60.14	0.37	0.11	-70.27
463.67	-3048.45	30+48.4	5.84	7.22	1.38	3.26	2.62	-19.63	0.46	0.72	56.52
350.48	-3131.47	31+31.5	5.11	6.56	1.45	2.58	1.08	-58.14	0.31	0.09	-70.97
232.34	-3250.38	32+50.4	4.91	5.78	0.87	1.26	2.07	64.29	0.07	0.41	485.71
197.96	-3284.76	32+84.8	4.34	4.52	0.18	5.30	0.45	-91.51	1.29	0.05	-96.12
148.31	-3334.41	N/A	4.01	4.01	0.00	1.51	1.50	-0.66	0.11	0.11	0.00
75.84	-3406.88	N/A	3.28	3.28	0.00	4.84	4.84	0.00	1.14	1.14	0.00
39.91	-3442.81	N/A	3.07	3.07	0.00	1.81	1.81	0.00	0.16	0.16	0.00

Table 21 – 2 YR Discharge Hydraulic Analysis RC-4 and Side Channel											
EX. River Station	**PR. River Station**	**PR. Alignment Station**	**EX. WSE**	**PR. WSE**	**Change in WSE**	**EX. Velocity**	**PR. Velocity**	**Percent Change Velocity**	**EX. Channel Shear Stress**	**PR. Channel Shear Stress**	**Percent Change Channel Shear Stress**
			(ft)	**(ft)**	**(ft)**	**(ft/s)**	**(ft/s)**	**(%)**	**(lbs/sq ft)**	**(lbs/sq ft)**	**(%)**
Tributary 1											
354.96	-5049.6	50+49.6	42.12	42.14	0.02	2.05	1.14	-44.39	0.29	0.19	-34.48
322.25	-5080.26	50+80.3	35.01	41.15	6.14	12.71	0.93	-92.68	19.36	0.13	-99.33
279.22	-5116.39	51+16.4	33.27	40.15	6.88	1.42	0.92	-35.21	0.16	0.13	-18.75
241.45	-5154.44	51+54.4	32.58	39.15	6.57	0.84	0.89	5.95	0.05	0.12	140.00
208.5	-5187.14	51+87.1	32.1	38.14	6.04	1.83	1.05	-42.62	0.25	0.17	-32.00
174.24	-5217.1	52+17.1	31.12	37.15	6.03	1.17	0.94	-19.66	0.09	0.13	44.44
148.34	-5242.1	52+42.1	30.79	36.13	5.34	1.06	1.24	16.98	0.09	0.24	166.67
123.11	-5267.1	52+67.1	30.24	35.15	4.91	1.33	0.84	-36.84	0.15	0.10	-33.33
97.62	-5292.1	52+92.1	28.78	34.12	5.34	2.95	1.50	-49.15	0.63	0.37	-41.27
70.58	-5317.1	53+17.1	26.39	32.92	6.53	1.67	0.04	-97.60	0.27	0.00	-100.00
Side Channel											
264.55	264.55	N/A	42.08	42.08	0	2.01	2.01	0	0.09	0.09	0
212.59	212.59	N/A	41.63	41.63	0	4.4	4.4	0	0.42	0.42	0
133.22	133.22	N/A	40.46	41.31	0.85	3.28	1.37	-58.23	0.23	0.03	-86.96
80.25	80.25	N/A	39.95	41.3	1.35	4.33	1	-76.91	0.42	0.02	-95.24

Table 22 – 10 YR Discharge Hydraulic Analysis RC-1, RC-2 & RC-3											
EX. River Station	**PR. River Station**	**PR. Alignment Station**	**EX. WSE**	**PR. WSE**	**Change in WSE**	**EX. Velocity**	**PR. Velocity**	**Percent Change Velocity**	**EX. Channel Shear Stress**	**PR. Channel Shear Stress**	**Percent Change Channel Shear Stress**
			(ft)	**(ft)**	**(ft)**	**(ft/s)**	**(ft/s)**	**(%)**	**(lbs/sq ft)**	**(lbs/sq ft)**	**(%)**
3701.65	-99.79	0+99.8	45.88	45.88	0.00	3.68	3.67	-0.27	0.25	0.25	0.00
3606.81	-194.63	1+94.6	45.09	45.09	0.00	5.31	5.32	0.19	0.57	0.57	0.00
3507.6	-293.83	2+93.8	44.13	44.13	0.00	3.65	3.65	0.00	0.25	0.25	0.00
3440.06	-361.38	3+61.4	43.49	43.49	0.00	5.09	5.09	0.00	0.54	0.54	0.00
3392.25	-410.38	4+10.4	42.19	42.97	0.78	7.27	2.76	-62.04	1.22	0.14	-88.52
3273.37	-514.37	5+14.4	39.79	42.68	2.89	3.35	1.89	-43.58	0.18	0.26	44.44
3161.78	-622.92	6+22.9	39.00	41.54	2.54	6.59	2.72	-58.73	0.71	0.57	-19.72
3110.53	-667.72	6+67.7	38.15	40.52	2.37	8.14	3.27	-59.83	1.22	0.84	-31.15
3057.41	-715.15	7+15.1	30.60	39.70	9.10	18.23	2.75	-84.91	16.62	0.54	-96.75
2987.08	-777.65	7+77.6	30.44	38.56	8.12	5.50	3.25	-40.91	0.94	0.81	-13.83
2865.6	-872.18	8+72.2	29.36	37.83	8.47	4.91	1.78	-63.75	0.74	0.21	-71.62
2714.78	-1007.55	10+07.5	28.15	36.49	8.34	4.46	3.23	-27.58	0.64	0.83	29.69
2653.5	-1066.83	10+66.8	27.52	35.83	8.31	5.13	2.23	-56.53	0.81	0.34	-58.02
2560.79	-1147.74	11+47.7	26.64	34.50	7.86	5.01	3.97	-20.76	0.80	1.25	56.25
2504.06	-1200.69	12+00.7	25.56	33.83	8.27	6.52	2.18	-66.56	1.40	0.32	-77.14
2415.02	-1284.68	12+84.7	24.10	32.54	8.44	4.10	3.94	-3.90	0.51	1.21	137.25
2373.13	-1326.24	13+26.2	23.74	31.62	7.88	4.63	2.88	-37.80	0.69	0.62	-10.14
2330.83	-1367.8	13+67.8	23.54	30.47	6.93	3.80	3.85	1.32	0.44	1.20	172.73
2282.49	-1409.38	14+09.4	22.84	29.88	7.04	5.87	2.20	-62.52	1.08	0.32	-70.37
2162.99	-1510.82	15+10.8	22.18	28.56	6.38	3.82	3.53	-7.59	0.44	0.96	118.18
2119.15	-1551.14	15+51.1	21.85	27.65	5.80	4.49	3.14	-30.07	0.60	0.72	20.00
2069.5	-1600.58	16+00.6	21.60	26.78	5.18	4.26	3.23	-24.18	0.53	0.73	37.74
1934.24	-1710.19	17+10.2	20.88	25.61	4.73	4.23	2.05	-51.54	0.53	0.31	-41.51
1873.32	-1779.12	17+79.1	20.37	24.38	4.01	5.09	3.39	-33.40	0.77	0.99	28.57

Table 22 – 10 YR Discharge Hydraulic Analysis RC-1, RC-2 & RC-3											
EX. River Station	**PR. River Station**	**PR. Alignment Station**	**EX. WSE**	**PR. WSE**	**Change in WSE**	**EX. Velocity**	**PR. Velocity**	**Percent Change Velocity**	**EX. Channel Shear Stress**	**PR. Channel Shear Stress**	**Percent Change Channel Shear Stress**
			(ft)	**(ft)**	**(ft)**	**(ft/s)**	**(ft/s)**	**(%)**	**(lbs/sq ft)**	**(lbs/sq ft)**	**(%)**
1832.11	-1821.4	18+21.4	20.16	23.58	3.42	4.45	2.39	-46.29	0.59	0.43	-27.12
1788.49	-1871.75	18+71.7	19.91	22.40	2.49	4.40	3.56	-19.09	0.57	1.08	89.47
1749.95	-1914.74	19+14.7	19.15	21.74	2.59	6.75	2.08	-69.19	1.41	0.30	-78.72
1673.69	-1990.31	19+90.3	18.55	20.51	1.96	4.66	3.97	-14.81	0.81	1.25	54.32
1619.34	-2041.37	20+41.4	18.03	19.65	1.62	4.89	2.41	-50.72	0.89	0.43	-51.69
1550.93	-2095.29	20+95.3	16.70	18.45	1.75	6.84	3.79	-44.59	1.84	1.18	-35.87
1489.01	-2142.27	21+42.3	15.29	17.69	2.40	6.88	2.23	-67.59	1.86	0.36	-80.65
1370.67	-2241	22+41.0	14.32	16.63	2.31	1.31	2.57	96.18	0.06	0.49	716.67
1262.41	-2324.97	23+25.0	13.29	15.73	2.44	7.35	2.36	-67.89	2.13	0.39	-81.69
1168.75	-2425	24+25.0	12.77	14.68	1.91	2.70	2.62	-2.96	0.27	0.49	81.48
1082.61	-2496.87	24+96.9	11.77	13.64	1.87	5.89	2.91	-50.59	1.46	0.62	-57.53
1003.65	-2574.84	25+74.8	10.25	12.78	2.53	4.57	2.37	-48.14	0.82	0.39	-52.44
898.69	-2653.46	26+53.5	9.49	11.38	1.89	2.30	3.46	50.43	0.19	1.04	447.37
843.07	-2703.16	27+03.2	9.10	10.63	1.53	4.18	1.89	-54.78	0.65	0.26	-60.00
703.67	-2821.09	28+21.1	8.14	9.65	1.51	4.46	2.29	-48.65	0.73	0.38	-47.95
589.35	-2939.46	29+39.5	7.51	8.80	1.29	3.87	1.99	-48.58	0.54	0.27	-50.00
463.67	-3048.45	30+48.4	6.29	7.53	1.24	5.74	3.25	-43.38	1.30	0.83	-36.15
350.48	-3131.47	31+31.5	5.63	7.06	1.43	2.95	1.70	-42.37	0.35	0.18	-48.57
232.34	-3250.38	32+50.4	5.16	5.97	0.81	2.70	3.84	42.22	0.29	1.20	313.79
197.96	-3284.76	32+84.8	4.79	4.98	0.19	4.95	2.08	-57.98	1.03	0.36	-65.05
148.31	-3334.41	N/A	4.06	4.06	0.00	4.17	4.15	-0.48	0.80	0.79	-1.25
75.84	-3406.88	N/A	3.74	3.75	0.01	2.08	2.07	-0.48	0.19	0.19	0.00
39.91	-3442.81	N/A	3.60	3.60	0.00	2.70	2.70	0.00	0.31	0.31	0.00

Table 23 – 10 YR Discharge Hydraulic Analysis RC-4 and Side Channel											
EX. River Station	**PR. River Station**	**PR. Alignment Station**	**EX. WSE**	**PR. WSE**	**Change in WSE**	**EX. Velocity**	**PR. Velocity**	**Percent Change Velocity**	**EX. Channel Shear Stress**	**PR. Channel Shear Stress**	**Percent Change Channel Shear Stress**
			(ft)	**(ft)**	**(ft)**	**(ft/s)**	**(ft/s)**	**(%)**	**(lbs/sq ft)**	**(lbs/sq ft)**	**(%)**
Tributary 1											
354.96	-5049.6	50+49.6	42.37	42.27	-0.10	3.12	1.99	-36.22	0.52	0.45	-13.46
322.25	-5080.26	50+80.3	35.07	41.27	6.20	15.49	1.51	-90.25	20.90	0.26	-98.76
279.22	-5116.39	51+16.4	33.41	40.27	6.86	2.33	1.55	-33.48	0.34	0.28	-17.65
241.45	-5154.44	51+54.4	32.80	39.28	6.48	1.62	1.46	-9.88	0.13	0.24	84.62
208.5	-5187.14	51+87.1	32.30	38.25	5.95	2.74	1.73	-36.86	0.42	0.36	-14.29
174.24	-5217.1	52+17.1	31.34	37.27	5.93	1.89	1.53	-19.05	0.20	0.27	35.00
148.34	-5242.1	52+42.1	30.95	36.23	5.28	2.07	2.01	-2.90	0.24	0.50	108.33
123.11	-5267.1	52+67.1	30.37	35.28	4.91	2.30	1.47	-36.09	0.34	0.25	-26.47
97.62	-5292.1	52+92.1	29.03	34.22	5.19	3.84	2.15	-44.01	0.88	0.59	-32.95
70.58	-5317.1	53+17.1	26.47	33.44	6.97	3.48	0.12	-96.55	0.89	0.00	-100.00
Side Channel											
264.55	264.55	N/A	42.79	42.79	0	2.58	2.58	0	0.12	0.12	0
212.59	212.59	N/A	42.2	42.2	0	6.16	6.16	0	0.67	0.67	0
133.22	133.22	N/A	41.13	41.57	0.44	4.7	3.46	-26.38	0.37	0.19	-48.65
80.25	80.25	N/A	40.45	41.54	1.09	6.49	2.6	-59.94	0.77	0.1	-87.01

Table 24 – 100 YR Discharge Hydraulic Analysis RC-1, RC-2 & RC-3											
EX. River Station	**PR. River Station**	**PR. Alignment Station**	**EX. WSE**	**PR. WSE**	**Change in WSE**	**EX. Velocity**	**PR. Velocity**	**Percent Change Velocity**	**EX. Channel Shear Stress**	**PR. Channel Shear Stress**	**Percent Change Channel Shear Stress**
			(ft)	**(ft)**	**(ft)**	**(ft/s)**	**(ft/s)**	**(%)**	**(lbs/sq ft)**	**(lbs/sq ft)**	**(%)**
3701.65	-99.79	0+99.8	47.03	47.03	0.00	5.71	5.69	-0.35	0.50	0.50	0.00
3606.81	-194.63	1+94.6	46.14	46.14	0.00	7.20	7.21	0.14	0.86	0.86	0.00
3507.6	-293.83	2+93.8	45.13	45.14	0.01	5.68	5.67	-0.18	0.51	0.51	0.00
3440.06	-361.38	3+61.4	44.47	44.47	0.00	6.81	6.84	0.44	0.79	0.79	0.00
3392.25	-410.38	4+10.4	42.86	42.87	0.01	9.98	9.91	-0.70	1.88	1.85	-1.60
3273.37	-514.37	5+14.4	41.06	43.35	2.29	6.06	2.96	-51.16	0.51	0.50	-1.96
3161.78	-622.92	6+22.9	40.37	42.05	1.68	8.87	4.39	-50.51	1.06	1.21	14.15
3110.53	-667.72	6+67.7	39.08	41.16	2.08	11.97	4.58	-61.74	2.16	1.28	-40.74
3057.41	-715.15	7+15.1	31.16	40.29	9.13	20.54	4.66	-77.31	15.88	1.28	-91.94
2987.08	-777.65	7+77.6	32.24	39.27	7.03	7.84	4.44	-43.37	1.59	1.17	-26.42
2865.6	-872.18	8+72.2	30.91	38.53	7.62	7.86	3.03	-61.45	1.62	0.51	-68.52
2714.78	-1007.55	10+07.5	30.10	37.18	7.08	5.73	4.22	-26.35	0.84	1.08	28.57
2653.5	-1066.83	10+66.8	29.05	36.59	7.54	8.15	3.59	-55.95	1.74	0.72	-58.62
2560.79	-1147.74	11+47.7	28.47	35.09	6.62	6.48	5.71	-11.88	1.08	2.03	87.96
2504.06	-1200.69	12+00.7	27.13	34.61	7.48	9.22	3.45	-62.58	2.29	0.65	-71.62
2415.02	-1284.68	12+84.7	25.86	33.13	7.27	6.03	5.81	-3.65	0.93	2.09	124.73
2373.13	-1326.24	13+26.2	25.65	32.18	6.53	5.72	4.81	-15.91	0.85	1.40	64.71
2330.83	-1367.8	13+67.8	25.55	31.05	5.50	4.94	5.40	9.31	0.62	1.83	195.16
2282.49	-1409.38	14+09.4	24.69	30.71	6.02	7.54	3.48	-53.85	1.53	0.66	-56.86
2162.99	-1510.82	15+10.8	24.42	29.11	4.69	4.79	5.54	15.66	0.56	1.90	239.29
2119.15	-1551.14	15+51.1	23.88	28.42	4.54	6.59	4.47	-32.17	1.08	1.15	6.48
2069.5	-1600.58	16+00.6	23.66	27.49	3.83	6.03	5.17	-14.26	0.90	1.52	68.89
1934.24	-1710.19	17+10.2	23.01	26.16	3.15	5.65	3.44	-39.12	0.80	0.72	-10.00
1873.32	-1779.12	17+79.1	21.67	24.87	3.20	9.25	4.73	-48.86	2.27	1.48	-34.80

Table 24 – 100 YR Discharge Hydraulic Analysis RC-1, RC-2 & RC-3											
EX. River Station	**PR. River Station**	**PR. Alignment Station**	**EX. WSE**	**PR. WSE**	**Change in WSE**	**EX. Velocity**	**PR. Velocity**	**Percent Change Velocity**	**EX. Channel Shear Stress**	**PR. Channel Shear Stress**	**Percent Change Channel Shear Stress**
			(ft)	**(ft)**	**(ft)**	**(ft/s)**	**(ft/s)**	**(%)**	**(lbs/sq ft)**	**(lbs/sq ft)**	**(%)**
1832.11	-1821.4	18+21.4	21.78	24.12	2.34	6.29	3.93	-37.52	1.00	0.94	-6.00
1788.49	-1871.75	18+71.7	21.37	22.88	1.51	6.85	5.15	-24.82	1.20	1.76	46.67
1749.95	-1914.74	19+14.7	21.03	22.48	1.45	7.25	3.26	-55.03	1.36	0.60	-55.88
1673.69	-1990.31	19+90.3	19.60	21.10	1.50	8.76	5.75	-34.36	2.45	2.06	-15.92
1619.34	-2041.37	20+41.4	18.35	20.27	1.92	9.94	3.87	-61.07	3.50	0.89	-74.57
1550.93	-2095.29	20+95.3	17.72	18.99	1.27	7.71	5.50	-28.66	1.97	1.94	-1.52
1489.01	-2142.27	21+42.3	16.88	18.36	1.48	7.72	3.55	-54.02	1.84	0.73	-60.33
1370.67	-2241	22+41.0	15.52	17.30	1.78	2.68	3.87	44.40	0.20	0.88	340.00
1262.41	-2324.97	23+25.0	14.83	16.48	1.65	7.32	3.63	-50.41	1.72	0.74	-56.98
1168.75	-2425	24+25.0	13.77	15.33	1.56	4.54	4.16	-8.37	0.65	1.01	55.38
1082.61	-2496.87	24+96.9	12.70	14.36	1.66	7.51	4.22	-43.81	1.94	1.04	-46.39
1003.65	-2574.84	25+74.8	11.18	13.44	2.26	7.95	4.01	-49.56	2.14	0.92	-57.01
898.69	-2653.46	26+53.5	10.77	11.83	1.06	3.79	5.08	34.04	0.44	1.74	295.45
843.07	-2703.16	27+03.2	10.31	11.28	0.97	5.89	2.93	-50.25	1.08	0.50	-53.70
703.67	-2821.09	28+21.1	9.21	10.40	1.19	6.76	3.31	-51.04	1.43	0.63	-55.94
589.35	-2939.46	29+39.5	8.39	9.46	1.07	5.99	3.41	-43.07	1.14	0.66	-42.11
463.67	-3048.45	30+48.4	7.33	8.34	1.01	6.75	3.98	-41.04	1.50	0.92	-38.67
350.48	-3131.47	31+31.5	6.49	7.91	1.42	5.04	2.81	-44.25	0.86	0.41	-52.33
232.34	-3250.38	32+50.4	5.91	6.52	0.61	4.25	5.57	31.06	0.63	1.97	212.70
197.96	-3284.76	32+84.8	5.32	5.52	0.20	7.80	4.18	-46.41	2.31	1.11	-51.95
148.31	-3334.41	N/A	4.87	4.87	0.00	4.08	4.06	-0.49	0.65	0.64	-1.54
75.84	-3406.88	N/A	4.60	4.60	0.00	3.17	3.16	-0.32	0.36	0.35	-2.78
39.91	-3442.81	N/A	4.44	4.44	0.00	3.97	3.97	0.00	0.56	0.56	0.00

Table 25 – 100 YR Discharge Hydraulic Analysis RC-4 and Side Channel											
EX. River Station	**PR. River Station**	**PR. Alignment Station**	**EX. WSE**	**PR. WSE**	**Change in WSE**	**EX. Velocity**	**PR. Velocity**	**Percent Change Velocity**	**EX. Channel Shear Stress**	**PR. Channel Shear Stress**	**Percent Change Channel Shear Stress**
			(ft)	**(ft)**	**(ft)**	**(ft/s)**	**(ft/s)**	**(%)**	**(lbs/sq ft)**	**(lbs/sq ft)**	**(%)**
Tributary 1											
354.96	-5049.6	50+49.6	42.86	42.52	-0.34	4.37	3.08	-29.52	0.81	0.85	4.94
322.25	-5080.26	50+80.3	35.19	41.49	6.30	17.65	2.55	-85.55	21.64	0.60	-97.23
279.22	-5116.39	51+16.4	33.66	40.51	6.85	4.10	2.35	-42.68	0.80	0.50	-37.50
241.45	-5154.44	51+54.4	33.28	39.50	6.22	2.74	2.49	-9.12	0.30	0.57	90.00
208.5	-5187.14	51+87.1	32.68	38.48	5.80	4.32	2.60	-39.81	0.81	0.63	-22.22
174.24	-5217.1	52+17.1	31.77	37.48	5.71	2.90	2.63	-9.31	0.35	0.64	82.86
148.34	-5242.1	52+42.1	31.25	36.44	5.19	4.00	2.99	-25.25	0.71	0.85	19.72
123.11	-5267.1	52+67.1	30.64	35.49	4.85	3.65	2.56	-29.86	0.63	0.61	-3.17
97.62	-5292.1	52+92.1	29.38	34.44	5.06	5.31	3.07	-42.18	1.41	0.90	-36.17
70.58	-5317.1	53+17.1	27.12	34.36	7.24	1.62	0.25	-84.57	0.11	0.00	-100.00
Side Channel											
264.55	264.55	N/A	43.99	43.99	0	3.56	3.56	0.00	0.18	0.18	0.00
212.59	212.59	N/A	43.2	43.2	0	8.42	8.42	0.00	1.04	1.04	0.00
133.22	133.22	N/A	42.03	42.15	0.12	7.69	7.19	-6.50	0.85	0.73	-14.12
80.25	80.25	N/A	41.35	42.05	0.7	8.66	5.69	-34.30	1.13	0.44	-61.06

11.3. Hydraulic Grade Line Computations

Hydraulic Grade Line (HGL) computations were performed at outfalls affected by the Project, including outfalls OP 1/OP 2. HGL computations are described below and additional information is included in Appendix K.

For outfall OP 1/OP2, the 10-year water surface elevation at the 18-inch CMP and 21-inch CMP for proposed conditions is 36.49 (located above the top inside of the pipes). An HY8 model was developed to determine the 10-year water surface elevation at the start of the pipes of 43.87. Outfall SO9B4O00016 is located upstream of OP1 and OP2. As-built drawing 26775 shows an HGL line for outfall SO9B4O00016 beginning at the crown of the 15-inch RCP. Since the 10-year water surface elevation at the 15-inch RCP for proposed conditions is 43.87 and the pipe is now submerged (top inside elevation of the 15-inch RCP is 43.05) a new HGL analysis was performed. The HGL analysis started at the 10-year water surface elevation. The HGL does not rise above the flooding elevation of the existing storm drain manhole or inlet as shown on the Contract Drawings and in Appendix K.

12. FUNCTION BASED ASSESSMENT

The Stream Functions Pyramid Framework (SFPF) from *A Function-Based Framework for Stream Assessment and Restoration Projects* (Harman et. al., 2012) was utilized throughout the entire project process to ensure that the most appropriate design approach would be selected.

Table 26 shows the assessment parameters by SFPF pyramid level that were evaluated as part of this Project. Table 26 also includes the measurement method(s) used to quantify the existing function-based condition.

Table 26 – Assessment Parameters by Pyramid Level

Level and Category	Parameter	Measurement Method
Level 1 – Hydrology	Runoff	Flow Regime (Flashiness)
Level 2 – Hydraulics	Floodplain Connectivity	Maximum Velocity
	Floodplain Drainage	Concentrated Flows
	Vertical Stability	Head Cuts
Level 3 – Geomorphology	Riparian Vegetation	Riparian Buffer Width
	Lateral Stability	BEHI/NBS
Level 4 – Physicochemical	Water Quality	Conductivity (µS/cm)
		DO (mg/L)
		pH
		Temperature (ºC)
Level 5 – Biology	Habitat & Macroinvertebrate Communities	RBP Score
		MPHI Score
		BIBI Score

Using the above assessment parameters and associated measurement methods, the existing function-based condition for each reach was quantified. Using the results of the existing function-based assessment, design objectives were developed, and the proposed condition of each reach was evaluated.

Documentation including the specific assessment parameters, measurement methods, performance standards, design goals and the anticipated functional uplift for the Project is provided in Appendix L.

13. STONE SIZING COMPUTATIONS

The rock structures will utilize a gradation of stone and salvaged bed sediments to help embed the interlocking stone matrix and create a stable grade control that mimics a more natural substrate. Stone size was calculated using a critical shear stress relationship developed by Shields (1936) and Andrews (1983). Since a gradation of stone will be utilized, the incipient stone size derived from the Shields equation for uniform stream beds was not appropriate. The competence relationships developed by Andrews provide a more accurate estimation of the threshold of movement for stream beds varying gradations of stone and thus is more applicable. The D_i/D_{50} ratio of bed armor for the Andrews equation can vary from 0.3 to 4.2, depending on the mix of the stone. However, an armor ratio of 2.5 can be substituted in the Andrews equation to form the "Modified Andrews Equation" (Schlindwein, 2003) that establishes a relationship between surface bed sediment size and critical shear stress. For the purpose of these calculations the void space is assumed to be 30 percent and the furnished stone is assumed to be immobile. Critical shear stress (ζ_{ci}) was set equal to shear stress (ζ) and was taken from the HEC-RAS model at the appropriate sections where structures are to be placed. The maximum shear stress for each section was generally used for the calculation. A Factor of Safety (FS) of 1.3 was used to increase the modeled shear stress and account for natural variations in the bed and localized jumps in bed shear. Equations and relationships used to calculate the constructed riffle stone size, as well as the proposed pool bed material are as follows:

Andrews Equation,

$$\zeta_{ci^*} = 0.0834(D_i/D_{s50})^{-0.872}$$

Modified Andrews Equation (1),

$$\zeta_{ci^*} = 0.0375(D_i/D_{s50})^{-0.872}$$

Shields Shear Stress Equation (2),

$$\zeta_{ci} = \zeta_{ci^*}(\rho_s-\rho_w)g^*d_i$$

Where,

g = 9.81 (m/sec^2)
D_i = D_{30} (m)
D_{50} = $D_{30}/0.3$ (m)
ρ_s = 2600 (kg/m^3)
ρ_w = 1000 (kg/m^3)

Solve for dimensionless critical shear stress,

$$\zeta_{ci^*} = 0.0375(0.3\ D_{50}/\ D_{s50})^{-0.887}$$

Solve for critical shear stress,

$$\zeta_{ci} = 15700\zeta_{ci^*}\ d_{30}$$

Reduce and solve Equation (2) for critical shear stress,

$$\zeta_{ci^*} = 0.107$$

Reduce and solve equation (1) for D_{30},

$$D_{30} = 0.000594\zeta_{ci}$$

Shear stress is converted from lbs/ft² to Pa by multiplying by 47.88, and this value is multiplied by a factor of safety of 1.3

$$\zeta_{ci}(Pa) = [\zeta_{ci} \text{ (in lbs/ft}^2 \text{ from HEC-RAS)} * 1.3] * 47.8803$$

Therefore,

$$D_{30} = \zeta_{ci}(Pa) * 0.000594$$

and,

$$D_{50} = D_{30} / 0.3$$

Stone mixes for the constructed material were based on the calculated D_{50} stone diameter. A graphical representation of the proposed percent by weight distribution was compared to the standard Maryland State Highway Administration riprap specifications to determine a suitable, well-graded mix that would promote interlocking of the particles and increase the structures resistance to flood flows up to the 100-year storm event.

14. POLLUTANT LOAD REDUCTION & IMPERVIOUS SURFACE TREATMENT

Pollutant load reduction for the main stem portion of the project was estimated using methodology from *Final Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects* (Schueler, T., Stack, B., 2014) as well as updated guidance for Protocol 1 (Prevented Sediment During Storm Flow), *Consensus Recommendations for Improving the Application of the Prevented Sediment Protocol for Urban Stream Restoration Projects Built for Pollutant Removal Credit* (Wood, D., 2020) and for Protocols 2 (Effective Hyporheic Zone) and 3 (Floodplain Reconnection), *Consensus Recommendations to Improve Protocols 2 and 3 for Defining Stream Restoration Pollutant Removal Credits (*Wood, D., Schueler, T., October 27, 2020).

Pollutant load reduction for Tributary 1 was estimated using methodology from the MDE guidance document *Municipal Separate Storm Sewer System Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated*, (MDE, November 2021) for Protocol 4 (Dry Channel RSC as an Upland Stormwater Retrofit) and *Recommendations for Crediting Outfall and Gully Stabilization Projects in the Chesapeake Bay Watershed* (Hanson, J., 2019) for Protocol 5 (Outfall and Gully Stabilization).

To estimate the credit for Protocol 1, multiple soil boring samples were obtained along the length of the Project, spaced approximately 500 linear feet apart to determine soil bulk density, Total Nitrogen (TN) and Total Phosphorus (TP) concentrations. As mentioned in Section 8, bulk density samples were collected in-situ using a density drive sampler and were then transported to BayLand for soil bulk density analysis. Additional soil borings were sent to a laboratory to determine TN and TP concentrations.

Ultimately, the TN/TP concentrations were multiplied by the pre-project stream bank erosion rates determined using the BANCS method (Section 9.8) and the mass load reduction was discounted 50 percent to account for the natural process of sediment transport in a stable stream channel.

For Protocol 2, denitrification in the hyporheic zone was calculated by defining the area associated with the Effective Hyporheic Zone (EHZ), applying a dentification rate, and applying site specific discount factors. For the Project, the EHZ was assumed to occur where the proposed floodplain elevation is less than 18 inches above the low flow water elevation since this depth represents the typical root zone that facilitates hyporheic exchange and provides a carbon source for dentification.

The EHZ was multiplied by a dentification rate (0.00269 lbs/sq ft/year) and the adjusted for site specific factors to determine TN removed, including a baseflow reduction factor (Bf), a floodplain height factor (Hf) and an aquifer conductivity reduction factor (Af).

To estimate credit for Protocol 3, pollutant reduction due to increased stream/floodplain connectivity was estimated by defining the vertical and lateral dimensions of the floodplain trapping zone (FTZ) to reflect the project's increased floodplain reconnection.

The FTZ was defined using topographic field data and hydraulic modeling. The depth of the FTZ is either one-foot or where floodplain flow velocities are below two feet per second (ft/sec) (up to three feet, or the 10-year water surface elevation, whichever is lower). A flow duration curve was developed using and was scaled to the project drainage area and utilized to determine the treatable flow for pre- and post- restoration conditions. CAST was utilized to determine the total loads delivered to the project site and multiplied by the treatable flow in the FTZ to determine a treatable load. Finally, the credit was adjusted based on sediment storage effectiveness to determine TN, TP and TSS removed.

Protocol 4 followed the MDE guidance document *Municipal Separate Storm Sewer System Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated*, (MDE, November 2021), which classifies SPSC systems as a bioretention practice. Therefore, the N, P, and suspended sediment removal efficiencies per one inch of rainfall treated for micro-bioretention were applied to the drainage area. When less than one inch of rainfall is treated, the percent of impervious area receiving water quality treatment is credited along with the associated prorated pollutant removal rates for Environmental Site Design (ESD) filtration practices.

The methodology described within the MDE document *Municipal Separate Storm Sewer System Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated,* (MDE, November 2021) was used to calculate the MS4 equivalent impervious acre credit for the stream restoration project. The methodology allows for site-specific TMDL nutrient reduction credits to be converted to calculate the impervious acres treated for MS4 crediting through an equivalent impervious acre conversion factor for each pollutant load (TN, TP, and Total Suspended Solids (TSS)).

The estimated pollutant load reduction and impervious area treated using the aforementioned assumptions is shown in Table 27. Supporting computations are provided as Appendix M.

Table 27 – Pollutant Load Reduction and Impervious Area Treated				
Protocol	**Total Nitrogen Credit (Edge of Field) (lbs TN/yr)**	**Total Phosphorous Credit (Edge of Field) (lbs TP/yr)**	**Total Sediment Credit (Edge of Field) (tons TSS/yr)**	**MS4 Impervious Acre Credit (acres)**
2021 MS4 Accounting Guidance Document (CBWM 6.0)				
1-Credit for Prevented Sediment During Storm Flow	394.2	133.5	585.9	105.9[a]
2-Credit for Effective Hyporheic Zone	279.5	0.0	0.0	
3- Credit for Floodplain Reconnection	75.4	10.6	115.1	
4-Credit for Dry Channel RSC as an Upland Stormwater Retrofit	22.0	2.4	0.9	
5-Credit for Outfall and Gully Stabilization	53.9	16.8	94.3	

[a] Assessed in accordance with *Municipal Separate Storm Sewer System Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, (MDE, November 2021).*

15. CONSTRUCTION CONSIDERATIONS

Access for the project is proposed from Hog Neck Road at the upstream end and Saltwood Glen at the downstream end. Maintenance of Traffic (MOT) devices shall be installed at the construction entrances as depicted on the erosion and sediment control plans to ensure the safe and efficient movement of traffic and pedestrians through or around the work area. The Project consists of two stages, one for the main stem and one for Tributary 1, as delineated in the sequence of construction (SOC) and depicted on the erosion and sediment control plans.

The stages can be subdivided into shorter setups as required to accommodate adequate diversion and dewatering. As detailed in the sequence of construction, as the Contractor completes construction, the valley wide weir structures can be used as downstream and/or upstream in-line sediment and erosion control measures in place of sandbag dikes to assist with clearwater diversion pump around and dewatering. It is highly likely that the Contractor will be required to use multiple sump pits to adequately dewater work areas. This information will be disseminated to the Contractor at the pre-bid and pre-construction meetings.

The Contractor shall take necessary precautions to protect overhead and underground utilities as well as curb, sidewalk and pavement at construction entrances. At Hog Neck Road, an overhead electric line crosses the stabilized construction entrance, which has an approximate minimum clearance of 20 feet. As needed, temporary cold mix asphalt or an approved alternative method shall be installed at all three stabilized construction entrances in order to bridge the curb. As needed, steel plates or mats or an approved alternative method shall be installed at the two stabilized construction entrances at Saltwood Glen to protect the sidewalk.

The access road is proposed within the existing channel along the Main Stem and Tributary 1 to limit impacts to the surrounding floodplain. The access road in the existing channel consists of sand at the Main Stem and sand/wood chip filter media at Tributary 1. Tributary 1 is a SPSC System and ultimately the entire facility bottom will be filled with sand/wood chip filter media. The access road outside of the existing channel primarily consists of a 15-foot-wide mulch road, although mats with mulch underneath are proposed over top of sanitary sewer line crossings and wetlands.

Per Section 4.6, all reaches within the Study Area are designated as “Use I” waters and instream work is prohibited from March 1 through June 15, inclusive of any year. Unlike ephemeral channels, perennial and intermittent streams are subject to the closure period. Work that may be performed during the closure period includes field marking the limit of disturbance and existing wetlands, clearing, and grubbing, and tree felling. It should be noted that the access road can be constructed and utilized during the closure period where it is depicted outside of the existing channel as long as channel crossings (temporary access bridges or culverts) over perennial and intermittent stream channels are installed prior to the start of the closure period.

All trees removed during construction operations shall be repurposed on site as woody debris in order to increase floodplain roughness and hydraulic diversity. The plans include two methods of installation including laying the woody debris on the surface and anchoring in place using pile logs or driving woody debris into the ground where subsoils may be softer.

Work in wet, unconsolidated soil poses a concern during construction and the Contractor should be made aware of these conditions during the pre-bid meeting. The Contractor should also be made aware that they will only be paid for rock required to construct the structure to the thickness detailed on the plans, and that additional bank run gravel and/or concrete sand will likely be required to create a stable/firmly compacted subbase underneath of proposed structures. It is assumed that cut material will be reused on site, however, some cut material may need to be stockpiled on site and dried out for several days. Considering this, the Contractor may elect to furnish all fill material and remove and dispose of all cut material at no additional cost to the County. Access to the site and staging/stockpile areas outside of the 100-year floodplain are limited and as a result, this may increase construction costs.

16. PERMITTING

The proposed Project will require local, state, and federal permits for disturbance to existing wetlands. A Joint Federal/State Application for the Alteration of any Floodplain, Water, Tidal or Non-Tidal Wetland in Maryland, submitted to MDE/USACE, will be prepared as part of the Project. A notice of intent (NOI) will be required for land disturbance greater than one acre, and an Anne Arundel County Grading Permit will be required for land disturbance greater than 5,000 square feet.

17. COST ANALYSIS

A cost estimate was developed for the project. The cost of construction of all proposed improvements is approximately $3,895,000. This is approximately $1,125 per linear foot of restoration or $36,775 per impervious acre treated. The itemized construction cost estimate is included as Appendix N.

18. CONCLUSION

The project reaches have been significantly influenced by historical channel alterations and increasing urbanization of the watershed. There is geomorphic evidence of active stream degradation and hydrologic evidence of floodplain disconnection. Stabilization of the reaches is needed to protect public infrastructure and enhance overall watershed health.

The RSC design and valley restoration will promote floodplain reconnection; provide design features that promote denitrification during baseflow; provide a reduction in annual mass of sediment and attached nutrients originating from on-site channel degradation and upstream loss being delivered to downstream receiving waters; provide water quality credit towards Anne Arundel County's NPDES MS4 permit watershed restoration requirement; and assist in meeting the County's WLA towards the Chesapeake Bay TMDL.

19. REFERENCES

Anne Arundel County Department of Public Works, 2009. Targeted Biological Assessment of Streams in Patapsco Tidal and Bodkin Creek Watersheds, Anne Arundel County, Maryland: 2009. https://www.aacounty.org/sites/default/files/2023-04/2009PatapscoBodkinTargetedBioMonitoring.pdf

Anne Arundel County, 2016. Magothy River Watershed. Retrieved from http://www.aacounty.org/departments/ public-works/wprp/watersheds/magothy% 20river/

Anne Arundel County, 2022. Design Guidelines for Step Pool Storm Conveyance Systems. Anne Arundel County Department of Public Works, Bureau of Watershed Protection and Restoration, Annapolis, MD.

Anne Arundel County Government. Topography 2020. Annapolis, MD: Anne Arundel County Government. Retrieved from http://www.aacounty.org/county-maps/

Anne Arundel County Government. Land Cover 2017. Annapolis, MD: Anne Arundel County Government. Retrieved from http://www.aacounty.org/county-maps/

Anne Arundel County Government. Zoning 2019. Annapolis, MD: Anne Arundel County Government. Retrieved from http://www.aacounty.org/county-maps/

Arcement, G.J., Jr. and V.R. Schneider, 1989. Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains. U.S. Geological Survey Water-Supply Paper 2339. U.S. Geological Survey, Denver, CO.

Baltimore Maryland Geological Survey, 1913. Johns Hopkins University Sheridan Library Website. Retrieved from https://jscholarship.library.jhu.edu/handle/1774.2 /36341.

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

Biedenharn, D., R. Copeland, C. Thorne, P. Soar, R. Hey, and C. Watson, 2000. Effective Discharge Calculation: A Practical Guide. USACE, Engineer Research and Development Center, ERDC/CHL TR-00-15.

Bierman, P.R., J. Howe, E. Stanley-Mann, J. Hilke and C.A. Massey, 2005. Old images record landscape change through time. GSA Today, 15 (4): 4-10.

Cluer, B. and Thorne, C., 2014. A Stream Evolution Model Integrating Habitat and Ecosystem Benefits. River Res. Applic. 30: 135-154.

Costa, J. E., 1975. Effects of agriculture on erosion and sedimentation in the Piedmont Province, Maryland. Geological Society of America Bulletin, 86: 1281-1286.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. United States Department of the Army, Waterways Experiment Station, Vicksburg, MS.

Federal Emergency Management Agency (FEMA); National Flood Insurance Program (NFIP). Panel 24003C0069F. Effective Date February 18, 2015. Retrieved from http://fema.maps.arcgis.com/home/webmap/viewer.html

Gellis, A.C. and Landwehr, J.M., 2006. Identifying sources of fine-grained suspended-sediment in the Pocomoke River, an Eastern Shore tributary to the Chesapeake Bay: Proceedings of the Joint Federal Interagency Conference, 2006, 8th Federal Interagency Sedimentation Conference, April 2006, Reno, NV. Paper 5C-1 in CD_ROM file ISBN 0-9779007-1-1, 9.

GISHydroNXT, 2018. University of Maryland (UMD) Department of Civil and Environmental Engineering and the Maryland State Highway Administration.

Hanson, J., Wood, D., and Schueler, T. 2019. Recommendations for Crediting Outfall and Gully Stabilization Projects in the Chesapeake Bay Watershed. Center for Watershed Protection and Virginia Tech. chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2019/10/FINAL-APPROVED-OUTFALL-RESTORATION-MEMO-101519.pdf.

Harman, W. R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012, A Function-Based Framework for Stream Assessment and Restoration Projects. U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, D.C. EPA 843-K-12-006.

Harrelson, C.C., C.L. Rawlins, and J.P. Potyondy, 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest, and Range Experiment Station. 61 p.

Knox, J.C., 1977. Human impacts on Wisconsin stream channels. Annals of the Association of American Geographers, 67: 323-342.

Maryland Department of Assessments & Taxation (SDAT) website. 2023. Retrieved from http://sdat.dat.maryland.gov/RealProperty.

Maryland Department of the Environment (MDE), 1996/1998. 1996/1998 303(d) List of Impaired Waterbodies. Retrieved from http://www.mde.state.md.us/programs/Water/TMDL/Integrated303dReports/Documents/Integrated_Report_Section_PDFs/303d_1996-1998/1996_1998list.pdf.

Maryland Department of the Environment (MDE), 2000. Maryland Stormwater Design Manual, Volumes I & II. MDE Water Management Administration, Baltimore, MD.

Maryland Department of the Environment (MDE), 2012. 2012 Integrated Report of Surface Water Quality. Retrieved from http://www.mde.state.md.us/programs/Water/TMDL/Integrated303dReports/Pages/Programs/WaterPrograms/TMDL/Maryland.
Maryland Department of the Environment (MDE) Designated Uses/Use Class Map Retrieved from http://www.mde.state.md.us/programs/Water/TMDL/Water%20Quality%20Standards/Pages/DesignatedUsesMaps. Accessed [2023].

Maryland Department of the Environment (MDE) Designated Uses/Use Class Map Retrieved from http://www.mde.state.md.us/programs/Water/TMDL/Water%20Quality%20Standards/Pages/DesignatedUsesMaps. Accessed [2023].

Maryland Department of the Environment (MDE), November 2021. Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated.

Maryland Department of Natural Resources (DNR), 1997. State Forest Conservation Technical Manual (Third Edition). Washington County, MD.

Maryland Department of Natural Resources (DNR), Maryland Natural Heritage Program, 2021. Maryland Plants and Wildlife.
http://dnr2.maryland.gov/Wildlife/Pages/plants_wildlife/home.aspx

Maryland's Environmental Resource and Land Information Network (MERLIN), 2023.
https://maryland.maps.arcgis.com/apps/webappviewer/index.html?id=434b195197364344a661da85c9bab3c9

Maryland Geological Survey, 2008. Open-File Report 08-03-1: Explanatory Text for the Physiographic Map of Maryland (version MDPHYS2003.2).

Maryland Hydrology Panel, 2020. Applications of Hydrologic Methods in Maryland. The Maryland State Highway Administration and the Maryland Department of the Environment. Baltimore, Maryland.

Maryland Hydrology Panel, 2022. Applications of Hydrologic Methods in Maryland Appendix 3 (2022 Update). The Maryland State Highway Administration and the Maryland Department of the Environment. Baltimore, Maryland.

McCandless, T.L., 2003. Maryland Stream Survey: Bankfull Discharge and Channel Characteristics in the Coastal Plain Hydrologic Region. US Fish and Wildlife Service Technical Report CBFO-S03-02, US Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, Maryland.

Miller, S.O., D.F. Ritter, R.C. Kochel, and J.R. Miller, 1993. Fluvial responses to land use changes and climatic variations within the Drury Creek watershed, southern Illinois: Geomorphology, 6: 309–329

National Weather Service Forecast Office, Baltimore/Washington. Retrieved from http://w2.weather.gov/climate/. Accessed [08/20/2024].

Paul, M.J., Stribling, J.B., Klauda, R.J., Kazyak, P.F., Southerland, M.T., Roth, N.E. (2003).“A Physical Habitat Index for Freshwater Wadeable Streams in Maryland.” Final Report. Maryland Department of Natural Resources. Monitoring and non-tidal assessment. https://dnr.maryland.gov/streams/Publications/ea-03-4_phi.pdf

Rosgen, D.L., 1996. Applied River Morphology. Wildland Hydrology, Fort Collins, CO.

Rosgen, D. L., 1998. The Reference Reach: A Blueprint for Natural Channel Design. American Society of Civil Engineers Conference 1998, Denver, CO.

Rosgen, D. and Silvey, L., 1998. Field Guide for Stream Classification. Second Edition. ISBN 0-9653289-1-0.

Rosgen, D., 2001. A Practical Method of Computing Streambank Erosion Rate. Proceedings of the Seventh Federal Interagency Sedimentation Conference, March 25-29, 2001. Reno, Nevada.

Simon, A., Hupp, C.R., 1986. Channel evolution in modified Tennessee channels. Proceedings, Fourth Federal Interagency Sedimentation Conference, Las Vegas, March 1986, vol. 2, pp. 5–71–5–82.

Schueler, T. and Stack, B., (2014). *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects*. Chesapeake Stormwater Network. Final Approval by CBP WQIT: September 8, 2014.

Schumm, S.A., M.D. Harvey, and C.C. Watson, 1984. Incised Channels: Morphology, Dynamics, and control. Water Resources Publications, Littleton, CO. 200 p.

Smoot Z. T., A.D. Jayakaran, D.M. Park, and D.R. Hitchcock, 2015. Hydraulic Geometry Curves in the Pee Dee Watershed. Journal of South Carolina Water Resources, vol. 2, issue 1, pp. 63-69.

Sweet W., J. W. Geratz, 2003. Bankfull Hydraulic Geometry Relationships and Recurrence intervals for North Carolina’s Coastal Plain. Journal of the American Water Resources Association (JAWRA) 39(4):861-871.

Thorne C.R. 1999. Bank processes and channel evolution in the incised rivers of North–Central Mississippi. In Incised River Channels, Darby SE, Simon A (eds). J Wiley: Chichester, UK, ISBN 0-471-98446-9; 97–122.

United States Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0). Vicksburg, MS.

United States Department of Agriculture Natural Resources Conversation Services (USDA-NRCS), 2017. Conservation Practice Standard Lined Waterway or Outlet, Code 648.

United States Department of Agriculture Natural Resources Conversation Services (USDA-NRCS), Soil Survey Staff. Web Soil Survey. Available online at http://websoilsurvey.nrcs.gov/. Accessed [07/20/2023].

United States Department of Agriculture, Natural Resources Conversation Services, (USDA-NRCS), Soil Survey Staff. Official Soil Series Descriptions. Available online. Accessed [2023].

United States Environmental Protection Agency (EPA), 2001. Total Maximum Daily Load (TMDL) Documentation for Chlordane in Baltimore Harbor. Retrieved from https://mde.maryland.gov/programs/Water/TMDL/Baltimore_Harbor_02130903/bhchlor_tmdl_main_fin.pdf

United States Environmental Protection Agency (EPA). 2007 Total Maximum Daily Loads of Nitrogen and Phosphorus for the Baltimore Harbor in Anne Arundel, Baltimore, Carroll and Howard Counties and Baltimore City, Maryland. Retrieved from https://mde.maryland.gov/programs/water/TMDL/Baltimore_Harbor_02130903/harbor-main-121406_final.pdf

United States Environmental Protection Agency (EPA). 2011. Decision Rationale Total Maximum Daily Loads of Bacteria Impaired Recreational Areas Marley Creek and Furnace Creek of Baltimore Harbor Basin, Anne Arundel County, Maryland. Retrieved from https://mde.maryland.gov/programs/Water/TMDL/Baltimore_Harbor_02130903/MarleyCreek_FurnaceCreek_Harbor_FC_DR.pdf.

United States Environmental Protection Agency (EPA). 2012. Decision Rationale Total Maximum Daily Loads of Polychlorinated Biphenyls in Baltimore Harbor, Curtis Creek/Bay and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment, Maryland. Retrieved from https://mde.maryland.gov/programs/water/TMDL/Baltimore_Harbor_02130903/BaltHarbor_PCBs_TMDL_EPA_Decision_Rationale.PDF.

United States Environmental Protection Agency (EPA). 2015. Total Maximum Daily Loads of Trash and Debris for the Middle Branch and Northwest Branch Portions of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment, Baltimore City and County, Maryland. Retrieved from https://mde.maryland.gov/programs/water/TMDL/Baltimore_Harbor_02130903/Harbor_Trash_120314_final.pdf

United States Environmental Protection Agency (EPA). 2022. Total Maximum Daily Load of Sediment in the Baltimore Harbor Watershed, Baltimore City, Baltimore County, and Anne Arundel County, Maryland. Retrieved from https://mde.maryland.gov/programs/water/TMDL/Baltimore_Harbor_02130903/Balt_Harbor_SedTMDL_final.pdf

United States Government Publishing Office Website, Code of Federal Regulations, 33 CFR 328.3 (e). Retrieved from https://www.gpo.gov/fdsys/pkg/CFR-2012-title33-vol3/pdf/CFR-2012-title33-vol3-sec328-3.pdf.

Wolman, M.G. and A.P. Schick, 1967. Effects of construction on fluvial sediment, urban and suburban areas of Maryland. Water Resources Research 3(2): 451-464.

Wood, David, 2020*. Consensus Recommendations for Improving the Application of the Prevented Sediment Protocol for Urban Stream Restoration Projects Built for Pollutant Removal Credit.*

Wood, D., Schueler, T., 2020. *Consensus Recommendations to Improve Protocols 2 and 3 for Defining Stream Restoration Pollutant Removal Credits*

APPENDIX A

Construction Drawings

BEFORE YOU DIG CALL
1-800-257-7777 OR DIAL 811

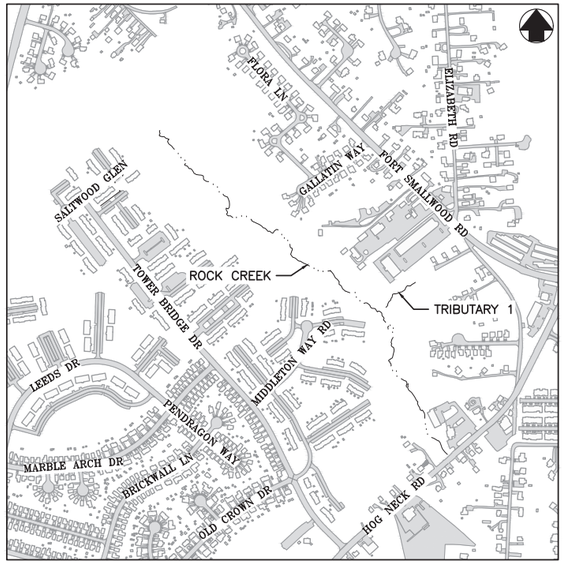
DEPARTMENT OF PUBLIC WORKS
BUREAU OF WATERSHED PROTECTION AND RESTORATION
ROCK CREEK STREAM RESTORATION
90% CONSTRUCTION DRAWINGS
CONTRACT NO. B553802
AUGUST 2025

ANNE ARUNDEL COUNTY MARYLAND

SHEET LIST TABLE

SHEET NUMBER	SHEET TITLE	DRAWING NUMBER
1	COVER SHEET	TS-01
2	GENERAL NOTES & SPECIMEN TREE SURVEY	AB-01
3	SOIL BORING LOGS	AB-02
4	KEY SHEET	SL-01
5	EXISTING CONDITIONS AND DEMOLITION PLAN	EF-01
6	EXISTING CONDITIONS AND DEMOLITION PLAN	EF-02
7	EXISTING CONDITIONS AND DEMOLITION PLAN	EF-03
8	EXISTING CONDITIONS AND DEMOLITION PLAN	EF-04
9	EXISTING CONDITIONS AND DEMOLITION PLAN	EF-05
10	EXISTING CONDITIONS AND DEMOLITION PLAN	EF-06
11	EXISTING CONDITIONS AND DEMOLITION PLAN	EF-07
12	SITE PLAN	C-01
13	SITE PLAN	C-02
14	SITE PLAN	C-03
15	SITE PLAN	C-04
16	SITE PLAN	C-05
17	SITE PLAN	C-06
18	SITE PLAN	C-07
19	STREAM RESTORATION DETAILS	DE-01
20	STREAM RESTORATION DETAILS	DE-02
21	STREAM RESTORATION DETAILS	DE-03
22	STREAM RESTORATION DETAILS	DE-04
23	STREAM RESTORATION DETAILS	DE-05
24	MAIN STEM PROFILE	PR-01
25	MAIN STEM PROFILE	PR-02
26	MAIN STEM, TRIBUTARY 1, AND OPEN PIPES 1 & 2 PROFILES	PR-03
27	MAIN STEM CROSS SECTIONS	CS-01
28	MAIN STEM CROSS SECTIONS	CS-02
29	MAIN STEM CROSS SECTIONS	CS-03
30	MAIN STEM CROSS SECTIONS	CS-04
31	MAIN STEM CROSS SECTIONS	CS-05
32	MAIN STEM CROSS SECTIONS	CS-06
33	MAIN STEM CROSS SECTIONS	CS-07
34	MAIN STEM CROSS SECTIONS	CS-08
35	MAIN STEM CROSS SECTIONS	CS-09
36	MAIN STEM CROSS SECTIONS	CS-10
37	MAIN STEM CROSS SECTIONS	CS-11
38	MAIN STEM CROSS SECTIONS	CS-12
39	MAIN STEM CROSS SECTIONS	CS-13
40	MAIN STEM CROSS SECTIONS	CS-14
41	MAIN STEM CROSS SECTIONS	CS-15
42	TRIBUTARY 1 CROSS SECTIONS	CS-16
43	TRIBUTARY 1 CROSS SECTIONS	CS-17
44	EROSION AND SEDIMENT CONTROL PLAN	ES-01
45	EROSION AND SEDIMENT CONTROL PLAN	ES-02
46	EROSION AND SEDIMENT CONTROL PLAN	ES-03
47	EROSION AND SEDIMENT CONTROL PLAN	ES-04
48	EROSION AND SEDIMENT CONTROL PLAN	ES-05
49	EROSION AND SEDIMENT CONTROL PLAN	ES-06
50	EROSION AND SEDIMENT CONTROL PLAN AND SEQUENCE OF CONSTRUCTION	ES-07
51	EROSION AND SEDIMENT CONTROL DETAILS	ES-08
52	EROSION AND SEDIMENT CONTROL DETAILS	ES-09
53	PLANTING PLAN	LS-01
54	PLANTING PLAN	LS-02
55	PLANTING PLAN	LS-03
56	PLANTING PLAN	LS-04
57	PLANTING PLAN	LS-05
58	PLANTING PLAN	LS-06
59	PLANTING PLAN	LS-07
60	PLANTING DETAILS	LS-08
61	PLANTING DETAILS	LS-09
62	PLANTING DETAILS	LS-10
63	PLANTING DETAILS	LS-11

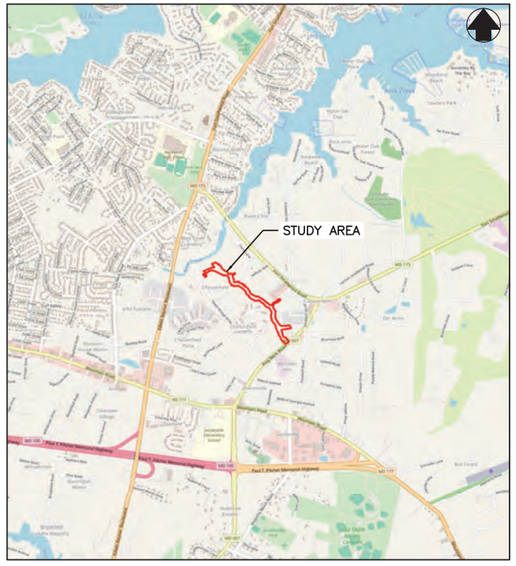
FOR SEQUENCE OF CONSTRUCTION, SEE DWG ES-07/SHEET 50



LOCATION MAP
SCALE: 1"=500'

0 250 500 1000

1 INCH = 500 FEET



VICINITY MAP
SCALE: 1"=2000'

0 1000 2000 4000

1 INCH = 2000 FEET

CONSULTANT'S CERTIFICATION

THE DEVELOPER'S PLAN TO CONTROL SILT AND EROSION IS ADEQUATE TO CONTAIN THE SILT AND EROSION ON THE PROPERTY COVERED BY THE PLAN. I CERTIFY THAT THIS PLAN OF EROSION AND SEDIMENT CONTROL REPRESENTS A PRACTICAL AND WORKABLE PLAN BASED ON MY PERSONAL KNOWLEDGE OF THIS SITE, AND WAS PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AASCD PLAN SUBMITTAL GUIDELINES AND THE CURRENT MARYLAND STANDARDS AND SPECIFICATION FOR SOIL EROSION AND SEDIMENT CONTROL. I HAVE REVIEWED THIS EROSION AND SEDIMENT CONTROL PLAN WITH THE OWNER / DEVELOPER

MD P.E. LICENSE # 200966

NAME SEAN CRAWFORD

FIRM NAME BAYLAND CONSULTANTS & DESIGNERS, INC.

ADDRESS 7455 NEW RIDGE ROAD, SUITE T

CITY HANOVER STATE MD ZIP CODE 21076

SIGNATURE

PROJECT INFORMATION

1.	OWNER/DEVELOPER INFORMATION:	ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS 2662 RIVA ROAD – 2ND FLOOR ANNAPOLIS, MD 21401 410-222-7908 ATTN: GERRY INGLESBY
2.	ENGINEER:	BAYLAND CONSULTANTS AND DESIGNERS, INC.
3.	ENGINEER INFORMATION:	7455 NEW RIDGE ROAD, SUITE T HANOVER, MARYLAND 21076 PH: 410-694-9401
4.	TAX MAP:	0017
5.	PARCEL:	631
6.	PLAT REF:	0080/0002
7.	DISTRICT:	3
8.	PROPERTY AREA:	6.091
9.	WATERSHED:	PATAPSCO RIVER
10.	A.A. CO GRADING PERMIT:	TBD
11.	STREAM USE DESIGNATION:	CLASS 1
12.	CRITICAL AREA:	YES
13.	ZONING:	OS (OPEN SPACE)

SITE ANALYSIS

1.	TOTAL SITE AREA:	7.73 ACRES
1.1.	PROPOSED DISTURBED AREA:	7.73 ACRES
2.	TOTAL AREA TO BE STABILIZED:	7.73 ACRES
2.1.	TOTAL EX. IMPERVIOUS AREA:	0.01 ACRES
2.2.	TOTAL EX. IMPERVIOUS AREA TO REMAIN:	0.01 ACRES
2.3.	TOTAL PR. IMPERVIOUS AREA:	0.00 ACRES
2.4.	TOTAL TO BE STABILIZED WITH VEGETATION:	5.75 ACRES
2.5.	PROPOSED CHANNEL AREA:	1.97 ACRES
3.	PROPOSED IMPERVIOUS AREA:	0.00 ACRES
4.	TOTAL ESTIMATED CUT:	506 CY
5.	TOTAL ESTIMATED FILL:	12,051 CY

NOTE:
THE QUANTITIES SHOWN ABOVE ARE FOR ANNE ARUNDEL COUNTY SOIL CONSERVATION DISTRICT INFORMATIONAL PURPOSES ONLY. BAYLAND MAKES NO GUARANTEES OF ACCURACY OF QUANTITIES OR BALANCE SITE. THE DEVELOPER AND CONTRACTOR SHALL TAKE FULL RESPONSIBILITY OF ACTUAL QUANTITIES ENCOUNTERED DURING CONSTRUCTION. CUT FILL QUANTITIES ARE BASED ON FINISHED GRADE AND ARE NOT INTENDED TO BE USED BY THE CONTRACTOR FOR ESTIMATING PURPOSES.

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 NO. 200966, EXPIRATION DATE: 01/16/2027.

STANDARD RESPONSIBILITY NOTES

1. I (WE) CERTIFY THAT:
   a. ALL DEVELOPMENT AND CONSTRUCTION WILL BE DONE IN ACCORDANCE WITH THIS SEDIMENT AND EROSION CONTROL PLAN, AND FURTHER, AUTHORIZE THE RIGHT OF ENTRY FOR PERIODIC ON-SITE EVALUATION BY THE ANNE ARUNDEL SOIL CONSERVATION DISTRICT (AASCD) BOARD OF SUPERVISORS OR THEIR AUTHORIZED AGENTS.
   b. ANY RESPONSIBLE PERSONNEL INVOLVED IN THE CONSTRUCTION PROJECT WILL HAVE A CERTIFICATE OF ATTENDANCE FROM THE MARYLAND DEPARTMENT OF THE ENVIRONMENT'S APPROVED TRAINING PROGRAM FOR THE CONTROL OF SEDIMENT AND EROSION BEFORE BEGINNING THE PROJECT.
   RESPONSIBLE PERSONNEL ON SITE: _____
   c. IF APPLICABLE, THE APPROPRIATE ENCLOSURE WILL BE CONSTRUCTED AND MAINTAINED ON SEDIMENT BASIN(S) INCLUDED IN THIS PLAN. SUCH STRUCTURE(S) WILL BE IN COMPLIANCE WITH THE ANNE ARUNDEL COUNTY CODE.
2. THE DEVELOPER IS RESPONSIBLE FOR THE ACQUISITION OF ALL EASEMENTS, RIGHT, AND/OR RIGHTS-OF-WAY THAT MAY BE REQUIRED FOR THE SEDIMENT AND EROSION CONTROL PRACTICES, STORM WATER MANAGEMENT PRACTICES AND THE DISCHARGE OF STORM WATER ONTO OR ACROSS ADJACENT OR DOWNSTREAM PROPERTIES INCLUDED IN THE PLAN.
3. FOR INITIAL SOIL DISTURBANCE OR RE-DISTURBANCE, PERMANENT AND/OR TEMPORARY STABILIZATION PER THE AASCD VEGETATIVE ESTABLISHMENT SHALL BE COMPLETED WITHIN THREE CALENDAR DAYS FOR THE SURFACE OF ALL CONTROLS, DIKES, SWALES, DITCHES, PERIMETER SLOPES AND ALL SLOPES GREATER THAN 3 HORIZONTAL TO 1 VERTICAL (3:1); AND SEVEN DAYS FOR ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.
4. THE GRADING AND SEDIMENT CONTROL APPROVAL ON THIS PLAN EXTENDS ONLY TO THOSE AREAS WITHIN THE LIMITS OF DISTURBANCE.
5. THE APPROVAL OF THIS PLAN FOR SEDIMENT AND EROSION CONTROL DOES NOT RELIEVE THE DEVELOPER/CONSULTANT FROM COMPLYING WITH FEDERAL, STATE OR COUNTY REQUIREMENTS PERTAINING TO ENVIRONMENTAL ISSUES.
6. THE DEVELOPER MUST REQUEST THAT THE SEDIMENT AND EROSION CONTROL INSPECTOR APPROVE WORK COMPLETED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN, THE GRADING OR BUILDING PERMIT, AND THE ORDINANCE.
7. ALL MATERIAL SHALL BE TAKEN TO A SITE WITH AN APPROVED SEDIMENT AND EROSION CONTROL PLAN.
8. FIRST PHASE INSPECTION AND APPROVAL OF THE SEDIMENT AND EROSION CONTROL INSPECTOR SHALL BE REQUIRED UPON COMPLETION OF THE INSTALLATION OF EROSION AND SEDIMENT CONTROLS PRIOR TO PROCEEDING WITH ANY OTHER EARTH DISTURBANCE OR GRADING. OTHER BUILDING OR GRADING INSPECTION APPROVALS MAY NOT BE AUTHORIZED UNTIL THE INITIAL APPROVAL BY THE SEDIMENT AND EROSION CONTROL INSPECTOR IS GIVEN. INSPECTION AND PERMITS MAY ALSO REQUIRE THAT AN INSPECTION AND CERTIFICATION OF THE INSTALLATION OF SEDIMENT CONTROL ALSO BE PERFORMED BY A DESIGN PROFESSIONAL PRIOR TO CONSTRUCTION COMMENCING.
9. APPROVAL FROM THE INSPECTOR MUST BE REQUESTED ON FINAL STABILIZATION OF ALL SITES PRIOR TO REMOVAL OF SEDIMENT AND EROSION CONTROLS.
10. EXISTING TOPOGRAPHY MUST BE FIELD VERIFIED BY RESPONSIBLE PERSONNEL TO THE SATISFACTION OF THE SEDIMENT CONTROL INSPECTOR PRIOR TO COMMENCING WORK.

SIGNATURE OF DEVELOPER/OWNER DATE

PRINT: NAME: ERIK MICHELSEN
TITLE: DEPUTY DIRECTOR
AFFILIATION: ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS
ADDRESS: 2662 RIVA ROAD, ANNAPOLIS, MARYLAND 21401
TELEPHONE NUMBER: 410-222-4240
EMAIL ADDRESS: PWMICH20@AACOUNTY.ORG

PROPOSED STREAM RESTORATION	STREAM LENGTH (LF)	POLLUTANT REDUCTION CREDITS			IMPERVIOUS AREA TREATED (ACRES)*
		TN (LBS/YR)	TP (LBS/YR)	TSS (TONS/YR)	
	3,455	825.0	163.3	796.2	105.9

NOTE:
MS4 EQUIVALENT IMPERVIOUS ACRE CREDIT FOR THE STREAM RESTORATION PROJECT WAS CALCULATED FROM THE METHODOLOGY DESCRIBED WITHIN THE MDE DOCUMENT "MUNICIPAL SEPARATE STORM SEWER SYSTEM ACCOUNTING FOR STORMWATER WASTELOAD ALLOCATIONS AND IMPERVIOUS ACRES TREATED" (MDE, NOVEMBER 2021).

AS-BUILT CERTIFICATION

I HEREBY CERTIFY THAT THE FACILITY SHOWN ON THIS PLAN WAS CONSTRUCTED AS SHOWN ON THE "AS-BUILT" PLANS AND MEETS THE APPROVED PLANS AND SPECIFICATIONS.

ENGINEER'S SIGNATURE DATE

PRINTED NAME MD P.E. REGISTRATION NO.

TS-01

90% CONSTRUCTION DRAWINGS

Bayland Consultants & Designers, Inc.
"Integrating Engineering and Environment"
7455 New Ridge Road, Suite T Phone: (410) 694-9401
Hanover, Maryland 21076 Fax: (410) 694-9105
www.baylandinc.com
BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE _____ CHIEF, ENGINEER
APPROVED DATE _____ PROJECT MANAGER
APPROVED DATE _____ DEPUTY DIRECTOR
APPROVED DATE _____ CHIEF, RIGHT OF WAY

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	1 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
COVER SHEET
COUNCIL DISTRICT 3

2\5_20201_ROCK CREEK_SHEET_RESTORATION\DWG Files\Sheet Files\5_20201_TS01.dwg

LEGEND

TRAVERSE POINT — TPS #1
EX. MAJOR CONTOUR — 5
EX. MINOR CONTOUR
LIMIT OF FIELD RUN TOPOGRAPHY
EX. PERENNIAL WATERS OF THE US (WUS) DELINEATED BY BAYLAND
EX. INTERMITTENT WATERS OF THE US (WUS) DELINEATED BY BAYLAND
EX. EPHEMERAL WATERS OF THE US (WUS) DELINEATED BY BAYLAND
EX. ROAD
EX. TREELINE
EX. GUARDRAIL
EX. OVERHEAD ELECTRIC LINES — OHE
EX. THALWEG
EX. 25' NON-TIDAL WETLAND BUFFER — WB
EX. NON-TIDAL WETLAND
EX. SEWER & MANHOLE — EX. 8" SS
EX. STORM DRAIN, INLET & MANHOLE — EX. 12" SD
EX. WATER & VALVE — EX. 6" W
EX. SPECIMEN TREE DBH ≥ 30" — TR 1
EX. SPECIMEN TREE DBH ≥ 30" TO BE REMOVED — TR 1
EX. SPECIMEN TREE DBH ≥ 30" TO BE PROTECTED — TR 1
EX. PROPERTY BOUNDARY
EX. GENERAL COMMON EASEMENT
EX. FOREST CONSERVATION EASEMENT — FC
EX. UTILITY EASEMENT
EX. STORM DRAIN EASEMENT
EX. CRITICAL AREA BOUNDARY — RCA / LDA

PR. MAJOR CONTOUR — 5
PR. MINOR CONTOUR
PR. ODD CONTOUR — 05
PR. ALIGNMENT/BASELINE OF CONSTRUCTION — 0+00, 0+15
PR. LIMIT OF DISTURBANCE — LOD
PR. LIMIT OF DISTURBANCE/HIGH VISIBILITY FENCE — LOD — HVF
DRAINAGE EASEMENT ACQUIRED PRIOR TO CONSTRUCTION
TEMPORARY CONSTRUCTION EASEMENT ACQUIRED PRIOR TO CONSTRUCTION
PR. SPOT ELEVATION — EL. 50.5
PR. RIFFLE-WEIR
PR. VALLEY WIDE WEIR
PR. RIFFLE GRADE CONTROL
EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND
PR. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND
EX. RIPRAP TO REMAIN
EX. CONCRETE
EX. GABION BASKETS
EX. STEEL SANITARY SEWER PROTECTION
EX. SIGN
EX. FIRE HYDRANT
SOIL BORING LOG — B-1
EX. SEWER CLEANOUT
EX. LIGHT POLE
EX. MAILBOX

ABBREVIATIONS

A.A.CO.	ANNE ARUNDEL COUNTY
AC	ACRES
BLDG	BUILDING
CA	CRITICAL AREA
CI	CAST IRON
C/L	CENTERLINE
CMP	CORRUGATED METAL PIPE
DBH	DIAMETER AT BREAST HEIGHT
DWG	DRAWING
EA	EACH
ELEV.	ELEVATION
EW	ENDWALL
EX.	EXISTING
FAC	FACULTATIVE
FACU	FACULTATIVE UPLAND
FACW	FACULTATIVE WETLAND
FC	FOREST CONSERVATION
FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY
FT.	FEET
HVF	HIGH VISIBILITY FENCE
HW	HEADWALL
IN.	INCHES
INV.	INVERT
LB	POUNDS
LDA	LOW DEVELOPMENT AREA
LF	LINEAR FEET
LOD	LIMIT OF DISTURBANCE
MAX.	MAXIMUM
MB	MOUNTABLE BERM
MH	MANHOLE
MIN	MINIMUM
OBL	OBLIGATE WETLAND
O.C.	OFF-CENTER
PERM.	PERMANENT
PLS	PURE LIVE SEED
PR.	PROPOSED
PVC	POLYVINYL CHLORIDE
RCA	RESOURCE CONSERVATION AREA
RCP	REINFORCED CONCRETE PIPE
RGC	RIFFLE GRADE CONTROL
RR	RIPRAP PROTECTION
RSF	REINFORCED SILT FENCE
RW	RIFFLE-WEIR
SCE	STABILIZED CONSTRUCTION ENTRANCE
SD	STORM DRAIN
SF	SQUARE FEET
SS	SANITARY SEWER
STA.	STATION
STD	STANDARD
SY.	SQUARE YARDS
TC	TERRACOTTA
TBR.	TO BE REMOVED
TOB	TOP OF BANK
TPS	TRAVERSE POINT
TYP.	TYPICAL
UPL	OBLIGATE UPLAND
VCP	VITRIFIED CLAY PIPE
VWW	VALLEY WIDE WEIR
W	WATER MAIN
WB	WETLAND BUFFER
WSE	WATER SURFACE ELEVATION
XS	CROSS-SECTION
YR.	YEAR

GENERAL CONSTRUCTION NOTES

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH ANNE ARUNDEL COUNTY STANDARD SPECIFICATIONS AND/OR DETAILS FOR CONSTRUCTION AND THE STATE HIGHWAY ADMINISTRATION'S STANDARD SPECIFICATIONS AND DETAILS FOR CONSTRUCTION UNLESS OTHERWISE NOTED.
2. THE CONTRACTOR SHALL CONTACT "MISS UTILITY" AT 1-800-257-7777 A MINIMUM OF 72 HOURS IN ADVANCE OF ANY EXCAVATION, BORING, PILE DRIVING AND/OR DIGGING FOR THE LOCATION OF GAS, ELECTRIC, TELEPHONE, WATER AND SEWER LINES.
3. WHILE WORKING NEAR GAS MAINS AND SERVICES PROPER CAUTIONS AND PROCEDURES SHOULD BE FOLLOWED. IF SPANS OF GAS MAINS ARE TO BE EXPOSED DURING EXCAVATION, CONTACT THE BGE GAS ENGINEERING DEPARTMENT AT 410-470-9573 TO ARRANGE APPROVAL OF SUPPORT METHODS AND INSPECTION. THE CONTRACTOR SHALL MAINTAIN 4 FOOT HORIZONTAL AND 12 FOOT VERTICAL CLEARANCE BETWEEN EXISTING GAS FACILITIES AND ANY NEW PROPOSED FACILITIES.
4. MECHANICAL EXCAVATION SHALL NOT BE CONDUCTED WITHIN 3 FEET HORIZONTALLY OR WITHIN 2 FEET VERTICALLY OF KNOWN UTILITY LOCATIONS. HAND OR SOFT DIGGING SHALL BE DONE WITHIN THESE LIMITS. UNDERGROUND UTILITIES, ONCE UNCOVERED, SHALL BE PROTECTED FROM BEING STRUCK BY EQUIPMENT.
5. IT SHALL BE DISTINCTLY UNDERSTOOD THAT FAILURE TO MENTION SPECIFICALLY ANY WORK WHICH WOULD NATURALLY BE REQUIRED TO COMPLETE THE PROJECT SHALL NOT RELIEVE THE CONTRACTOR OF THEIR RESPONSIBILITY TO COMPLETE SUCH WORK.
6. FOR FILL REQUIREMENTS, REFER TO THE CONTRACT DOCUMENTS.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MATERIALS TESTING IN ACCORDANCE WITH THE CONTRACT DOCUMENTS INCLUDING ALL CONCRETE, FILL COMPACTION, AND TOPSOIL TESTING REQUIRED BY THE COUNTY. ALL MATERIALS TESTING SHALL BE COMPENSATED FOR AS PART OF THE APPROPRIATE PAY ITEM.
8. ALL DISTURBED AREAS SHALL HAVE PERMANENT OR TEMPORARY STABILIZATION COMPLETED WITHIN:
   - 8.A. END OF THE WORK DAY FOR AREAS WITHIN WATERWAYS.
   - 8.B. THREE CALENDAR DAYS ON SLOPES GREATER THAN 3:1 AND TO THE SURFACE OF ALL PERIMETER SEDIMENT CONTROLS.
   - 8.C. SEVEN CALENDAR DAYS AS TO ALL OTHER DISTURBED OR GRADED AREAS.
   - 8.D. ALL STABILIZATION MUST BE IN ACCORDANCE WITH MARYLAND DEPARTMENT OF AGRICULTURE FERTILIZER LAW.
9. ALL TREES WITH A DIAMETER AT BREAST HEIGHT GREATER THAN 30 INCHES WITHIN THE LIMIT OF DISTURBANCE SHALL NOT BE REMOVED UNLESS EXPLICITLY SHOWN ON THE PLANS TO BE REMOVED OR IF PRIOR APPROVAL IS OBTAINED FROM THE COUNTY. ALL TREES GREATER THAN 30 INCHES WITHIN THE LIMIT OF DISTURBANCE THAT ARE NOT MARKED FOR REMOVAL SHALL BE PROTECTED.
10. PAYMENT FOR FELLING AND/OR STOCKPILING GREEN WASTE AND ANY TREES WITH A DIAMETER SMALLER THAN 8 INCHES WILL BE CONSIDERED INCIDENTAL TO PAYMENT FOR CLEARING AND GRUBBING.
11. ALL DISTURBED AREAS WITH SLOPES GREATER THAN 3:1 SHALL BE STABILIZED WITH BIODEGRADABLE SOIL STABILIZATION MATTING THAT HAS A SUFFICIENT DESIGN SHEAR STRESS FOR THE APPLICATION WITH 4 INCHES OF TOPSOIL PER 2011 MDE SPECIFICATIONS.
12. ALL PERMANENTLY STABILIZED AREAS SHALL INCLUDE A MINIMUM OF 4 INCHES OF TOPSOIL PER THE 2011 MDE SPECIFICATIONS OR AS DIRECTED BY THE COUNTY, SEE DWG ES-08/SHEET 51 FOR SPECIFICATIONS. ALL SUITABLE TOPSOIL SHALL BE SALVAGED & STOCKPILED ONSITE & AMENDED AS NEEDED. ANY IMPORT OF TOPSOIL REQUIRES APPROVAL BY THE COUNTY.
13. ALL STAKING, RESTAKING, AND CUT SHEETS SHALL BE PERFORMED OR SUPERVISED BY A REGISTERED LAND SURVEYOR OR PROFESSIONAL ENGINEER AT THE CONTRACTOR'S EXPENSE.
14. ALL CONSTRUCTION TO BE PERFORMED IN ACCORDANCE WITH STATE OF MARYLAND OCCUPATIONAL SAFETY LAWS.
15. CONTRACTOR MUST ENSURE THAT COPIES OF FEDERAL, STATE, AND COUNTY PERMITS ARE POSTED ON SITE PRIOR TO THE START OF ANY WORK.
16. ALL ROADS SHALL BE CLEANED AND CLEARED BY THE END OF EACH DAY. ANY MUD OR ROCKS TRACKED ON THE ROADWAYS SHALL BE SWEPT THROUGHOUT THE WORK DAY.
17. THE CONTRACTOR SHALL RESTORE ALL AREAS IMPACTED BY CONSTRUCTION ACTIVITY TO A CONDITION EQUAL TO OR BETTER THAN PRE-CONSTRUCTION CONDITIONS AT NO ADDITIONAL EXPENSE TO THE COUNTY. THIS SHALL INCLUDE BUT IS NOT LIMITED TO GRASS AREAS, ROADS, AND PAVED AREAS AS WELL AS CURB AND GUTTER AND PAVEMENT AT CONSTRUCTION ENTRANCES.
18. SUMP PITS SHALL BE INSTALLED AS REQUIRED FOR ADEQUATE DEWATERING IN ACCORDANCE WITH THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL AT NO ADDITIONAL EXPENSE TO THE COUNTY.
19. THE CONTRACTOR SHALL PERFORM IN-PLACE COMPACTION TESTING AS REQUIRED BY THE COUNTY. COMPACTION TESTING SHALL BE AS SPECIFIED IN SECTION 02250 AND 02260.
20. ELECTRONIC CAD FILES WILL BE PROVIDED AFTER AWARD OF CONTRACT TO ASSIST WITH CONSTRUCTION STAKEOUT.
21. HEAVY EQUIPMENT AND DUMPING OF STONE SHALL NOT BE ALLOWED OVER SANITARY SEWER LINES UNLESS OTHERWISE SHOWN. ALL CROSSINGS OVER SANITARY SEWER LINES WILL CONSIST OF 12" MULCH AND MATS TO DISTRIBUTE LOADS.
22. FOR ANY OVERHEAD FACILITIES IN THE AREA THE CONTRACTOR SHALL ADHERE TO THE MARYLAND HIGH VOLTAGE LINE ACT.

GENERAL SITE NOTES

1. TOPOGRAPHIC SURVEY PERFORMED BY BAYLAND CONSULTANTS & DESIGNERS, INC., DATED APRIL 2023 THROUGH MAY 2023 AND JANUARY 2025.
2. HORIZONTAL AND VERTICAL CONTROL ESTABLISHED FROM REAL TIME KINEMATIC (RTK) GLOBAL POSITIONING SYSTEM (GPS) CONTROL POINTS. TRAVERSE POINTS ARE IRON REBAR UNLESS OTHERWISE SPECIFIED. COORDINATES AND BEARINGS SHOWN HEREON ARE REFERRED TO THE MARYLAND COORDINATE SYSTEM (NAD83/1991). ELEVATIONS SHOWN HEREON ARE REFERRED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

TRAVERSE	NORTHING	EASTING	ELEVATION	DESCRIPTION
TPS# 1	532,983.20	1,449,395.81	54.40	YELLOW PLASTIC CAP ADJUSTED
TPS# 2	532,839.76	1,449,250.87	54.38	YELLOW PLASTIC CAP ADJUSTED
TPS# 4	534,939.00	1,446,724.52	52.16	MAG DISK
TPS# 501	533,159.04	1,449,025.04	41.37	YELLOW PLASTIC CAP ADJUSTED
TPS# 502	533,324.61	1,448,937.70	37.74	YELLOW PLASTIC CAP ADJUSTED
TPS# 503	533,550.13	1,448,883.35	39.38	YELLOW PLASTIC CAP ADJUSTED
TPS# 504	533,766.40	1,448,868.99	37.71	YELLOW PLASTIC CAP ADJUSTED
TPS# 505	533,974.35	1,448,645.52	30.38	YELLOW PLASTIC CAP ADJUSTED
TPS# 506	534,130.08	1,448,393.93	24.32	YELLOW PLASTIC CAP ADJUSTED
TPS# 507	534,239.66	1,448,109.03	19.45	YELLOW PLASTIC CAP ADJUSTED
TPS# 508	534,389.71	1,447,988.75	15.89	YELLOW PLASTIC CAP ADJUSTED
TPS# 509	534,500.32	1,447,821.76	13.26	YELLOW PLASTIC CAP ADJUSTED
TPS# 510	534,477.91	1,447,668.30	13.84	YELLOW PLASTIC CAP ADJUSTED
TPS# 511	534,603.78	1,447,574.02	12.06	YELLOW PLASTIC CAP ADJUSTED
TPS# 512	534,736.37	1,447,559.29	8.90	YELLOW PLASTIC CAP ADJUSTED
TPS# 513	534,772.76	1,447,463.33	12.98	YELLOW PLASTIC CAP ADJUSTED
TPS# 514	534,804.95	1,447,310.01	10.95	YELLOW PLASTIC CAP ADJUSTED
TPS# 515	534,929.15	1,447,159.89	9.25	YELLOW PLASTIC CAP ADJUSTED
TPS# 516	534,936.86	1,447,025.32	43.60	YELLOW PLASTIC CAP ADJUSTED
TPS# 603	534,839.96	1,446,869.88	51.47	MAG DISK

3. THE EXISTING UTILITIES, GRADES, AND OBSTRUCTIONS SHOWN ARE FROM THE BEST AVAILABLE RECORDS AND SHALL BE VERIFIED BY THE CONTRACTOR TO THEIR SATISFACTION PRIOR TO CONSTRUCTION. NECESSARY PRECAUTIONS SHALL BE TAKEN BY THE CONTRACTOR TO PROTECT EXISTING SERVICES AND MAINS AND ANY DAMAGE TO THEM SHALL BE REPAIRED IMMEDIATELY AT THEIR OWN EXPENSE.
4. CONTOURS AND PLANIMETRICS SHOWN OUTSIDE OF LIMIT OF FIELD RUN SURVEY ARE BASED ON ANNE ARUNDEL COUNTY ONE FOOT INTERVAL 2020 GIS TOPOGRAPHY AND 2016, 2018, 2019 & 2021 GIS DATA.
5. PROPERTY LINES SHOWN ARE BASED ON BEST AVAILABLE PLAT AND DEED RECORDS AND PROPERTY CORNER SURVEY PERFORMED BY BAYLAND IN 2023.
6. ONLY TREES WITH A 30" DIAMETER OR GREATER ARE SHOWN ON THE PLANS.
7. WETLAND DELINEATION WAS PERFORMED BY BAYLAND CONSULTANTS AND DESIGNERS, INC DATED APRIL 2023. WETLANDS AND ASSOCIATED BUFFERS OUTSIDE OF LIMIT OF WORK ARE NOT SHOWN ON PLANS.
8. FEMA FIRM PANEL #24003C0069F EFFECTIVE FEBRUARY 18 2015 SHOWS THAT THE PROJECT SITE IS NOT WITHIN THE 100-YEAR FEMA FLOODPLAIN LIMITS.
9. ROCK CREEK IS A TRIBUTARY TO THE PATAPSCO RIVER (MD WATERSHED BASIN CODE 02-13-09-03) WHICH IS A USE 1 STREAM WITH STREAM CLOSURE PERIOD FROM MARCH 1ST THROUGH JUNE 15TH.
10. THE PROJECT SITE IS PARTIALLY WITHIN THE CRITICAL AREA.

EXISTING SPECIMEN TREE SURVEY

TREE NUMBER	DBH, IN	ABBREVIATION	LATIN NAME	COMMON NAME	CONDITION
TR 01	30, 27.5	MA	MORUS ALBA	WHITE MULBERRY	FAIR
TR 02	45.0	PO	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FAIR
TR 03	49.0	PO	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FAIR
TR 04	36.0	PO	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FAIR
TR 05	45.3	PO	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FAIR
TR 06	39.0	PO	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FAIR
TR 07	38.5	PO	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FAIR
TR 08	32.8	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	GOOD
TR 09 (TBR)	30.9	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	FAIR
TR 10 (TBR)	35.2	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	GOOD
TR 11 (TBR)	33.3	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	GOOD
TR 12 (TBR)	36.3	QF	QUERCUS FALCATA	SOUTHERN RED OAK	FAIR
TR 13 (TBR)	33.2	AR	ACER RUBRUM	RED MAPLE	POOR
TR 14 (TBR)	31.4	QA	QUERCUS ALBA	WHITE OAK	FAIR
TR 15 (TBR)	31.9	QPR	QUERCUS PRINUS	CHESTNUT OAK	GOOD
TR 16	35.0	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	GOOD
TR 17	40.4	QPR	QUERCUS PRINUS	CHESTNUT OAK	GOOD
TR 18	52.1	QPR	QUERCUS PRINUS	CHESTNUT OAK	FAIR
TR 19	31.3	QA	QUERCUS ALBA	WHITE OAK	FAIR
TR 20	36.6	QF	QUERCUS FALCATA	SOUTHERN RED OAK	FAIR
TR 21 (TBR)	41.1	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	FAIR
TR 22	32.7	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	GOOD
TR 23	31.8	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	GOOD
TR 24	73.1	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	FAIR
TR 25	38.4	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	FAIR
TR 26 (TBR)	34.9	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	FAIR
TR 27	33.5	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	GOOD
TR 28 (TBR)	32.6	AR	ACER RUBRUM	RED MAPLE	FAIR
TR 29	31.5	LT	LIRIODENDRON TULIPIFERA	TULIP POPLAR	FAIR
TR 31	33.3	PO	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FAIR
TR 32	34.5	LS	LIQUIDAMBAR STYRACIFLUA	SWEET GUM	FAIR
TR 33	33.0	PO	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FAIR
TR 34	35.5	PO	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FAIR

NOTES:
1. ONLY TREES WITH A 30" DIAMETER OR GREATER (SPECIMEN TREES) WITHIN "LIMIT OF FIELD RUN SURVEY" ARE SHOWN ON THE PLANS.
2. (TBR) INDICATES SPECIMEN TREE TO BE REMOVED.

UTILITY DRAWING REFERENCES

DWG 53067 TE9963 HOG NECK ROAD STORM DRAIN IMPROVEMENTS
DWG 53068 TE9963 HOG NECK ROAD STORM DRAIN IMPROVEMENTS
DWG 17032 TE26090 TICK NECK COLLECTION SYSTEM SECTION TWO
DWG 17033 TE26090 TICK NECK COLLECTION SYSTEM SECTION TWO
DWG 17034 TE26090 TICK NECK COLLECTION SYSTEM SECTION TWO
DWG 17035 TE26090 TICK NECK COLLECTION SYSTEM SECTION TWO
DWG 26781 TE28097 CHESTERFIELD PHASE 2-B SEWER AND WATER PLANS
DWG 26782 TE28097 CHESTERFIELD PHASE 2-B SEWER AND WATER PLANS
DWG 40736 TE30444 GALLATIN WOODS ROAD PLANS
DWG 40771 TE30450 GALLATIN WOODS SEWER & WATER PLANS
DWG 52727 TE9902 JACOBS WOODS SINGLE FAMILY RESIDENTIAL SUBDIVISION ROADS AND STORM DRAIN PLANS
DWG 51336 TE1339 APPLEGATE NORTH STORM DRAINS AND ROADS
DWG 75303 TE35397 ELIZABETH PLACE WATER AND SEWER PLANS

STORMWATER MANAGEMENT NOTE

THIS PROJECT IS A STREAM RESTORATION PROJECT AND NO NEW IMPERVIOUS AREA IS PROPOSED. THIS PROJECT WILL NOT RESULT IN HYDROLOGIC CHANGES.

Bayland Consultants & Designers, Inc.
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BAYLAND JOB NO. 5_20201

AB-01

90% CONSTRUCTION DRAWINGS

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED ____ DATE ____ CHIEF ENGINEER
APPROVED ____ DATE ____ PROJECT MANAGER
APPROVED ____ DATE ____ DEPUTY DIRECTOR
APPROVED ____ DATE ____ CHIEF, RIGHT OF WAY

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	2 OF 63
CONTRACT NO.	B553802

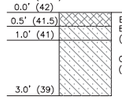
ROCK CREEK STREAM RESTORATION
GENERAL NOTES & SPECIMEN TREE SURVEY
COUNCIL DISTRICT 3

2\5_20201_ROCK CREEK STREAM RESTORATION\DWG Files\Sheet Files\5_20201_01.dgn

SOIL BORING LOG

BORING B-1

DEPTH(ELEV)	CLASSIFICATION
0.0' (42)	42 GROUND SURFACE
0.5' (41.5)	BROWN SILTY SAND WITH ORGANICS (SM)
1.0' (41)	BROWN POORLY GRADED SAND WITH SILT (SP-SM)
	ORANGE POORLY-GRADED SAND WITH SILT (SP-SM)
3.0' (39)	



BOTTOM EL. 39

SCALE: NOT TO SCALE

SOIL BORING LOG

BORING B-2

DEPTH(ELEV)	CLASSIFICATION
0.0' (38)	38 GROUND SURFACE
1.0' (37)	BROWN SILTY SAND WITH ORGANICS (SM)
2.0' (36)	BROWN/TAN POORLY GRADED SAND WITH SILT (SP-SM)
	ORANGE POORLY-GRADED SAND WITH SILT (SP-SM)
7.0' (31)	
▽(GW) 9.0' (29)	TAN POORLY-GRADED SAND (SP)

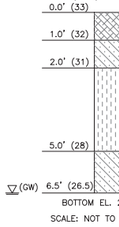
BOTTOM EL. 29

SCALE: NOT TO SCALE

SOIL BORING LOG

BORING B-3

DEPTH(ELEV)	CLASSIFICATION
0.0' (33)	33 GROUND SURFACE
1.0' (32)	BROWN SILTY SAND WITH ORGANICS (SM)
2.0' (31)	BROWN/TAN POORLY GRADED SAND WITH SILT (SP-SM)
	ORANGE POORLY-GRADED SAND (SP)
5.0' (28)	
▽(GW) 6.5' (26.5)	TAN POORLY-GRADED SAND WITH SILT (SP-SM)



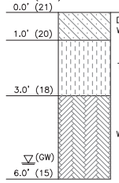
BOTTOM EL. 26.5

SCALE: NOT TO SCALE

SOIL BORING LOG

BORING B-4

DEPTH(ELEV)	CLASSIFICATION
0.0' (21)	21 GROUND SURFACE
1.0' (20)	DARK BROWN POORLY-GRADED SAND WITH SILT AND ORGANICS (SP-SM)
	TAN POORLY-GRADED SAND (SP)
3.0' (18)	
	WHITE SANDY SILTY CLAY (CL-ML)
▽(GW) 6.0' (15)	



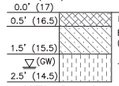
BOTTOM EL. 15

SCALE: NOT TO SCALE

SOIL BORING LOG

BORING B-5

DEPTH(ELEV)	CLASSIFICATION
0.0' (17)	17 GROUND SURFACE
0.5' (16.5)	DARK BROWN SILTY SAND WITH ORGANICS (SM)
1.5' (15.5)	BROWN POORLY-GRADED SAND WITH SILT (SP-SM)
▽(GW) 2.5' (14.5)	TAN POORLY-GRADED SAND (SP)



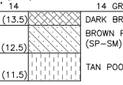
BOTTOM EL. 14.5

SCALE: NOT TO SCALE

SOIL BORING LOG

BORING B-6

DEPTH(ELEV)	CLASSIFICATION
0.0' 14	14 GROUND SURFACE
0.5' (13.5)	DARK BROWN SILTY SAND WITH ORGANICS (SM)
1.5' (12.5)	BROWN POORLY-GRADED SAND WITH SILT (SP-SM)
▽(GW) 2.5' (11.5)	TAN POORLY-GRADED SAND (SP)



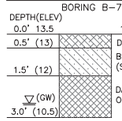
BOTTOM EL. 11.5

SCALE: NOT TO SCALE

SOIL BORING LOG

BORING B-7

DEPTH(ELEV)	CLASSIFICATION
0.0' 13.5	13.5 GROUND SURFACE
0.5' (13)	DARK BROWN SILTY SAND WITH ORGANICS (SM)
1.5' (12)	BROWN POORLY-GRADED SAND WITH SILT (SP-SM)
▽(GW) 3.0' (10.5)	DARK BROWN SILTY, CLAYEY SAND WITH ORGANICS (SC-SM)



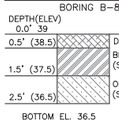
BOTTOM EL. 10.5

SCALE: NOT TO SCALE

SOIL BORING LOG

BORING B-8

DEPTH(ELEV)	CLASSIFICATION
0.0' 39	39 GROUND SURFACE
0.5' (38.5)	DARK BROWN SILTY SAND WITH ORGANICS (SM)
1.5' (37.5)	BROWN POORLY-GRADED SAND WITH CLAY (SP-SC)
2.5' (36.5)	ORANGE POORLY-GRADED SAND WITH SILT (SP-SM)



BOTTOM EL. 36.5

SCALE: NOT TO SCALE

SOIL BORING LOG

BORING B-9

DEPTH(ELEV)	CLASSIFICATION
0.0' (38)	38 GROUND SURFACE
1.0' (37)	DARK BROWN SILTY SAND WITH ORGANICS (SM)
	TAN POORLY-GRADED SAND (SP)
8.0' (30)	

BOTTOM EL. 30

SCALE: NOT TO SCALE

SOIL CLASSIFICATION

SOIL SAMPLE NUMBER	DEPTH (FT)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTIC INDEX (PI)	PERCENT PASSING NO. 200 SIEVE	USCS CLASSIFICATION
B-2	2.0-7.0	NV	NP	NP	8	SP-SM (POORLY GRADED SAND WTH SILT)
B-4	3.0-6.0	25	18	7	68	CL-ML (SANDY SILTY CLAY)
B-7	0.5-1.5	NV	NP	NP	11	SP-SM (POORLY-GRADED SAND WITH SILT)

SOIL BULK DENSITY

SOIL SAMPLE NUMBER	BULK DENSITY (LBS/FT^3)	USCS CLASSIFICATION
B-2	90.52	SP-SM (POORLY GRADED SAND WTH SILT)
B-4	112.99	CL-ML (SANDY SILTY CLAY)
B-7	87.40	SP-SM (POORLY-GRADED SAND WITH SILT)
B-8	97.39	SP-SC (POORLY-GRADED SAND WITH CLAY)
B-9	92.39	SP (POORLY-GRADED SAND)

1. BORING LAYERS IDENTIFIED IN THE SOIL CLASSIFICATION TABLE HAVE UNDERGONE LABORATORY TESTING AND FORMAL USCS CLASSIFICATION PROCEDURES. ALL OTHER BORING LOGS ARE BASED ON VISUAL FIELD CLASSIFICATION ONLY.
2. SOIL BORINGS WERE CONDUCTED BY BAYLAND IN MAY 2023. THE CONDITIONS INDICATED BY SOIL BORINGS AS SPECIFIED ON THE CONTRACT DRAWINGS APPLY ONLY AT THE SPECIFIC LOCATION OF EACH BORING AT THE TIME THAT THE BORINGS WERE MADE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY CONDITIONS TO THEIR SATISFACTION. THE OWNER AND DESIGN CONSULTANTS ASSUME NO RESPONSIBILITY WHATSOEVER IN RESPECT TO THE SUFFICIENCY OF ACCURACY OF THESE INVESTIGATIONS AND THERE IS NO WARRANTY OR GUARANTEE THAT CONDITIONS OTHER THAN THOSE IDENTIFIED BY THE SUBSURFACE INVESTIGATION WILL NOT BE ENCOUNTERED.

AB-02

90% CONSTRUCTION DRAWINGS

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

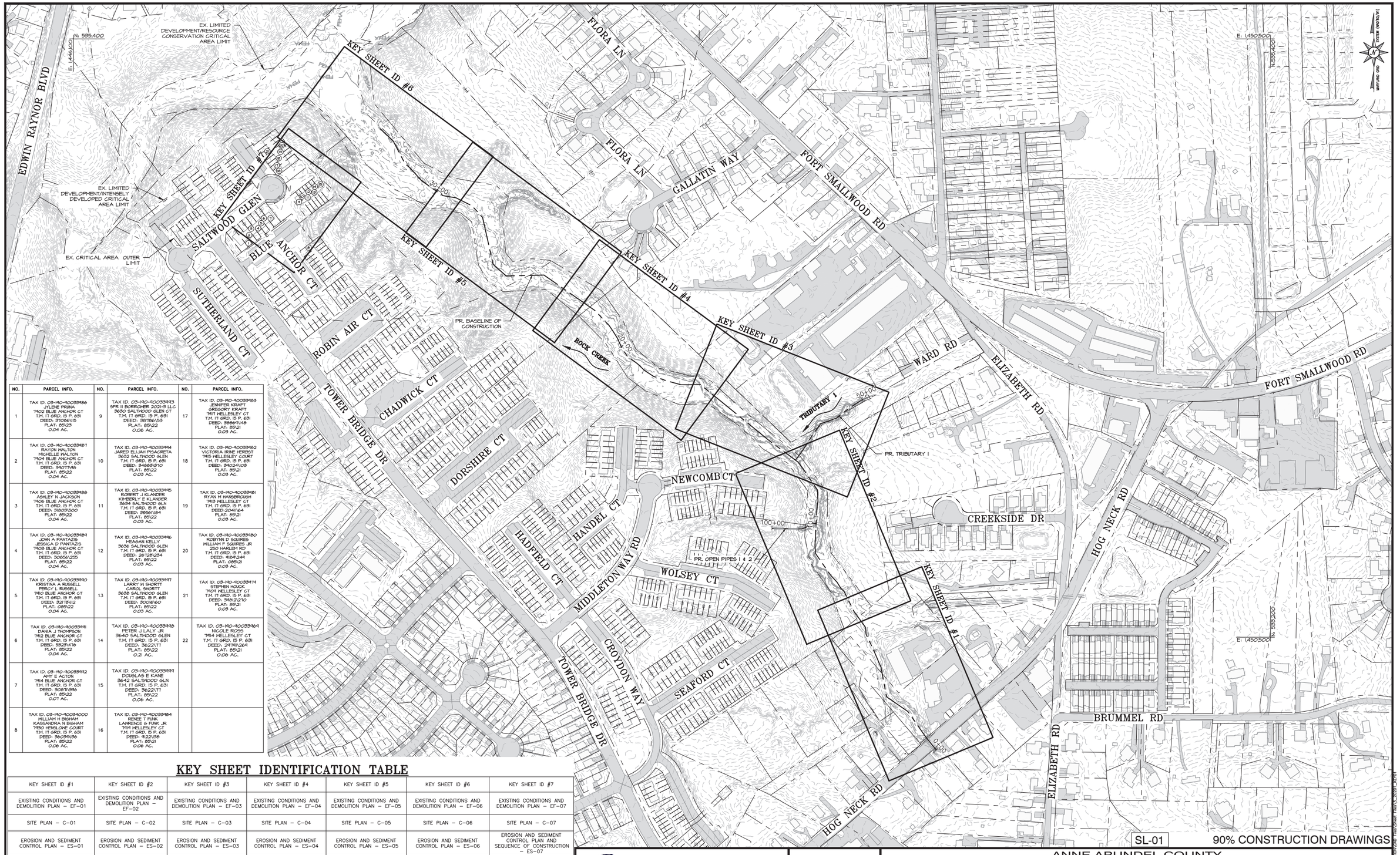
REVISED DATE	BY

APPROVED DATE		APPROVED DATE	
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY: CMS/SC	8/13/25
SHEET NO.	3 OF 63
CONTRACT NO. B553802	

ROCK CREEK STREAM RESTORATION
SOIL BORING LOGS
COUNCIL DISTRICT 3

2/5_20201_ROCK CREEK STREAM RESTORATION\DWG Files\Sheet Files\5_20201_DT1.dwg



NO.	PARCEL INFO.	NO.	PARCEL INFO.	NO.	PARCEL INFO.
1	TAX ID. 03-190-90033486 JYLENE PRUNA 7102 BLUE ANCHOR CT T.M. 17 GRID. 15 P. 631 DEED. 31056115 PLAT. 89123 0.04 AC.	9	TAX ID. 03-190-90033493 SFR II BORROWER 2021-3 LLC 3630 SALTWOOD GLEN CT T.M. 17 GRID. 15 P. 631 DEED. 38786153 PLAT. 89122 0.06 AC.	17	TAX ID. 03-190-90033483 JENNIFER KRAFT GREGORY KRAFT 7117 KELLESLEY CT T.M. 17 GRID. 15 P. 631 DEED. 38864148 PLAT. 89121 0.03 AC.
2	TAX ID. 03-190-90033487 RAYON HALTON MICHELLE HALTON 7104 BLUE ANCHOR CT T.M. 17 GRID. 15 P. 631 DEED. 31077148 PLAT. 89122 0.04 AC.	10	TAX ID. 03-190-90033494 JARED ELIJAH PISACRETA 3632 SALTWOOD GLEN T.M. 17 GRID. 15 P. 631 DEED. 34883570 PLAT. 89122 0.03 AC.	18	TAX ID. 03-190-90033482 VICTORIA IRINE HERBST 7115 KELLESLEY COURT T.M. 17 GRID. 15 P. 631 DEED. 31022410 PLAT. 89121 0.03 AC.
3	TAX ID. 03-190-90033488 ASHLEY N JACKSON 7106 BLUE ANCHOR CT T.M. 17 GRID. 15 P. 631 DEED. 31023000 PLAT. 89122 0.04 AC.	11	TAX ID. 03-190-90033495 ROBERT J KLANDER KIMBERLY E KLANDER 3634 SALTWOOD GLN T.M. 17 GRID. 15 P. 631 DEED. 38561184 PLAT. 89122 0.03 AC.	19	TAX ID. 03-190-90033481 RYAN M HANSBROUGH 7113 KELLESLEY CT T.M. 17 GRID. 15 P. 631 DEED.20461144 PLAT. 89121 0.03 AC.
4	TAX ID. 03-190-90033489 JOHN A PANTAZIS JESSICA D PANTAZIS 7108 BLUE ANCHOR CT T.M. 17 GRID. 15 P. 631 DEED. 30856255 PLAT. 89122 0.04 AC.	12	TAX ID. 03-190-90033496 MEAGAN KELLY 3636 SALTWOOD GLEN T.M. 17 GRID. 15 P. 631 DEED. 26728234 PLAT. 89122 0.03 AC.	20	TAX ID. 03-190-90033480 ROBYNN D SQUIRES WILLIAM F SQUIRES JR 250 HARLEM RD T.M. 17 GRID. 15 P. 631 DEED. 41842.68 PLAT. 089121 0.03 AC.
5	TAX ID. 03-190-90033490 KRISTINA A RUSSELL PERCY L RUSSELL 7110 BLUE ANCHOR CT T.M. 17 GRID. 15 P. 631 DEED. 32178112 PLAT. 089122 0.04 AC.	13	TAX ID. 03-190-90033497 LARRY H SHORTT CAROL SHORTT 3638 SALTWOOD GLEN T.M. 17 GRID. 15 P. 631 DEED. 30016960 PLAT. 89122 0.03 AC.	21	TAX ID. 03-190-90033479 STEPHEN HOUCK 7109 KELLESLEY CT T.M. 17 GRID. 15 P. 631 DEED. 39842370 PLAT. 89121 0.03 AC.
6	TAX ID. 03-190-90033491 DANA J THOMPSON 7112 BLUE ANCHOR CT T.M. 17 GRID. 15 P. 631 DEED. 53234.76 PLAT. 89122 0.04 AC.	14	TAX ID. 03-190-90033498 PETER J LALY JR 3640 SALTWOOD GLEN T.M. 17 GRID. 15 P. 631 DEED. 36221.71 PLAT. 89122 0.21 AC.	22	TAX ID. 03-190-90033464 NICOLE ROSS 7114 KELLESLEY CT T.M. 17 GRID. 15 P. 631 DEED. 24781.264 PLAT. 89121 0.06 AC.
7	TAX ID. 03-190-90033492 AMY E ACTON 7114 BLUE ANCHOR CT T.M. 17 GRID. 15 P. 631 DEED. 30811.396 PLAT. 89122 0.07 AC.	15	TAX ID. 03-190-90033499 DOUGLAS E KANE 3642 SALTWOOD GLN T.M. 17 GRID. 15 P. 631 DEED. 36221.71 PLAT. 89122 0.06 AC.		
8	TAX ID. 03-190-90034000 WILLIAM H BISHAM KASSANDRA N BISHAM 7130 HENSLOWE COURT T.M. 17 GRID. 15 P. 631 DEED. 36031.136 PLAT. 89122 0.06 AC.	16	TAX ID. 03-190-90033484 RENEE T FUNK LAWRENCE G FUNK JR 7114 KELLESLEY CT T.M. 17 GRID. 15 P. 631 DEED. 41223.58 PLAT. 89121 0.06 AC.		

KEY SHEET IDENTIFICATION TABLE

KEY SHEET ID #1	KEY SHEET ID #2	KEY SHEET ID #3	KEY SHEET ID #4	KEY SHEET ID #5	KEY SHEET ID #6	KEY SHEET ID #7
EXISTING CONDITIONS AND DEMOLITION PLAN – EF–01	EXISTING CONDITIONS AND DEMOLITION PLAN – EF–02	EXISTING CONDITIONS AND DEMOLITION PLAN – EF–03	EXISTING CONDITIONS AND DEMOLITION PLAN – EF–04	EXISTING CONDITIONS AND DEMOLITION PLAN – EF–05	EXISTING CONDITIONS AND DEMOLITION PLAN – EF–06	EXISTING CONDITIONS AND DEMOLITION PLAN – EF–07
SITE PLAN – C–01	SITE PLAN – C–02	SITE PLAN – C–03	SITE PLAN – C–04	SITE PLAN – C–05	SITE PLAN – C–06	SITE PLAN – C–07
EROSION AND SEDIMENT CONTROL PLAN – ES–01	EROSION AND SEDIMENT CONTROL PLAN – ES–02	EROSION AND SEDIMENT CONTROL PLAN – ES–03	EROSION AND SEDIMENT CONTROL PLAN – ES–04	EROSION AND SEDIMENT CONTROL PLAN – ES–05	EROSION AND SEDIMENT CONTROL PLAN – ES–06	EROSION AND SEDIMENT CONTROL PLAN AND SEQUENCE OF CONSTRUCTION – ES–07
PLANTING PLAN – LS–01	PLANTING PLAN – LS–02	PLANTING PLAN – LS–03	PLANTING PLAN – LS–04	PLANTING PLAN – LS–05	PLANTING PLAN – LS–06	PLANTING PLAN – LS–07

KEY SHEET

SCALE: 1" = 150'

0 75 150 300

1 INCH = 150 FEET

SL-01

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BAYLAND JOB NO. 5_20201

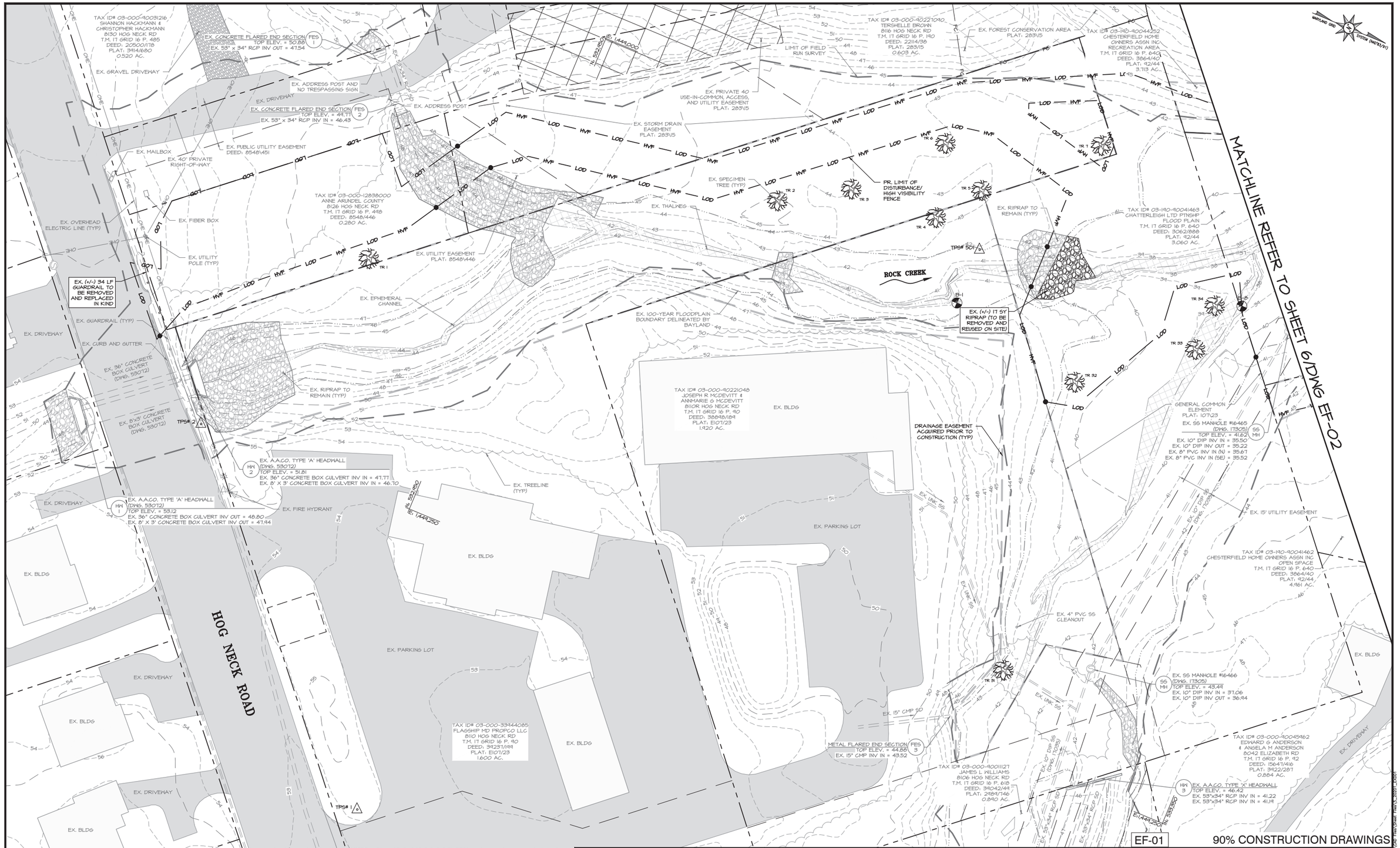
ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE CHIEF, ENGINEER	APPROVED DATE PROJECT MANAGER	SCALE: 1" = 150'	
APPROVED DATE DEPUTY DIRECTOR	APPROVED DATE CHIEF, RIGHT OF WAY	DESIGNED BY: MKS	8/13/25
		DRAWN BY: MG/KM	8/13/25
		CHECKED BY: CMS/SC	8/13/25
		SHEET NO. 4 OF 63	
		CONTRACT NO. B553802	

ROCK CREEK STREAM RESTORATION
KEY SHEET

COUNCIL DISTRICT 3



NOTES:
1. FOR EXISTING SPECIMEN TREE SURVEY SEE DWG AB-01/SHEET 2.
2. FOR SOIL BORING LOGS, SEE DWG AB-02/SHEET 3.
3. WETLAND DELINEATION WAS PERFORMED BY BAYLAND CONSULTANTS AND DESIGNERS, INC. DATED APRIL 2023. WETLANDS AND ASSOCIATED BUFFERS OUTSIDE LIMIT OF WORK ARE NOT SHOWN ON PLANS. DISCONTINUOUS WETLAND BOUNDARY INDICATES WETLAND EXTENDS BEYOND THE LIMIT OF WORK.
4. EXISTING TREES TO BE REMOVED WITHIN THE LIMITS OF DISTURBANCE SHALL NOT BE DISPOSED OF OFF SITE WITHOUT COUNTY PERMISSION.
5. EXISTING SUITABLE ROCK WITHIN THE LIMITS OF PROPOSED GRADING SHOULD BE REMOVED, STOCKPILED AND RE-USED ONSITE IF IT MEETS MATERIAL SPECIFICATIONS PER THE CONTRACT DOCUMENTS AND IS APPROVED BY THE ENGINEER.

EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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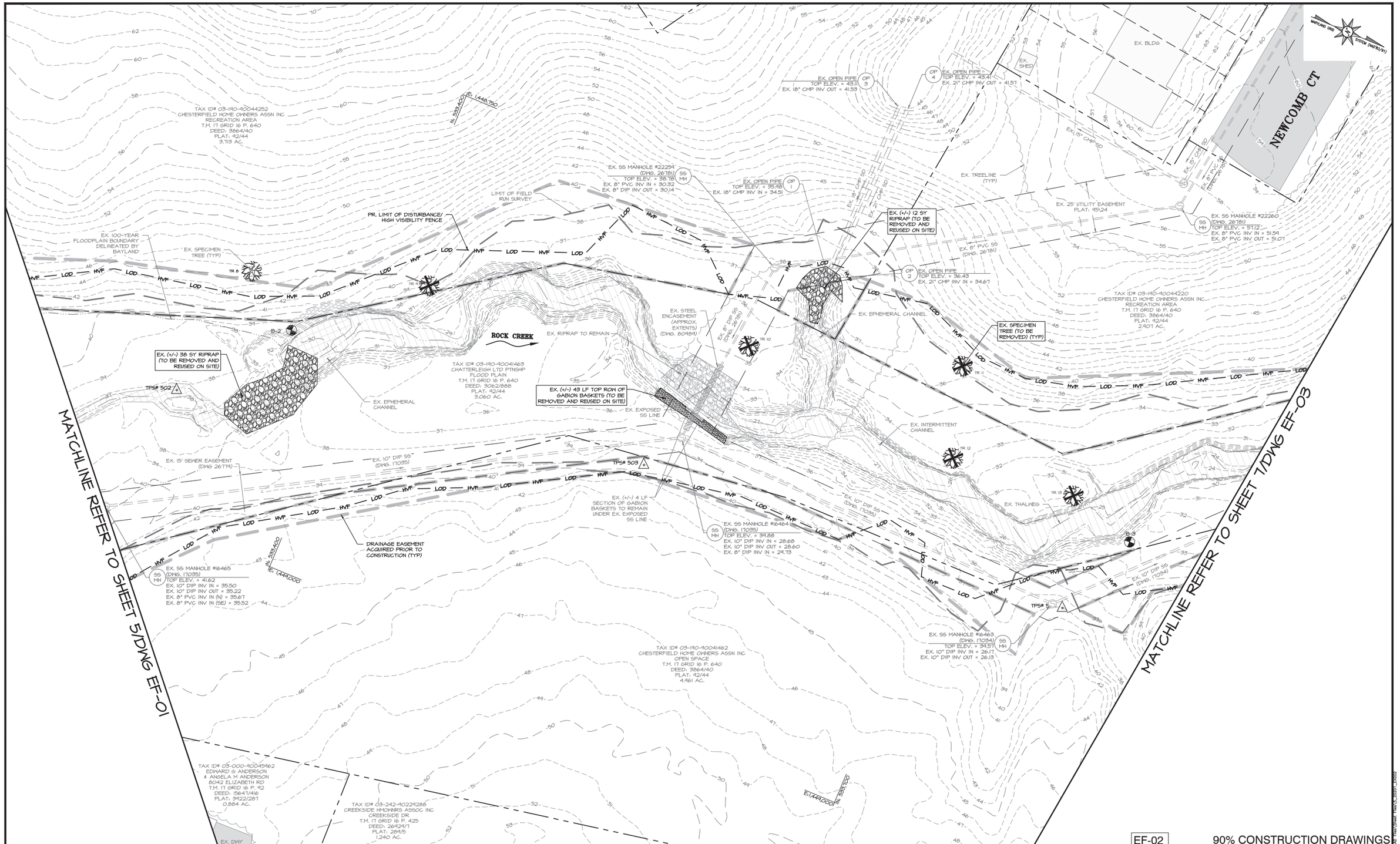
BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE	APPROVED DATE	SCALE:	1" = 20'
CHIEF ENGINEER	PROJECT MANAGER	DESIGNED BY: MKS	8/13/25
APPROVED DATE	APPROVED DATE	DRAWN BY: MG/KM	8/13/25
DEPUTY DIRECTOR	CHIEF, RIGHT OF WAY	CHECKED BY:CMS/SC	8/13/25
		SHEET NO. 5 OF 63	
		CONTRACT NO. B553802	

ROCK CREEK STREAM RESTORATION
EXISTING CONDITIONS AND DEMOLITION PLAN
COUNCIL DISTRICT 3



NOTES:
1. FOR EXISTING SPECIMEN TREE SURVEY SEE DWG AB-01/SHEET 2.
2. FOR SOIL BORING LOGS, SEE DWG AB-02/SHEET 3.
3. WETLAND DELINEATION WAS PERFORMED BY BAYLAND CONSULTANTS AND DESIGNERS, INC. DATED APRIL 2023. WETLANDS AND ASSOCIATED BUFFERS OUTSIDE LIMIT OF WORK ARE NOT SHOWN ON PLANS. DISCONTINUOUS WETLAND BOUNDARY INDICATES WETLAND EXTENDS BEYOND THE LIMIT OF WORK.
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EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

EF-02

90% CONSTRUCTION DRAWINGS

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE		APPROVED DATE	SCALE: 1" = 20'
CHIEF ENGINEER		PROJECT MANAGER	DESIGNED BY: MKS 8/13/25
APPROVED DATE		APPROVED DATE	DRAWN BY: MG/KM 8/13/25
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	CHECKED BY:CMS/SG 8/13/25
			SHEET NO. 6 OF 63
			CONTRACT NO. B553802

ROCK CREEK STREAM RESTORATION
EXISTING CONDITIONS AND DEMOLITION PLAN
COUNCIL DISTRICT 3

J:\5_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\5_20201_EX002

MATCHLINE REFER TO SHEET 6/DWG EF-02

MATCHLINE REFER TO SHEET 8/DWG EF-04

MARYLAND GRID NORTH

DRAINAGE EASEMENT ACQUIRED PRIOR TO CONSTRUCTION (TYP)

EX. INTERMITTENT CHANNEL

LIMIT OF FIELD RUN SURVEY

EX. THALWEG

TAX ID# 03-190-90044220
CHESTERFIELD HOME OWNERS ASSN INC
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
2.907 AC.

EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

EX. EXPOSED SS LINE

EX. 10" DIP SS (DWG. 17034)

EX. 15' UTILITY EASEMENT

PR. LIMIT OF DISTURBANCE/ HIGH VISIBILITY FENCE

EX. SPECIMEN TREE (TYP)

TAX ID# 03-190-90041462
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
4.961 AC.

EX. SS MANHOLE #16462 (DWG. 17034) SS MH
TOP ELEV. = 31.61
EX. 10" DIP INV IN = 22.03
EX. 10" DIP INV OUT = 21.96

TPS# 505

ROCK CREEK

EX. PERENNIAL CHANNEL

EX. 10" DIP SS (DWG. 17034)

EX. EXPOSED SS MH

TAX ID# 03-247-90234207
ELIZABETH PLACE HOA INC
OPEN SPACE
T.M. 17 GRID 16 P. 44
DEED: 27254/402
PLAT: 321/44
0.818 AC.

EX. SWM FACILITY AND OUTFALL CHANNEL TO BE RETROFIT BY OTHERS*

EX. RIPRAP TO BE INSTALLED BY OTHERS*

EX. HEADWALL TO BE INSTALLED BY OTHERS*

EX. SPECIMEN TREE (TO BE REMOVED) (TYP)

EX. SS MANHOLE # 16461 (DWG. 17034) SS MH
TOP ELEV. = 25.40
EX. 10" DIP INV IN = 17.50
EX. 10" DIP INV OUT = 17.18

*OUTFALL RETROFIT TO BE CONDUCTED PRIOR TO START OF CONSTRUCTION UNDER SEPARATE CONTRACT

EX. 36" RCP SD TO BE INSTALLED BY OTHERS*

EX. 5D MANHOLE TO BE INSTALLED BY OTHERS*

EX. 5D RISER TO BE INSTALLED BY OTHERS*

TAX ID# 03-000-09878490
GNS ASSETS LLC
8894 FT SMALLWOOD RD
T.M. 17 GRID 16 P. 45
DEED: 18087/182
9.80 AC.

EX. FOREST CONSERVATION AREA PLAT: 33701

TAX ID# 03-247-90242954
ELIZABETH PLACE II HOA INC
OPEN SPACE#1/REC AREA#1/
FOREST CONSERV AREA
T.M. 17 GRID 16 P. 302
DEED: 30263/204
0.483 AC.

TRIBUTARY 1

EX. EPHEMERAL CHANNEL

EX. (+/-) 2 SY RIPRAP (TO BE REMOVED AND REUSED ON SITE)

EX. FOREST CONSERVATION EASEMENT PLAT: 32744

EX. BMP 1875

EX. (+/-) 33 SY RIPRAP (TO BE REMOVED AND REUSED ON SITE)

EX. A.A.C.O. TYPE 'B' HEADWALL HW 3
TOP ELEV. = 45.45
EX. 27" RCP INV IN = 42.03

EX. PARKING LOT

EX. BLDG

EX. 24" PVC SD

TAX ID# 03-000-13860700
VINCENT R HEWITT SR
& JACQUELINE L HEWITT
8842 FORT SMALLWOOD RD
T.M. 17 GRID 16 P. 480
DEED: 4825/881
1.000 AC.

EX. TREELINE (TYP)

EX. DRIVEWAY

EX. PERPETUAL EASEMENT FOR DRAINAGE FACILITY PLAT: 32744

EX. 27" RCP SD

EX. RIPRAP TO REMAIN (TYP)

NOTES:
1. FOR EXISTING SPECIMEN TREE SURVEY SEE DWG AB-01/SHEET 2.
2. FOR SOIL BORING LOGS, SEE DWG AB-02/SHEET 3.
3. WETLAND DELINEATION WAS PERFORMED BY BAYLAND CONSULTANTS AND DESIGNERS, INC. DATED APRIL 2023. WETLANDS AND ASSOCIATED BUFFERS OUTSIDE LIMIT OF WORK ARE NOT SHOWN ON PLANS. DISCONTINUOUS WETLAND BOUNDARY INDICATES WETLAND EXTENDS BEYOND THE LIMIT OF WORK.
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EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

0 10 20 40
1 INCH = 20 FEET

BayLand Consultants & Designers, Inc.
"Integrating Engineering and Environment"
7455 New Ridge Road, Suite T Phone: (410) 694-9401
Hanover, Maryland 21076 Fax: (410) 694-9105
www.baylandinc.com

BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE		APPROVED DATE	
CHIEF, ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	7 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
EXISTING CONDITIONS AND DEMOLITION PLAN
COUNCIL DISTRICT 3

EF-03

90% CONSTRUCTION DRAWINGS

MATCHLINE REFER TO SHEET 7/DWG EF-03

MATCHLINE REFER TO SHEET 9/DWG EF-05

NORTHING (NAD83/91)
EASTING (NAD83/91)

SS MANHOLE #22303 (DWG. 26782)
TOP ELEV. = 37.64
EX. 8" PVC INV OUT = 26.76

EX. 25' UTILITY EASEMENT PLAT: 92/44

EX. 25' NON-TIDAL WETLAND BUFFER (TYP)

EX. 12" CMP INV

EX. 8" PVC INV

TAX ID# 03-190-90044252
CHESTERFIELD HOME OWNERS ASSN INC
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
3.113 AC.

EX. SPECIMEN TREE (TYP)

N: 594,000
E: 1,439,350

FES 2 METAL FLARED END SECTION
TOP ELEV. = 19.42
EX. 12" CMP INV IN = 18.37

TAX ID# 03-190-90041508
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
2.580 AC.

LIMIT OF FIELD RUN SURVEY

E: 1,441,700
N: 594,360

EX. SS MANHOLE #16459 (DWG. 17033)
TOP ELEV. = 17.28
EX. 10" DIP INV IN = 9.61
EX. 10" DIP INV OUT = 9.51

TAX ID# 03-190-90041505
CHESTERFIELD HOME OWNERS' ASSN INC.
OPEN SPACE
T.M. 17 GRID 16 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

TPS# 507

EX. NON-TIDAL WETLAND (TYP)

TAX ID# 03-190-90041463
CHATTERLEIGH LTD PTNSHP
FLOOD PLAIN
T.M. 17 GRID 16 P. 640
DEED: 3062/888
PLAT: 92/44
3.060 AC.

EX. THALWEG

EX. EXPOSED SS MH

EX. 10" DIP SS (DWG. 17033)

EX. PERENNIAL CHANNEL

EX. SS MANHOLE #16460 (DWG. 17034)
TOP ELEV. = 20.10
EX. 10" DIP INV IN = 11.56
EX. 10" DIP INV OUT = 11.34
EX. 8" PVC INV IN = 12.43

EX. 10" DIP SS (DWG. 17034)

ROCK CREEK

B-5

EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

EX. 15' SEWER EASEMENT (DWG 26779)

TPS# 508

EX. 10" DIP SS (DWG. 17033)

TPS# 506

DRAINAGE EASEMENT ACQUIRED PRIOR TO CONSTRUCTION (TYP)

EX. SPECIMEN TREE (TO BE REMOVED) (TYP)

PR. LIMIT OF DISTURBANCE/ HIGH VISIBILITY FENCE

TAX ID# 03-190-90041462
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
4.961 AC.

EX. EPHEMERAL CHANNEL (TYP)

TAX ID# 03-190-90031259
ANNE ARUNDEL COUNTY
FLOOD PLAINS
TM. 17 GRID 16 P. 631
DEED: 3443/371
PLAT: 80/2

TAX ID# 03-190-90034092
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

TAX ID# 03-000-13860700
VINCENT R HEWITT SR
& JACQUELINE L HEWITT
8892 FORT SMALLWOOD RD
T.M. 17 GRID 16 P. 480
DEED: 4825/881
1.000 AC

E: 1,441,950
N: 594,250

TAX ID# 03-000-28477200
PAUL R STAMMER &
LAURA A STAMMER
8882 FT SMALLWOOD RD
T.M. 17 GRID 16 P. 242
DEED: 6564/603
4.780 AC.

EX. BLDG

TAX ID# 03-308-90084865
LEE GORSCHE &
STEPHANIE GORSCHE
1101 GALLATIN WAY
T.M. 17 GRID 10 P. 100
DEED: 33614/247
PLAT: 166/46
0.229 AC.

EX. TREELINE (TYP)

EX. SHED

EX. BLDG

TAX ID# 03-308-90084866
ARSEAN HOOMAN
1103 GALLATIN WAY
T.M. 17 GRID 10 P. 100
DEED: 24125/441
PLAT: 194/27
0.171 AC.

TAX ID# 03-308-90084864
CHRISTOPHER M SMITH
& JENNIFER L SMITH
1100 GALLATIN WAY
T.M. 17 GRID 10 P. 100
DEED: 36399/201
PLAT: 166/46
0.192 AC.

NOTES:
1. FOR EXISTING SPECIMEN TREE SURVEY SEE DWG AB-01/SHEET 2.
2. FOR SOIL BORING LOGS, SEE DWG AB-02/SHEET 3.
3. WETLAND DELINEATION WAS PERFORMED BY BAYLAND CONSULTANTS AND DESIGNERS, INC. DATED APRIL 2023. WETLANDS AND ASSOCIATED BUFFERS OUTSIDE LIMIT OF WORK ARE NOT SHOWN ON PLANS. DISCONTINUOUS WETLAND BOUNDARY INDICATES WETLAND EXTENDS BEYOND THE LIMIT OF WORK.
4. EXISTING TREES TO BE REMOVED WITHIN THE LIMITS OF DISTURBANCE SHALL NOT BE DISPOSED OF OFF SITE WITHOUT COUNTY PERMISSION.
5. EXISTING SUITABLE ROCK WITHIN THE LIMITS OF PROPOSED GRADING SHOULD BE REMOVED, STOCKPILED AND RE-USED ONSITE IF IT MEETS MATERIAL SPECIFICATIONS PER THE CONTRACT DOCUMENTS AND IS APPROVED BY THE ENGINEER.

EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

0 10 20 40
1 INCH = 20 FEET

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	8 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
EXISTING CONDITIONS AND DEMOLITION PLAN
COUNCIL DISTRICT 3

EF-04

90% CONSTRUCTION DRAWINGS

Z:\5_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\5_20201_EX004

MATCHLINE REFER TO SHEET 8/DWG EF-04

MATCHLINE REFER TO SHEET 10/DWG EF-06

EX. SS MANHOLE #16457 (DWG. 17033) SS MH
TOP ELEV. = 13.68
EX. 12" DIP INV IN = 6.38
EX. 12" DIP INV OUT = 6.04

EX. SS MANHOLE #16456 (DWG. 17033) SS MH
TOP ELEV. = 12.82
EX. 12" DIP INV IN = 5.58
EX. 12" DIP INV OUT = 5.34

EX. SS MANHOLE #16455 (DWG. 17033) SS MH
TOP ELEV. = 11.09
EX. 12" DIP INV IN = 4.60
EX. 12" DIP INV OUT = 4.54

EX. SS MANHOLE #16454 (DWG. 17033) SS MH
TOP ELEV. = 10.55
EX. 12" DIP INV IN = 4.00
EX. 12" DIP INV OUT = 3.41

EX. SS MANHOLE #16458 (DWG. 17033) SS MH
TOP ELEV. = 14.45
EX. 10" DIP INV IN = 7.00
EX. 12" DIP INV OUT = 6.92

N: 534,400
E: 1,441,850

N: 534,150
E: 1,441,920

B-6

TR 18

TPS# 510
TPS# 511
TPS# 512
TPS# 513
TPS# 514

ROCK CREEK

EX. THALWEG

EX. 12" DIP SS (DWG. 17033)

EX. 10" DIP SS (DWG. 17033)

EX. 15" SEWER EASEMENT (DWG 26774)

EX. NON-TIDAL WETLAND (TYP)

EX. SPECIMEN TREE (TYP)

EX. LIMITED DEVELOPMENT/RESOURCE CONSERVATION CRITICAL AREA LIMIT

EX. EPHEMERAL CHANNEL (TYP)

EX. PERENNIAL CHANNEL

EX. INTERMITTENT CHANNEL (TYP)

EX. 25' NON-TIDAL WETLAND BUFFER (TYP)

EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

PR. LIMIT OF DISTURBANCE/ HIGH VISIBILITY FENCE

DRAINAGE EASEMENT ACQUIRED PRIOR TO CONSTRUCTION (TYP)

EX. LIMITED DEVELOPMENT CRITICAL AREA LIMIT

ELEVATION: 584.160

TAX ID# 03-190-90034042
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

TAX ID# 03-190-90031259
ANNE ARUNDEL COUNTY
FLOOD PLAINS
T.M. 17 GRID 16 P. 631
DEED: 3443/371
PLAT: 80/2
6.041 AC.

TAX ID# 03-308-90084864
CHRISTOPHER M SMITH
& JENNIFER L SMITH
1100 GALLATIN WAY
T.M. 17 GRID 10 P. 100
DEED: 36399/201
PLAT: 166/46
0.192 AC.

TAX ID# 03-308-90084863
MARIA E. ALARD-PEREZ
1102 GALLATIN WAY
T.M. 17 GRID 10 P. 100
DEED: 14874/172
PLAT: 166/46
0.192 AC.

TAX ID# 03-308-90084871
GALLATIN WOODS HOA
GALLATIN WAY
T.M. 17 GRID 10 P. 100
DEED: 7688/359
PLAT: 166/46
0.590 AC.

NOTES:
1. FOR EXISTING SPECIMEN TREE SURVEY SEE DWG AB-01/SHEET 2.
2. FOR SOIL BORING LOGS, SEE DWG AB-02/SHEET 3.
3. WETLAND DELINEATION WAS PERFORMED BY BAYLAND CONSULTANTS AND DESIGNERS, INC. DATED APRIL 2023. WETLANDS AND ASSOCIATED BUFFERS OUTSIDE LIMIT OF WORK ARE NOT SHOWN ON PLANS. DISCONTINUOUS WETLAND BOUNDARY INDICATES WETLAND EXTENDS BEYOND THE LIMIT OF WORK.
4. EXISTING TREES TO BE REMOVED WITHIN THE LIMITS OF DISTURBANCE SHALL NOT BE DISPOSED OF OFF SITE WITHOUT COUNTY PERMISSION.
5. EXISTING SUITABLE ROCK WITHIN THE LIMITS OF PROPOSED GRADING SHOULD BE REMOVED, STOCKPILED AND RE-USED ONSITE IF IT MEETS MATERIAL SPECIFICATIONS PER THE CONTRACT DOCUMENTS AND IS APPROVED BY THE ENGINEER.

EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

0 10 20 40
1 INCH = 20 FEET

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE		APPROVED DATE	
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	9 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
EXISTING CONDITIONS AND DEMOLITION PLAN
COUNCIL DISTRICT 3

EF-05

90% CONSTRUCTION DRAWINGS

J:\5_2020\P_ROCK CREEK STREAM RESTORATION\CAD Files\Sheet Files\5_20201_2.dwg

MATCHLINE REFER TO SHEET 9/DWG EF-05

MATCHLINE REFER TO SHEET 11/DWG EF-07

TAX ID# 03-190-90034042
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

N: 594,700
E: 1,447,350

LDA
RCA

EX. SS MANHOLE #16452
(DWG. 17032)
TOP ELEV. = 10.77
EX. 12" DIP INV IN = 1.30
EX. 12" DIP INV OUT = 1.01

LIMIT OF FIELD RUN SURVEY

EX. LIMITED DEVELOPMENT/RESOURCE CONSERVATION CRITICAL AREA LIMIT (TYP)

EX. SS MANHOLE #16453
(DWG. 17033)
TOP ELEV. = 10.91
EX. 12" DIP INV IN = 3.50
EX. 12" DIP INV OUT = 3.31

TPS# 514

TPS# 515

EX. 15' SEWER EASEMENT
(DWG 26774)

EX. 12" DIP SS
(DWG. 17033)

EX. 12" DIP SS
(DWG. 17032)

TAX ID# 03-190-90031259
ANNE ARUNDEL COUNTY
FLOOD PLAINS
T.M. 17 GRID 16 P. 631
DEED: 3443/371
PLAT: 80/2
6.041 AC.

EX. 25' NON-TIDAL WETLAND BUFFER (TYP)

TAX ID# 03-190-90031260
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
6.235 AC.

EX. SS MANHOLE #16451
(DWG. 17032)
TOP ELEV. = 6.31
EX. 12" DIP INV IN = -0.32
EX. 12" DIP INV OUT = -0.44

EX. NON-TIDAL WETLAND (TYP)

EX. THALWEG

ROCK CREEK

EX. PERENNIAL CHANNEL (TYP)

B-1

E: 1,446,900
N: 595,100

ZONE A SHFA SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
FIRM NO. 24003C0068F

EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

PR. LIMIT OF DISTURBANCE/HIGH VISIBILITY FENCE

DRAINAGE EASEMENT ACQUIRED PRIOR TO CONSTRUCTION (TYP)

TAX ID# 03-190-90034042
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

E: 1,447,350
N: 595,100

EF-06

90% CONSTRUCTION DRAWINGS

NOTES:
1. FOR EXISTING SPECIMEN TREE SURVEY SEE DWG AB-01/SHEET 2.
2. FOR SOIL BORING LOGS, SEE DWG AB-02/SHEET 3.
3. WETLAND DELINEATION WAS PERFORMED BY BAYLAND CONSULTANTS AND DESIGNERS, INC. DATED APRIL 2023. WETLANDS AND ASSOCIATED BUFFERS OUTSIDE LIMIT OF WORK ARE NOT SHOWN ON PLANS. DISCONTINUOUS WETLAND BOUNDARY INDICATES WETLAND EXTENDS BEYOND THE LIMIT OF WORK.
4. EXISTING TREES TO BE REMOVED WITHIN THE LIMITS OF DISTURBANCE SHALL NOT BE DISPOSED OF OFF SITE WITHOUT COUNTY PERMISSION.
5. EXISTING SUITABLE ROCK WITHIN THE LIMITS OF PROPOSED GRADING SHOULD BE REMOVED, STOCKPILED AND RE-USED ONSITE IF IT MEETS MATERIAL SPECIFICATIONS PER THE CONTRACT DOCUMENTS AND IS APPROVED BY THE ENGINEER.

EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

0 10 20 40
1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

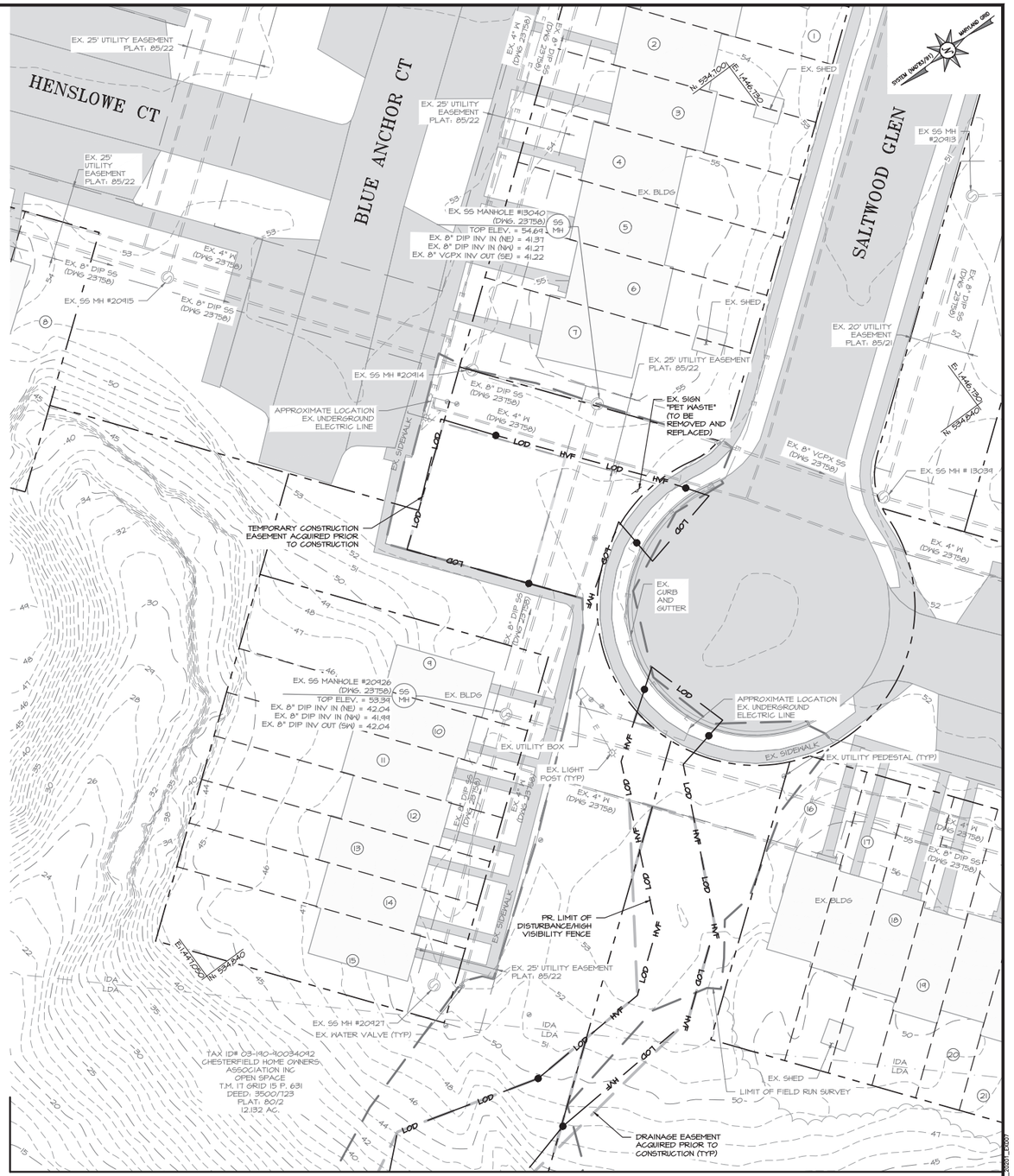
REVISED DATE	BY

APPROVED ____ DATE ____ CHIEF ENGINEER
APPROVED ____ DATE ____ PROJECT MANAGER
APPROVED ____ DATE ____ DEPUTY DIRECTOR
APPROVED ____ DATE ____ CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MC/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	10 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
EXISTING CONDITIONS AND DEMOLITION PLAN
COUNCIL DISTRICT 3

25_20201_ROCK_CREEK_STREAM_RESTORATION\Cad Files\Sheet Files\25_20201_EX06



MATCHLINE REFER TO SHEET 10/DWG EF-06

EF-07

90% CONSTRUCTION DRAWINGS

NOTES:
1. FOR EXISTING SPECIMEN TREE SURVEY SEE DWG AB-01/SHEET 2.
2. FOR SOIL BORING LOGS, SEE DWG AB-02/SHEET 3.
3. WETLAND DELINEATION WAS PERFORMED BY BAYLAND CONSULTANTS AND DESIGNERS, INC. DATED APRIL 2023. WETLANDS AND ASSOCIATED BUFFERS OUTSIDE LIMIT OF WORK ARE NOT SHOWN ON PLANS. DISCONTINUOUS WETLAND BOUNDARY INDICATES WETLAND EXTENDS BEYOND THE LIMIT OF WORK.
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EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE		APPROVED DATE	
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	11 OF 63
CONTRACT NO. B553802	

ROCK CREEK STREAM RESTORATION
EXISTING CONDITIONS AND DEMOLITION PLAN
COUNCIL DISTRICT 3

I:\5_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\5_20201_EF07

MATCHLINE REFER TO SHEET 13/DWG C-02

MARYLAND GRID SYSTEM (NAD83/91)

TAX ID# 03-000-40031216
SHANNON HACKMANN &
CHRISTOPHER HACKMANN
8130 HOG NECK RD
T.M. 17 GRID 16 P. 485
DEED: 20500/178
PLAT: 3814/680
0.520 AC.

REMOVE EX. CONCRETE FLARED END SECTION
NEW TOP ELEV. = 50.88
EX. 54" RCP OUT = 47.54
FES 1

EX. GRAVEL DRIVEWAY

EX. ADDRESS POST AND NO TRESPASSING SIGN

EX. SIGN "ROAD WORK AHEAD"

EX. DRIVEWAY

EX. ADDRESS POST

EX. CONCRETE FLARED END SECTION
TOP ELEV. = 49.77
EX. 53"x34" RCP INV IN = 46.43
FES 2

EX. PUBLIC UTILITY EASEMENT
DEED: 8548\451

EX. MAILBOX

EX. 40' PRIVATE RIGHT-OF-WAY

TAX ID# 03-000-12838000
ANNE ARUNDEL COUNTY
8126 HOG NECK RD
T.M. 17 GRID 16 P. 448
DEED: 8548/446
0.280 AC.

EX. OVERHEAD ELECTRIC LINE (TYP)

EX. CURB & GUTTER

EX. FIBER BOX

EX. UTILITY POLE (TYP)

EX. (+/-) 33 LF GUARDRAIL TO BE REPLACED IN KIND

EX. GUARDRAIL (TYP)

EX. 36" CONCRETE BOX CULVERT (DWG. 53072)

EX. 8'x3' CONCRETE BOX CULVERT (DWG. 53072)

EX. GUARDRAIL

EX. FIRE HYDRANT

HW 1
EX. A.A.C.O. TYPE 'A' HEADWALL (DWG. 53072)
TOP ELEV. = 53.12
EX. 36" CONCRETE BOX CULVERT INV OUT = 48.80
EX. 8' X 3' CONCRETE BOX CULVERT INV OUT = 47.44

HW 2
EX. A.A.C.O. TYPE 'A' HEADWALL (DWG. 53072)
TOP ELEV. = 51.81
EX. 36" CONCRETE BOX CULVERT INV IN = 47.71
EX. 8' X 3' CONCRETE BOX CULVERT INV IN = 46.70

EX. DRIVEWAY

EX. BLDG

HOG NECK ROAD

EX. PARKING LOT

EX. BLDG

EX. DRIVEWAY

EX. BLDG

EX. DRIVEWAY

EX. BLDG

TAX ID# 03-000-33444085
FLAGSHIP MD PROPCO LLC
8110 HOG NECK RD
T.M. 17 GRID 16 P. 90
DEED: 34237/199
PLAT: E107/23
1.600 AC.

N 532,850
E 1,444,000

N 532,850
E 1,444,250

N 532,850
E 1,444,300

EX. STORM DRAIN EASEMENT
PLAT: 283\15

EX. PRIVATE 40' USE-IN-COMMON, ACCESS, AND UTILITY EASEMENT
PLAT: 283\15

EX. FOREST CONSERVATION AREA
PLAT: 283\15

EX. SPECIMEN TREE (TYP)

PR. ADAPTIVE MANAGEMENT PATH
SEE DETAIL DWG DE-04/SHEET 22

EX. THALWEG

EX. UTILITY EASEMENT
PLAT: 8548\446

EX. EPHEMERAL CHANNEL

PR. BASELINE OF CONSTRUCTION/ALIGNMENT

PR. LIMIT OF DISTURBANCE/HIGH VISIBILITY FENCE

DRAINAGE EASEMENT ACQUIRED PRIOR TO CONSTRUCTION (TYP)

LIMIT OF FIELD RUN SURVEY

EX. TREELINE (TYP)

ROCK TO BE INSTALLED IN THE APRON AND RUN FOR PROPOSED STRUCTURES, INCLUDING VALLEY WIDE WEIRS AND RIFFLE-WEIRS, IS NOT SHOWN IN PLAN VIEW. SEE DETAILS FOR THE FULL EXTENTS OF ROCK TO BE INSTALLED.

TAX ID# 03-000-40227040
TERSHELLE BROWN
8116 HOG NECK RD
T.M. 17 GRID 16 P. 190
DEED: 2214/38
PLAT: 283/15
0.603 AC.

TAX ID# 03-190-40041463
CHATTERLEIGH LTD PTNSHP
FLOOD PLAIN
T.M. 17 GRID 16 P. 640
DEED: 3062/888
PLAT: 42/44
3.060 AC.

TAX ID# 03-190-40044252
CHESTERFIELD HOME OWNERS ASSN INC
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 42/44
3.113 AC.

PR. VALLEY WIDE WEIR
SEE DETAIL DWG DE-02/ SHEET 20
VWW-01

EL. 34.1

EL. 42.0

ROCK CREEK

EX. RIPRAP TO REMAIN (TYP)

PR. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

TAX ID# 03-000-40221048
JOSEPH R MCDEVITT &
ANNMARIE G MCDEVITT
8110R HOG NECK RD
T.M. 17 GRID 16 P. 90
DEED: 38848/184
PLAT: E107/23
1.920 AC.

EX. BLDG

EX. SPECIMEN TREE TO BE PROTECTED WITH TREE FLANKING (TYP)

GENERAL COMMON ELEMENT
PLAT: 10T\23

SSMH #16465 TO BE ADJUSTED
SEE DETAIL DWG DE-05/SHEET 23

EX. SS MANHOLE #16465
(DWG. 17305)
TOP ELEV. = 41.62
EX. 10" DIP INV IN = 35.50'
EX. 10" DIP INV OUT = 35.22
EX. 8" PVC INV IN (N) = 35.67
EX. 8" PVC INV IN (SE) = 35.52

EX. 15' SEWER EASEMENT (DWG 26774)

TAX ID# 03-190-40041462
CHESTERFIELD HOME OWNERS ASSN INC.
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 42/44
4.961 AC.

EX. 4" PVC SS CLEANOUT

EX. CONCRETE WALL

EX. SS MANHOLE #16466
(DWG. 17305)
TOP ELEV. = 48.44
EX. 10" DIP INV IN = 37.06
EX. 10" DIP INV OUT = 36.94

EX. 15" CMP SD

METAL FLARED END SECTION
TOP ELEV. = 44.88
EX. 15" CMP INV IN = 43.52
FES 3

TAX ID# 03-000-40045462
EDWARD G ANDERSON
& ANGELA M ANDERSON
8042 ELIZABETH RD
T.M. 17 GRID 16 P. 92
DEED: 15647/416
PLAT: 3422/281
0.884 AC.

TAX ID# 03-000-40011127
JAMES L WILLIAMS
8106 HOG NECK RD
T.M. 17 GRID 16 P. 618
DEED: 34042/49
PLAT: 2884/746
0.840 AC.

HW 3
EX. A.A.C.O. TYPE 'X' HEADWALL
TOP ELEV. = 46.42
EX. 53"x34" RCP INV IN = 41.22
EX. 53"x34" RCP INV IN = 41.19

EX. DRIVEWAY

EX. BLDG

EX. 10" DIP SS (DWG. 17035)

EX. 10" DIP SS (DWG. 17035)

EX. 53"x34" RCP SD

EX. 53"x34" RCP SD

EX. UNK. SS

EX. UNK. SS

EX. PARKING LOT

EX. BLDG

TR 1 TR 2 TR 4 TR 5 TR 6 TR 7 TR 31 TR 32 TR 33 TR 34

C-01

90% CONSTRUCTION DRAWINGS

NOTES:
1. FOR EXISTING SPECIMEN TREE SURVEY SEE DWG AB-01/SHEET 2.
2. WETLAND DELINEATION WAS PERFORMED BY BAYLAND CONSULTANTS AND DESIGNERS, INC. DATED APRIL 2023. WETLANDS AND ASSOCIATED BUFFERS OUTSIDE LIMIT OF WORK ARE NOT SHOWN ON PLANS. DISCONTINUOUS WETLAND BOUNDARY INDICATES WETLAND EXTENDS BEYOND THE LIMIT OF WORK.
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5. FOR STRUCTURE DETAILS, SEE DWG DE-01/SHEET 19 TO DWG DE-05/SHEET 23.

SITE PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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www.baylandinc.com
BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED	DATE	APPROVED	DATE
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED	DATE	APPROVED	DATE
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	12 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
SITE PLAN
COUNCIL DISTRICT 3

C:\DWG\ROCK CREEK\DWG RESTORATION\DWG Files\Sheet Files\5_20201_SH01

SITE PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

C-02

90% CONSTRUCTION DRAWINGS

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE		APPROVED DATE	SCALE: 1" = 20'
CHIEF ENGINEER		PROJECT MANAGER	DESIGNED BY: MKS 8/13/25
APPROVED DATE		APPROVED DATE	DRAWN BY: MG/KM 8/13/25
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	CHECKED BY:CMS/SG 8/13/25
			SHEET NO. 13 OF 63
			CONTRACT NO. B553802

ROCK CREEK STREAM RESTORATION
SITE PLAN
COUNCIL DISTRICT 3

J:\5_20201_ROCK_CREEK_STREAM_RESTORATION\DGN Files\Sheet Files\5_20201_SP02

MATCHLINE REFER TO SHEET 13/DWG C-02

MATCHLINE REFER TO SHEET 15/DWG C-04

PR. ADAPTIVE MANAGEMENT PATH SEE DETAIL DWG DE-04/SHEET 22

LIMIT OF FIELD RUN SURVEY

ROCK TO BE INSTALLED IN THE APRON AND RUN FOR PROPOSED STRUCTURES, INCLUDING VALLEY WIDE WEIRS AND RIFFLE-WEIRS, IS NOT SHOWN IN PLAN VIEW. SEE DETAILS FOR THE FULL EXTENTS OF ROCK TO BE INSTALLED.

TAX ID# 03-190-90044220
CHESTERFIELD HOME OWNERS ASSN INC.
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 42/44
2.907 AC.

EX. SHED

EX. SHED

EX. SHED

EX. INTERMITTENT CHANNEL

PR. VALLEY WIDE WEIR (TYP) SEE DETAIL DWG DE-02/SHEET 20

VWW-10

VWW-11

VWW-12

VWW-13

VWW-14

VWW-15

VWW-16

VWW-17

FILL AROUND EX. EXPOSED SS LINE. SEE SEWER PIPE PROTECTION DETAIL DWG DE-05/SHEET 23

EX. 10" DIP SS (DWG. 17034)

EX. THALWEG

ROCK CREEK

EX. PERENNIAL CHANNEL

PR. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

EX. 15" SEWER EASEMENT (DWG 26774)

PR. BASELINE OF CONSTRUCTION/ ALIGNMENT

RW-01

RW-02

RW-03

RW-04

RW-05

RW-06

RW-07

RW-08

RW-09

RW-10

SSMH #16462 TO BE ADJUSTED SEE DETAIL DWG DE-05/SHEET 23

EX. SS MANHOLE #16462 (DWG. 17034) SS MH
TOP ELEV. = 31.01
EX. 10" DIP INV IN = 22.03
EX. 10" DIP INV OUT = 21.96

DRAINAGE EASEMENT ACQUIRED PRIOR TO CONSTRUCTION (TYP)

PR. TRIBUTARY 1

TRIBUTARY 1

EX. SPECIMEN TREE (TYP)

STEP POOL STORMWATER CONVEYANCE SYSTEM

EX. SWM FACILITY AND OUTFALL CHANNEL TO BE RETROFIT BY OTHERS*

EX. FOREST CONSERVATION EASEMENT PLAT: 32749

EX. RIPRAP TO BE INSTALLED BY OTHERS*

EX. HEADWALL TO BE INSTALLED BY OTHERS*

EX. SPECIMEN TREE TO BE PROTECTED WITH PLANKING

PR. LIMIT OF DISTURBANCE/HIGH VISIBILITY FENCE

*OUTFALL RETROFIT TO BE CONDUCTED PRIOR TO START OF CONSTRUCTION, UNDER SEPARATE CONTRACT

EX. SS MANHOLE # 16461 (DWG. 17034) SS MH
TOP ELEV. = 25.40
EX. 10" DIP INV IN = 17.90
EX. 10" DIP INV OUT = 17.78

FILL AROUND EX. EXPOSED SS MH, SEE EXPOSED SEWER MANHOLE BACKFILL DETAIL DWG DE-05/SHEET 23

SSMH #16461 TO BE ADJUSTED SEE DETAIL DWG DE-05/SHEET 23

EX. 10" DIP INV IN = 17.90
EX. 10" DIP INV OUT = 17.78

EX. 5D MANHOLE TO BE INSTALLED BY OTHERS*

EX. 5D RISER TO BE INSTALLED BY OTHERS*

EX. 36" RCP TO BE INSTALLED BY OTHERS*

EX. 24" RCP TO BE INSTALLED BY OTHERS*

TAX ID# 03-000-09878490
GMS ASSETS LLC
8894 FT SMALLWOOD RD
T.M. 17 GRID 16 P. 95
DEED: 18087/182
3.80 AC.

EX. BMP 1875

TAX ID# 03-000-19860700
VINCENT R HENITT SR
& JACQUELINE L HENITT
8842 FORT SMALLWOOD RD
T.M. 17 GRID 16 P. 480
DEED: 4825/881
1.000 AC.

EX. TREELINE (TYP)

TAX ID# 03-190-90041462
CHESTERFIELD HOME OWNERS ASSN INC.
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 42/44
4.981 AC.

EX. FOREST CONSERVATION AREA (OPEN SPACE/RECREATIONAL AREA) PLAT: 33701

TAX ID# 03-247-90242454
ELIZABETH PLACE II HOA INC
OPEN SPACE#II/REC AREA#I/ FOREST CONSERV AREA
T.M. 17 GRID 16 P. 302
DEED: 30263/209
0.483 AC.

TAX ID# 03-247-90234201
ELIZABETH PLACE HOA INC
OPEN SPACE
T.M. 17 GRID 16 P. 94
DEED: 21259/402
PLAT: 32749
0.578 AC.

EX. EPHEMERAL CHANNEL

EX. A.A.C.O. TYPE 'B' HEADWALL
TOP ELEV. = 45.45
EX. 27" RCP INV IN = 42.03

EX. PERPETUAL EASEMENT FOR DRAINAGE FACILITY PLAT: 32749

EX. 27" RCP 90°

EX. RIPRAP TO REMAIN (TYP)

PR. (+/-) 52 SY RIPRAP PROTECTION SEE DETAIL DWG DE-04/SHEET 22 RR-02

EX. PARKING LOT

EX. BLDG

EX. DRIVEWAY

EX. 24" RCP 90°

N 539,850 E 1,448,150

N 539,250 E 1,448,850

NOTES:
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SITE PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

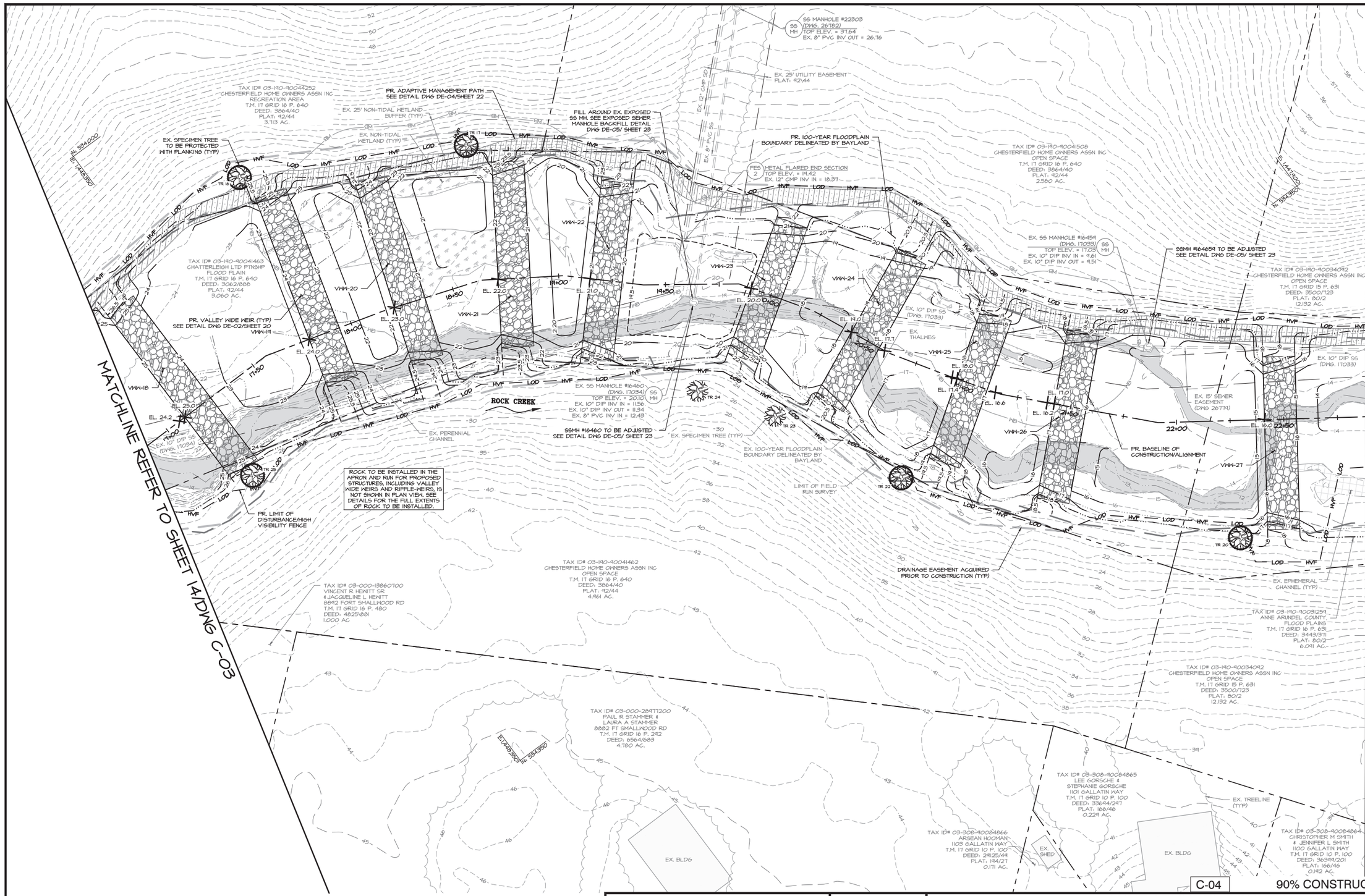
APPROVED DATE		APPROVED DATE	
CHIEF, ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	14 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
SITE PLAN
COUNCIL DISTRICT 3

C-03

90% CONSTRUCTION DRAWINGS



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SITE PLAN

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1 INCH = 20 FEET

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

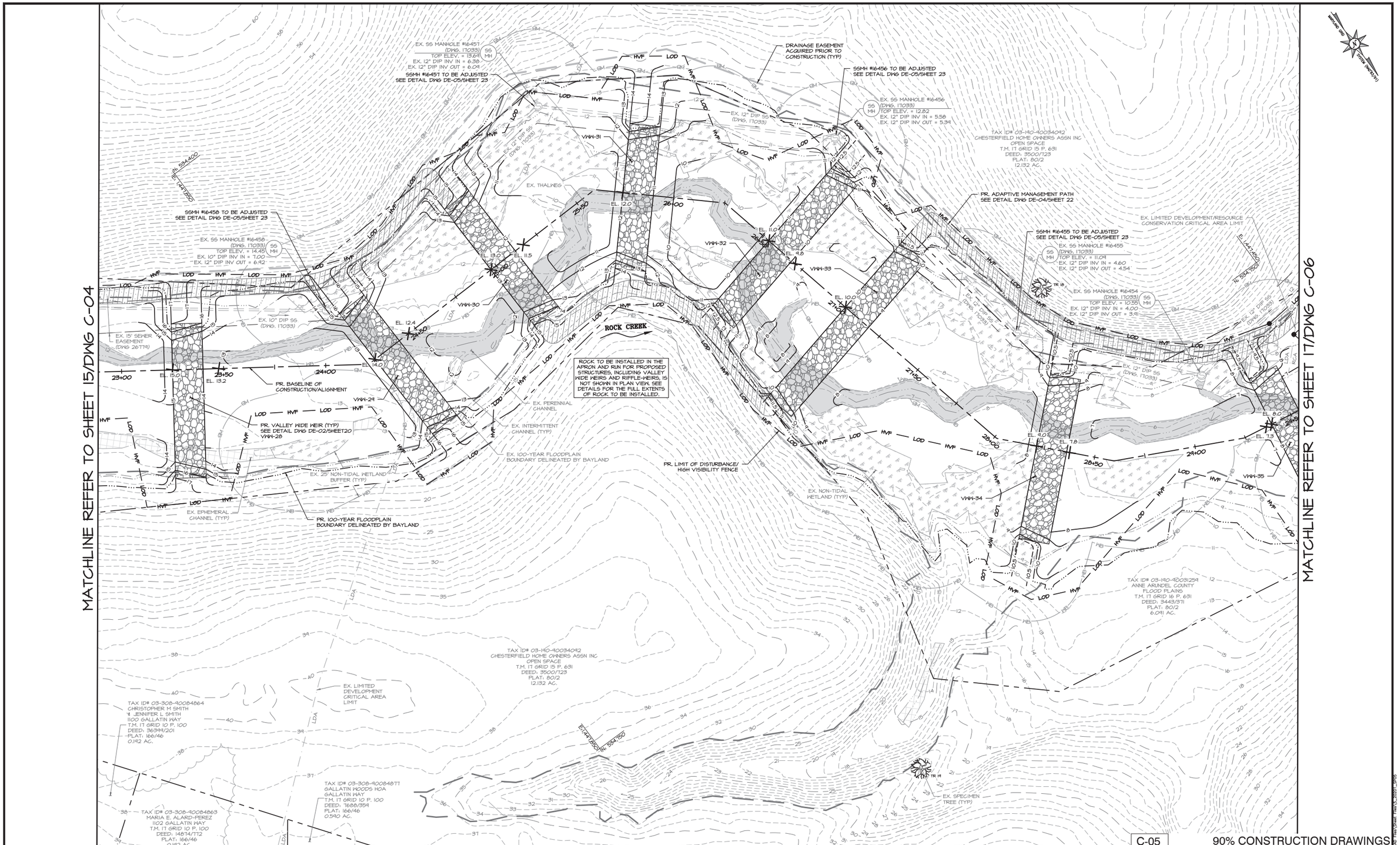
APPROVED DATE		APPROVED DATE	
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	15 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
SITE PLAN
COUNCIL DISTRICT 3

C-04

90% CONSTRUCTION DRAWINGS



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SITE PLAN

SCALE: 1" = 20'

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1 INCH = 20 FEET

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED CHIEF ENGINEER	DATE	APPROVED PROJECT MANAGER	DATE
APPROVED DEPUTY DIRECTOR	DATE	APPROVED CHIEF, RIGHT OF WAY	DATE

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	16 OF 63
CONTRACT NO.	B553802

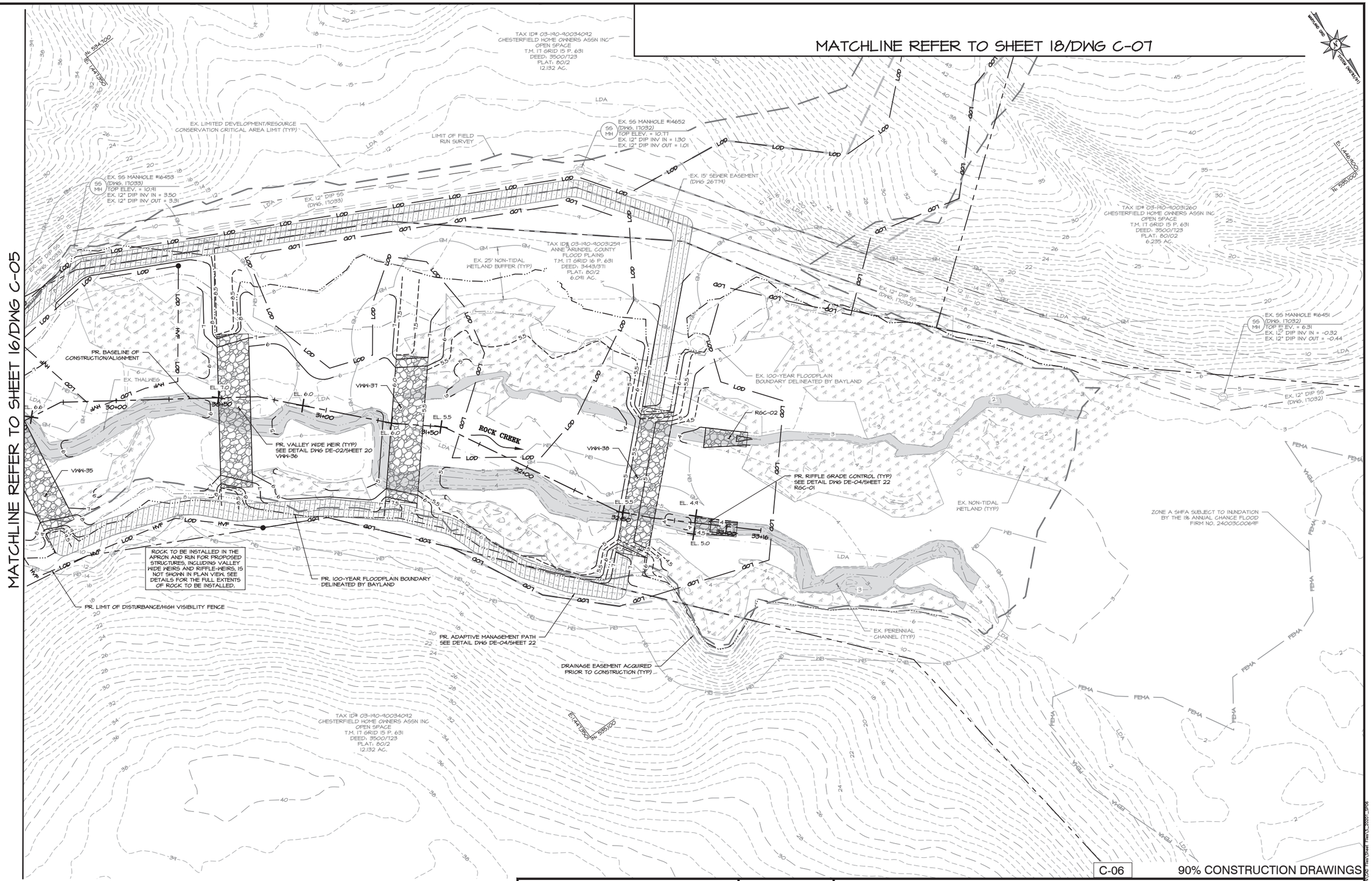
ROCK CREEK STREAM RESTORATION
SITE PLAN
COUNCIL DISTRICT 3

C-05

90% CONSTRUCTION DRAWINGS

MATCHLINE REFER TO SHEET 16/DWG C-05

MATCHLINE REFER TO SHEET 18/DWG C-07



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SITE PLAN

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED ____ DATE ____ CHIEF ENGINEER
APPROVED ____ DATE ____ PROJECT MANAGER
APPROVED ____ DATE ____ DEPUTY DIRECTOR
APPROVED ____ DATE ____ CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
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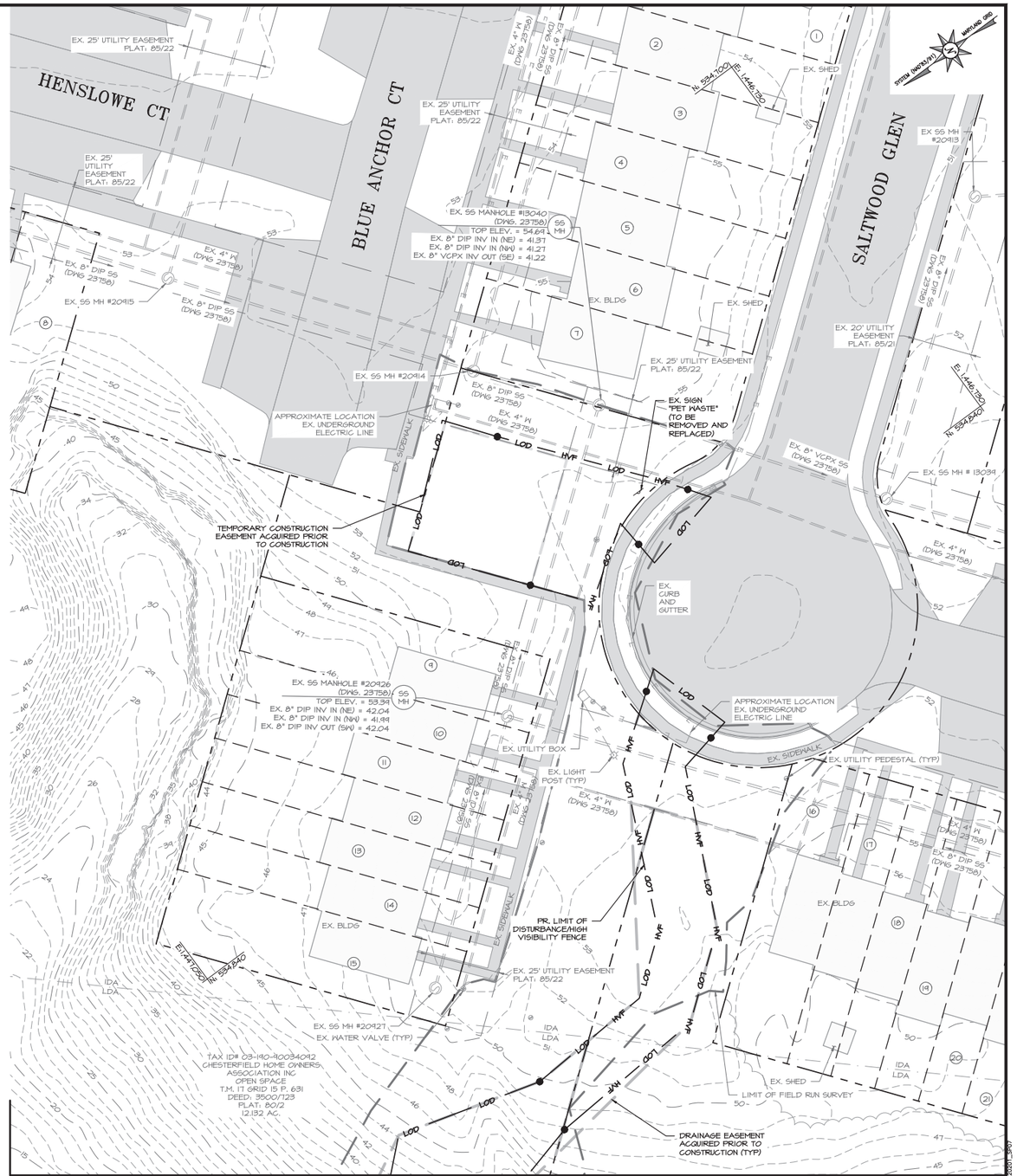
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	17 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
SITE PLAN
COUNCIL DISTRICT 3

C-06

90% CONSTRUCTION DRAWINGS



MATCHLINE REFER TO SHEET 17/DWG C-06

NOTES:
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SITE PLAN

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1 INCH = 20 FEET

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C-07

90% CONSTRUCTION DRAWINGS

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER	APPROVED DATE — PROJECT MANAGER	SCALE: 1" = 20'	
APPROVED DATE — DEPUTY DIRECTOR	APPROVED DATE — CHIEF, RIGHT OF WAY	DESIGNED BY: MKS	8/13/25
		DRAWN BY: MG/KM	8/13/25
		CHECKED BY:CMS/SG	8/13/25
		SHEET NO. 18 OF 63	
		CONTRACT NO. B553802	

ROCK CREEK STREAM RESTORATION
SITE PLAN
COUNCIL DISTRICT 3

P:\5_20201_ROCK CREEK_STREAM_RESTORATION\DGN Files\Sheet Files\5_20201_SHT

SPSC RIFFLE–WEIR CONSTRUCTION SPECIFICATIONS

MATERIALS

THE CONTRACTOR WILL NOT BE GRANTED AN EXTENSION OF EXTRA TIME OR EXTRA COMPENSATION DUE TO DELAY CAUSED BY SAMPLING, TESTING, APPROVAL OR DISAPPROVAL OF THE MATERIALS UNDER THE REQUIREMENTS OF THESE SPECIFICATIONS. THE MATERIAL SHALL BE AS SPECIFIED ON THE RIFFLE–WEIR ROCK SIZE TABLE AND HEREIN. IF SUFFICIENT MATERIAL IS NOT AVAILABLE FROM THE SITE, THE CONTRACTOR SHALL OBTAIN MATERIAL FROM A QUARRY AND PROVIDE A CERTIFICATE VERIFYING THAT THE STONE MEETS THE SPECIFIED REQUIREMENTS AND/OR A SAMPLE OF STONE TO THE COUNTY FOR APPROVAL PRIOR TO INSTALLATION. IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO MAKE ALL NECESSARY ARRANGEMENTS WITH THE SOURCE OF SUPPLY IN A TIMELY FASHION, SO THAT THE CONTRACTOR SHALL MAINTAIN AN ADEQUATE SUPPLY OF ALL MATERIALS AND THAT WORK SHALL NOT BE UNNECESSARILY DELAYED DUE TO INSUFFICIENT SUPPLY.

1. BOULDERS – BOULDERS SHALL BE AS SPECIFIED ON THE RIFFLE–WEIR ROCK SIZE TABLE. BOULDERS SHALL BE GRANITE, OBLONG, AND FLAT IN APPEARANCE, AND DARK BROWN OR DARK GRAY IN COLOR. IN GENERAL, FOOTER ROCKS SHALL BE SELECTED TO BE THE LARGEST ROCKS AVAILABLE. FOOTER ROCKS SHALL BE PLACED AT THE BOTTOM AND DOWNSTREAM SIDE OF THE TRENCH. BOULDERS MUST HAVE A MINIMUM DRY UNIT WEIGHT OF 160 LBS/CF.

2. SUBANGULAR SILICA COBBLE – SUBANGULAR SILICA COBBLE SHALL MEET THE STONE SIZES SPECIFIED IN THE RIFFLE–WEIR ROCK SIZE TABLE. COBBLE SHALL BE COMPOSED OF A WELL–GRADED MIXTURE OF STONE SIZE SO THAT 50% OF THE PIECES BY WEIGHT SHALL BE LARGER THAN THE D50 SIZE. ANGULAR SILICA COBBLE SHALL BE DARK BROWN OR DARK GRAY IN COLOR. NO WHITE STONE SHALL BE ALLOWED. THE ROCK SHALL BE FREE FROM LAMINATIONS AND WEAK CLEAVAGES AND SHALL NOT DISINTEGRATE FROM THE ACTION OF AIR, WATER, HANDLING OR PLACING.

3. RIPRAP – RIPRAP SHALL BE AS SPECIFIED IN SECTION 901.02.01 OF THE MARYLAND DEPARTMENT OF TRANSPORTATION, STATE HIGHWAY ADMINISTRATION'S STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS, LATEST EDITION AND ANY ADDENDA THERETO. RIPRAP SHALL BE COMPOSED OF A WELL–GRADED MIXTURE OF STONE SIZE SO THAT 50% OF THE PIECES BY WEIGHT SHALL BE LARGER THAN THE D50 SIZE. RIPRAP MUST BE OF APPROPRIATE COLOR; NO WHITE STONE SHALL BE ALLOWED. RIPRAP SHALL BE GRANITE WITH A MINIMUM DRY UNIT WEIGHT OF 160 LBS/CF.

4. BANK RUN GRAVEL FILTER – BANK RUN GRAVEL FILTER SHALL MEET THE AGGREGATE GRADING REQUIREMENTS AS SPECIFIED IN AGGREGATE BASE AND SUBBASE COURSES OF AACO SPECIFICATION 02621.02.C OR AS DIRECTED BY THE COUNTY. IT SHALL BE A MIX OF EQUAL PARTS BANK RUN GRAVEL SUBBASE COURSE AND COARSE AGGREGATE FOR BASE COURSE.

4. SUITABLE FILL – SUITABLE FILL SHALL BE FROM ON–SITE EXCAVATIONS (IF OF PROPERTY QUALITY). ALL FILL AND/OR BACKFILL MATERIAL SHALL BE FREE FROM VEGETATIVE MANNER, ORGANICS, FROZEN MATERIAL, ROCKS/STONES GREATER THAN ONE AND A HALF INCHES IN ANY DIMENSION, WASTE METAL PRODUCTS, UNSIGHTLY DEBRIS, TOXIC MATERIAL, OR OTHER DELETERIOUS MATERIALS. THE MATERIAL SHALL NOT CONTAIN MICA IN QUANTITIES, WHICH, IN THE JUDGEMENT OF THE ENGINEER ARE SUFFICIENT TO AFFECT COMPACTION CHARACTERISTICS AND SHALL BE A MINIMUM OF 85 POUNDS PER CUBIC FOOT FOR THE MAXIMUM DRY DENSITY ACCORDING TO AASHTO T–180, METHOD C. CONCRETE SAND MAY BE SUBSTITUTED FOR SUITABLE FILL WITH COUNTY APPROVAL.

5. TOPSOIL – MATERIALS FOR SALVAGED TOPSOIL SHALL MEET THE REQUIREMENTS OF THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION CONTROL AND SEDIMENT CONTROL FOR PERMANENT STABILIZATION AND TOPSOIL. INVASIVE SPECIES AND THE TOPSOIL THAT SUPPORTED THEIR GROWTH SHALL BE DISPOSED OF.

6. SAND/WOOD CHIP FILTER MEDIA – SAND/WOOD CHIP FILTER MEDIA MATERIAL SPECIFICATIONS SHALL BE AS FOLLOWS:
   A. SAND SHALL BE 0.02" TO 0.04" AND CLASSIFY AS AASHTO M–6 OR ASTM–C–33. SAND SUBSTITUTIONS SUCH AS DIABASE AND GRAYSTONE (AASHTO) #10 ARE NOT ACCEPTABLE. NO CALCIUM CARBONATED OR DOLOMITIC SAND SUBSTITUTIONS ARE ACCEPTABLE. NO "ROCK DUST" CAN BE USED FOR SAND.
   B. WOOD CHIPS SHALL BE EITHER HARDWOOD OR SOFTWOOD PRODUCED BY A CHIPPING MACHINE TO A MAXIMUM SIZE OF 2 X 2 X 0.5 INCHES. WOOD CHIPS SHALL BE FREE FROM LEAVES, TWIGS, WOOD SHAVINGS, FINES, SAWDUST, TOXIC SUBSTANCES, AND ALL FOREIGN MATERIAL. THE WOODCHIPS ARE ADDED TO THE SAND MIX (PRIOR TO PLACEMENT), APPROXIMATELY 20% BY VOLUME, TO INCREASE THE ORGANIC CONTENT AND PROMOTE PLANT GROWTH AND SUSTAINABILITY.

8. STREAMBED MATERIAL FOR USE SHALL CONSIST OF SALVAGED SAND, GRAVEL AND COBBLE MATERIAL FROM THE TOP SIX (6) TO TWELVE (12) INCHES OF THE EXISTING STREAM CHANNEL IN AREAS OF CUT. STREAMBED MATERIAL INCLUDES ALL–NATURAL STONE WITHIN THE CHANNEL AND MAY RANGE IN DIAMETER FROM ONE (1) MILLIMETER TO SIX (6) INCHES. STREAMBED MATERIAL SHALL BE STORED ONSITE IN STOCKPILE AREAS DESIGNATED ON CONTRACT DRAWINGS FOR USE IN CONSTRUCTING STRUCTURES AND THE PROPOSED STREAM BED AS DESCRIBED IN THE CONTRACT DOCUMENTS. WITH COUNTY APPROVAL, BANK RUN GRAVEL MAY BE USED IN PLACE OF STREAMBED MATERIAL IF SUFFICIENT SALVAGED MATERIAL IS NOT AVAILABLE TO PROVIDE THE MATERIAL NEEDED PER THE CONTRACT DOCUMENTS.

9. FOR ANCHOR STAKE AND SOIL STABILIZATION MATTING REQUIREMENTS, SEE DWG ES–08/SHEET 51.

SUBMITTALS

1. THE CONTRACTOR SHALL PROVIDE CERTIFICATIONS OF COMPLIANCE STATING THAT ALL ITEMS FURNISHED ARE IN ACCORDANCE WITH AND MEET THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

2. PRIOR TO THE START OF WORK ON THIS ITEM, THE CONTRACTOR SHALL SUBMIT THE SOURCE OF SUPPLY OF STONE TO THE COUNTY FOR REVIEW AND APPROVAL. IF REQUIRED BY THE COUNTY, THE CONTRACTOR AND THE COUNTY OR ITS REPRESENTATIVE WILL JOINTLY VISIT THE SOURCE SITES TO DETERMINE WHETHER THE STONE MEETS THE SPECIFIED REQUIREMENTS AND WHETHER THERE ARE SUFFICIENT QUANTITIES OF THE STONE TO MEET THE PROJECT REQUIREMENTS. THE CONTRACTOR WILL NOT BE GRANTED AN EXTENSION OF TIME OR EXTRA COMPENSATION DUE TO DELAY CAUSED BY SAMPLING, TESTING, APPROVAL OR DISAPPROVAL OF MATERIAL UNDER THE REQUIREMENTS OF THESE SPECIFICATIONS. THE CONTRACTOR SHALL SUBMIT TO THE COUNTY A CERTIFICATE VERIFYING THE FOLLOWING:
   C. STONE CLASSIFICATION
   D. STONE DENSITY (I.E., WEIGHT PER CUBIC FOOT)
   E. WEIGHT OF STONE BEING SUPPLIED.
   F. STONE QUALITY SHALL MEET ALL OF THE ABOVE SPECIFICATIONS.

3. THE CONTRACTOR SHALL PROVIDE PHOTOGRAPHIC DOCUMENTATION OF ALL ROCK INCLUDING BOULDERS, SUBANGULAR COBBLE AND RIPRAP TO VERIFY COLOR REQUIREMENTS.

4. THE CONTRACTOR SHALL PROVIDE A CERTIFICATION FOR REVIEW AND APPROVAL THAT VERIFIES THE BANK RUN GRAVEL MEETS THE REQUIRED GRADATION. MATERIAL MAY NOT BE INSTALLED WITHOUT PRIOR APPROVAL.

5. THE CONTRACTOR SHALL PROVIDE SAND/WOOD CHIP FILTER MEDIA SOURCE AND MATERIAL SPECIFICATIONS TO THE COUNTY FOR APPROVAL.

6. THE CONTRACTOR SHALL FURNISH SPECIFICATIONS AND A SOURCE OF SOIL STABILIZATION MATTING TO THE COUNTY FOR REVIEW AND APPROVAL.

7. ANY UNAPPROVED MATERIAL BROUGHT TO THE PROJECT SITE THAT IS NOT APPROVED WILL BE REMOVED AND REPLACED AT NO EXPENSE TO THE COUNTY.

CONSTRUCTION

1. THE RIFFLE–WEIRS SHALL BE INSTALLED ACCORDING TO THE SEQUENCE OF CONSTRUCTION, THE CONSTRUCTION DRAWINGS, THESE SPECIFICATIONS, AND AS DIRECTED BY THE COUNTY.

2. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO CONSTRUCT, INSTALL, AND MAINTAIN THE RIFFLE–WEIRS AS SHOWN ON THE CONTRACT DRAWINGS AND DESCRIBED IN THESE SPECIFICATIONS OR AS DIRECTED BY THE COUNTY.

3. THE CONTRACTOR SHALL REVIEW THE DETAILS AND SPECIFICATIONS WITH THE ENGINEER PRIOR TO CONSTRUCTION.

4. THE CONTRACTOR SHALL STAKE OUT THE EXTENTS OF EACH STRUCTURE AND IF REQUIRED, REVIEW THE STAKEOUT WITH THE COUNTY PRIOR TO CONSTRUCTION. AT A MINIMUM, THE FIRST RIFFLE–WEIR STRUCTURE STAKEOUT MUST BE REVIEWED AND APPROVED BY THE COUNTY PRIOR TO CONSTRUCTION.

5. SAND/WOOD CHIP FILTER MEDIA SHALL BE USED FOR FILLING THE FACILITY BOTTOM TO ACHIEVE THE GRADE NECESSARY FOR THE INSTALLATION OF THE STRUCTURES. SAND/WOOD CHIP FILTER MEDIA SHALL BE PLACED IN LIFTS NO MORE THAN EIGHT (8) INCHES THICK AND COMPACTED.

6. RUNS SHALL BE PLACED AT THE INTERFACE OF THE POOLS AND WEIRS AS SHOWN ON THE CONSTRUCTION DRAWINGS. RUNS MUST EXTEND A MINIMUM OF TWO FEET VERTICALLY BELOW THE DOWNSTREAM WEIR INVERT TO PREVENT UNDERMINING. BANK RUN GRAVEL FILTER SHALL BE USED TO SEPARATE THE SAND/WOOD CHIP FILTER MEDIA AND THE RIPRAP THAT LINE THE FACILITY BOTTOM. RIFFLE–WEIR MIX SHALL BE PLACED ADJACENT TO THE POOL BOTTOM AT THE WEIR ELEVATION UPSTREAM OF THE POOL BOTTOM TO FORM THE WEIR CHANNEL PARABOLIC SHAPE. RIPRAP SHALL BE ARRANGED HORIZONTALLY IN THE CENTER OF THE CHANNEL AND THE ARMS ON EITHER SIDE SHALL BE EXTENDED PARABOLICALLY AT APPROXIMATELY A 20 DEGREE ANGLE LONGITUDINALLY TO THE CENTER OF THE POOL OR AS DIRECTED BY THE ENGINEER. RIPRAP SHALL BE ARRANGED TO MAXIMIZE INTERLOCKING. THE FACE OF THE RIPRAP SHALL BE TILTED DOWNSTREAM TO OCCUPY HALF OF THE INCLINE MADE UP OVER THE ENTIRE LENGTH OF THE WEIR.

7. ONCE THE RUN HAS BEEN PLACED, ONE ROW OF WEDGE BOULDERS SHALL BE PLACED AT THE DOWNSTREAM INVERT OF THE RIFFLE–WEIR AS SHOWN ON THE CONSTRUCTION DRAWINGS. BOULDERS SHALL BE ARRANGED HORIZONTALLY IN THE CENTER OF THE CHANNEL AND THE ARMS ON EITHER SIDE OF THE CHANNEL SHALL BE EXTENDED PARABOLICALLY AT APPROXIMATELY A 20 DEGREE ANGLE LONGITUDINALLY TO THE CENTER OF THE POOL OR AS DIRECTED BY THE ENGINEER. THE BOULDERS SHALL BE ARRANGED TO MAXIMIZE INTERLOCKING. THE FACE OF THE BOULDERS SHALL BE TILTED DOWNSTREAM TO OCCUPY HALF OF THE INCLINE MADE UP OVER THE ENTIRE LENGTH OF THE RIFFLE–WEIR.

8. ONCE THE WEDGE BOULDERS HAVE BEEN PLACED, RIFFLE–WEIR MIX SHALL BE PLACED TO FORM THE RIFFLE PORTION OF THE RIFFLE WEIR. SMALL RIFFLE–WEIR MIX APRONS SHALL BE PLACED FROM THE UPSTREAM RIFFLE–WEIR INVERT TO A MINIMUM OF 3 FEET UPSTREAM OF THE RIFFLE–WEIR UPSTREAM INVERT. SMALL AND LARGE STONES SHALL BE MIXED TO MINIMIZE VOID SPACE.

9. RIFFLE–WEIR MIX SHOULD BE PLACED IN VERTICAL LIFTS OF NO MORE THAN EIGHT (8) INCHES DEEP. A MIX OF 50% BANK RUN GRAVEL, 30% #57 STONE, AND 20% #2 STONE SHALL BE WASHED INTO THE MIX AFTER EACH LAYER IS PLACED TO MINIMIZE VOID SPACE IN THE MIXTURE EXCEPT FOR THE TOP 4 INCHES WHICH DO NOT REQUIRE THE MIX. STONE SHALL BE PLACED IN A MANNER SO THAT IT SHINGLES IN A DOWNSTREAM DIRECTION, MINIMIZES VOID SPACE AND PROMOTES INTERLOCKING. DUMPING OF STONE WILL NOT BE PERMITTED. VOID SPACE MUST BE MINIMIZED TO THE SATISFACTION OF THE ENGINEER PRIOR TO ACCEPTANCE OF EACH CONSTRUCTED STEP.

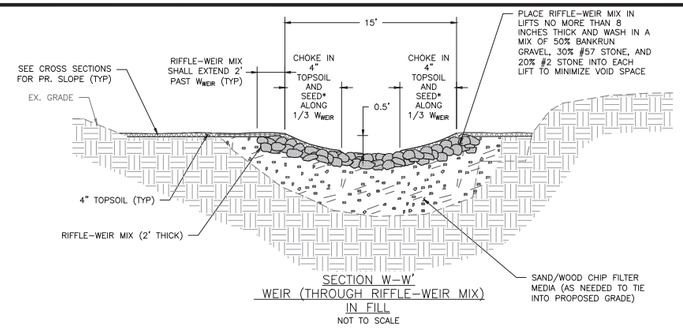
10. OBSERVE DURING AND AFTER STORMS TO NOTE FLOW OVER WEIRS AND ADD ADDITIONAL SMALL ROCK AND A MIX OF 50% BANK RUN GRAVEL, 30% #57 STONE, AND 20% #2 STONE IN STRATEGIC LOCATIONS TO FILL VOIDS INCLUDING ALONG THE SHOULDERS OF THE WEIRS. WITHIN THE BASEFLOW PATH, THE TOP 4 INCHES OF THE RIFFLE–WEIR MIX DO NOT REQUIRE THE MIX.

11. ONCE THE RIFFLE–WEIR–POOL COMBINATION IS COMPLETE, THE ENTIRE SURFACE SHALL BE STABILIZED. ANY DISTURBED AREA SHALL BE STABILIZED IN ACCORDANCE WITH CONTRACT DOCUMENTS AT THE END OF EACH WORKING DAY.

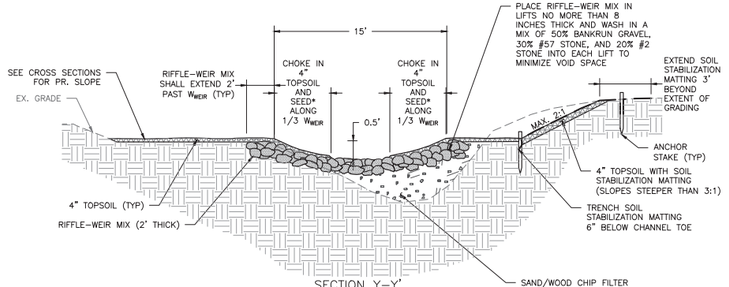
12. SURFACE ELEVATIONS OF THE STRUCTURES SHALL CONFORM TO THE PROPOSED DESIGN STREAM PROFILES AND CROSS SECTIONS SPECIFIED IN THE CONTRACT DOCUMENTS. TOLERANCES OF THE FINISHED STRUCTURE ARE AS FOLLOWS:

SURFACE ELEVATION:	+/– 0.2 FEET
SLOPE:	+/– 0.1 PERCENT

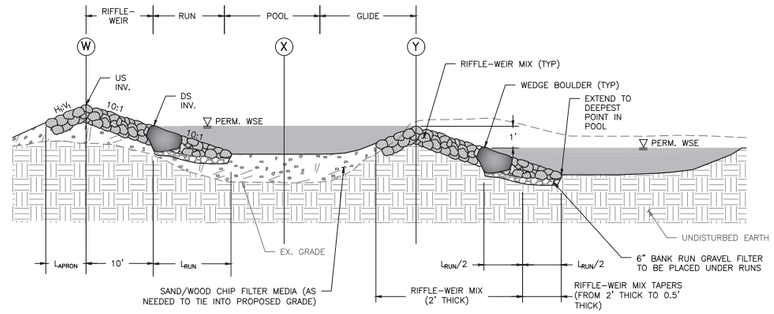
13. PLACED MATERIAL NOT CONFORMING TO THE SPECIFIED LIMITS SHALL BE REMOVED AND REPLACED AS DIRECTED BY THE ENGINEER AT NO ADDITIONAL COST.



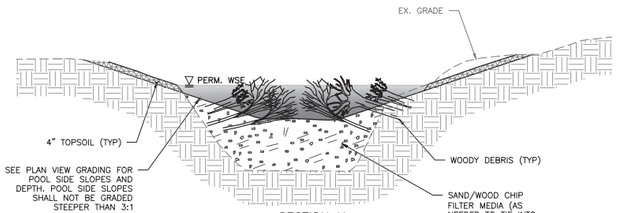
SECTION W–W'
WEIR (THROUGH RIFFLE–WEIR MIX)
IN FILL
NOT TO SCALE



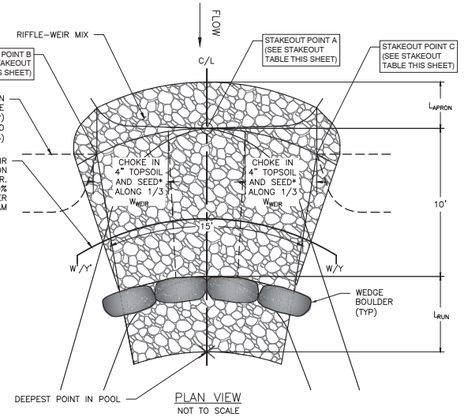
SECTION Y–Y'
WEIR (THROUGH RIFFLE–WEIR MIX)
IN CUT
NOT TO SCALE



PROFILE VIEW (SHOWN AT THALWEG)
NOT TO SCALE



SECTION X
THROUGH POOL IN FILL
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

*SEED WITH NATIVE SEED MIX CONSISTENT WITH ADJACENT ZONE (DWG LS–11/SHEET 63)

SPSC RIFFLE–WEIR DETAILS

NOT TO SCALE

SPSC RIFFLE–WEIR STAKEOUT TABLE

	POINT ID	ALIGNMENT	STATION	OFFSET	NORTHING	EASTING	ELEV.
RW–01	A	PR. TRIBUTARY 1	50+49.6	0.0	534,061.80	1,448,980.83	42.0
	B	PR. TRIBUTARY 1	50+51.3	8.0	534,067.77	1,448,975.21	43.0
	C	PR. TRIBUTARY 1	50+51.3	–8.0	534,054.05	1,448,983.47	43.0
RW–02	A	PR. TRIBUTARY 1	50+80.3	0.0	534,044.56	1,448,955.49	41.0
	B	PR. TRIBUTARY 1	50+82.0	–8.0	534,050.11	1,448,949.47	41.5
	C	PR. TRIBUTARY 1	50+82.0	–8.0	534,037.02	1,448,958.68	41.5
RW–03	A	PR. TRIBUTARY 1	51+16.4	0.0	534,022.97	1,448,926.56	40.0
	B	PR. TRIBUTARY 1	51+18.1	8.0	534,028.01	1,448,920.11	40.5
	C	PR. TRIBUTARY 1	51+18.1	–8.0	534,015.70	1,448,930.34	40.5
RW–04	A	PR. TRIBUTARY 1	51+54.4	0.0	534,002.30	1,448,895.21	39.0
	B	PR. TRIBUTARY 1	51+56.2	8.0	534,009.26	1,448,890.91	39.5
	C	PR. TRIBUTARY 1	51+56.2	–8.0	533,994.17	1,448,896.24	39.5
RW–05	A	PR. TRIBUTARY 1	51+87.1	0.0	533,991.41	1,448,864.38	38.0
	B	PR. TRIBUTARY 1	51+88.9	8.0	533,998.38	1,448,860.08	38.5
	C	PR. TRIBUTARY 1	51+88.9	–8.0	533,983.29	1,448,865.41	38.5
RW–06	A	PR. TRIBUTARY 1	52+17.1	0.0	533,976.45	1,448,839.92	37.0
	B	PR. TRIBUTARY 1	52+18.8	8.0	533,979.63	1,448,832.37	37.5
	C	PR. TRIBUTARY 1	52+18.8	–8.0	533,970.44	1,448,845.47	37.5
RW–07	A	PR. TRIBUTARY 1	52+42.1	0.0	533,955.99	1,448,825.55	36.0
	B	PR. TRIBUTARY 1	52+43.8	8.0	533,959.17	1,448,818.01	36.5
	C	PR. TRIBUTARY 1	52+43.8	–8.0	533,949.98	1,448,831.10	36.5
RW–08	A	PR. TRIBUTARY 1	52+67.1	0.0	533,935.53	1,448,811.19	35.0
	B	PR. TRIBUTARY 1	52+68.8	8.0	533,938.35	1,448,803.50	35.5
	C	PR. TRIBUTARY 1	52+68.8	–8.0	533,929.78	1,448,817.02	35.5
RW–09	A	PR. TRIBUTARY 1	52+92.1	0.0	533,914.42	1,448,797.81	34.0
	B	PR. TRIBUTARY 1	52+93.8	8.0	533,917.23	1,448,790.12	34.5
	C	PR. TRIBUTARY 1	52+93.8	–8.0	533,908.67	1,448,803.64	34.5
RW–10	A	PR. TRIBUTARY 1	53+17.1	0.0	533,893.30	1,448,784.42	32.0
	B	PR. TRIBUTARY 1	53+18.8	8.0	533,896.12	1,448,776.73	33.5
	C	PR. TRIBUTARY 1	53+18.8	–8.0	533,887.55	1,448,790.25	33.5

SPSC RIFFLE–WEIR ROCK SIZE TABLE

ALIGNMENT	ROCK TYPE	ROCK SIZE	% BY WEIGHT
PR. TRIBUTARY 1	RIFFLE–WEIR MIX	COBBLE (RANGE=4.0" TO 7.0"; D_{50}=5.5"; D_{100}=7.0")	40
		CLASS I RIPRAP (D_{50}=9.5"; D_{100}=15.0")	60
PR. TRIBUTARY 1	WEDGE BOULDERS	GREATER THAN 3.5'X2'X1'	10
		2.5'X2'X1' TO 3.5'X2'X1'	80
		LESS THAN 2.5'X2'X1'	10

NOTES:
1. THE MINIMUM DRY UNIT WEIGHT FOR ALL STONE SHALL BE 160 LB/CF.
2. SILICA STONE CAN BE SUBSTITUTED FOR GRANITE. SILICA STONE MUST MEET THE SIZING REQUIREMENTS IN THE RIFFLE–WEIR ROCK SIZE TABLE AND MUST HAVE A MINIMUM DRY UNIT WEIGHT OF 145 LB/CF.

A
PROPOSED STRUCTURE STAKEOUT LOCATION (TYP) SEE STAKEOUT TABLE THIS SHEET

PERMANENT STABILIZATION FOR DISTURBED FLOODPLAIN/TERRACE ADJACENT TO THE RESTORED STREAM CHANNEL WILL CONSIST OF PLACING A MINIMUM OF 4 INCHES OF TOPSOIL IN ACCORDANCE WITH THESE DETAILS. BIODEGRADABLE SOIL STABILIZATION MATTING WITH 4 INCHES OF TOPSOIL SHALL BE USED WHERE SLOPES ARE GREATER THAN 3:1 AND/OR AT THE DIRECTION OF THE COUNTY AND/OR ENGINEER.

SPSC RIFFLE–WEIR DATA TABLE

	RW–01	RW–02	RW–03	RW–04	RW–05	RW–06	RW–07	RW–08	RW–09	RW–10
H_2:V_1 (GLIDE SLOPE)	N/A	3:1	3:1	3:1	3:1	3:1	3:1	3:1	3:1	3:1
RUN LENGTH (L_{RUN}, FEET)	15.0	15.0	15.0	15.0	10.0	10.0	10.0	10.0	10.0	10.0
APRON LENGTH (L_{APRON}, FEET)	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0

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DE-01

90% CONSTRUCTION DRAWINGS

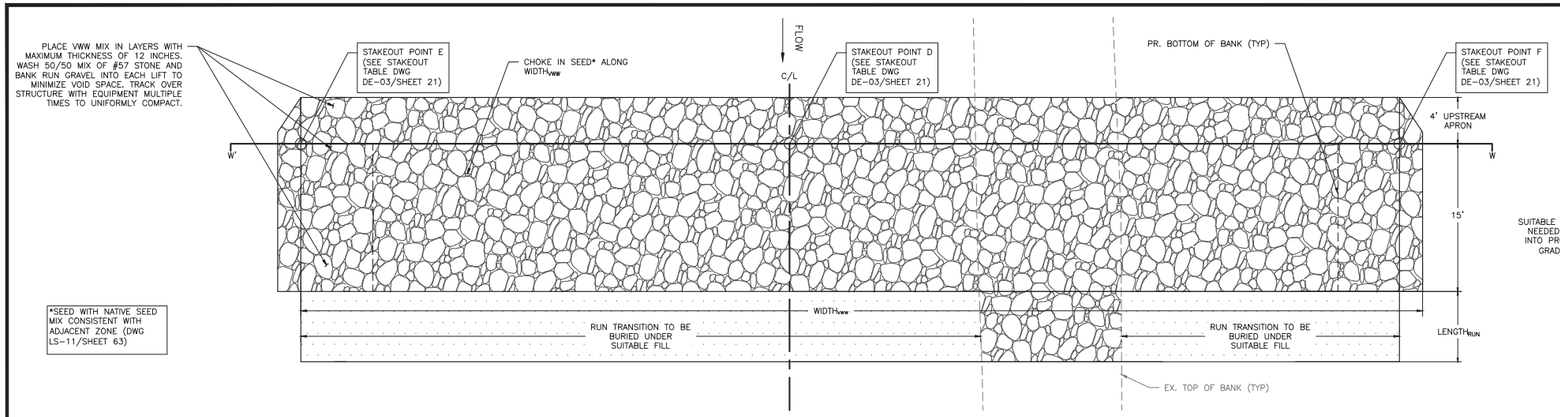
ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

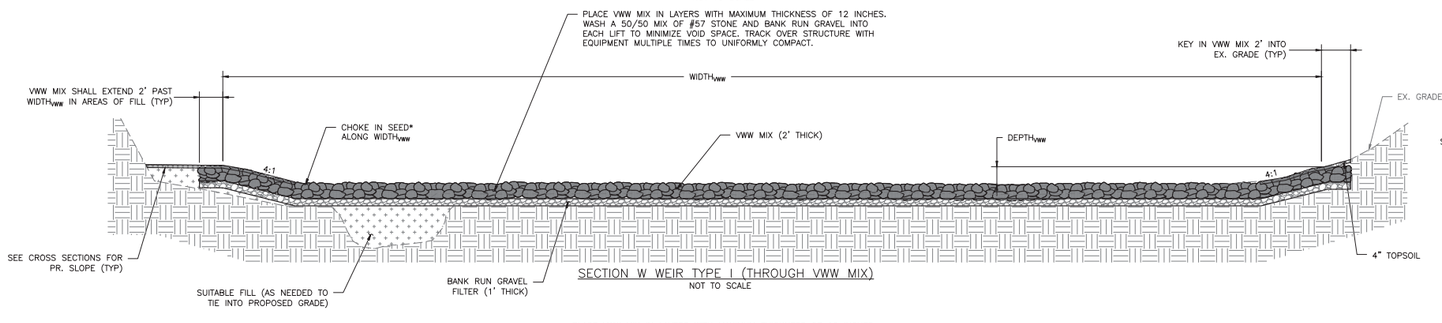
APPROVED DATE — CHIEF ENGINEER
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	19 OF 63
CONTRACT NO.	B553802

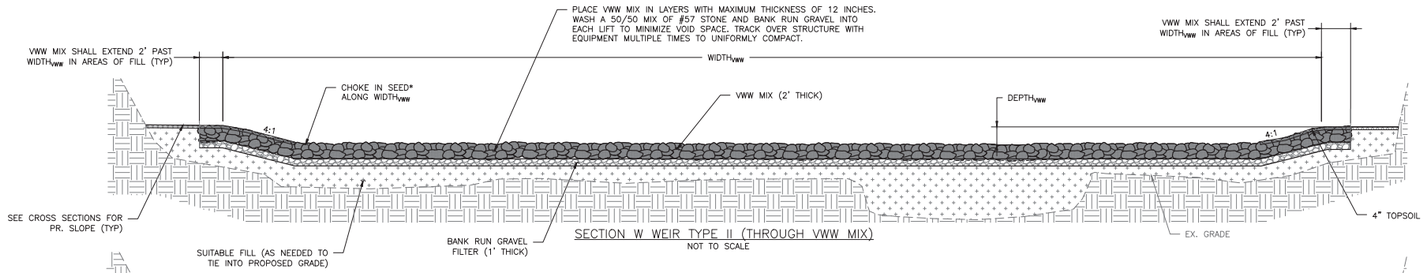
ROCK CREEK STREAM RESTORATION
STREAM RESTORATION DETAILS
COUNCIL DISTRICT 3



PLAN VIEW
NOT TO SCALE



SECTION W WEIR TYPE I (THROUGH VWW MIX)
NOT TO SCALE



SECTION W WEIR TYPE II (THROUGH VWW MIX)
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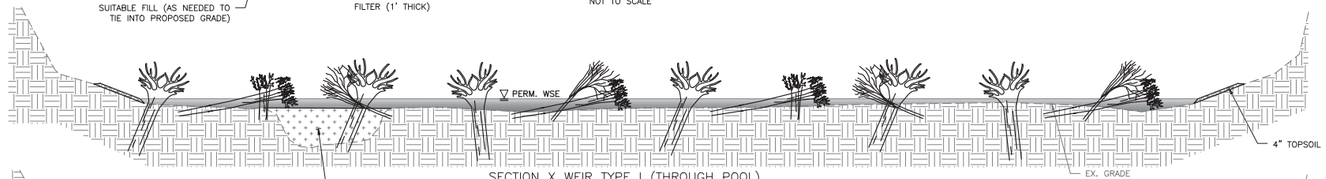
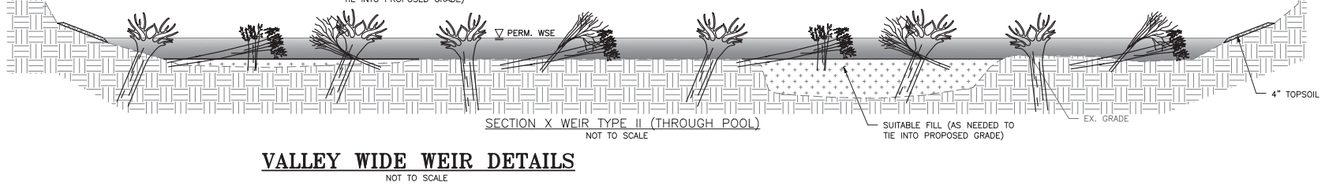


SECTION X WEIR TYPE I (THROUGH POOL)
NOT TO SCALE



SECTION X WEIR TYPE II (THROUGH POOL)
NOT TO SCALE

VALLEY WIDE WEIR DETAILS

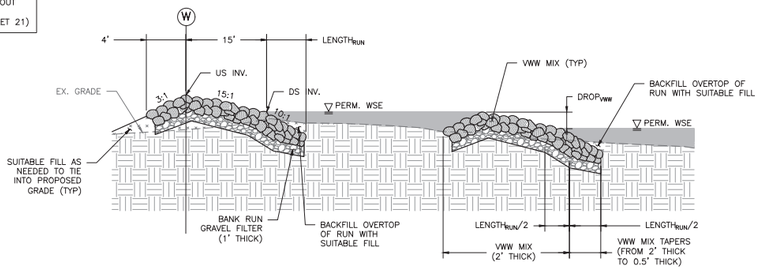
NOT TO SCALE

VALLEY WIDE WEIR NOTES:

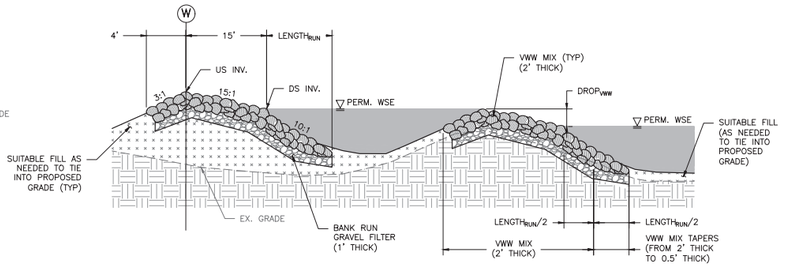
1. RIPRAP, BANK RUN GRAVEL FILTER AND SUITABLE FILL MATERIAL AND SUBMITTAL REQUIREMENTS SHALL BE AS INDICATED ON DWG DE-01/SHEET 19.
2. STONE MUST BE DARK GRAY IN COLOR. NO WHITE STONE SHALL BE ALLOWED.
3. PLACE VWW MIX IN VERTICAL LIFTS NO MORE THAN TWELVE INCHES DEEP. A 50/50 MIX OF #57 STONE AND BANK RUN GRAVEL SHALL BE WASHED INTO THE MIX AFTER EACH LAYER IS PLACED TO MINIMIZE VOID SPACE.
4. CHOKE SEED INTO THE TOP 4 INCHES OF THE STRUCTURE.
5. CONTRACTOR SHALL TRACK OVER THE THE STRUCTURE MULTIPLE TIMES TO UNIFORMLY COMPACT.
6. VOID SPACE MUST BE MINIMIZED TO THE SATISFACTION OF THE ENGINEER PRIOR TO ACCEPTANCE OF EACH STRUCTURE.
7. SAND MAY BE USED IN PLACE OF BANK RUN GRAVEL WITH COUNTY APPROVAL.
8. MORE THAN 1 FOOT OF SUBBASE MAY BE REQUIRED TO ACHIEVE A STABLE/COMPACTED SUBBASE.

D

PROPOSED STRUCTURE STAKEOUT LOCATION (TYP) SEE STAKEOUT TABLE ON DWG DE-03/SHEET 21



PROFILE VIEW TYPE I (SHOWN THROUGH FLOODPLAIN)
NOT TO SCALE



PROFILE VIEW TYPE II (SHOWN THROUGH FLOODPLAIN)
NOT TO SCALE

VALLEY WIDE WEIR ROCK SIZE TABLE

STRUCTURE ID	ROCK TYPE	ROCK SIZE	% BY WEIGHT
VWW-09, VWW-11, VWW-13, VWW-15, VWW-17, VWW-19, VWW-21, VWW-23, VWW-25, VWW-32, VWW-38	VALLEY WIDE WEIR MIX #1	CLASS 0 RIPRAP (D_{50}=5.5"; D_{100}=7.0")	10
		CLASS 1 RIPRAP (D_{50}=9.5"; D_{100}=15.0")	90
VWW-01, VWW-02, VWW-03, VWW-04, VWW-05, VWW-06, VWW-07, VWW-08, VWW-10, VWW-12, VWW-14, VWW-16, VWW-18, VWW-20, VWW-22, VWW-24, VWW-26, VWW-27, VWW-28, VWW-29, VWW-30, VWW-31, VWW-33, VWW-34, VWW-35, VWW-36, VWW-37	VALLEY WIDE WEIR MIX #2	CLASS 0 RIPRAP (D_{50}=5.5"; D_{100}=7.0")	65
		CLASS 1 RIPRAP (D_{50}=9.5"; D_{100}=15.0")	35

NOTES:
1. THE MINIMUM DRY UNIT WEIGHT FOR ALL STONE SHALL BE 160 LB/CF.
2. SILICA STONE CAN BE SUBSTITUTED FOR GRANITE. SILICA STONE MUST MEET THE SIZING REQUIREMENTS IN THE VALLEY WIDE WEIR ROCK SIZE TABLE AND MUST HAVE A MINIMUM DRY UNIT WEIGHT OF 145 LB/CF.

PERMANENT STABILIZATION FOR DISTURBED FLOODPLAIN/TERRACE ADJACENT TO THE RESTORED STREAM CHANNEL WILL CONSIST OF PLACING A MINIMUM OF 4 INCHES OF TOPSOIL IN ACCORDANCE WITH THESE DETAILS. BIODEGRADABLE SOIL STABILIZATION MATTING WITH 4 INCHES OF TOPSOIL SHALL BE USED WHERE SLOPES ARE GREATER THAN 3:1 AND/OR AT THE DIRECTION OF THE COUNTY AND/OR ENGINEER.

Bayland Consultants & Designers, Inc.
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www.baylandinc.com
BAYLAND JOB NO. 5_20201

DE-02

90% CONSTRUCTION DRAWINGS

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED	DATE	APPROVED	DATE
CHIEF, ENGINEERING		PROJECT MANAGER	
APPROVED	DATE	APPROVED	DATE
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY: CMS/SC	8/13/25
SHEET NO.	20 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
STREAM RESTORATION DETAILS
COUNCIL DISTRICT 3

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VALLEY WIDE WEIR DATA TABLE

	VWW-01	VWW-02	VWW-03	VWW-04	VWW-05	VWW-06	VWW-07	VWW-08	VWW-09	VWW-10	VWW-11	VWW-12	VWW-13	VWW-14	VWW-15	VWW-16	VWW-17	VWW-18	VWW-19	VWW-20	VWW-21	VWW-22	VWW-23	VWW-24	VWW-25	VWW-26	VWW-27	VWW-28	VWW-29	VWW-30	VWW-31	VWW-32	VWW-33	VWW-34	VWW-35	VWW-36	VWW-37	VWW-38
DROP ACROSS VALLEY WIDE WEIR ($DROP_{VWW}$, FEET)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	1.0
VALLEY WIDE WEIR WIDTH ($WIDTH_{VWW}$, FEET)	91.3	87.9	77.2	69.2	73.2	85.5	81.9	71.3	63.9	72.5	63.6	69.4	70.0	68.3	68.7	65.8	55.5	95.2	93.3	87.2	86.4	83.0	67.4	78.5	72.8	79.1	80.5	75.6	74.2	71.5	71.3	92.3	100.1	82.0	76.8	72.5	69.3	70.0
VALLEY WIDE WEIR DEPTH ($DEPTH_{VWW}$, FEET)	1.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.5	2.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	1.5	1.5	1.5	1.5	2.0	2.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5
RUN LENGTH ($LENGTH_{RUN}$, FEET)	10.0	10.0	10.0	7.1	6.7	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	5.0	7.2	5.0	5.0	10.0	10.0	10.0	10.0	5.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0

VALLEY WIDE WEIR STAKEOUT TABLE

STRUCTURE ID	STAKEOUT ID	ALIGNMENT	STA	OFFSET	NORTHING	EASTING	ELEV.	TYPE
VWW-01	D	BASELINE OF CONSTRUCTION	5+14.4	0.0	533,211.05	1,449,013.05	42.0	II
	E	BASELINE OF CONSTRUCTION	5+14.4	13.0	533,212.01	1,449,026.01	43.0	
	F	BASELINE OF CONSTRUCTION	5+14.4	−78.3	533,205.29	1,448,934.96	43.5	
VWW-02	D	BASELINE OF CONSTRUCTION	6+22.9	0.0	533,304.45	1,448,963.53	41.0	II
	E	BASELINE OF CONSTRUCTION	6+22.9	30.7	533,317.90	1,448,991.15	43.0	
	F	BASELINE OF CONSTRUCTION	6+22.9	−57.2	533,279.42	1,448,912.14	43.0	
VWW-03	D	BASELINE OF CONSTRUCTION	6+67.7	0.0	533,344.73	1,448,943.92	40.0	II
	E	BASELINE OF CONSTRUCTION	6+67.7	27.8	533,356.90	1,448,968.92	42.0	
	F	BASELINE OF CONSTRUCTION	6+67.7	−49.4	533,323.10	1,448,899.51	42.0	
VWW-04	D	BASELINE OF CONSTRUCTION	7+15.1	0.0	533,383.70	1,448,917.91	39.0	II
	E	BASELINE OF CONSTRUCTION	7+15.1	31.1	533,399.99	1,448,944.37	41.0	
	F	BASELINE OF CONSTRUCTION	7+15.1	−38.1	533,363.73	1,448,885.48	41.0	
VWW-05	D	BASELINE OF CONSTRUCTION	7+77.6	0.0	533,432.61	1,448,879.40	38.0	I
	E	BASELINE OF CONSTRUCTION	7+77.6	40.5	533,455.58	1,448,912.72	40.0	
	F	BASELINE OF CONSTRUCTION	7+77.6	−32.7	533,414.08	1,448,852.52	40.0	
VWW-06	D	BASELINE OF CONSTRUCTION	8+72.2	0.0	533,510.92	1,448,827.37	37.0	II
	E	BASELINE OF CONSTRUCTION	8+72.2	43.0	533,514.56	1,448,870.21	39.0	
	F	BASELINE OF CONSTRUCTION	8+72.2	−42.5	533,507.31	1,448,785.00	39.0	
VWW-07	D	BASELINE OF CONSTRUCTION	10+07.5	0.0	533,646.04	1,448,831.10	36.0	II
	E	BASELINE OF CONSTRUCTION	10+07.5	25.4	533,644.56	1,448,856.44	38.0	
	F	BASELINE OF CONSTRUCTION	10+07.5	−56.5	533,649.33	1,448,774.69	38.0	
VWW-08	D	BASELINE OF CONSTRUCTION	10+66.8	0.0	533,705.03	1,448,836.21	35.0	II
	E	BASELINE OF CONSTRUCTION	10+66.8	22.3	533,706.03	1,448,858.47	37.0	
	F	BASELINE OF CONSTRUCTION	10+66.8	−49.0	533,702.84	1,448,787.25	37.0	
VWW-09	D	BASELINE OF CONSTRUCTION	11+47.7	0.0	533,778.07	1,448,809.32	34.0	II
	E	BASELINE OF CONSTRUCTION	11+47.7	19.3	533,788.97	1,448,825.22	35.5	
	F	BASELINE OF CONSTRUCTION	11+47.7	−44.6	533,752.84	1,448,772.53	35.5	
VWW-10	D	BASELINE OF CONSTRUCTION	12+00.7	0.0	533,821.99	1,448,779.77	33.0	II
	E	BASELINE OF CONSTRUCTION	12+00.7	36.3	533,844.29	1,448,808.38	35.0	
	F	BASELINE OF CONSTRUCTION	12+00.7	−36.3	533,799.68	1,448,751.17	35.0	
VWW-11	D	BASELINE OF CONSTRUCTION	12+84.7	0.0	533,877.64	1,448,717.78	32.0	II
	E	BASELINE OF CONSTRUCTION	12+84.7	34.5	533,905.36	1,448,738.39	33.5	
	F	BASELINE OF CONSTRUCTION	12+84.7	−26.5	533,856.37	1,448,701.96	33.5	
VWW-12	D	BASELINE OF CONSTRUCTION	13+26.2	0.0	533,902.45	1,448,684.43	31.0	II
	E	BASELINE OF CONSTRUCTION	13+26.2	31.0	533,927.32	1,448,702.93	32.5	
	F	BASELINE OF CONSTRUCTION	13+26.2	−38.4	533,871.66	1,448,661.54	32.5	
VWW-13	D	BASELINE OF CONSTRUCTION	13+67.8	0.0	533,927.56	1,448,651.33	30.0	II
	E	BASELINE OF CONSTRUCTION	13+67.8	25.0	533,946.95	1,448,667.11	31.5	
	F	BASELINE OF CONSTRUCTION	13+67.8	−45.0	533,892.68	1,448,622.95	31.5	
VWW-14	D	BASELINE OF CONSTRUCTION	14+09.4	0.0	533,953.81	1,448,619.08	29.0	I
	E	BASELINE OF CONSTRUCTION	14+09.4	26.2	533,974.13	1,448,635.61	31.0	
	F	BASELINE OF CONSTRUCTION	14+09.4	−42.1	533,921.16	1,448,592.51	31.0	
VWW-15	D	BASELINE OF CONSTRUCTION	15+10.8	0.0	534,017.82	1,448,540.39	28.0	I
	E	BASELINE OF CONSTRUCTION	15+10.8	31.6	534,042.31	1,448,560.32	30.0	
	F	BASELINE OF CONSTRUCTION	15+10.8	−37.1	533,989.02	1,448,516.96	30.0	
VWW-16	D	BASELINE OF CONSTRUCTION	15+51.1	0.0	534,043.27	1,448,509.11	27.0	I
	E	BASELINE OF CONSTRUCTION	15+51.1	27.8	534,064.85	1,448,526.67	29.0	
	F	BASELINE OF CONSTRUCTION	15+51.1	−38.0	534,013.79	1,448,485.13	29.0	
VWW-17	D	BASELINE OF CONSTRUCTION	16+00.6	0.0	534,074.47	1,448,470.76	26.0	I
	E	BASELINE OF CONSTRUCTION	16+00.6	25.7	534,094.40	1,448,486.97	28.0	
	F	BASELINE OF CONSTRUCTION	16+00.6	−29.8	534,051.32	1,448,451.93	28.0	
VWW-18	D	BASELINE OF CONSTRUCTION	17+10.2	0.0	534,128.55	1,448,380.47	25.0	II
	E	BASELINE OF CONSTRUCTION	17+10.2	35.6	534,164.13	1,448,380.06	26.5	
	F	BASELINE OF CONSTRUCTION	17+10.2	−59.6	534,068.93	1,448,381.17	26.5	
VWW-19	D	BASELINE OF CONSTRUCTION	17+79.1	0.0	534,133.82	1,448,312.34	24.0	II
	E	BASELINE OF CONSTRUCTION	17+79.1	23.6	534,156.52	1,448,318.65	25.5	
	F	BASELINE OF CONSTRUCTION	17+79.1	−69.8	534,066.60	1,448,293.65	25.5	

STRUCTURE ID	STAKEOUT ID	ALIGNMENT	STA	OFFSET	NORTHING	EASTING	ELEV.	TYPE
VWW-20	D	BASELINE OF CONSTRUCTION	18+21.4	0.0	534,145.48	1,448,271.70	23.0	II
	E	BASELINE OF CONSTRUCTION	18+21.4	27.8	534,171.78	1,448,280.73	24.5	
	F	BASELINE OF CONSTRUCTION	18+21.4	−59.3	534,089.35	1,448,252.44	24.5	
VWW-21	D	BASELINE OF CONSTRUCTION	18+71.7	0.0	534,163.65	1,448,224.99	22.0	I
	E	BASELINE OF CONSTRUCTION	18+71.7	31.9	534,190.26	1,448,242.53	23.5	
	F	BASELINE OF CONSTRUCTION	18+71.7	−54.5	534,118.13	1,448,194.98	23.5	
VWW-22	D	BASELINE OF CONSTRUCTION	19+14.7	0.0	534,188.92	1,448,190.36	21.0	I
	E	BASELINE OF CONSTRUCTION	19+14.7	36.8	534,215.73	1,448,215.50	23.0	
	F	BASELINE OF CONSTRUCTION	19+14.7	−46.2	534,155.21	1,448,158.75	23.0	
VWW-23	D	BASELINE OF CONSTRUCTION	19+90.3	0.0	534,237.15	1,448,132.70	20.0	II
	E	BASELINE OF CONSTRUCTION	19+90.3	32.0	534,254.91	1,448,159.37	22.0	
	F	BASELINE OF CONSTRUCTION	19+90.3	−35.3	534,217.57	1,448,103.28	22.0	
VWW-24	D	BASELINE OF CONSTRUCTION	20+41.4	0.0	534,281.27	1,448,107.34	19.0	I
	E	BASELINE OF CONSTRUCTION	20+41.4	34.1	534,295.28	1,448,138.46	20.5	
	F	BASELINE OF CONSTRUCTION	20+41.4	−44.4	534,263.05	1,448,066.85	20.5	
VWW-25	D	BASELINE OF CONSTRUCTION	20+95.3	0.0	534,328.04	1,448,080.78	18.0	I
	E	BASELINE OF CONSTRUCTION	20+95.3	38.8	534,349.81	1,448,112.91	19.5	
	F	BASELINE OF CONSTRUCTION	20+95.3	−34.0	534,309.00	1,448,052.67	19.5	
VWW-26	D	BASELINE OF CONSTRUCTION	21+42.3	0.0	534,364.39	1,448,051.25	17.0	I
	E	BASELINE OF CONSTRUCTION	21+42.3	44.5	534,394.87	1,448,083.62	18.5	
	F	BASELINE OF CONSTRUCTION	21+42.3	−34.7	534,340.64	1,448,026.02	18.5	
VWW-27	D	BASELINE OF CONSTRUCTION	22+41.0	0.0	534,428.54	1,447,976.90	16.0	I
	E	BASELINE OF CONSTRUCTION	22+41.0	51.3	534,470.62	1,448,006.20	18.0	
	F	BASELINE OF CONSTRUCTION	22+41.0	−29.2	534,404.59	1,447,960.22	18.0	
VWW-28	D	BASELINE OF CONSTRUCTION	23+25.0	0.0	534,476.53	1,447,907.99	15.0	I
	E	BASELINE OF CONSTRUCTION	23+25.0	53.1	534,520.12	1,447,938.34	17.0	
	F	BASELINE OF CONSTRUCTION	23+25.0	−22.5	534,458.06	1,447,895.12	17.0	
VWW-29	D	BASELINE OF CONSTRUCTION	24+25.0	0.0	534,531.38	1,447,825.20	14.0	I
	E	BASELINE OF CONSTRUCTION	24+25.0	45.9	534,577.29	1,447,824.23	16.0	
	F	BASELINE OF CONSTRUCTION	24+25.0	−28.3	534,503.09	1,447,825.81	16.0	
VWW-30	D	BASELINE OF CONSTRUCTION	24+96.9	0.0	534,529.86	1,447,753.35	13.0	I
	E	BASELINE OF CONSTRUCTION	24+96.9	34.2	534,564.08	1,447,752.62	15.0	
	F	BASELINE OF CONSTRUCTION	24+96.9	−37.3	534,492.61	1,447,754.14	15.0	
VWW-31	D	BASELINE OF CONSTRUCTION	25+74.8	0.0	534,537.86	1,447,679.02	12.0	II
	E	BASELINE OF CONSTRUCTION	25+74.8	37.3	534,565.42	1,447,704.15	14.0	
	F	BASELINE OF CONSTRUCTION	25+74.8	−34.0	534,512.77	1,447,656.15	14.0	
VWW-32	D	BASELINE OF CONSTRUCTION	26+53.5	0.0	534,599.36	1,447,635.63	11.0	I
	E	BASELINE OF CONSTRUCTION	26+53.5	43.5	534,608.85	1,447,678.10	12.5	
	F	BASELINE OF CONSTRUCTION	26+53.5	−48.8	534,588.71	1,447,588.01	12.5	
VWW-33	D	BASELINE OF CONSTRUCTION	27+03.2	0.0	534,647.86	1,447,624.79	10.0	I
	E	BASELINE OF CONSTRUCTION	27+03.2	57.8	534,660.46	1,447,681.19	11.5	
	F	BASELINE OF CONSTRUCTION	27+03.2	−42.3	534,638.64	1,447,583.55	11.5	
VWW-34	D	BASELINE OF CONSTRUCTION	28+21.1	0.0	534,758.17	1,447,589.93	9.0	I
	E	BASELINE OF CONSTRUCTION	28+21.1	46.0	534,789.31	1,447,623.65	10.5	
	F	BASELINE OF CONSTRUCTION	28+21.1	−36.0	534,733.80	1,447,563.44	10.5	
VWW-35	D	BASELINE OF CONSTRUCTION	29+39.5	0.0	534,818.02	1,447,491.05	8.0	I
	E	BASELINE OF CONSTRUCTION	29+39.5	52.3	534,869.58	1,447,499.83	9.5	
	F	BASELINE OF CONSTRUCTION	29+39.5	−24.5	534,793.86	1,447,486.94	9.5	
VWW-36	D	BASELINE OF CONSTRUCTION	30+48.4	0.0	534,866.46	1,447,395.96	7.0	I
	E	BASELINE OF CONSTRUCTION	30+48.4	42.6	534,901.40	1,447,420.34	8.5	
	F	BASELINE OF CONSTRUCTION	30+48.4	−29.9	534,841.94	1,447,378.85	8.5	
VWW-37	D	BASELINE OF CONSTRUCTION	31+31.5	0.0	534,924.71	1,447,337.32	6.0	I
	E	BASELINE OF CONSTRUCTION	31+31.5	37.0	534,952.71	1,447,361.49	7.5	
	F	BASELINE OF CONSTRUCTION	31+31.5	−32.3	534,900.26	1,447,316.21	7.5	
VWW-38	D	BASELINE OF CONSTRUCTION	32+50.4	0.0	535,023.91	1,447,274.35	5.5	II
	E	BASELINE OF CONSTRUCTION	32+50.4	19.0	535,036.89	1,447,288.22	7.0	
	F	BASELINE OF CONSTRUCTION	32+50.4	−51.0	534,989.06	1,447,237.11	7.0	

DE-03 90% CONSTRUCTION DRAWINGS

Bay Land Consultants & Designers, Inc.
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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	21 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
STREAM RESTORATION DETAILS
COUNCIL DISTRICT 3

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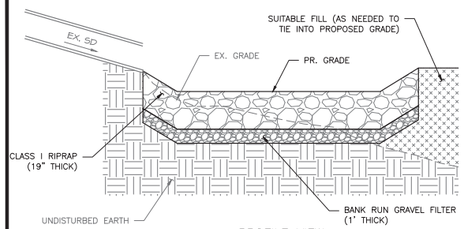
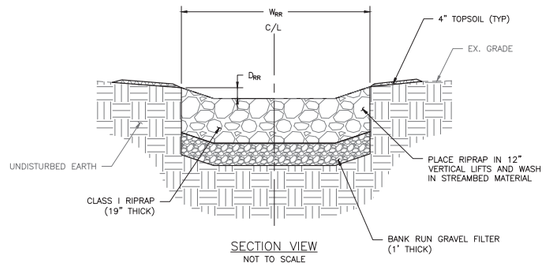


PROFILE VIEW
NOT TO SCALE



SECTION VIEW
NOT TO SCALE

RIPRAP PROTECTION DETAILS

NOT TO SCALE

RIPRAP PROTECTION NOTES:
1. RIPRAP, STREAMBED MATERIAL AND BANK RUN GRAVEL FILTER MATERIAL AND SUBMITTAL REQUIREMENTS SHALL BE AS INDICATED ON DWG DE-01/SHEET 19.
2. STONE MUST BE DARK GRAY IN COLOR. NO WHITE STONE SHALL BE ALLOWED.
3. SMALL AND LARGE STONES SHALL BE MIXED TO MINIMIZE VOID SPACES. STONE MUST BE PLACED IN A MANNER TO PROMOTE INTERLOCKING. DUMPING OF STONE WILL NOT BE PERMITTED.
4. PLACE RIPRAP IN VERTICAL LIFTS NO MORE THAN TWELVE INCHES THICK. STREAMBED MATERIAL SHALL BE WASHED INTO THE MIX AFTER EACH LAYER IS PLACED TO MINIMIZE VOID SPACE.

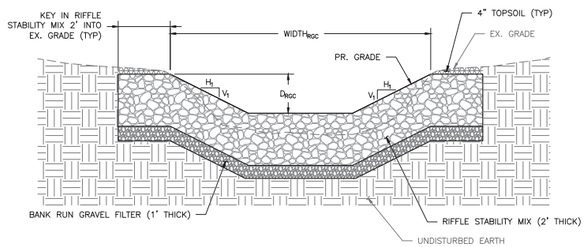
RIPRAP PROTECTION DATA TABLE

	RR-01	RR-02
RIPRAP START STATION	100+91.6	50+09.3
RIPRAP END STATION	101+24.4	50+45.6
RIPRAP WIDTH (W_{RR}, FEET)	11.1 TO 23.0	4.6 TO 17.9
RIPRAP DEPTH (D_{RR}, FEET)	0.5	VARIES, SEE DWG C-03/SHEET 14

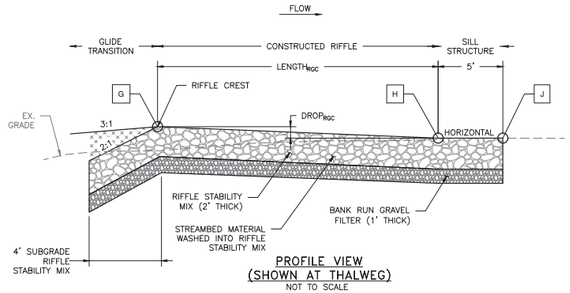
RIFFLE STABILITY MIX ROCK SIZE TABLE

STRUCTURE ID	ROCK SIZE	% BY WEIGHT
RGC-01; RGC-02	CLASS 0 RIPRAP (D_{50}=5.5"; D_{100}=7.0")	65
	CLASS I RIPRAP (D_{50}=9.5"; D_{100}=15.0")	35

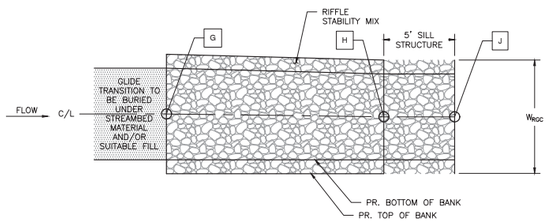
NOTES:
1. THE MINIMUM DRY UNIT WEIGHT FOR ALL STONE SHALL BE 160 LB/CF.
2. SILICA STONE CAN BE SUBSTITUTED FOR GRANITE IF APPROVED BY THE COUNTY AND ENGINEER IN WRITING. SILICA STONE MUST MEET THE SIZING REQUIREMENTS IN THE RIFFLE STABILITY MIX ROCK SIZE TABLE AND MUST HAVE A MINIMUM DRY UNIT WEIGHT OF 145 LB/CF.



SECTION VIEW THROUGH RIFFLE STABILITY MIX
NOT TO SCALE



PROFILE VIEW (SHOWN AT THALWEG)
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

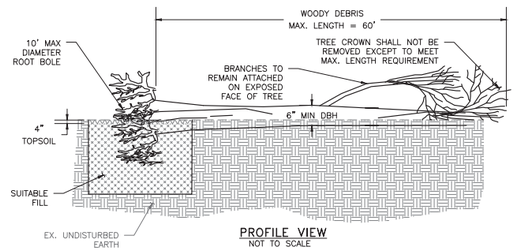
RIFFLE GRADE CONTROL DATA TABLE

	RCG-01	RGC-02
WIDTH (W_{RGC}, FEET)	8.6 TO 7.1	10.6 TO 6.9
SIDE SLOPE (H1:V1)	2:1	HORIZONTAL TO 2:1
DEPTH ($DEPTH_{RGC}$, FEET)	0.4 TO 1.0	0 TO 1.0
LENGTH ($LENGTH_{RGC}$, FEET)	20.4	15.0
DROP ($DROP_{RGC}$, FEET)	1.4	1.0

RIFFLE GRADE CONTROL DETAILS

NOT TO SCALE

RIFFLE GRADE CONTROL NOTES:
1. RIPRAP, BANK RUN GRAVEL FILTER, STREAMBED MATERIAL AND SUITABLE FILL MATERIAL AND SUBMITTAL REQUIREMENTS SHALL BE AS INDICATED ON DWG DE-01/SHEET 19.
2. STONE MUST BE DARK GRAY IN COLOR. NO WHITE STONE SHALL BE ALLOWED.
3. REFER TO THE SITE PLANS, PROFILES, AND CROSS SECTIONS FOR PROPOSED GRADES.
4. SMALL AND LARGE STONES SHALL BE MIXED TO MINIMIZE VOID SPACES. STONE MUST BE PLACED IN A MANNER TO PROMOTE INTERLOCKING. DUMPING OF STONE WILL NOT BE PERMITTED.
5. PLACE RIFFLE STABILITY MIX IN VERTICAL LIFTS NO MORE THAN TWELVE INCHES THICK. STREAMBED MATERIAL SHALL BE WASHED INTO THE MIX AFTER EACH LAYER IS PLACED TO MINIMIZE VOID SPACE.

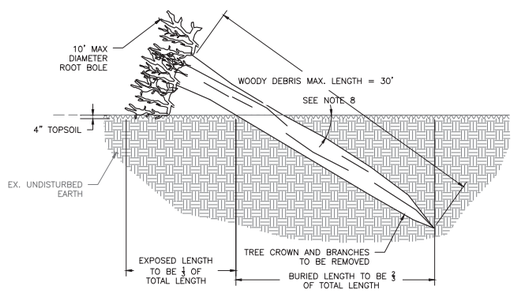


PROFILE VIEW
NOT TO SCALE

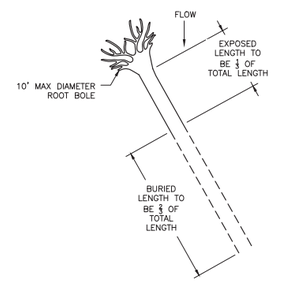
WOODY DEBRIS INSTALLATION OPTION 1

NOT TO SCALE

WOODY DEBRIS NOTES:
1. EXISTING TREES TO BE REMOVED WITHIN THE LIMIT OF DISTURBANCE SHALL NOT BE DISPOSED OF OFFSITE WITHOUT PERMISSION FROM THE COUNTY.
2. ALL REMOVED TREES THAT ARE NOT USED IN OTHER PROPOSED STRUCTURES SHALL BE PLACED WITHIN THE FLOODPLAIN FOLLOWING THE SPECIFICATIONS WITHIN THE WOODY DEBRIS DETAIL OR AT THE DIRECTION OF THE COUNTY.
3. WOODY DEBRIS SHALL BE PLACED AT THE DIRECTION OF THE COUNTY IN THE FIELD.
4. WOODY DEBRIS SHALL BE PLACED WITHIN THE FLOODPLAIN A MINIMUM OF 5 FEET FROM THE PROPOSED CHANNEL TOP OF BANK AND VALLEY WALL TOE OF SLOPE AND A MINIMUM OF 10 FEET LATERAL AND VERTICAL CLEARANCE FROM ALL UTILITIES.
5. IF REQUIRED BY THE ENGINEER/COUNTY, BRANCHES SHALL BE PRUNED FROM PORTION OF TREE TO BE BURIED BELOW GRADE.
6. TIMBER FOR USE IN PROPOSED WOODY DEBRIS STRUCTURE SHALL BE HARVESTED ON SITE. NO INVASIVE SPECIES SHALL BE UTILIZED.
7. WOODY DEBRIS SHALL ALWAYS BE ORIENTED WITH THE ROOT BOLE UPSTREAM.
8. ANGLE OF INSTALLATION MAY RANGE FROM 30 DEGREES TO VERTICAL (90 DEGREES) AS DIRECTED BY THE COUNTY.
9. WOODY DEBRIS INSTALLATION OPTION 1 IS PREFERRED. WOODY DEBRIS INSTALLATION OPTION 2 MAY BE USED IN WET AREAS.



PROFILE VIEW
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

WOODY DEBRIS INSTALLATION OPTION 2

WOODY DEBRIS INSTALLATION OPTION 1 IS PREFERRED. WOODY DEBRIS INSTALLATION OPTION 2 MAY BE USED IN WET AREAS.

WOODY DEBRIS DETAILS

NOT TO SCALE

FLOODPLAIN MICROTOPOGRAPHY NOTES

1. FLOODPLAIN MICROTOPOGRAPHY SHALL BE INCORPORATED INTO THE FLOODPLAIN WITHIN THE LIMIT OF DISTURBANCE AS DIRECTED BY THE COUNTY/ENGINEER. MICROTOPOGRAPHY SHALL NOT BE INCORPORATED INTO PROPOSED BERMS.
2. FLOODPLAIN MICROTOPOGRAPHY SHALL CONSIST OF SCARIFYING THE PROPOSED SURFACE AND INSTALLING HUMMOCKS ORIENTED PARALLEL TO THE DIRECTION OF FLOW AND INSTALLED IN A RANDOM PATTERN.
3. HUMMOCKS SHALL FEATURE A MAXIMUM ELEVATION DIFFERENCE OF 0.5 FEET ABOVE PROPOSED GRADE.
4. NO SEPARATE PAYMENT WILL BE MADE FOR THE CREATION OF FLOODPLAIN MICROTOPOGRAPHY.

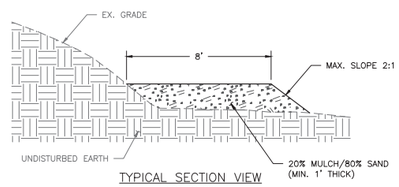
G

PROPOSED STRUCTURE STAKEOUT LOCATION (TYP) SEE STAKEOUT TABLE THIS SHEET

PERMANENT STABILIZATION FOR DISTURBED FLOODPLAIN/TERRACE ADJACENT TO THE RESTORED STREAM CHANNEL WILL CONSIST OF PLACING A MINIMUM OF 4 INCHES OF TOPSOIL IN ACCORDANCE WITH THESE DETAILS. BIODEGRADABLE SOIL STABILIZATION MATTING WITH 4 INCHES OF TOPSOIL SHALL BE USED WHERE SLOPES ARE GREATER THAN 3:1 AND/OR AT THE DIRECTION OF THE COUNTY AND/OR ENGINEER.

RIFFLE GRADE CONTROL STAKEOUT TABLE

	STAKEOUT ID	ALIGNMENT	STA	OFFSET	NORTHING	EASTING	ELEV.
RGC-01	G	BASELINE OF CONSTRUCTION	32+84.8	1.1	535,048.88	1,447,250.67	4.5
	H	BASELINE OF CONSTRUCTION	32+99.8	0.9	353,058.92	1,447,239.53	3.5
	J	BASELINE OF CONSTRUCTION	33+04.8	0.9	535,062.33	1,447,235.87	3.5
RGC-02	G	BASELINE OF CONSTRUCTION	32+84.8	−40.6	535,018.38	1,447,222.24	4.0
	H	BASELINE OF CONSTRUCTION	32+99.8	−41.8	535,027.70	1,447,210.42	3.0
	J	BASELINE OF CONSTRUCTION	33+04.8	−41.8	535,031.10	1,447,206.76	3.0



TYPICAL SECTION VIEW
NOT TO SCALE

ADAPTIVE MANAGEMENT PATH DETAIL

NOT TO SCALE

NOTE: SAND AND MULCH FROM THE CONSTRUCTION ACCESS ROAD AND STOCKPILE/STAGING AREAS MAY BE REUSED FOR THE ADAPTIVE MANAGEMENT PATH

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE ____ CHIEF ENGINEER
APPROVED DATE ____ PROJECT MANAGER
APPROVED DATE ____ DEPUTY DIRECTOR
APPROVED DATE ____ CHIEF, RIGHT OF WAY

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	22 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
STREAM RESTORATION DETAILS
COUNCIL DISTRICT 3

DE-04
90% CONSTRUCTION DRAWINGS

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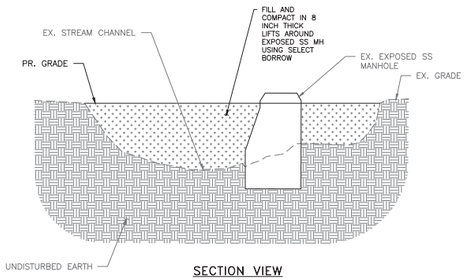
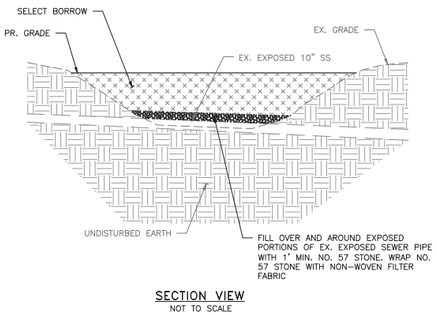


SECTION VIEW
NOT TO SCALE

EXPOSED SEWER MANHOLE BACKFILL DETAIL

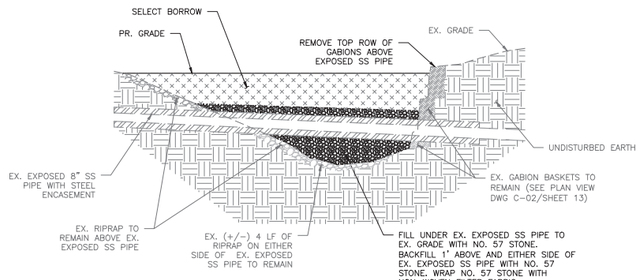
NOT TO SCALE



SECTION VIEW
NOT TO SCALE

TRIBUTARY EXPOSED SEWER PIPE PROTECTION DETAIL

NOT TO SCALE



SECTION VIEW
NOT TO SCALE

MAIN STEM EXPOSED SEWER PIPE PROTECTION DETAIL

NOT TO SCALE

SEWER PIPE PROTECTION NOTES:

1. REMOVE ANY LOOSE OR UNSTABLE BED MATERIAL FROM AROUND THE EXPOSED SEWER PIPE. DO NOT DISTURB ANY COMPACTED BED MATERIAL THAT IS SUPPORTING THE SANITARY SEWER LINE. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO THE PIPE DURING REMOVAL OF MATERIAL. THE SIZE OF THE EXPOSED AREA WILL VARY. THE EXPOSED PIPE MUST BE SUPPORTED AT ALL TIMES BY THE CONTRACTOR.
2. NO STONE SHALL BE REMOVED FROM UNDER THE MAIN STEM EXPOSED SEWER PIPE. ALL OTHER STONE OUTSIDE THESE LIMITS MAY BE REMOVED AS NEEDED AND REUSED ON SITE.
3. ANY PART OF THE PIPE THAT IS EXPOSED WILL BE ENCASED WITH A SEWER PROTECTION ENVELOPE. THE SEWER PROTECTION ENVELOPE SHALL CONSIST OF NO. 57 STONE FILLED TO A MINIMUM ELEVATION OF 1 FOOT ABOVE THE CROWN OF THE PIPE. THE NO. 57 STONE SHALL FILL ALL VOIDS AND SUPPORT THE PIPE (IF NECESSARY).
4. COMPACT SELECT BORROW TO MATCH PROPOSED GRADE UNLESS OTHERWISE SPECIFIED.
5. SELECT BORROW SHALL BE USED FROM APPROX. STA 9+00 TO 9+50 AND 12+00 TO 12+85.

PERMANENT STABILIZATION FOR DISTURBED FLOODPLAIN/TERRACE ADJACENT TO THE RESTORED STREAM CHANNEL WILL CONSIST OF PLACING A MINIMUM OF 4 INCHES OF TOPSOIL IN ACCORDANCE WITH THESE DETAILS. BIODEGRADABLE SOIL STABILIZATION MATTING WITH 4 INCHES OF TOPSOIL SHALL BE USED WHERE SLOPES ARE GREATER THAN 3:1 AND/OR AT THE DIRECTION OF THE COUNTY AND/OR ENGINEER.

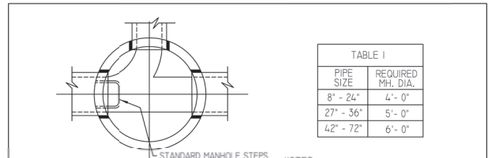
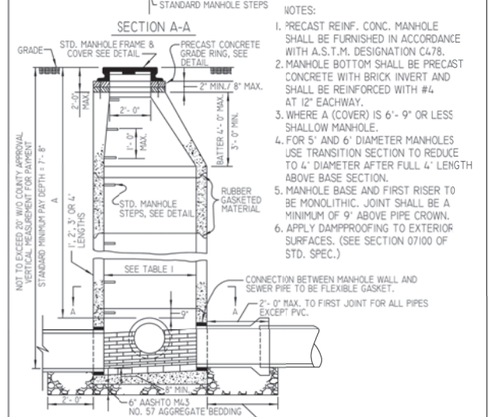


TABLE I	
PIPE SIZE	REQUIRED MH. DIA.
8" - 24"	4'- 0"
27" - 36"	5'- 0"
42" - 72"	6'- 0"

NOTES:

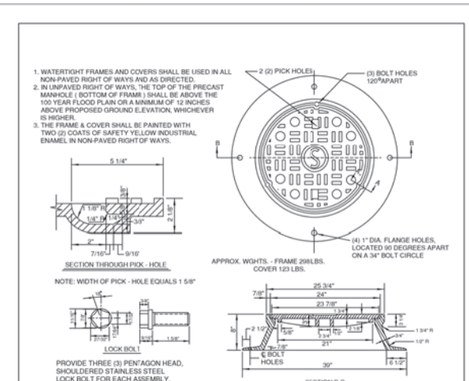
1. PRECAST REINF. CONC. MANHOLE SHALL BE FURNISHED IN ACCORDANCE WITH A.S.T.M. DESIGNATION C478.
2. MANHOLE BOTTOM SHALL BE PRECAST CONCRETE WITH BRICK INVERT AND SHALL BE REINFORCED WITH #4 AT 12" EACHWAY.
3. WHERE A (COVER) IS 6'- 9" OR LESS SHALLOW MANHOLE.
4. FOR 5' AND 6' DIAMETER MANHOLES USE TRANSITION SECTION TO REDUCE TO 4' DIAMETER AFTER FULL 4' LENGTH ABOVE BASE SECTION.
5. MANHOLE BASE AND FIRST RISER TO BE MONOLITHIC. JOINT SHALL BE A MINIMUM OF 9" ABOVE PIPE CROWN.
6. APPLY DAMPPROOFING TO EXTERIOR SURFACES. (SEE SECTION 07100 OF STD. SPEC.)



SECTIONAL ELEVATION
STANDARD PRECAST MANHOLE

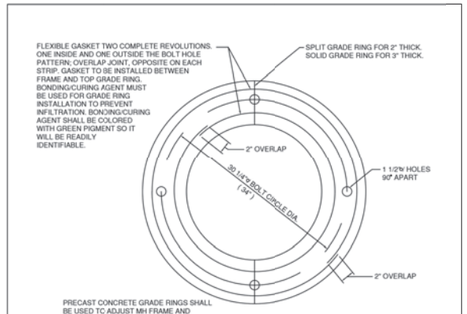
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED: CHIEF ENGINEER; DESIGN ENGINEER; DATE:	STANDARD SANITARY SEWER DETAILS — STANDARD PRECAST MANHOLE	REVISED	S 11

Published: 01/01; Revised: 5/16/2022



ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED: CHIEF ENGINEER; DESIGN ENGINEER; DATE:	STANDARD SANITARY SEWER DETAILS — STANDARD WATERTIGHT FRAME & COVER	REVISED	S 18

6/2018

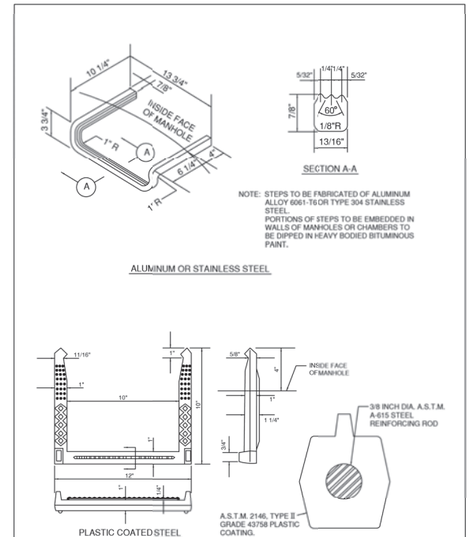


NOTES:

1. PRECAST CONC. F'C=5000 PS AT 28 DAYS.
2. REINFORCEMENT SHALL CONFORM TO A.S.T.M. C-478.
3. EACH GRADE RING SHALL BE FLAT AND TRUE WITHIN 1/4".
4. GASKET SHALL BE EXTRUDED ROPE, TYPE B, 3/4 INCH MINIMUM DIAMETER, BUTYL BASE CONFORMING TO AASHTO M-198.
5. DIMENSIONS IN PARENTHESIS FOR USE WITH WATERTIGHT FRAME & COVERS.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED: CHIEF ENGINEER; DESIGN ENGINEER; DATE:	STANDARD SANITARY SEWER DETAILS — ADJUSTMENT GRADE RING	REVISED	S 20

6/2018



ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED: CHIEF ENGINEER; DESIGN ENGINEER; DATE:	STANDARD SANITARY SEWER DETAILS — STANDARD MANHOLE STEPS	REVISED	S 21

6/2018

DE-05 90% CONSTRUCTION DRAWINGS

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

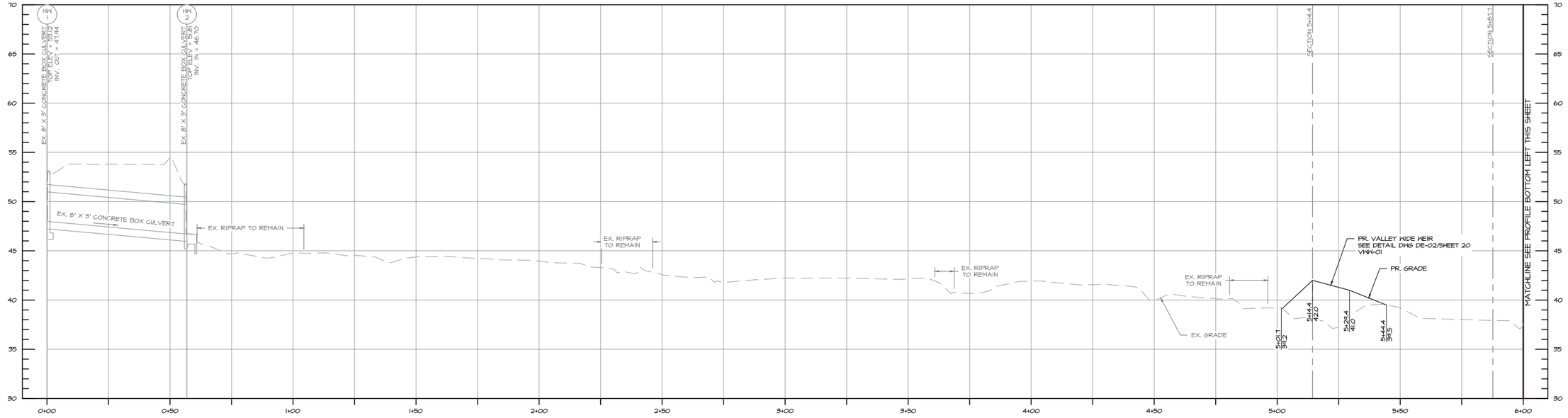
REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	23 OF 63
CONTRACT NO.	B553802

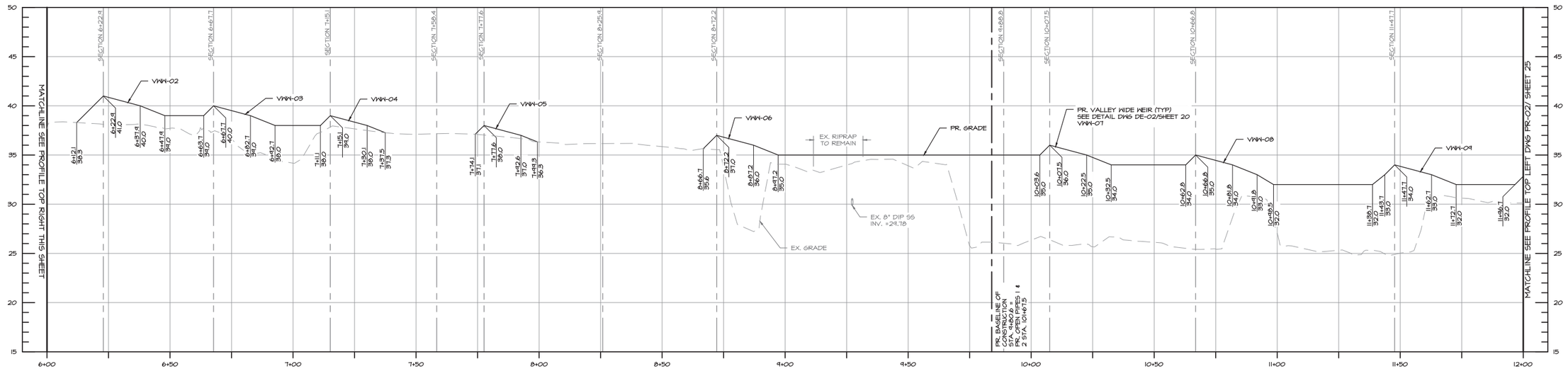
ROCK CREEK STREAM RESTORATION
STREAM RESTORATION DETAILS
COUNCIL DISTRICT 3

21\5_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\5_20201_DT108



PROFILE BASELINE OF CONSTRUCTION STA: 0+00 TO STA: 6+00

SCALE: HORZ. 1" = 20'
VERT. 1" = 5'



PROFILE BASELINE OF CONSTRUCTION STA: 6+00 TO STA: 12+00

SCALE: HORZ. 1" = 20'
VERT. 1" = 5'

0 10 20 40
1 INCH = 20 FEET

0 2.5 5 10
1 INCH = 5 FEET

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PR-01 90% CONSTRUCTION DRAWINGS

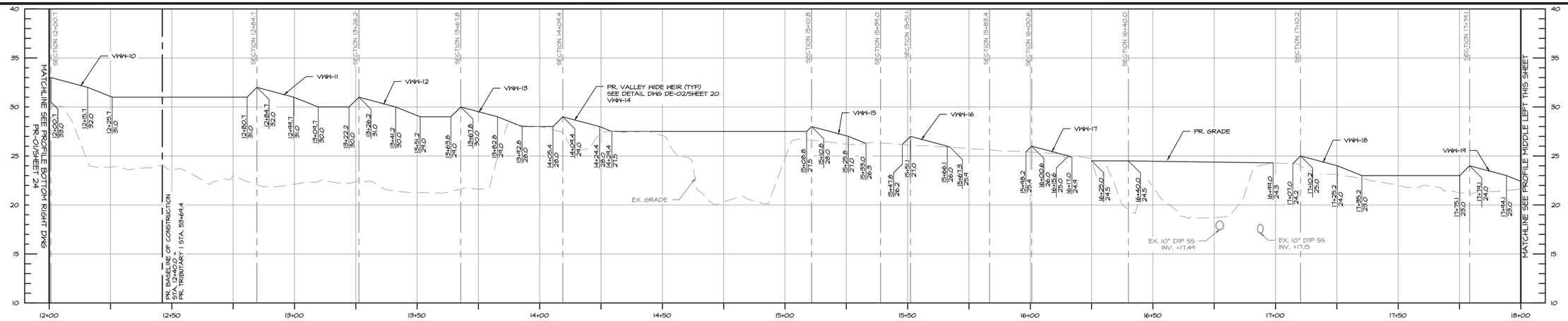
ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE	APPROVED DATE	SCALE: AS SHOWN	
CHIEF ENGINEER	PROJECT MANAGER	DESIGNED BY: MKS	8/13/25
APPROVED DATE	APPROVED DATE	DRAWN BY: MG/KM	8/13/25
DEPUTY DIRECTOR	CHIEF, RIGHT OF WAY	CHECKED BY:CMS/SC	8/13/25
		SHEET NO. 24 OF 63	
		CONTRACT NO. B553802	

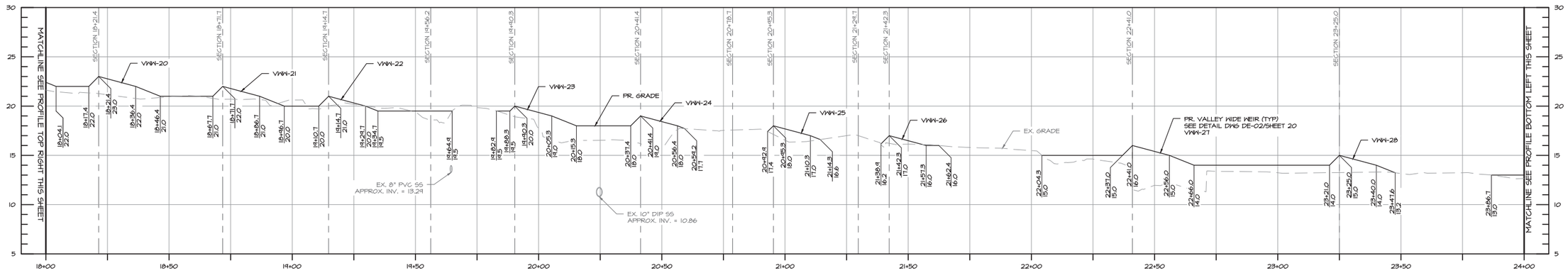
ROCK CREEK STREAM RESTORATION
MAIN STEM PROFILE
COUNCIL DISTRICT 3

25_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\S_20201_PR01



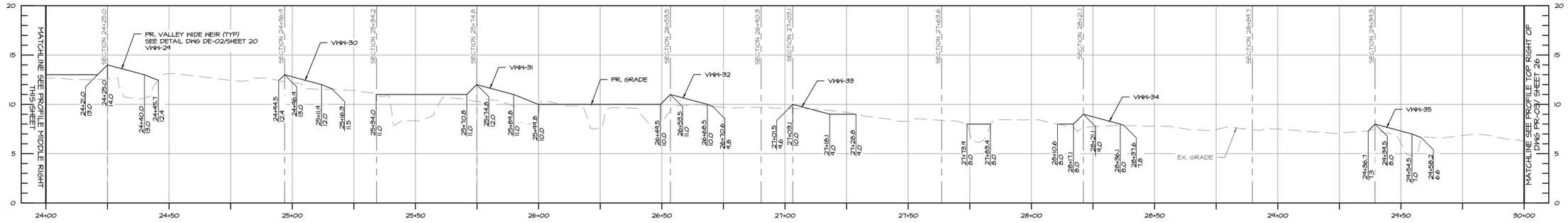
PROFILE BASELINE OF CONSTRUCTION STA: 12+00 TO STA: 18+00

SCALE: HORZ. 1" = 20'
VERT. 1" = 5'



PROFILE BASELINE OF CONSTRUCTION STA: 18+00 TO STA: 24+00

SCALE: HORZ. 1" = 20'
VERT. 1" = 5'



PROFILE BASELINE OF CONSTRUCTION STA: 24+00 TO STA: 30+00

SCALE: HORZ. 1" = 20'
VERT. 1" = 5'

0 10 20 40
1 INCH = 20 FEET

0 2.5 5 10
1 INCH = 5 FEET

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PR-02 90% CONSTRUCTION DRAWINGS

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE		APPROVED DATE	
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	25 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
MAIN STEM PROFILE
COUNCIL DISTRICT 3

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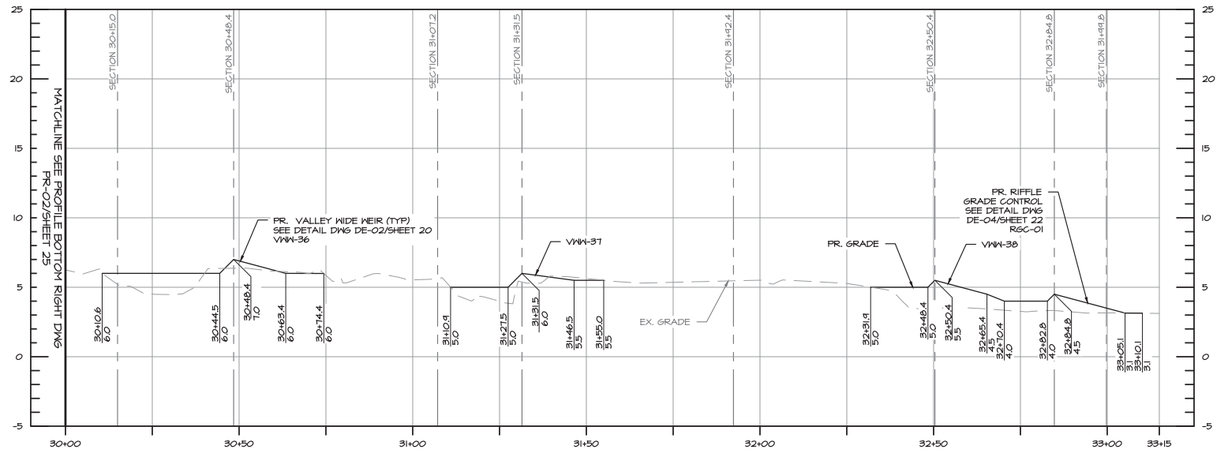
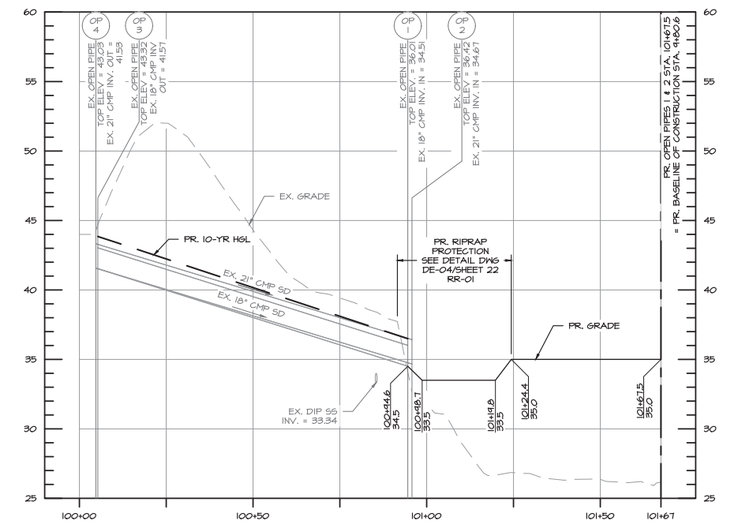


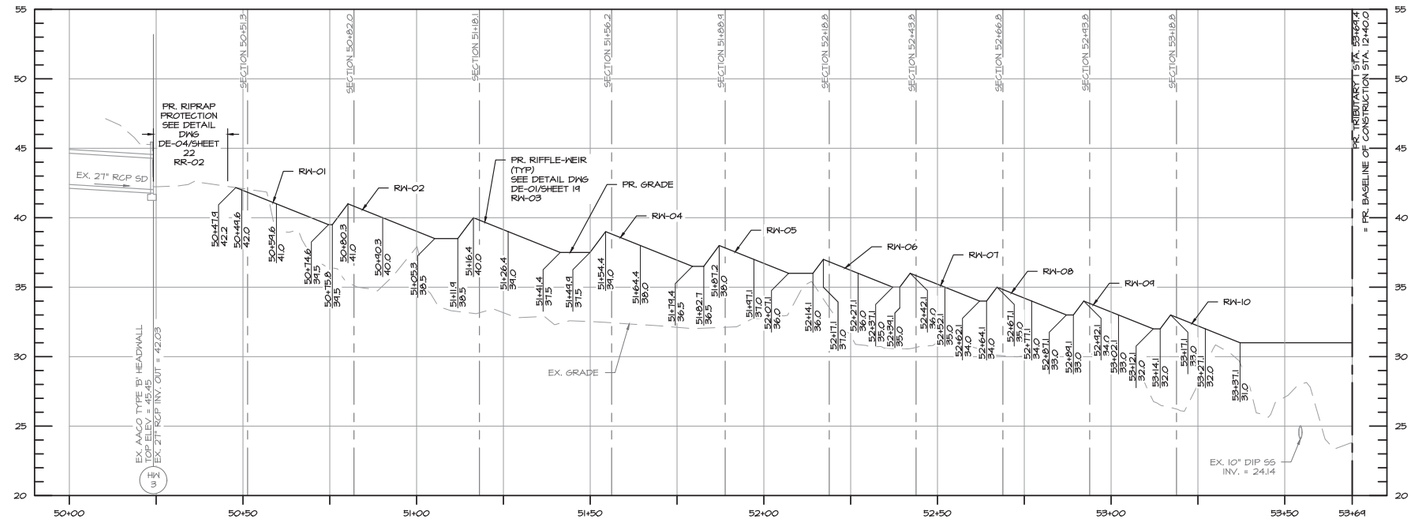
PROFILE BASELINE OF CONSTRUCTION STA: 30+00 TO STA: 33+15

SCALE: HORZ. 1" = 20'
VERT. 1" = 5'



PROFILE PR. OPEN PIPES 1 & 2 STA: 100+00 TO STA: 101+67

SCALE: HORZ. 1" = 20'
VERT. 1" = 5'



PROFILE PR. TRIBUTARY 1 STA: 50+00 TO STA: 53+69

SCALE: HORZ. 1" = 20'
VERT. 1" = 5'

PR-03

90% CONSTRUCTION DRAWINGS

0 10 20 40
1 INCH = 20 FEET

0 2.5 5 10
1 INCH = 5 FEET

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

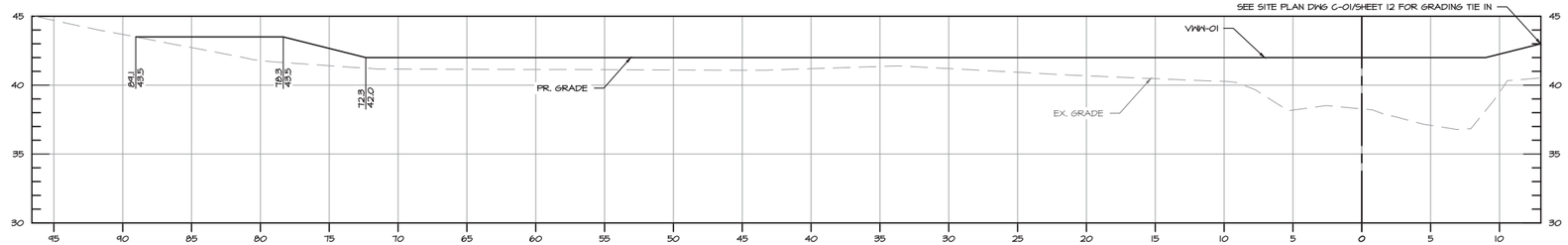
REVISED DATE	BY

APPROVED	DATE	APPROVED	DATE
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED	DATE	APPROVED	DATE
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

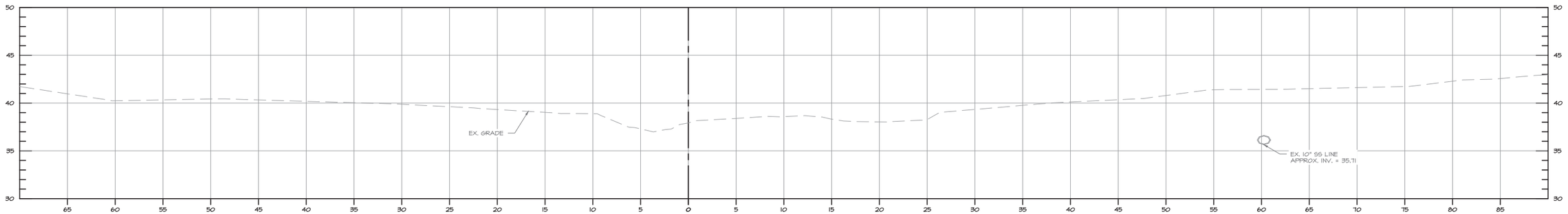
SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	26 OF 63
CONTRACT NO. B553802	

ROCK CREEK STREAM RESTORATION
MAIN STEM, TRIBUTARY 1, AND OPEN PIPES 1 & 2 PROFILES
COUNCIL DISTRICT 3

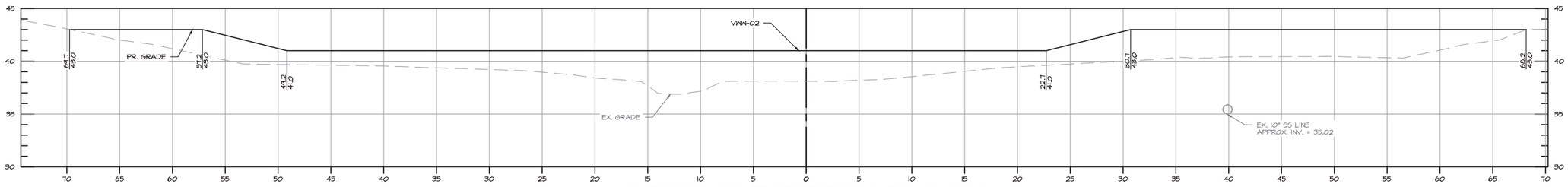
2/5_20201_ROCK_CREEK_STREAM_RESTORATION\DWG Files\Sheet Files\5_20201_PR0103



BASELINE OF CONSTRUCTION STA 5+14.4



BASELINE OF CONSTRUCTION STA 5+87.7



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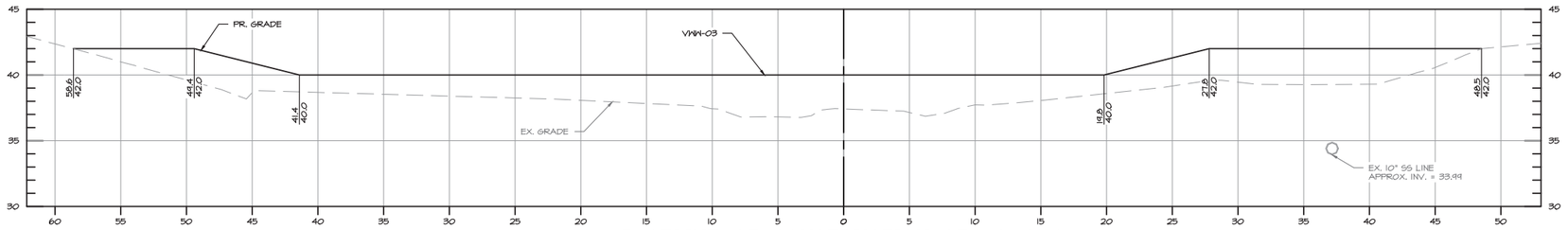

BASELINE OF CONSTRUCTION STA 6+67.7

CS-01

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

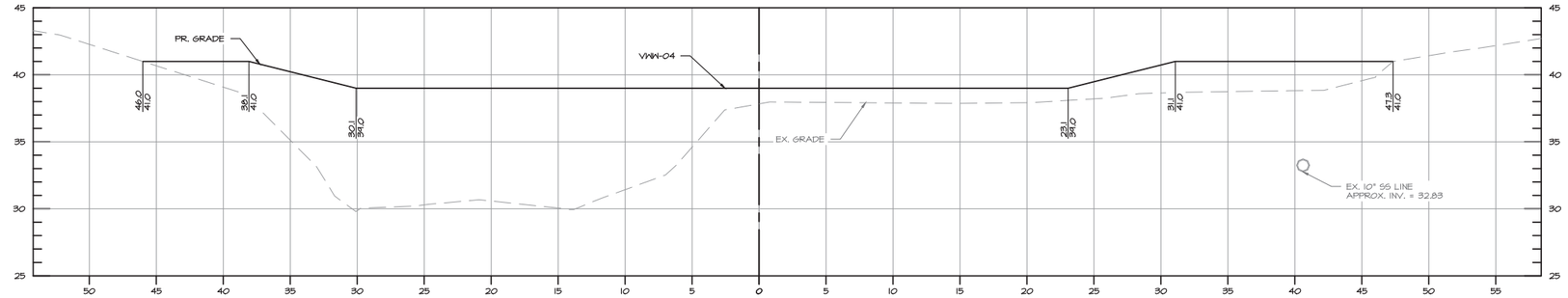
REVISED DATE	BY

APPROVED DATE	APPROVED DATE	SCALE:	1" = 5'
		DESIGNED BY: MKS	8/13/25
		DRAWN BY: MG/KM	8/13/25
CHIEF ENGINEER	PROJECT MANAGER	CHECKED BY:CMS/SC	8/13/25
APPROVED DATE	APPROVED DATE	SHEET NO.	27 OF 63
		CONTRACT NO.	B553802
DEPUTY DIRECTOR	CHIEF, RIGHT OF WAY		

ROCK CREEK STREAM RESTORATION
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

21\5_20201_ROCK CREEK_CS\MVD_DESIGN\DWG Files\Sheet Files\5_20201_CS501



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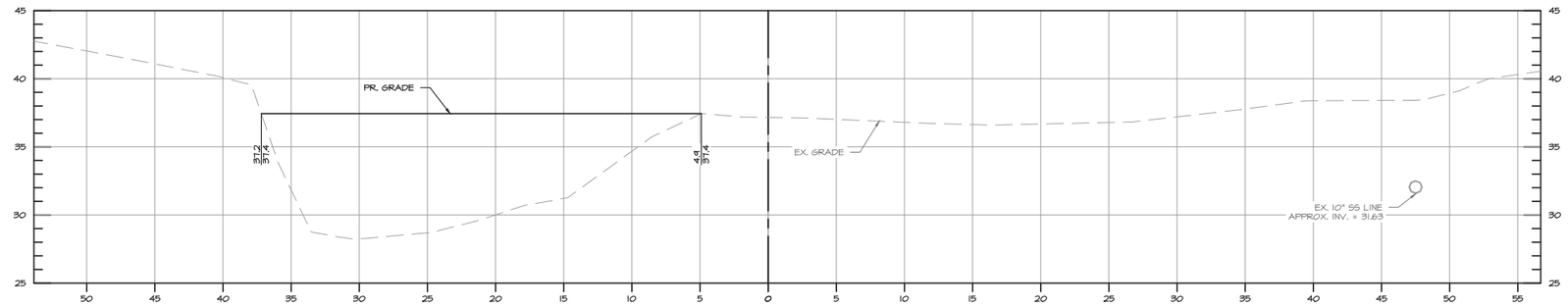

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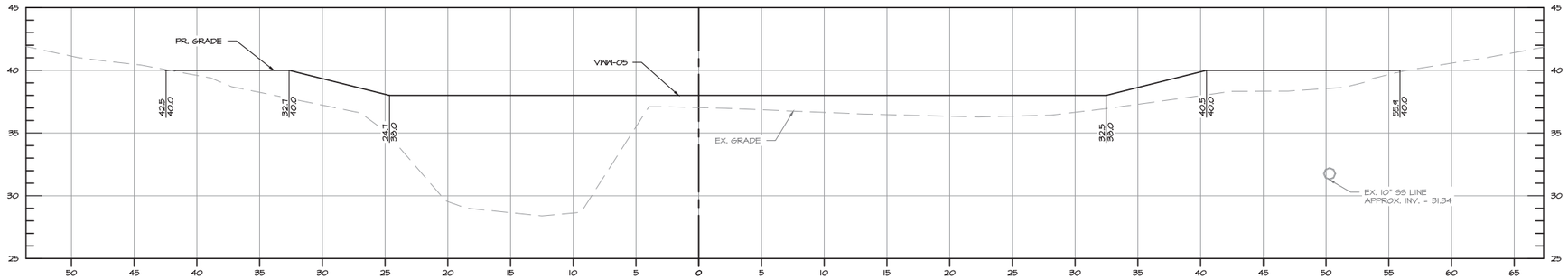

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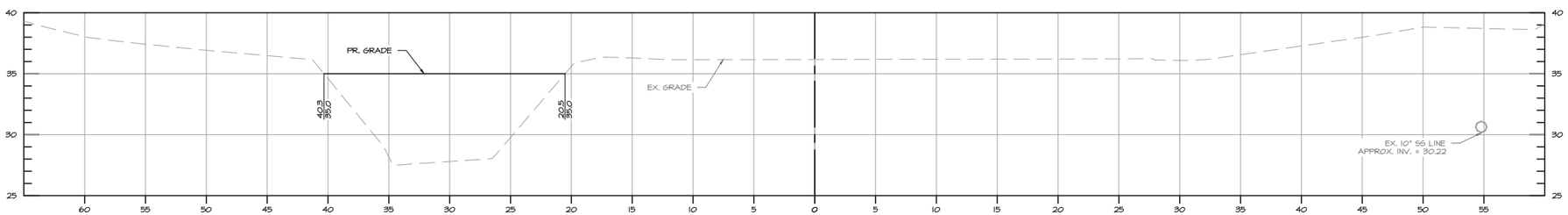

BASELINE OF CONSTRUCTION STA 8+25.9

CS-02

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE		APPROVED DATE	
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

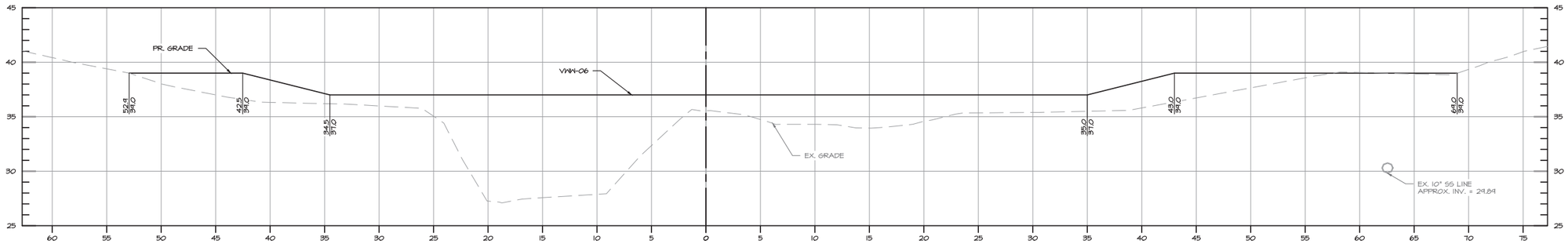
SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	28 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION

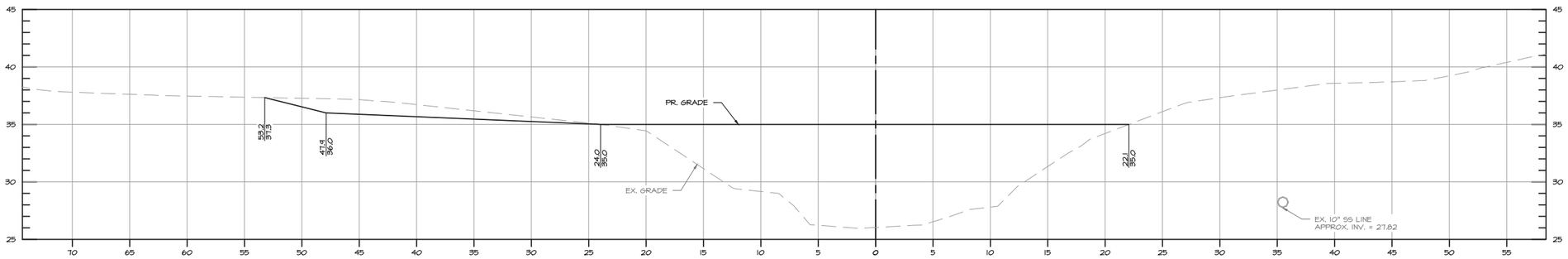
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

2\5_20201_ROCK_CREEK_STREAM_RESTORATION\06 Plan\Sheet Files\5_20201_CS02.dgn



BASELINE OF CONSTRUCTION STA 8+72.2



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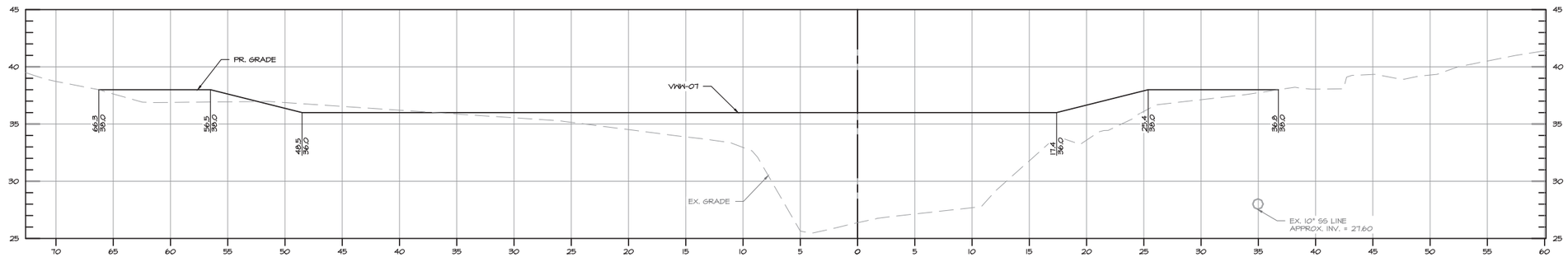
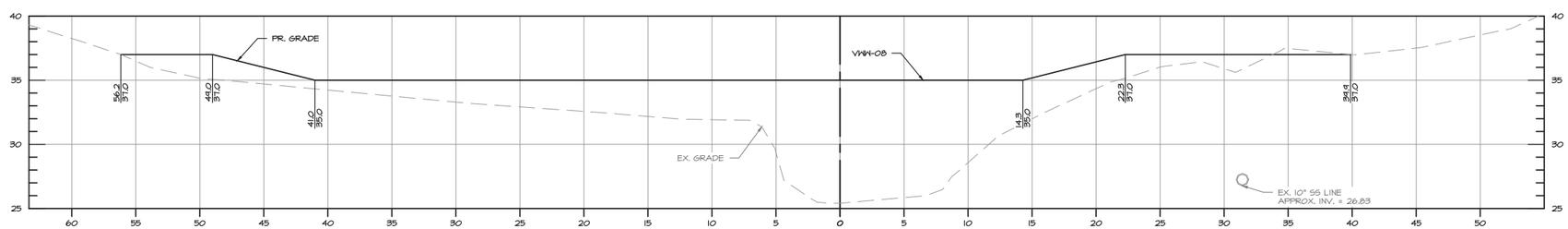


BASELINE OF CONSTRUCTION STA 10+07.5



BASELINE OF CONSTRUCTION STA 10+66.8

CS-03

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

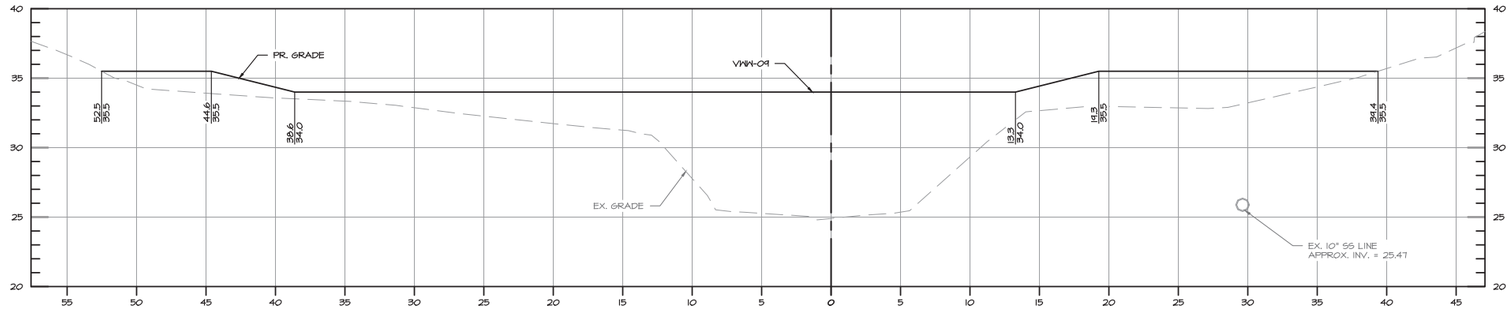
REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — CHIEF, RIGHT OF WAY

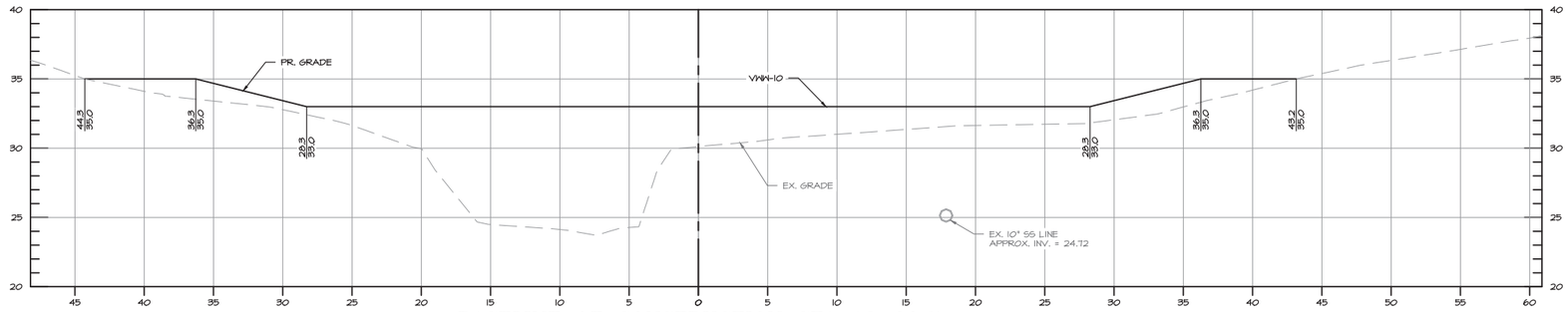
SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	29 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
MAIN STEM CROSS SECTIONS
COUNCIL DISTRICT 3

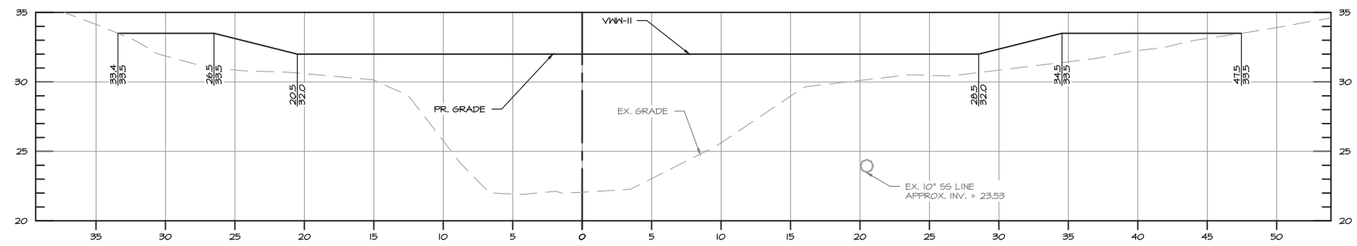
2_20201_ROCK_CREEK_CROSS_SECTIONS.dwg Plot Sheet Plot 5_20201_CS0303



BASELINE OF CONSTRUCTION STA 11+47.7



BASELINE OF CONSTRUCTION STA 12+00.7



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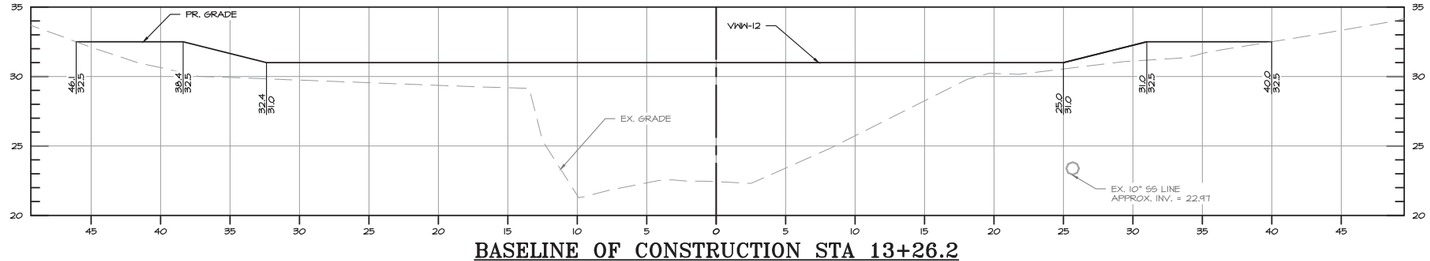

BASELINE OF CONSTRUCTION STA 13+26.2

CS-04

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED	DATE	APPROVED	DATE
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED	DATE	APPROVED	DATE
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

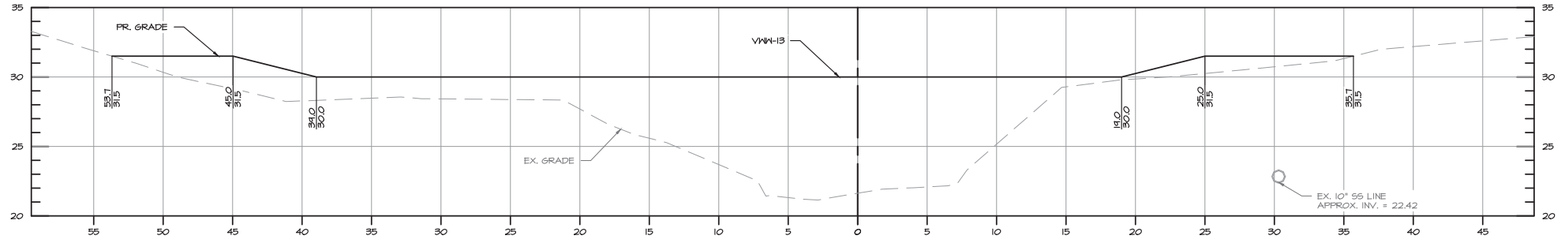
SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	30 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION

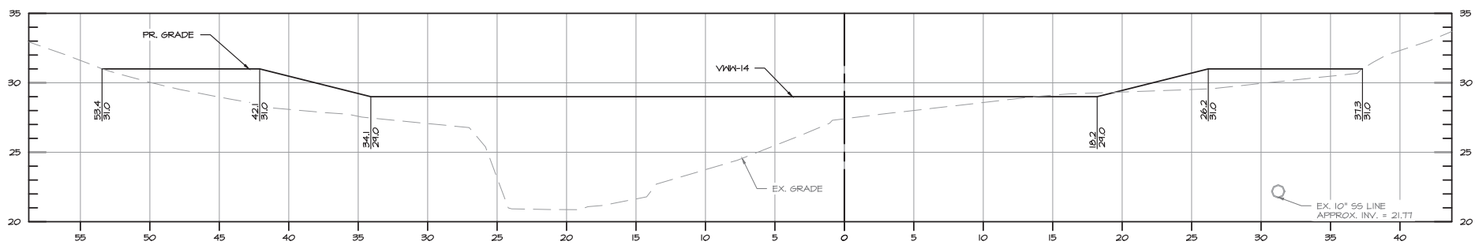
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

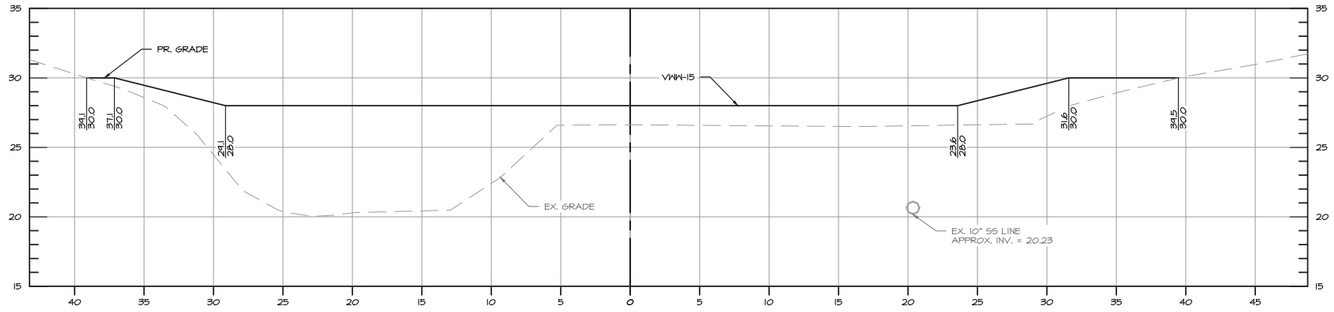
21_5_20201_BOOK_CHECK_SHEET_DESIGN\DWG Files\Sheet Files\5_20201_CS3604



BASELINE OF CONSTRUCTION STA 13+67.8



BASELINE OF CONSTRUCTION STA 14+09.4



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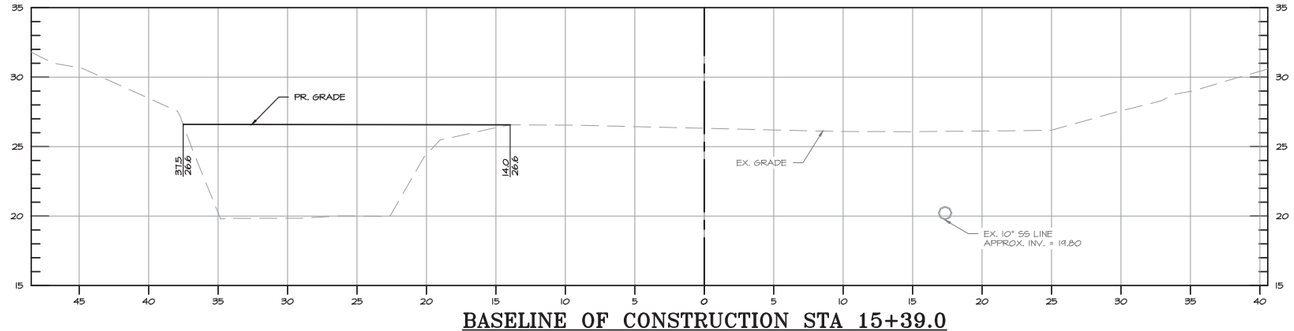

BASELINE OF CONSTRUCTION STA 15+39.0

CS-05

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER

APPROVED DATE — PROJECT MANAGER

APPROVED DATE — DEPUTY DIRECTOR

APPROVED DATE — CHIEF, RIGHT OF WAY

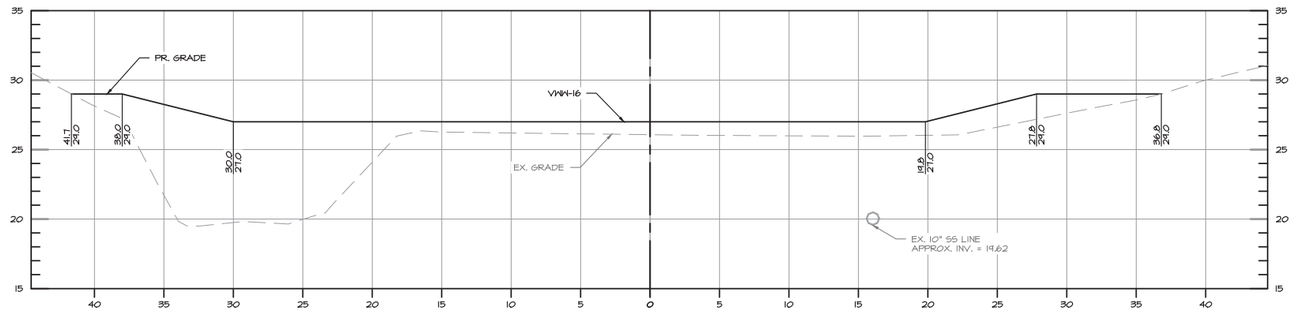
SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	31 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION

MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

2\5_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\5_20201_CS0105



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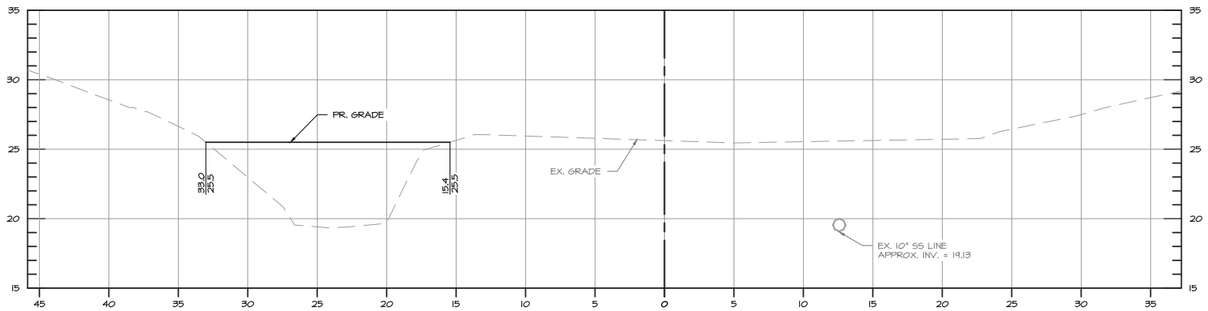

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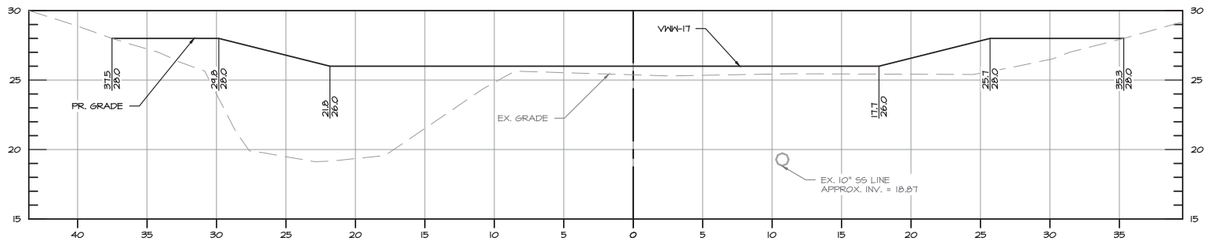

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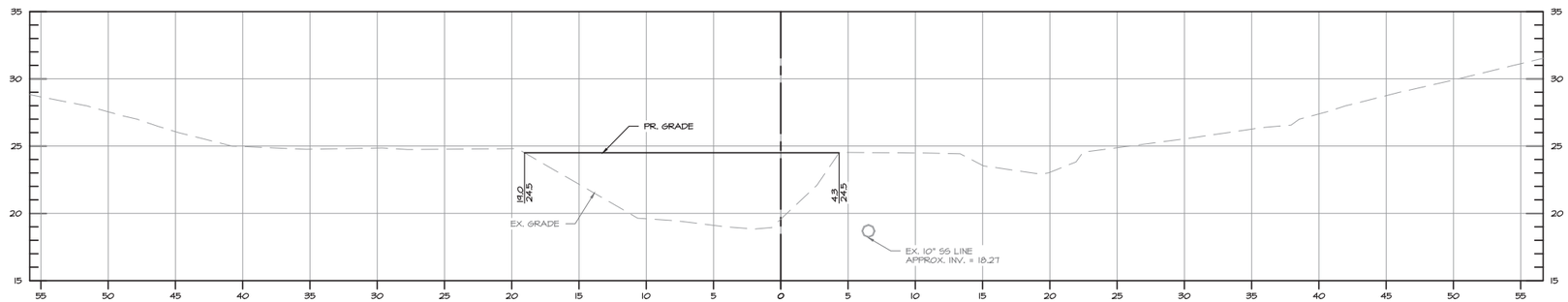

BASELINE OF CONSTRUCTION STA 16+40.0

CS-06

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE _____ CHIEF ENGINEER

APPROVED DATE _____ DEPUTY DIRECTOR

APPROVED DATE _____ PROJECT MANAGER

APPROVED DATE _____ CHIEF, RIGHT OF WAY

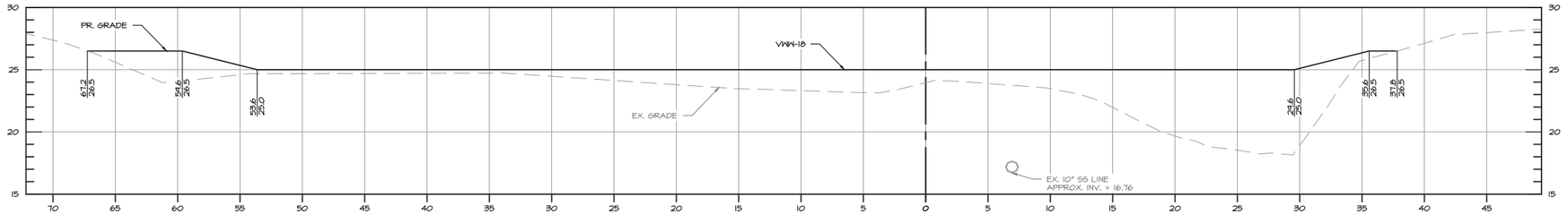
SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	32 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION

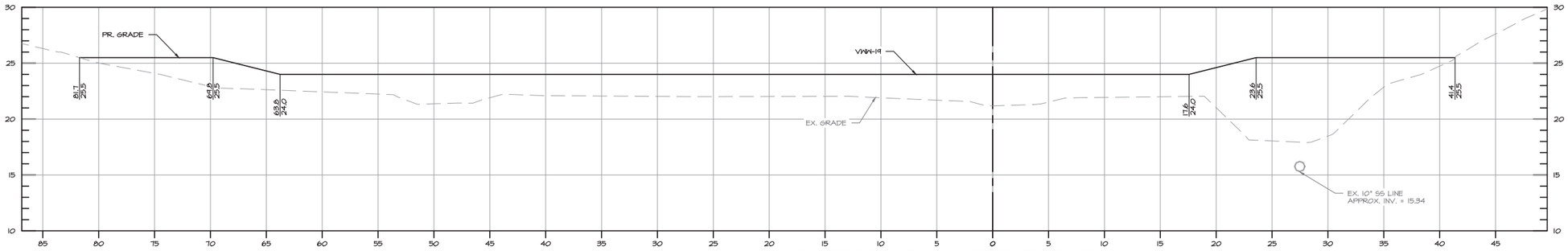
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

25_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\S_20201_CS06.dwg



BASELINE OF CONSTRUCTION STA 17+10.2



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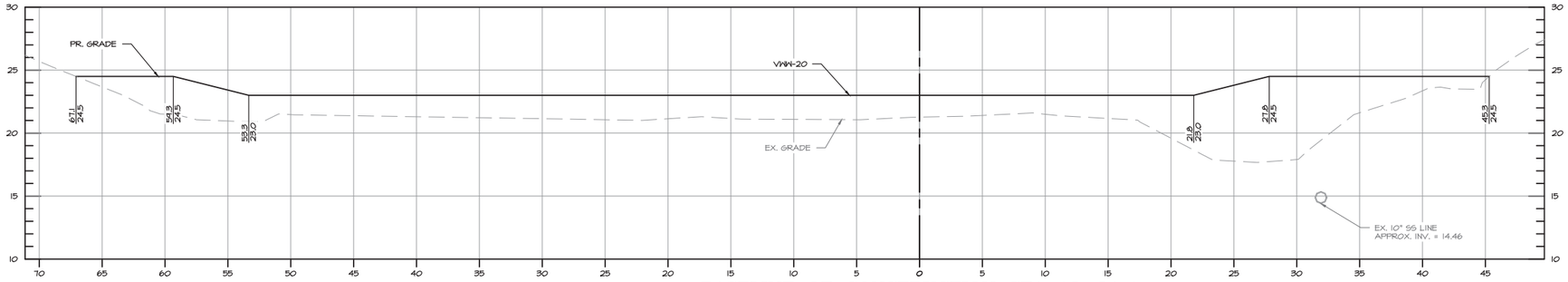
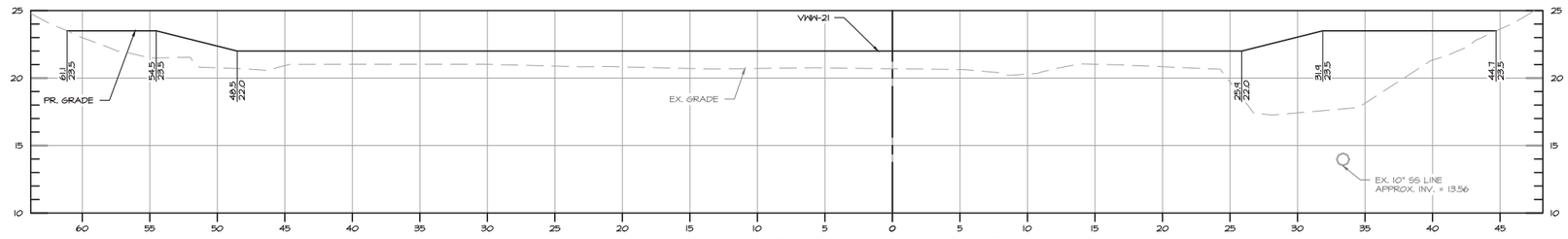


BASELINE OF CONSTRUCTION STA 18+21.4



BASELINE OF CONSTRUCTION STA 18+71.7

CS-07

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

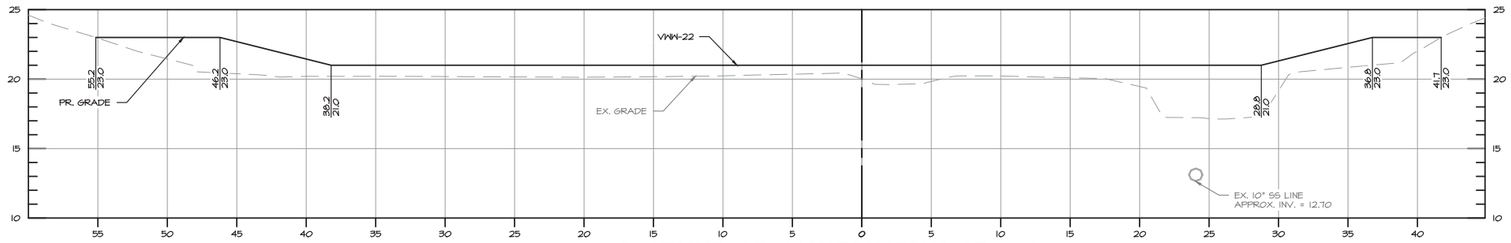
APPROVED ____ DATE ____ CHIEF ENGINEER	APPROVED ____ DATE ____ PROJECT MANAGER	SCALE:	1" = 5'
		DESIGNED BY: MKS	8/13/25
		DRAWN BY: MG/KM	8/13/25
		CHECKED BY:CMS/SC	8/13/25
APPROVED ____ DATE ____ DEPUTY DIRECTOR	APPROVED ____ DATE ____ CHIEF, RIGHT OF WAY	SHEET NO. 33 OF 63	
		CONTRACT NO. B553802	

ROCK CREEK STREAM RESTORATION

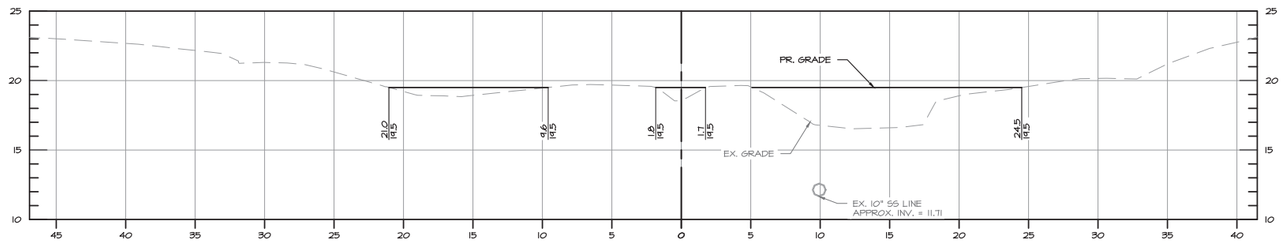
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

K:\5_20201_ROCK_CREEK_STREAM_RESTORATION\00 Files\Sheet Files\5_20201_CS07



BASELINE OF CONSTRUCTION STA 19+14.7



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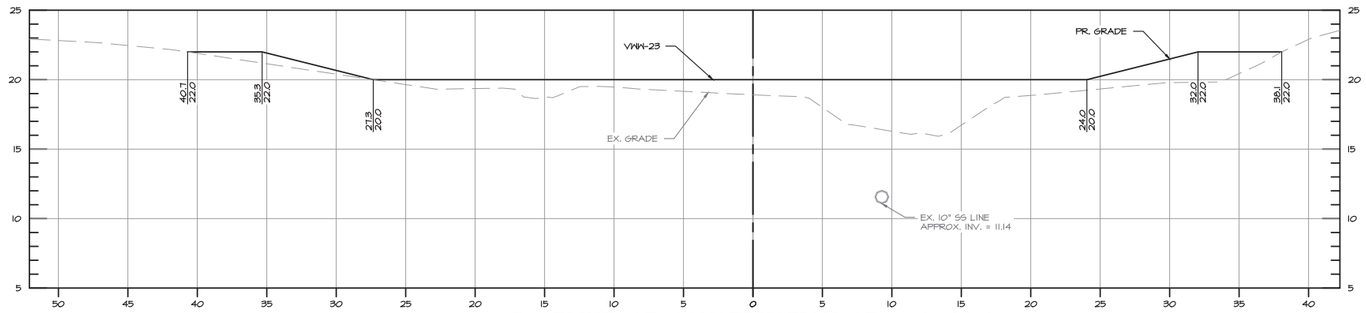

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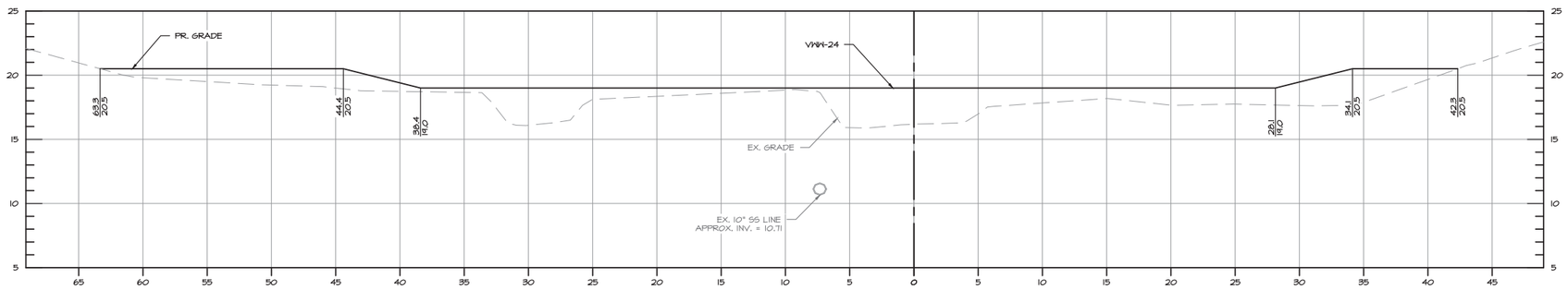

BASELINE OF CONSTRUCTION STA 20+41.4

CS-08

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

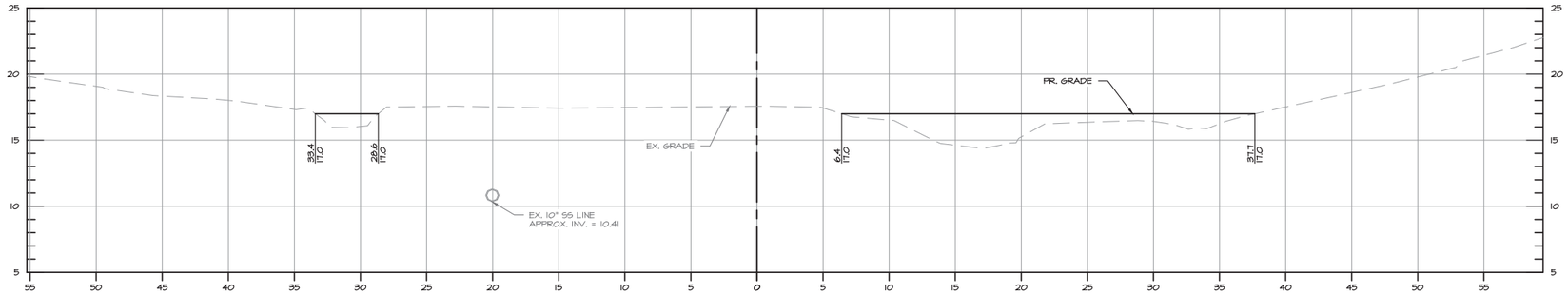
APPROVED DATE	APPROVED DATE	SCALE:	1" = 5'
		DESIGNED BY: MKS	8/13/25
		DRAWN BY: MG/KM	8/13/25
CHIEF ENGINEER	PROJECT MANAGER	CHECKED BY:CMS/SG	8/13/25
APPROVED DATE	APPROVED DATE	SHEET NO. 34 OF 63	
		CONTRACT NO. B553802	
DEPUTY DIRECTOR	CHIEF, RIGHT OF WAY		

ROCK CREEK STREAM RESTORATION

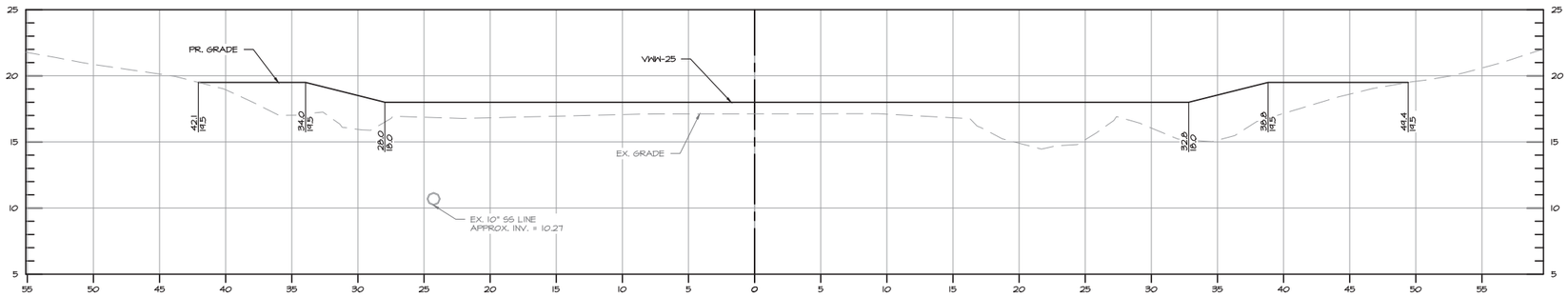
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

P:\5_20201_ROCK CREEK\CS\ROCK CREEK RESTORATION CAD Files\Sheet Files\5_20201_CS0208



BASELINE OF CONSTRUCTION STA 20+78.7



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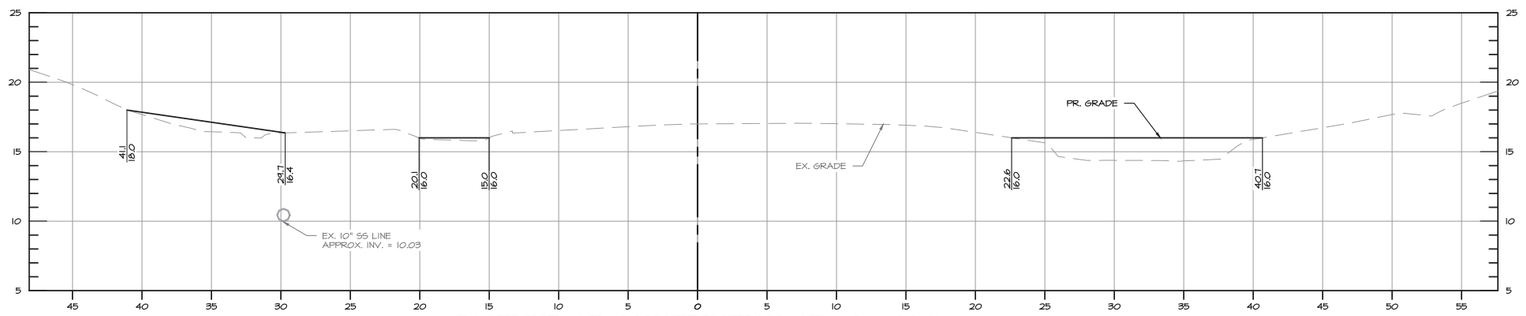

BASELINE OF CONSTRUCTION STA 21+29.7

0 2.5 5 10

1 INCH = 5 FEET

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"Integrating Engineering and Environment"
7455 New Ridge Road, Suite T Phone: (410) 694-9401
Hanover, Maryland 21076 Fax: (410) 694-9105
www.baylandinc.com
BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

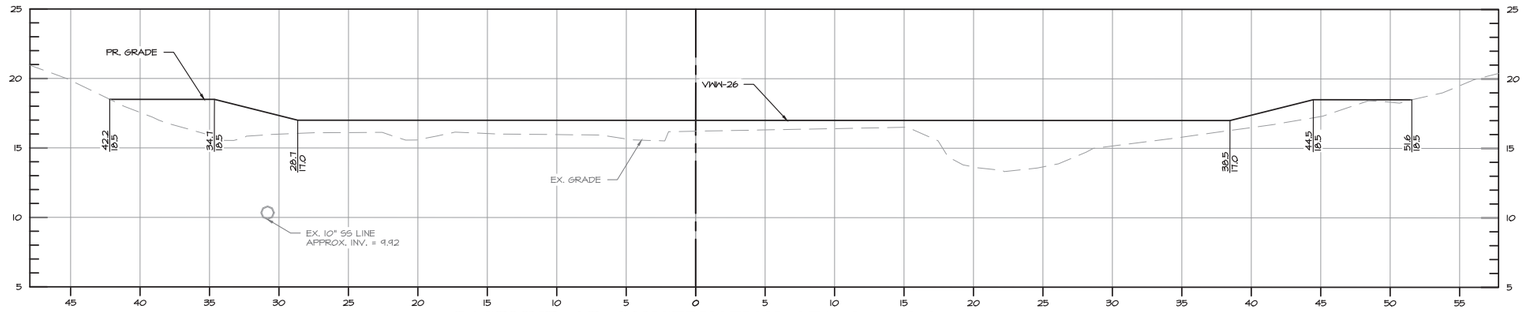
REVISED DATE	BY

APPROVED DATE _____ CHIEF, ENGINEER
APPROVED DATE _____ PROJECT MANAGER
APPROVED DATE _____ DEPUTY DIRECTOR
APPROVED DATE _____ CHIEF, RIGHT OF WAY

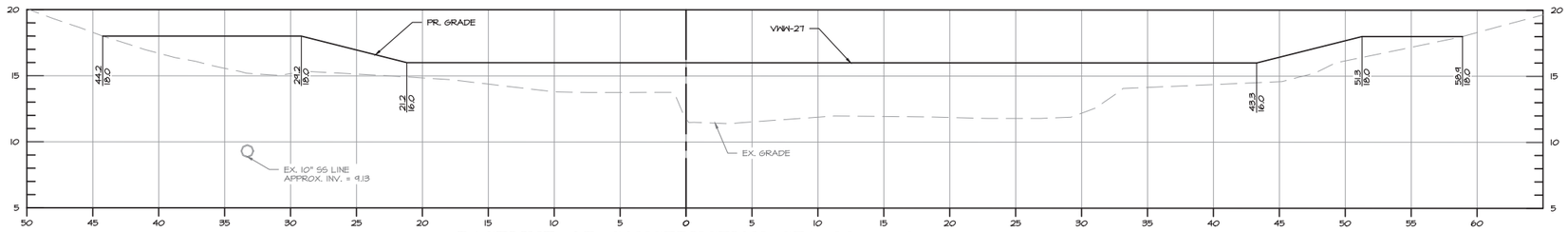
SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	35 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
MAIN STEM CROSS SECTIONS
COUNCIL DISTRICT 3

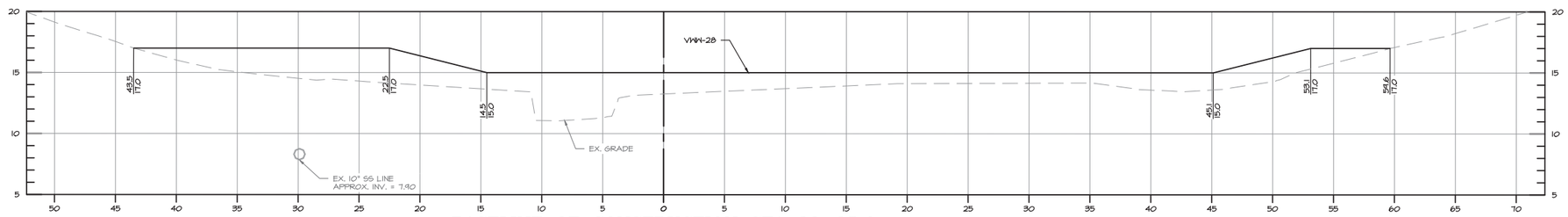
215_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\S_20201_CS0511



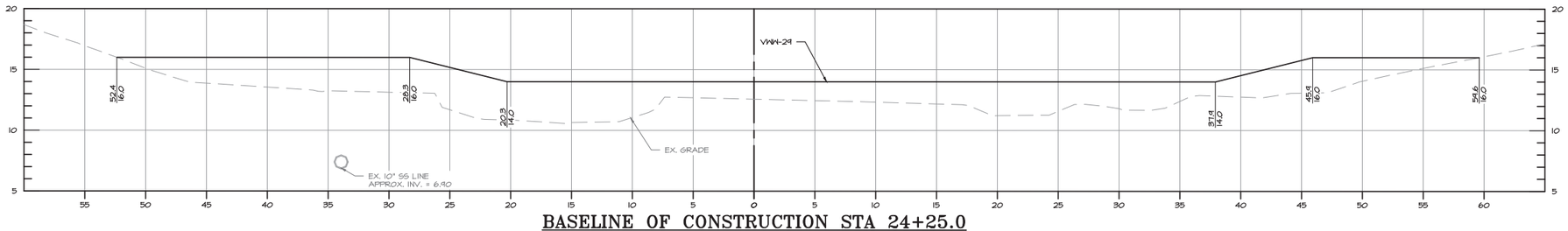
BASELINE OF CONSTRUCTION STA 21+42.3



BASELINE OF CONSTRUCTION STA 22+41.0



BASELINE OF CONSTRUCTION STA 23+25.0



BASELINE OF CONSTRUCTION STA 24+25.0

CS-10

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER

APPROVED DATE — PROJECT MANAGER

APPROVED DATE — DEPUTY DIRECTOR

APPROVED DATE — CHIEF, RIGHT OF WAY

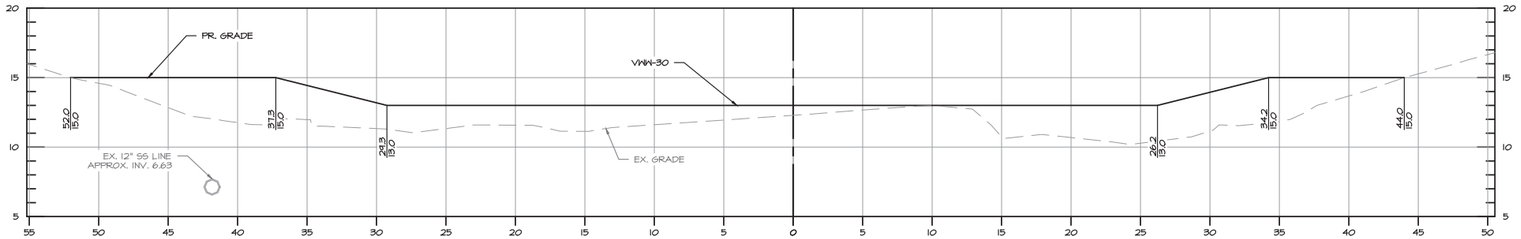
SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	36 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION

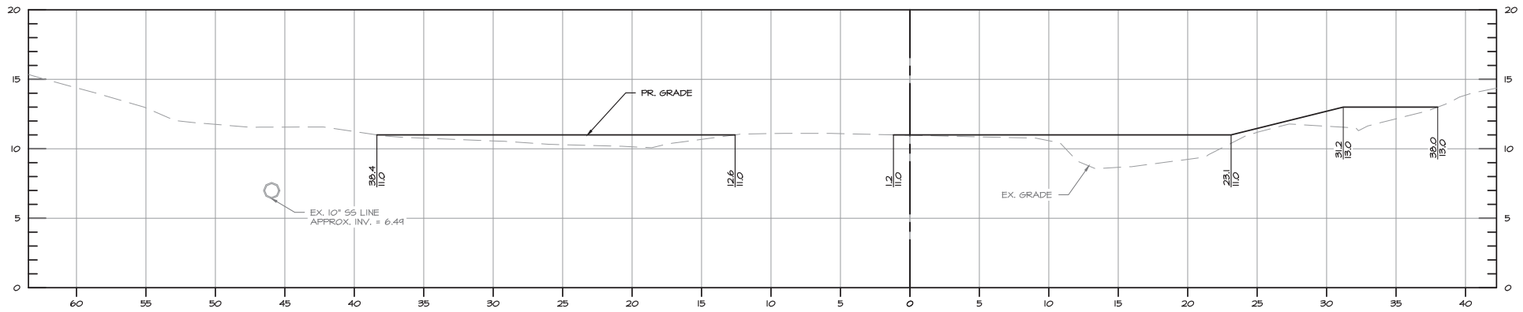
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

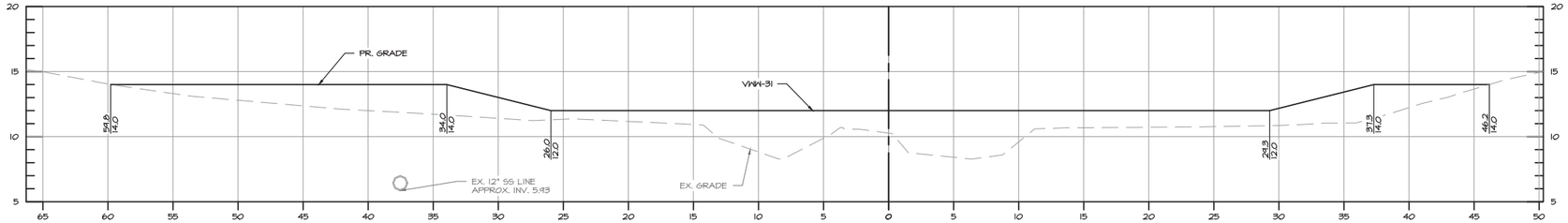
21\5_20201_ROCK CREEK STREAM RESTORATION\06 Plan Sheet Files\5_20201_CS0612



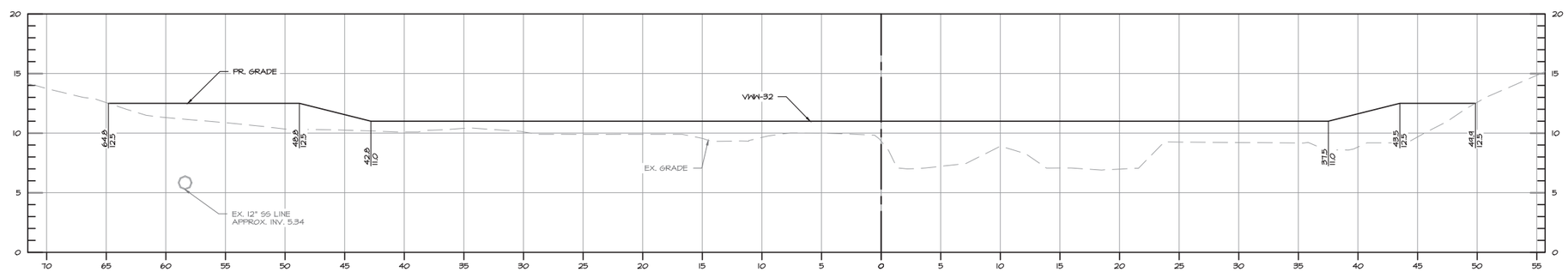
BASELINE OF CONSTRUCTION STA 24+96.9



BASELINE OF CONSTRUCTION STA 25+34.2



BASELINE OF CONSTRUCTION STA 25+74.8



BASELINE OF CONSTRUCTION STA 26+53.5

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

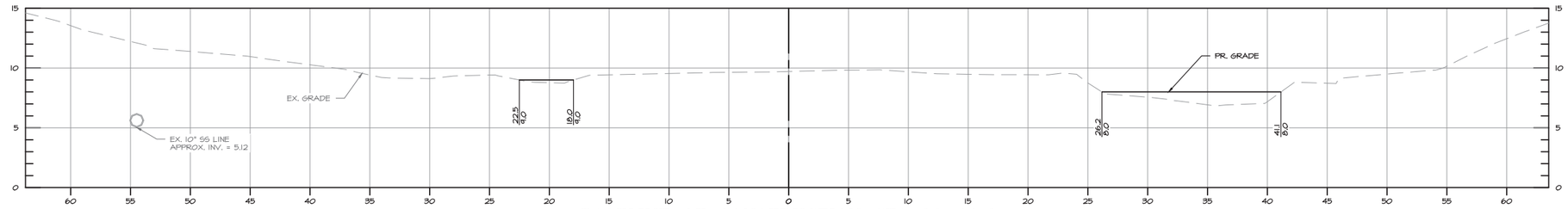
APPROVED DATE		APPROVED DATE	
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	37 OF 63
CONTRACT NO. B553802	

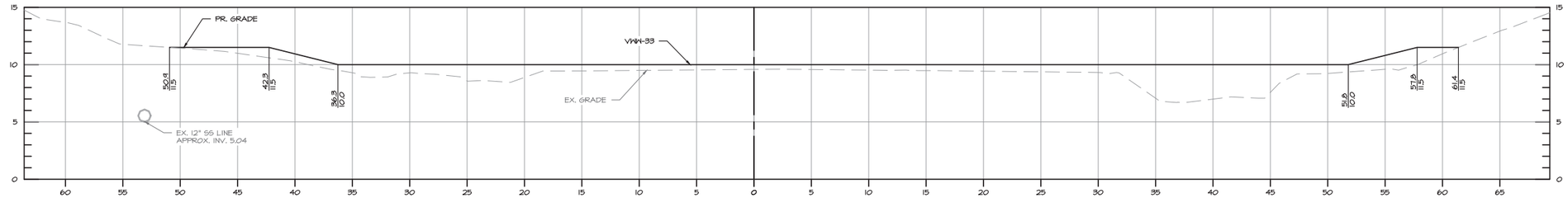
ROCK CREEK STREAM RESTORATION
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

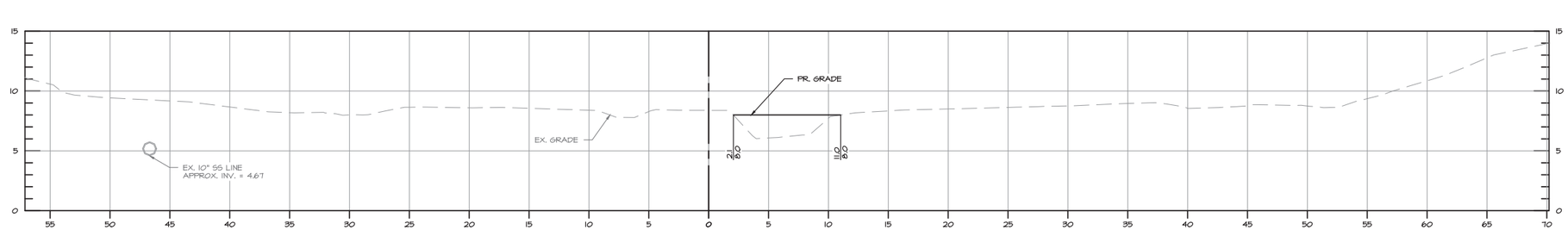
2_20201_ROCK_CREEK_STREAM_RESTORATION\DWG Files\Sheet Files\5_20201_CS0013



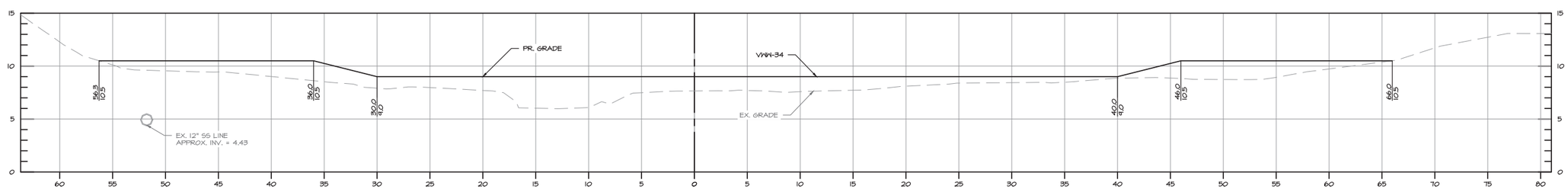
BASELINE OF CONSTRUCTION STA 26+90.3



BASELINE OF CONSTRUCTION STA 27+03.2



BASELINE OF CONSTRUCTION STA 27+63.6



BASELINE OF CONSTRUCTION STA 28+21.1

CS-12

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

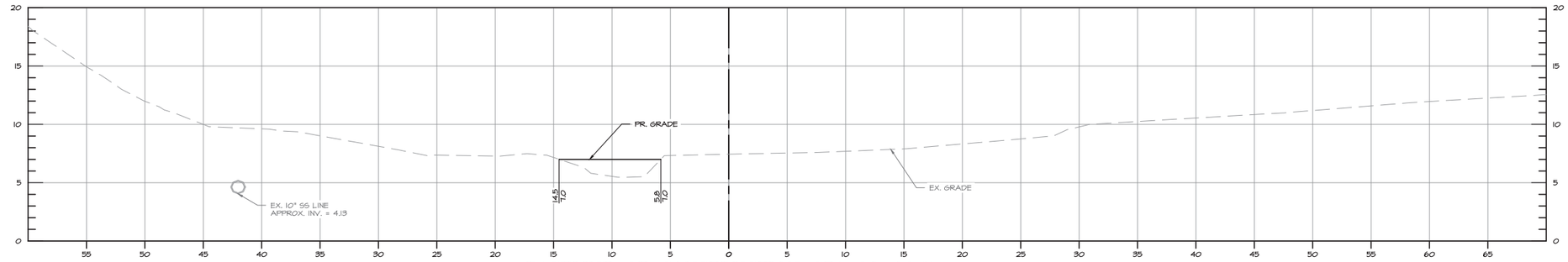
APPROVED DATE — CHIEF ENGINEER	APPROVED DATE — PROJECT MANAGER	SCALE: 1" = 5'	
APPROVED DATE — DEPUTY DIRECTOR	APPROVED DATE — CHIEF, RIGHT OF WAY	DESIGNED BY: MKS	8/13/25
		DRAWN BY: MG/KM	8/13/25
		CHECKED BY:CMS/SC	8/13/25
		SHEET NO. 38 OF 63	
		CONTRACT NO. B553802	

ROCK CREEK STREAM RESTORATION

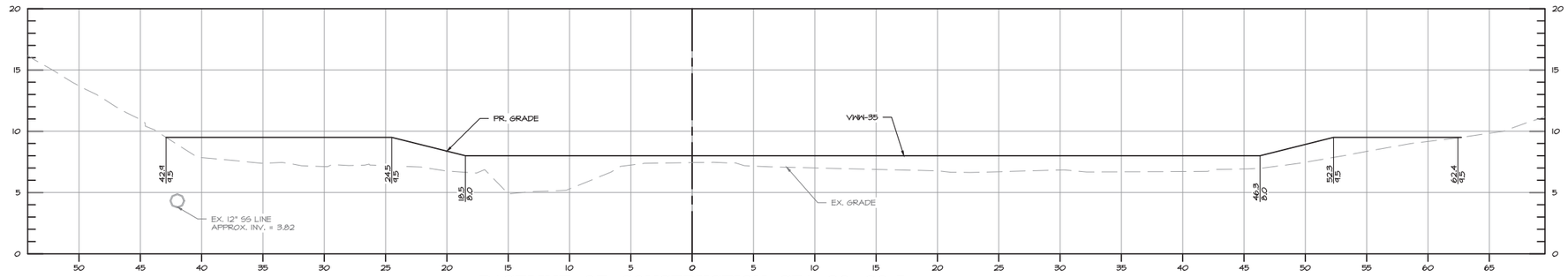
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

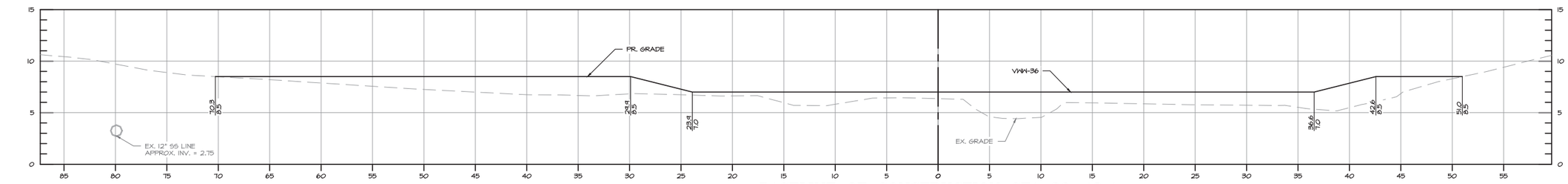
2\5_20201_ROCK_CREEK_STREAM_RESTORATION\05 Final\Sheet Files\5_20201_SEC14



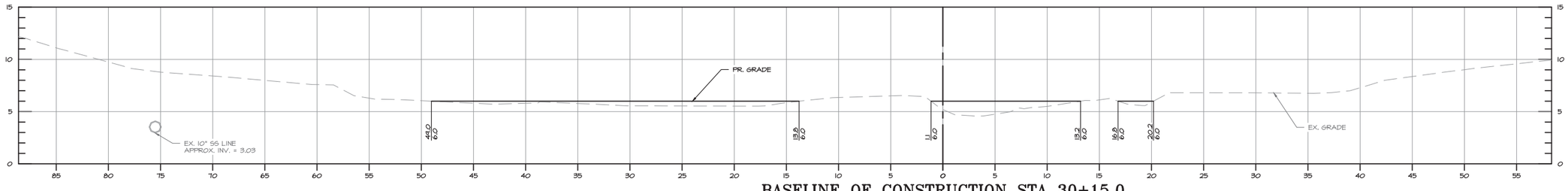
BASELINE OF CONSTRUCTION STA 28+89.7



BASELINE OF CONSTRUCTION STA 29+39.5



BASELINE OF CONSTRUCTION STA 30+48.4



BASELINE OF CONSTRUCTION STA 30+15.0

CS-13

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

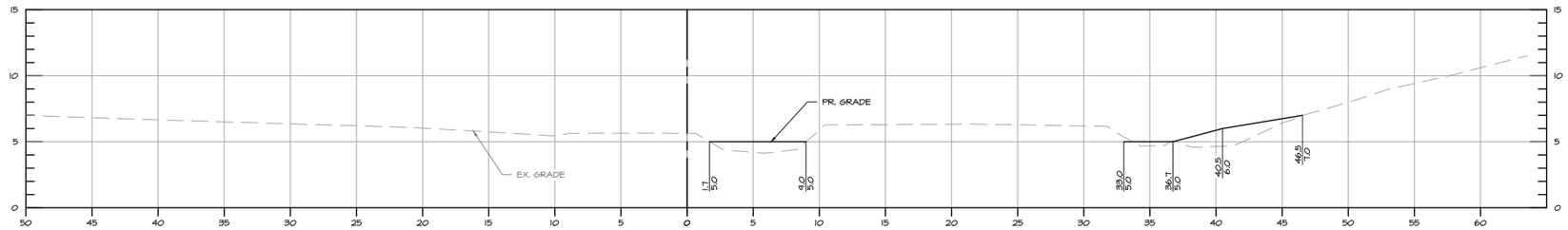
REVISED DATE	BY

APPROVED DATE	APPROVED DATE	SCALE:	1" = 5'
CHIEF ENGINEER	PROJECT MANAGER	DESIGNED BY: MKS	8/13/25
APPROVED DATE	APPROVED DATE	DRAWN BY: MG/KM	8/13/25
DEPUTY DIRECTOR	CHIEF, RIGHT OF WAY	CHECKED BY:CMS/SC	8/13/25
		SHEET NO. 39 OF 63	
		CONTRACT NO. B553802	

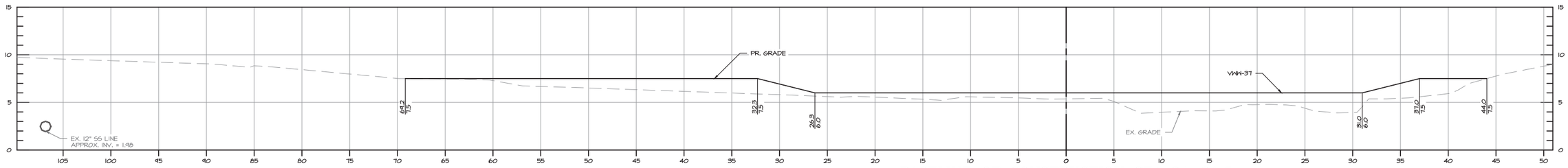
ROCK CREEK STREAM RESTORATION
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

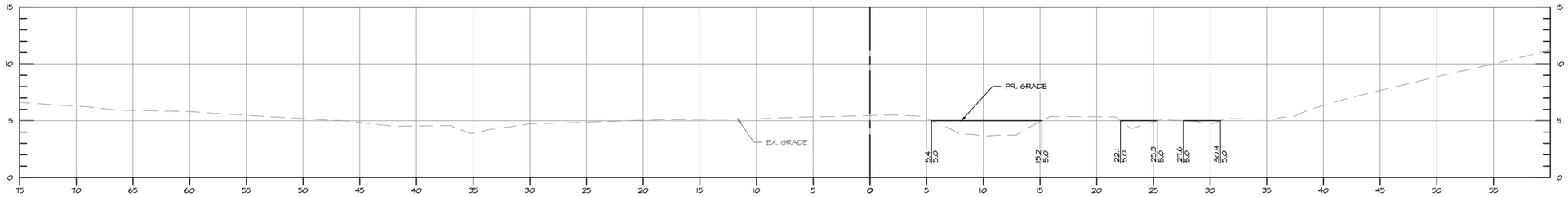
21\5_20201_ROCK CREEK_STREAM_RESTORATION\06 Plans\Sheet Files\5_20201_CS3613



BASELINE OF CONSTRUCTION STA 31+07.2



BASELINE OF CONSTRUCTION STA 31+31.5



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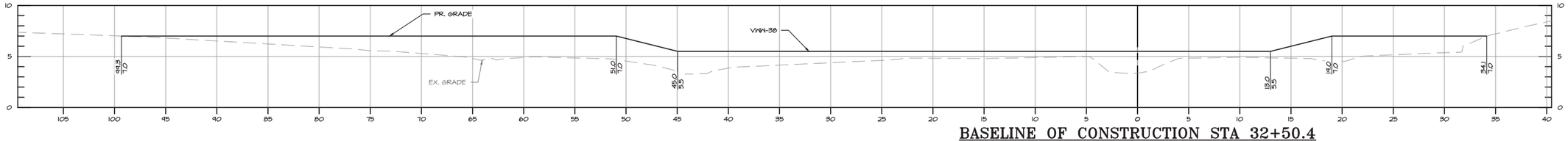

BASELINE OF CONSTRUCTION STA 32+50.4

CS-14

90% CONSTRUCTION DRAWINGS

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

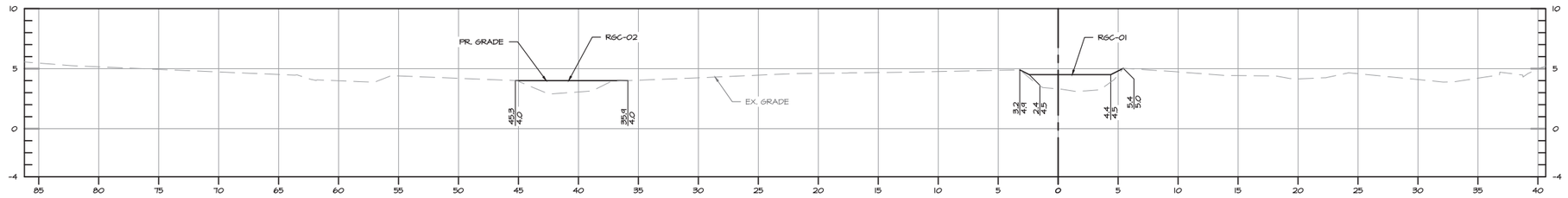
APPROVED DATE	APPROVED DATE	SCALE:	1" = 5'
CHIEF ENGINEER	PROJECT MANAGER	DESIGNED BY: MKS	8/13/25
APPROVED DATE	APPROVED DATE	DRAWN BY: MG/KM	8/13/25
DEPUTY DIRECTOR	CHIEF, RIGHT OF WAY	CHECKED BY:CMS/SC	8/13/25
		SHEET NO. 40 OF 63	
		CONTRACT NO. B553802	

ROCK CREEK STREAM RESTORATION

MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

J:\5_20201_ROCK_CREEK_STREAM_RESTORATION\00 Final\Sheet Files\5_20201_CS0614



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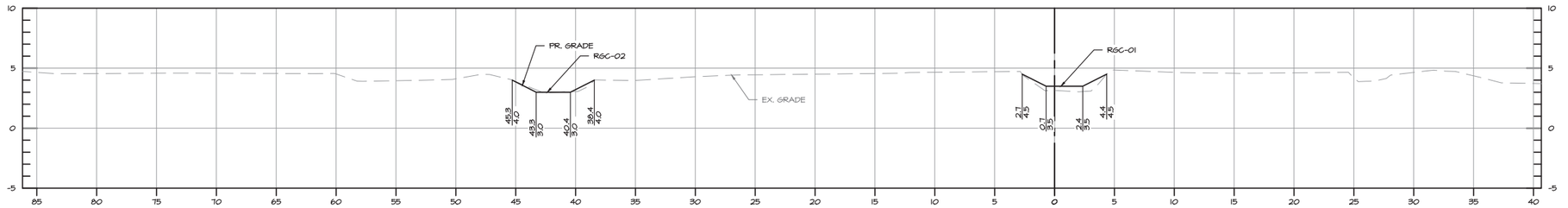

BASELINE OF CONSTRUCTION STA 32+99.8

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE _____ CHIEF ENGINEER

APPROVED DATE _____ PROJECT MANAGER

APPROVED DATE _____ DEPUTY DIRECTOR

APPROVED DATE _____ CHIEF, RIGHT OF WAY

SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	41 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION

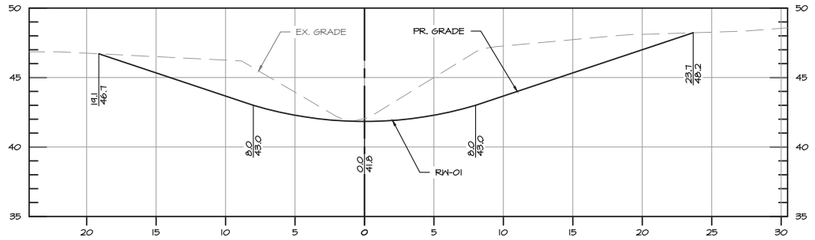
MAIN STEM CROSS SECTIONS

COUNCIL DISTRICT 3

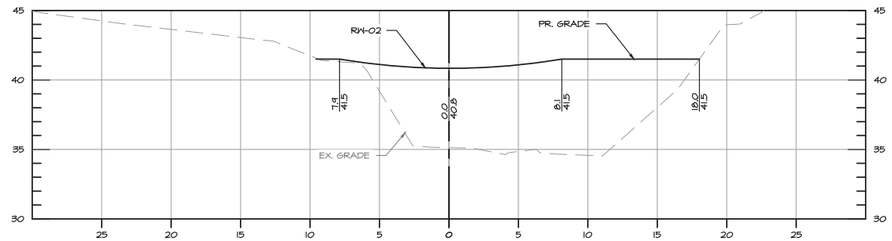
CS-15

90% CONSTRUCTION DRAWINGS

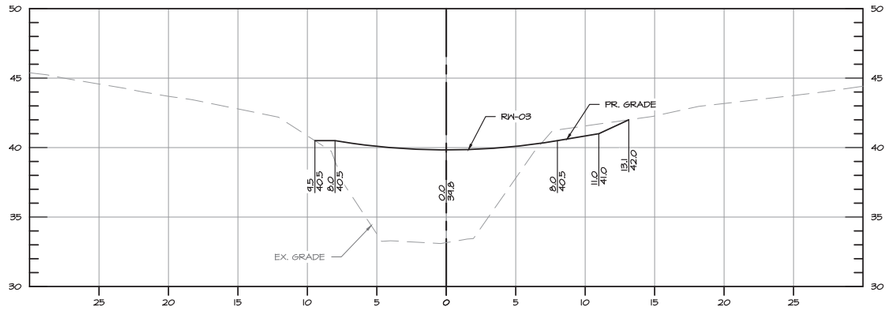
215_20201_ROCK_CREEK_STREAM_RESTORATION\DWG Files\Sheet Files\CS_20201_CS15.dwg



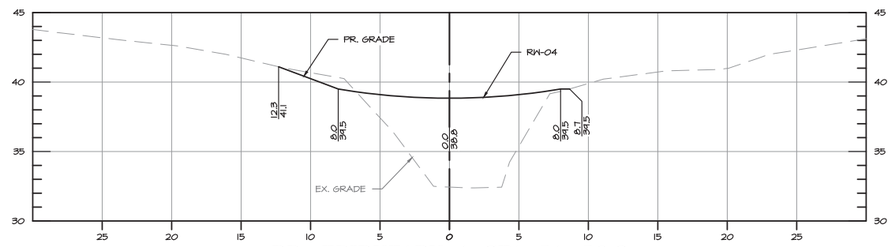
PR. TRIBUTARY 1 STA 50+51.3



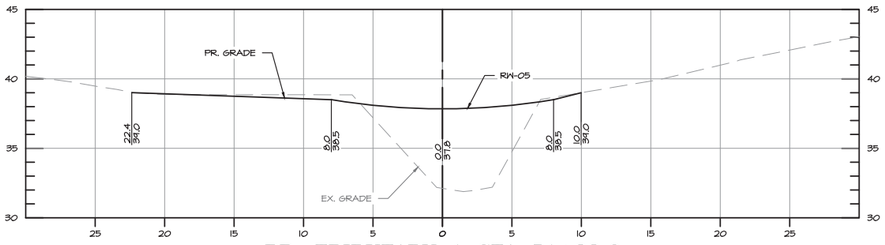
PR. TRIBUTARY 1 STA 50+82.0



PR. TRIBUTARY 1 STA 51+18.1



PR. TRIBUTARY 1 STA 51+56.2



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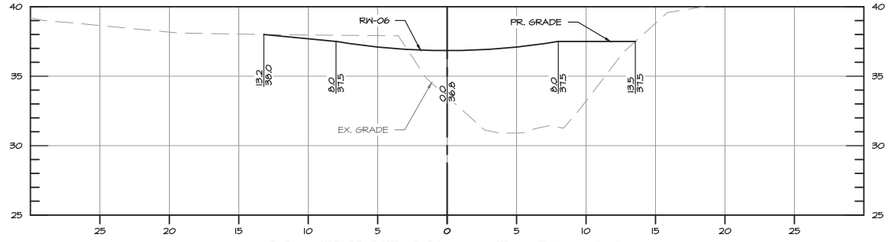

PR. TRIBUTARY 1 STA 52+18.8

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE _____ CHIEF ENGINEER

APPROVED DATE _____ PROJECT MANAGER

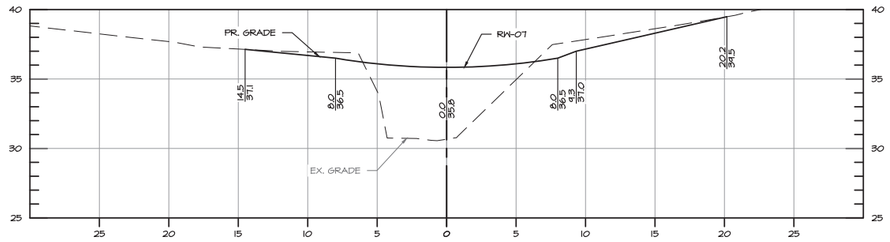
APPROVED DATE _____ DEPUTY DIRECTOR

APPROVED DATE _____ CHIEF, RIGHT OF WAY

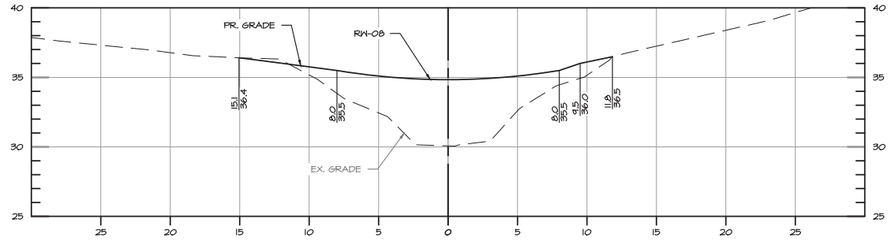
SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	42 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
TRIBUTARY 1 CROSS SECTIONS

COUNCIL DISTRICT 3



PR. TRIBUTARY 1 STA 52+43.8



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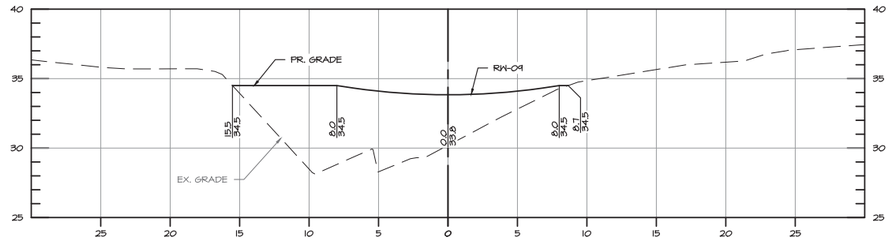
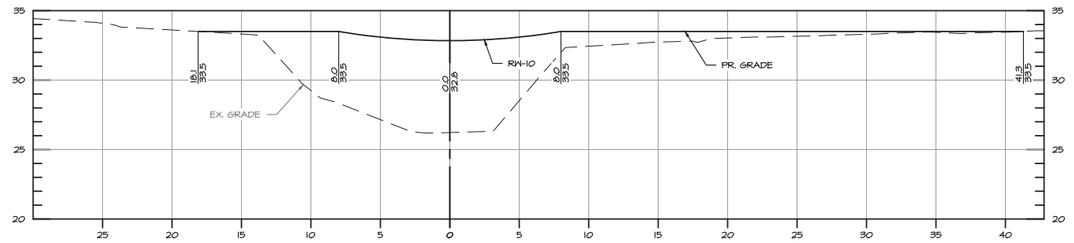


PR. TRIBUTARY 1 STA 52+93.8



PR. TRIBUTARY 1 STA 53+18.8

0 2.5 5 10

1 INCH = 5 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE _____ CHIEF ENGINEER

APPROVED DATE _____ PROJECT MANAGER

APPROVED DATE _____ DEPUTY DIRECTOR

APPROVED DATE _____ CHIEF, RIGHT OF WAY

SCALE:	1" = 5'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	43 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION

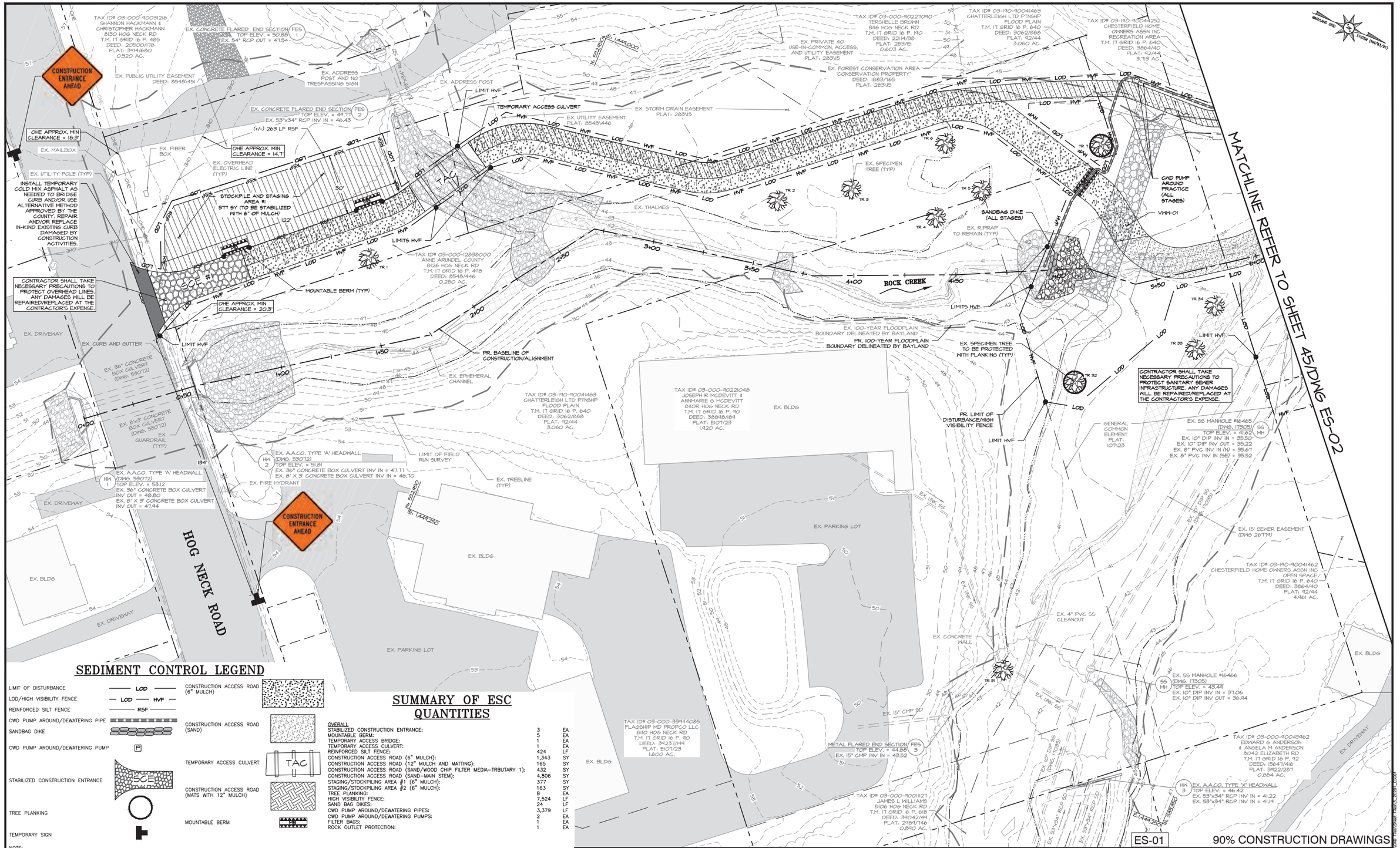
TRIBUTARY 1 CROSS SECTIONS

COUNCIL DISTRICT 3

CS-17

90% CONSTRUCTION DRAWINGS

21_20201_ROCK_CREEK_STREAM_RESTORATION\06 Plan Sheet Files\S_20201_CS3611.dwg



SEDIMENT CONTROL LEGEND

- LIMIT OF DISTURBANCE — LOD
- LOD/HIGH VISIBILITY FENCE — LOD — HVF
- REINFORCED SILT FENCE — RSF
- CWD PUMP AROUND/DEWATERING PIPE
- SANDBAG DIKE
- CWD PUMP AROUND/DEWATERING PUMP (P)
- STABILIZED CONSTRUCTION ENTRANCE (SCE)
- TREE PLANKING
- TEMPORARY SIGN
- CONSTRUCTION ACCESS ROAD (6" MULCH)
- CONSTRUCTION ACCESS ROAD (SAND)
- TEMPORARY ACCESS CULVERT (TAC)
- CONSTRUCTION ACCESS ROAD (MATS WITH 12" MULCH)
- MOUNTABLE BERM

NOTE:
- THIS SUMMARY OF SEDIMENT CONTROL QUANTITIES IS FOR USE BY THE ANNE ARUNDEL SOIL CONSERVATION DISTRICT ONLY. THIS SUMMARY IS NOT INTENDED TO BE USED BY THE CONTRACTOR FOR ESTIMATING AND BIDDING PURPOSES.
- NO DISTURBED AREA SHALL BE LEFT OVERNIGHT. STABILIZE ON DAILY BASIS USING TEMPORARY SEEDING.
- SANDBAG DIKES AND FILTER BAGS MAY BE REUSED AT CONTRACTOR'S DISCRETION.
- WETLAND PROTECTION MATTING SHALL BE USED IN PLACE OF MULCH CONSTRUCTION ACCESS ROAD WHEN CROSSING EXISTING WETLANDS AND UNDERGROUND UTILITIES.
- FOR EROSION AND SEDIMENT CONTROL DETAILS, SEE DWG ES-08/SHEET 51 AND DWG ES-09/SHEET 52.
- CONTRACTOR MAY ADD CLEAR WATER GRAVITY DISPOSAL PRACTICES FOR STORM DRAIN OUTFALLS AND INTERMITTENT AND EPHEMERAL CHANNELS FOR SEASONAL/POST STORM FLOW AT NO ADDITIONAL COST TO THE COUNTY. CONTRACTOR MUST PROVIDE A STABLE DISCHARGE POINT FOR DIVERSION PRACTICES.
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- STOCKPILE MAX HEIGHT CANNOT EXCEED 15 FT. STOCKPILE MAX SLOPE CANNOT EXCEED 2:1.
- ROCK OUTLET PROTECTION IS NOT REQUIRED IF CWD PUMP AROUND PRACTICES DISCHARGE ON COMPLETED VWW STRUCTURE
- A TEMPORARY ACCESS CULVERT MAY BE USED IN PLACE OF A TEMPORARY ACCESS BRIDGE WITH COUNTY APPROVAL.

SUMMARY OF ESC QUANTITIES

OVERALL		
STABILIZED CONSTRUCTION ENTRANCE:	3	EA
MOUNTABLE BERM:	5	EA
TEMPORARY ACCESS BRIDGE:	1	EA
TEMPORARY ACCESS CULVERT:	1	EA
REINFORCED SILT FENCE:	424	LF
CONSTRUCTION ACCESS ROAD (6" MULCH):	1,343	SY
CONSTRUCTION ACCESS ROAD (12" MULCH AND MATTING):	165	SY
CONSTRUCTION ACCESS ROAD (SAND/WOOD CHIP FILTER MEDIA--TRBUTARY 1):	432	SY
CONSTRUCTION ACCESS ROAD (SAND--MAIN STEM):	4,806	SY
STAGING/STOCKPILING AREA #1 (6" MULCH):	377	SY
STAGING/STOCKPILING AREA #2 (6" MULCH):	163	SY
TREE PLANKING:	8	EA
HIGH VISIBILITY FENCE:	7,524	LF
SAND BAG DIKES:	24	LF
CWD PUMP AROUND/DEWATERING PIPES:	3,379	LF
CWD PUMP AROUND/DEWATERING PUMPS:	2	EA
FILTER BAGS:	1	EA
ROCK OUTLET PROTECTION:	1	EA

EROSION AND SEDIMENT CONTROL PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

BayLand Consultants & Designers, Inc.
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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED	DATE	APPROVED	DATE
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED	DATE	APPROVED	DATE
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	44 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
EROSION AND SEDIMENT CONTROL PLAN
COUNCIL DISTRICT 3

SEDIMENT CONTROL LEGEND

LIMIT OF DISTURBANCE — LOD

LOD/HIGH VISIBILITY FENCE — LOD — HVF —

EX. 50' STREAM PROTECTION ZONE — SPZ

CWD PUMP AROUND/DEWATERING PIPE

CONSTRUCTION ACCESS ROAD (SAND)

MARYLAND GRID & SYSTEM (NAD'83/91)

TAX ID# 03-190-90044252
CHESTERFIELD HOME OWNERS ASSN INC
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
3.713 AC.

EX. OPEN PIPE (OP 3)
TOP ELEV. = 43.11
EX. 18" CMP INV OUT = 41.53

EX. OPEN PIPE (OP 4)
TOP ELEV. = 43.41
EX. 21" CMP INV OUT = 41.57

EX. OPEN PIPE (OP 1)
TOP ELEV. = 35.48
EX. 18" CMP INV IN = 34.51

EX. SS MANHOLE #22259 (DWG. 26781)
TOP ELEV. = 38.78
EX. 8" PVC INV IN = 30.32
EX. 8" DIP INV OUT = 30.14

PR. OPEN PIPES 1 & 2

EX. OPEN PIPE (OP 2)
TOP ELEV. = 36.43
EX. 21" CMP INV IN = 34.67

EX. BLDG

EX. SHED

NEWCOMB CT

EX. TREELINE (TYP)

EX. 25' UTILITY EASEMENT
PLAT: 95\24

EX. SS MANHOLE #22260 (DWG. 26781)
TOP ELEV. = 51.12
EX. 8" PVC INV IN = 51.54
EX. 8" PVC INV OUT = 51.07

EX. 8" PVC SS (DWG. 26781)

CWD PUMP AROUND PRACTICE (ALL STAGES)

PR. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

EX. SPECIMEN TREE (TYP)

LIMIT OF FIELD RUN SURVEY

EX. INTERMITTENT CHANNEL

EX. EPHEMERAL CHANNEL (TYP)

VMH-01 VMH-02 VMH-03 VMH-04 VMH-05 VMH-06 VMH-07 VMH-08 VMH-09 VMH-10

PR. BASELINE OF CONSTRUCTION/ALIGNMENT

ROCK CREEK

EX. THALWEG

EX. EXPOSED SS LINE

EX. 10" DIP SS (DWG. 17035)

EX. STEEL ENCASEMENT (APPROX. EXTENTS) (DWG. 60184)

EX. 15" SEWER EASEMENT (DWG 26779)

PR. LIMIT OF DISTURBANCE/HIGH VISIBILITY FENCE

CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT SANITARY SEWER INFRASTRUCTURE. ANY DAMAGES WILL BE REPAIRED/REPLACED AT THE CONTRACTOR'S EXPENSE.

EX. SS MANHOLE #16464 (DWG. 17035)
TOP ELEV. = 31.88
EX. 10" DIP INV IN = 28.68
EX. 10" DIP INV OUT = 28.60
EX. 8" DIP INV IN = 24.73

EX. 50' STREAM PROTECTION ZONE

EX. SS MANHOLE #16465 (DWG. 17035)
TOP ELEV. = 41.62
EX. 10" DIP INV IN = 35.50
EX. 10" DIP INV OUT = 35.22
EX. 8" PVC INV IN (N) = 35.61
EX. 8" PVC INV IN (SE) = 35.52

EX. SS MANHOLE #16463 (DWG. 17034)
TOP ELEV. = 39.57
EX. 10" DIP INV IN = 26.17
EX. 10" DIP INV OUT = 26.13

EX. 10" DIP SS (DWG. 17034)

TAX ID# 03-190-90041463
CHATTERLEIGH LTD PTNSHP
FLOOD PLAIN
T.M. 17 GRID 16 P. 640
DEED: 3062/888
PLAT: 92/44
3.060 AC.

TAX ID# 03-190-90041462
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
4.961 AC.

TAX ID# 03-190-90044220
CHESTERFIELD HOME OWNERS ASSN INC
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
2.901 AC.

TAX ID# 03-000-90045962
EDWARD G ANDERSON
& ANGELA M ANDERSON
8042 ELIZABETH RD
T.M. 17 GRID 16 P. 92
DEED: 15947/416
PLAT: 3922/281
0.884 AC.

TAX ID# 03-242-90229288
CREEKSIDE HMOWNRS ASSOC INC
CREEKSIDE DR
T.M. 17 GRID 16 P. 425
DEED: 26924/1
PLAT: 28975
1.240 AC.

EX. DWY

MATCHLINE REFER TO SHEET 44/DWG ES-01

MATCHLINE REFER TO SHEET 46/DWG ES-03

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EROSION AND SEDIMENT CONTROL PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

ES-02

90% CONSTRUCTION DRAWINGS

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE		APPROVED DATE	
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	45 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
EROSION AND SEDIMENT CONTROL PLAN

COUNCIL DISTRICT 3

I:\5_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\5_20201_ES02

MATCHLINE REFER TO SHEET 45/DWG ES-02

MATCHLINE REFER TO SHEET 47/DWG ES-04

CWD PUMP AROUND PRACTICE (ALL STAGES)

LIMIT OF FIELD RUN SURVEY

TAX ID# 03-190-90044220
CHESTERFIELD HOME OWNERS ASSN INC.
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
2.907 AC.

EX. SHED

EX. SHED

EX. SHED

N 539,850
E 1,448,950

EX. THALWEG

PR. LIMIT OF DISTURBANCE/ HIGH VISIBILITY FENCE

EX. 50' STREAM PROTECTION ZONE

ROCK CREEK

EX. PERENNIAL CHANNEL

EX. EXPOSED SS LINE

EX. INTERMITTENT CHANNEL

EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

EX. SPECIMEN TREE (TYP)

PR. BASELINE OF CONSTRUCTION/ ALIGNMENT

EX. SS MANHOLE #16462 (DWG. 17034) SS MH
TOP ELEV. = 31.61
EX. 10" DIP INV IN = 22.03
EX. 10" DIP INV OUT = 21.96

EX. 10" DIP SS (DWG. 17034)

PR. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT SANITARY SEWER INFRASTRUCTURE. ANY DAMAGES WILL BE REPAIRED/REPLACED AT THE CONTRACTOR'S EXPENSE.

TAX ID# 03-190-90041462
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
4.961 AC.

EX. FOREST CONSERVATION AREA (OPEN SPACE/RECREATIONAL AREA) PLAT: 33701

EX. FOREST CONSERVATION EASEMENT PLAT: 32749

EX. SWM FACILITY AND OUTFALL CHANNEL TO BE RETROFIT BY OTHERS*

EX. RIPRAP TO BE INSTALLED BY OTHERS*

EX. 15' SEWER EASEMENT (DWG 26779)

EX. HEADWALL TO BE INSTALLED BY OTHERS*

EX. TREE TO BE PROTECTED WITH PLANKING

*OUTFALL RETROFIT TO BE CONDUCTED PRIOR TO START OF CONSTRUCTION, UNDER SEPARATE CONTRACT

EX. SD MANHOLE TO BE INSTALLED BY OTHERS*

EX. SD RISER TO BE INSTALLED BY OTHERS*

EX. 36" RCP SD TO BE INSTALLED BY OTHERS*

EX. SS MANHOLE # 16461 (DWG. 17034) SS MH
TOP ELEV. = 25.40
EX. 10" DIP INV IN = 17.40
EX. 10" DIP INV OUT = 17.18

TAX ID# 03-000-04878490
GWS ASSETS LLC
8894 FT SMALLWOOD RD
T.M. 17 GRID 16 P. 95
DEED: 18087/182
3.80 AC.

TAX ID# 03-000-13860700
VINCENT R HEWITT SR
& JACQUELINE L HEWITT
8842 FORT SMALLWOOD RD
T.M. 17 GRID 16 P. 480
DEED: 4825/881
1.000 AC.

E 1,449,450
N 534,250

EX. TREELINE (TYP)

EX. EXPOSED SS MH

EX. BMP 1875

EX. BLDG

EX. DRIVEWAY

EX. PARKING LOT

EX. BLDG

EX. PARKING LOT

EX. 24" RCP SD

TAX ID# 03-241-90242954
ELIZABETH PLACE II HOA INC
OPEN SPACE#1/REC AREA#1/
FOREST CONSERV AREA
T.M. 17 GRID 16 P. 302
DEED: 30263/204
0.483 AC.

TRIBUTARY 1

PR. TRIBUTARY 1

EX. EPHEMERAL CHANNEL

EX. A.A.C.O. TYPE 'B' HEADWALL HW 3
TOP ELEV. = 45.45
EX. 21" RCP INV IN = 42.03

EX. 21" RCP SD

TAX ID# 03-241-90234207
ELIZABETH PLACE HOA INC
OPEN SPACE
T.M. 17 GRID 16 P. 94
DEED: 21259/402
PLAT: 32749
0.878 AC.

EX. PERPETUAL EASEMENT FOR DRAINAGE FACILITY PLAT: 32749

VMH-10
VMH-11
VMH-12
VMH-13
VMH-14
VMH-15
VMH-16
VMH-17

TR 14
TR 24
TR 28
TR 21
TR 28

12+50
13+00
13+50
14+00
14+50
15+00
15+50
16+00
16+50

SEDIMENT CONTROL LEGEND

- LIMIT OF DISTURBANCE — LOD —
- LOD/HIGH VISIBILITY FENCE — LOD — HVF —
- EX. 50' STREAM PROTECTION ZONE — SPZ —
- CWD PUMP AROUND/DEWATERING PIPE
- CONSTRUCTION ACCESS ROAD (SAND OR SAND/WOOD CHIP FILTER MEDIA)
- TREE PLANKING

NOTE:
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EROSION AND SEDIMENT CONTROL PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

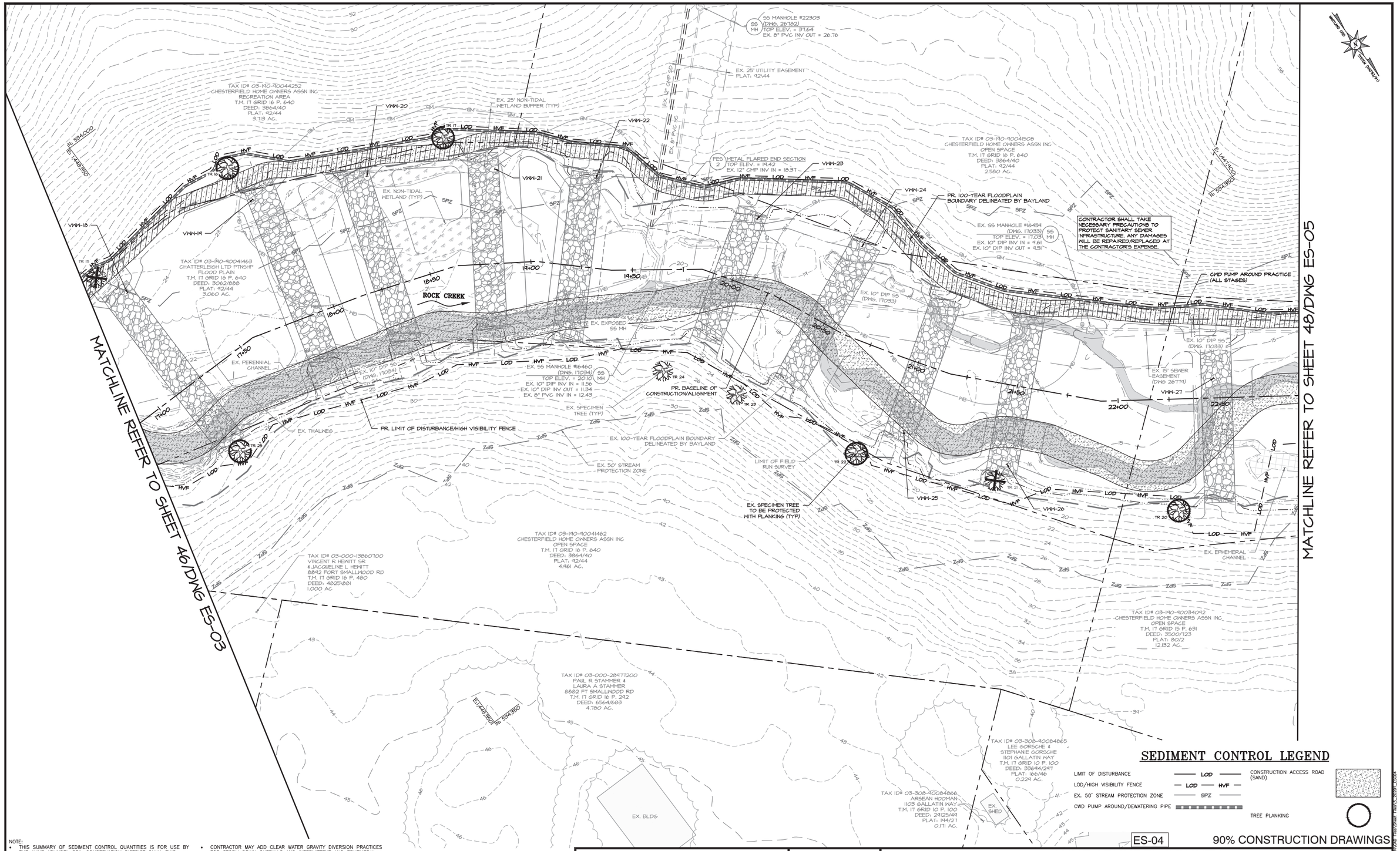
APPROVED DATE — CHIEF ENGINEER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY: CMS/SG	8/13/25
SHEET NO.	46 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
EROSION AND SEDIMENT CONTROL PLAN
COUNCIL DISTRICT 3

ES-03

90% CONSTRUCTION DRAWINGS



NOTE:

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- A TEMPORARY ACCESS CULVERT MAY BE USED IN PLACE OF A TEMPORARY ACCESS BRIDGE WITH COUNTY APPROVAL.

EROSION AND SEDIMENT CONTROL PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

SEDIMENT CONTROL LEGEND

- LIMIT OF DISTURBANCE — LOD
- LOD/HIGH VISIBILITY FENCE — LOD HVF
- EX. 50' STREAM PROTECTION ZONE — SPZ
- CWD PUMP AROUND/DEWATERING PIPE
- CONSTRUCTION ACCESS ROAD (SAND)
- TREE PLANKING

ES-04

90% CONSTRUCTION DRAWINGS

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	47 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
EROSION AND SEDIMENT CONTROL PLAN

COUNCIL DISTRICT 3

215_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\S_20201_ES04

SEDIMENT CONTROL LEGEND

LIMIT OF DISTURBANCE — LOD —
LOD/HIGH VISIBILITY FENCE — LOD — HVF —
EX. 50' STREAM PROTECTION ZONE — SPZ —
CWD PUMP AROUND/DEWATERING PIPE
CONSTRUCTION ACCESS ROAD (SAND)

MATCHLINE REFER TO SHEET 47/DWG ES-04

MATCHLINE REFER TO SHEET 49/DWG ES-06

CWD PUMP AROUND PRACTICE (ALL STAGES)

CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT SANITARY SEWER INFRASTRUCTURE. ANY DAMAGES WILL BE REPAIRED/REPLACED AT THE CONTRACTOR'S EXPENSE.

EX. SS MANHOLE #16457 (DWG. 17033) SS MH
TOP ELEV. = 13.68
EX. 12" DIP INV IN = 6.38
EX. 12" DIP INV OUT = 6.04

EX. SS MANHOLE #16458 (DWG. 17033) SS MH
TOP ELEV. = 14.45
EX. 10" DIP INV IN = 7.00
EX. 12" DIP INV OUT = 6.92

EX. SS MANHOLE #16456 (DWG. 17033) SS MH
TOP ELEV. = 12.82
EX. 12" DIP INV IN = 5.56
EX. 12" DIP INV OUT = 5.34

EX. SS MANHOLE #16455 (DWG. 17033) SS MH
TOP ELEV. = 11.09
EX. 12" DIP INV IN = 4.60
EX. 12" DIP INV OUT = 4.54

EX. SS MANHOLE #16454 (DWG. 17033) SS MH
TOP ELEV. = 10.55
EX. 12" DIP INV IN = 4.00
EX. 12" DIP INV OUT = 3.91

EX. 12" DIP SS (DWG. 17033)
EX. 10" DIP SS (DWG. 17033)
EX. 15' SEWER EASEMENT (DWG 26774)

VWH-28 VWH-29 VWH-30 VWH-31 VWH-32 VWH-33 VWH-34 VWH-35

PR. BASELINE OF CONSTRUCTION/ ALIGNMENT
PR. LIMIT OF DISTURBANCE/ HIGH VISIBILITY FENCE
PR. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND
EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND
EX. PERENNIAL CHANNEL
EX. INTERMITTENT CHANNEL (TYP)
EX. EPHEMERAL CHANNEL (TYP)
EX. 25' NON-TIDAL WETLAND BUFFER (TYP)
EX. NON-TIDAL WETLAND (TYP)
EX. 50' STREAM PROTECTION ZONE
EX. THALWEG
ROCK CREEK
LIMIT HVF
EX. LIMITED DEVELOPMENT/RESOURCE CONSERVATION CRITICAL AREA LIMIT
EX. LIMITED DEVELOPMENT CRITICAL AREA LIMIT
EX. SPECIMEN TREE (TYP)
TR 18
TR 19

N 534,400 E 1,447,850
N 534,100 E 1,447,850

TAX ID# 03-190-90034042
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

TAX ID# 03-190-90031259
ANNE ARUNDEL COUNTY
FLOOD PLAINS
T.M. 17 GRID 16 P. 631
DEED: 3443/371
PLAT: 80/2
6.041 AC.

TAX ID# 03-308-90084864
CHRISTOPHER M SMITH
& JENNIFER L SMITH
1100 GALLATIN WAY
T.M. 17 GRID 10 P. 100
DEED: 36349/201
PLAT: 166/46
0.142 AC.

TAX ID# 03-308-90084863
MARIA E. ALARD-PEREZ
1102 GALLATIN WAY
T.M. 17 GRID 10 P. 100
DEED: 14874/172
PLAT: 166/46
0.182 AC.

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- WETLAND PROTECTION MATTING SHALL BE USED IN PLACE OF MULCH CONSTRUCTION ACCESS ROAD WHEN CROSSING EXISTING WETLANDS AND UNDERGROUND UTILITIES.
- FOR EROSION AND SEDIMENT CONTROL DETAILS, SEE DWG ES-08/SHEET 51 AND DWG ES-09/SHEET 52.
- CONTRACTOR MAY ADD CLEAR WATER GRAVITY DIVERSION PRACTICES FOR STORM DRAIN OUTFALLS AND INTERMITTENT AND EPHEMERAL CHANNELS FOR SEASONAL/POST STORM FLOW AT NO ADDITIONAL COST TO THE COUNTY. CONTRACTOR MUST PROVIDE A STABLE DISCHARGE POINT FOR DIVERSION PRACTICES.
- CONTRACTOR MAY RELOCATE CONSTRUCTION ACCESS ROAD AND TEMPORARY CROSSINGS TO REDUCE IMPACTS WITH COUNTY APPROVAL.
- CONTRACTOR MAY INSTALL GRAVEL UNDERDRAIN WITH COUNTY APPROVAL WHERE ACCESS ROAD IS IN EX. CHANNEL.
- STOCKPILE MAX HEIGHT CANNOT EXCEED 15 FT. STOCKPILE MAX SLOPE CANNOT EXCEED 2:1.
- ROCK OUTLET PROTECTION IS NOT REQUIRED IF CWD PUMP AROUND PRACTICES DISCHARGE ON COMPLETED VWW STRUCTURE
- A TEMPORARY ACCESS CULVERT MAY BE USED IN PLACE OF A TEMPORARY ACCESS BRIDGE WITH COUNTY APPROVAL.

EROSION AND SEDIMENT CONTROL PLAN

SCALE: 1" = 20'

0 10 20 40
1 INCH = 20 FEET

BayLand Consultants & Designers, Inc.
"Integrating Engineering and Environment"
7455 New Ridge Road, Suite T Phone: (410) 694-9401
Hanover, Maryland 21076 Fax: (410) 694-9105
www.baylandinc.com
BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	48 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
EROSION AND SEDIMENT CONTROL PLAN
COUNCIL DISTRICT 3

ES-05 90% CONSTRUCTION DRAWINGS

MATCHLINE REFER TO SHEET 48/DWG ES-05

MATCHLINE REFER TO SHEET 50/DWG ES-07

TAX ID# 03-190-90034092
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

EX. LIMITED DEVELOPMENT/RESOURCE CONSERVATION CRITICAL AREA LIMIT (TYP)

LIMIT OF FIELD RUN SURVEY

EX. SS MANHOLE #16453 (DWG. 17033)
TOP ELEV. = 10.41
EX. 12" DIP INV IN = 3.50
EX. 12" DIP INV OUT = 3.31

EX. SS MANHOLE #14652 (DWG. 17032)
TOP ELEV. = 10.77
EX. 12" DIP INV IN = 1.30
EX. 12" DIP INV OUT = 1.01

EX. 12" DIP SS (DWG. 17033)

EX. 15' SEWER EASEMENT (DWG 26719)

MATS WITH 12" MULCH (TYP)

CONTRACTOR SHALL CLEAR MINIMUM AREA NECESSARY TO INSTALL STABLE CONSTRUCTION ACCESS ROAD.

CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT SANITARY SEWER INFRASTRUCTURE. ANY DAMAGES WILL BE REPAIRED/REPLACED AT THE CONTRACTOR'S EXPENSE.

TAX ID# 03-190-90031260
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/02
6.235 AC.

EX. SS MANHOLE #16451 (DWG. 17032)
TOP ELEV. = 6.31
EX. 12" DIP INV IN = -0.32
EX. 12" DIP INV OUT = -0.44

EX. 12" DIP SS (DWG. 17032)

CWD PUMP AROUND PRACTICE (ALL STAGES)

LIMIT HVF

EX. NON-TIDAL WETLAND (TYP)

VMH-37

VMH-36

VMH-35

MATS WITH 12" MULCH

ROCK CREEK

R6C-02

SANDBAG DIKE (ALL STAGES)

R6C-01

ROCK OUTLET PROTECTION (ALL STAGES)

DEWATERING PRACTICE (ALL STAGES)

EX. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

EX. 25' WETLAND BUFFER (TYP)

PR. LIMIT OF DISTURBANCE/ HIGH VISIBILITY FENCE

EX. 50' STREAM PROTECTION ZONE

EX. PERENNIAL CHANNEL (TYP)

PR. 100-YEAR FLOODPLAIN BOUNDARY DELINEATED BY BAYLAND

ZONE A SHFA SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD FIRM NO. 24003C0084F

TAX ID# 03-190-90034092
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

E: 1,447,350
N: 594,100

E: 1,448,900
N: 595,100

SEDIMENT CONTROL LEGEND

- LIMIT OF DISTURBANCE — LOD
- LOD/HIGH VISIBILITY FENCE — LOD — HVF
- EX. 50' STREAM PROTECTION ZONE — SPZ
- CWD PUMP AROUND/DEWATERING PIPE
- SANDBAG DIKE
- CWD PUMP AROUND/DEWATERING PUMP — P
- ROCK OUTLET PROTECTION
- MOUNTABLE BERM — MB
- FILTER BAG
- CONSTRUCTION ACCESS ROAD (SAND)
- CONSTRUCTION ACCESS ROAD (MATS WITH 12" MULCH)
- CONSTRUCTION ACCESS ROAD (6" MULCH)

NOTE:
- THIS SUMMARY OF SEDIMENT CONTROL QUANTITIES IS FOR USE BY THE ANNE ARUNDEL SOIL CONSERVATION DISTRICT ONLY. THIS SUMMARY IS NOT INTENDED TO BE USED BY THE CONTRACTOR FOR ESTIMATING AND BIDDING PURPOSES.
- NO DISTURBED AREA SHALL BE LEFT OVERNIGHT. STABILIZE ON DAILY BASIS USING TEMPORARY SEEDING.
- SANDBAG DIKES AND FILTER BAGS MAY BE REUSED AT CONTRACTOR'S DISCRETION.
- WETLAND PROTECTION MATTING SHALL BE USED IN PLACE OF MULCH CONSTRUCTION ACCESS ROAD WHEN CROSSING EXISTING WETLANDS AND UNDERGROUND UTILITIES.
- FOR EROSION AND SEDIMENT CONTROL DETAILS, SEE DWG ES-08/SHEET 51 AND DWG ES-09/SHEET 52.
- CONTRACTOR MAY ADD CLEAR WATER GRAVITY DIVERSION PRACTICES FOR STORM DRAIN OUTFALLS AND INTERMITTENT AND EPHEMERAL CHANNELS FOR SEASONAL/POST STORM FLOW AT NO ADDITIONAL COST TO THE COUNTY. CONTRACTOR MUST PROVIDE A STABLE DISCHARGE POINT FOR DIVERSION PRACTICES.
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- STOCKPILE MAX HEIGHT CANNOT EXCEED 15 FT. STOCKPILE MAX SLOPE CANNOT EXCEED 2:1.
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- A TEMPORARY ACCESS CULVERT MAY BE USED IN PLACE OF A TEMPORARY ACCESS BRIDGE WITH COUNTY APPROVAL.

EROSION AND SEDIMENT CONTROL PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED ____ DATE ____ CHIEF ENGINEER
APPROVED ____ DATE ____ PROJECT MANAGER
APPROVED ____ DATE ____ DEPUTY DIRECTOR
APPROVED ____ DATE ____ CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
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SHEET NO.	49 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
EROSION AND SEDIMENT CONTROL PLAN
COUNCIL DISTRICT 3

ES-06

90% CONSTRUCTION DRAWINGS

SEQUENCE OF CONSTUCTION

SEQUENCE OF CONSTRUCTION NOTES:

STREAM CLOSURE PERIOD FOR USE I STREAMS IN MARYLAND IS MARCH 1 – JUNE 15.

NOTIFY THE DEPARTMENT OF INSPECTIONS AND PERMITS (410–222–7780) AT LEAST 48 HOURS BEFORE COMMENCING WORK. WORK MAY NOT COMMENCE UNTIL THE PERMITTEE OR THE RESPONSIBLE PERSONNEL HAVE MET ON SITE WITH THE SEDIMENT AND EROSION CONTROL INSPECTOR TO REVIEW THE APPROVED PLANS.

LOD AND NON–TIDAL WETLANDS MUST BE FIELD MARKED PRIOR TO CLEARING OF TREES AND/OR OTHER LAND DISTURBANCES. THE APPROVAL OF THE EROSION AND SEDIMENT CONTROL INSPECTOR IS REQUIRED UPON INSTALLATION OF PERIMETER EROSION AND SEDIMENT CONTROLS, PRIOR TO PROCEEDING WITH ANY OTHER EARTH DISTURBANCES OR GRADING.

CLEAR THE MINIMUM AREA NECESSARY TO INSTALL SEDIMENT CONTROLS AND THE STAGING/LAYDOWN AREAS. MECHANICAL STABILIZATION WILL BE REQUIRED ON THE STAGING/LAYDOWN AREAS AND HEAVY USE AREAS, INCLUDING TRAVEL LANES. WOOD CHIPS MAY BE UTILIZED WITH APPROVAL FROM INSPECTIONS AND PERMITS.

INSTALL SEDIMENT CONTROL DEVICES ACCORDING TO THE STAGING OPERATIONS. ONCE SEDIMENT CONTROLS HAVE BEEN INSTALLED, CONTACT THE INSPECTOR FOR APPROVAL OF SEDIMENT CONTROL INSTALLATION PRIOR TO COMMENCING WORK; INSPECTIONS AND PERMITS MAY REQUIRE THAT AN INSPECTION AND CERTIFICATION OF THE INSTALLATION OF SEDIMENT CONTROL ALSO BE PERFORMED BY A DESIGN PROFESSIONAL PRIOR TO CONSTRUCTION COMMENCING.

WORK SHALL BE LIMITED TO AREAS THAT CAN BE COMPLETED AND STABILIZED AT THE END OF EACH WORKING DAY. NO UNSTABILIZED AREAS SHALL BE LEFT OVERNIGHT.

EXISTING TOPSOIL, SPOIL MATERIAL, STREAMBED MATERIAL AND ROCK SHALL BE SALVAGED AND STOCKPILED SEPARATELY ON SITE. UNSUITABLE MATERIAL SHALL BE DISPOSED OF BY THE CONTRACTOR.

WETLAND PROTECTION MATTING WITH A MINIMUM OF 12" OF MULCH SHOULD BE UTILIZED TO PROVIDE ACCESS ANYWHERE THE CONSTRUCTION ACCESS ROAD CROSSES OVER WETLANDS OR WHEN CROSSING WITHIN 5' OF OR DIRECTLY OVERTOP OF EXISTING UTILITIES.

STOCKPILE AREAS NOT TO EXCEED 15 FT IN HEIGHT OR HAVE SIDE SLOPES STEEPER THAN 2:1. IF ADDITIONAL STOCKPILE AREAS ARE NEEDED WITHIN THE EXISTING LIMIT OF DISTURBANCE, THE CONTRACTOR MUST GET APPROVAL FROM THE INSPECTOR AND WRAP THE STOCKPILES WITH FILTER LOGS OR REINFORCED SILT FENCE.

ONCE EACH AREA IS 95% STABILIZED AND WITH SEDIMENT CONTROL INSPECTOR'S APPROVAL, REMOVE ANY REMAINING EROSION AND SEDIMENT CONTROLS AND STABILIZE ANY AREAS DISTURBED WITH PERMANENT SEED MIX. IMMEDIATELY STABILIZE ANY DISTURBED AREAS THAT RESULT FROM THE REMOVAL OF THE EROSION AND SEDIMENT CONTROLS.

THE SEQUENCE OF CONSTRUCTION IS INTENDED TO CONVEY THE INSTALLATION OF SEDIMENT CONTROLS AND GENERAL INSTRUCTION TO THE CONTRACTOR. THE SEQUENCE MAY BE ADJUSTED IN THE FIELD WITH THE SEDIMENT CONTROL INSPECTOR'S PERMISSION TO ACCOMMODATE CONTRACTOR'S MEANS AND METHODS.

AREAS AND STAGES MAY BE CONSTRUCTED IN ANY ORDER, SEPARATELY OR CONCURRENTLY WITH WRITTEN APPROVAL FROM THE COUNTY.

PUMP AROUND PRACTICES SHALL CONSIST OF CLEAR WATER DIVERSION (CWD) AND DIRTY WATER (DEWATERING) PUMP AROUND SETUPS, SUMP PITS (IF REQUIRED), SANDBAG DIVERSIONS (DIKES), VELOCITY DISSIPATERS (ROCK OUTLET PROTECTION), FILTER BAGS, AND HOSES AND ALL ITEMS NECESSARY TO PERFORM PUMP AROUND OPERATIONS AS SPECIFIED ON THE CONTRACT DOCUMENTS.

PUMP AROUND PRACTICE COMPONENTS THAT ARE SHOWN ON THE CONTRACT DRAWINGS SHALL BE FIELD LOCATED BY THE CONTRACTOR AND ARE SHOWN ON THE CONTRACT DRAWINGS TO ILLUSTRATE THE POTENTIAL ALIGNMENT AND PLACEMENT ONLY. STREAM PUMP AROUNDS MUST BE INSTALLED TO DIVERT STREAM FLOW AROUND THE WORK AREA AND ISOLATE THE WORK AREA FROM STREAM FLOW.

THE HAUL ROAD SHOWN ILLUSTRATES THE POTENTIAL ALIGNMENT ONLY. THE HAUL ROAD LOCATION MAY BE FIELD ADJUSTED WITHIN THE LIMITS OF DISTURBANCE WITH THE APPROVAL OF THE SEDIMENT CONTROL INSPECTOR.

OVERALL	OVERALL APPROXIMATE DAYS (BY STAGE)
1. DEMARCATE LOD, NON–TIDAL WETLANDS TO BE PROTECTED, AND TREES TO BE PROTECTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.	4
2. INSTALL TREE PROTECTION FENCING AND/OR TREE PLANKING AT THE LOCATIONS SHOWN ON THE PLANS AND/OR AS DIRECTED BY THE COUNTY.	2
3. INSTALL STABILIZED CONSTRUCTION ENTRANCE #1 OFF HOG NECK RD AND MOT CONTROLS INCLUDING SIGNAGE.	1
4. INSTALL STABILIZED CONSTRUCTION ENTRANCES #2 AND #3 OFF SALTWOOD GLEN AND MOT CONTROLS INCLUDING SIGNAGE.	1
5. INSTALL HIGH VISIBILITY FENCE AS INDICATED ON THE CONSTRUCTION DRAWINGS.	7
6. CLEAR AND GRUB THE MINIMUM AREA REQUIRED FOR THE INSTALLATION OF STOCKPILE/STAGING AREAS #1 & #2 AND SEDIMENT CONTROL DEVICES REQUIRED FOR STOCKPILE/STAGING AREAS #1 & #2, INCLUDING REINFORCED SILT FENCE, WETLAND PROTECTION MATTING, AND MOUNTABLE BERMS. IMMEDIATELY STABILIZE ANY DISTURBED AREA.	4
7. INSTALL CLEAR WATER DIVERSION (CWD) PUMP AROUND PRACTICES AND DEWATERING PRACTICES REQUIRED TO ISOLATE THE MAIN STEM FROM STREAM FLOW AND DEWATER THE WORK AREA, INCLUDING SAND BAG DIKES, ROCK OUTLET PROTECTION, DEWATERING/DIVERSION PUMPS AND PIPES, FILTER BAGS AND IF REQUIRED, SUMP PITS. USE AND RELOCATE AS NEEDED TO COMPLETE PROPOSED WORK. ROCK OUTLET PROTECTION IS NOT REQUIRED IF CWD PUMP AROUND PRACTICES DISCHARGE ON COMPLETED VALLEY WIDE WEIR STRUCTURES.	4
8. INSTALL THE CONSTRUCTION ACCESS ROAD (EXCEPT FOR THE PORTION OF THE ROAD IN TRIBUTARY 1), STOCKPILE/STAGING AREAS #1 & #2, AND SEDIMENT CONTROL DEVICES REQUIRED FOR STOCKPILE/STAGING AREAS #1 & #2 INCLUDING REINFORCED SILT FENCE, WETLAND PROTECTION MATTING, AND MOUNTABLE BERMS. IMMEDIATELY STABILIZE ANY DISTURBED AREA.	5
9. CONTACT THE INSPECTOR FOR APPROVAL OF SEDIMENT CONTROL INSTALLATION. INSPECTIONS AND PERMITS MAY REQUIRE THAT AN INSPECTION AND CERTIFICATION OF THE INSTALLATION OF SEDIMENT CONTROLS ALSO BE PERFORMED BY A DESIGN PROFESSIONAL PRIOR TO CONSTRUCTION COMMENCING.	1
SUBTOTAL DAYS: 29	

STAGE 1 (TRIBUTARY 1, APPROXIMATELY STA 50+30 TO APPROXIMATELY STA 53+60)	STAGE 1 APPROXIMATE DAYS (BY STAGE)
1. INSTALL THE HAUL ROAD IN THE CHANNEL OF TRIBUTARY 1.	4
2. ONCE APPROVAL HAS BEEN OBTAINED FROM THE INSPECTOR, COMPLETE PROPOSED WORK IN STAGE 1 INCLUDING EARTHWORK OPERATIONS AND INSTALLATION OF PROPOSED STRUCTURES. INSTALL WOOD IN POOLS AND THE FLOODPLAIN AT THE DIRECTION OF THE COUNTY.	7
3. AFTER THE AREA HAS BEEN STABILIZED AND WITH APPROVAL FROM THE SEDIMENT CONTROL NSPECTOR, SHUTDOWN AND REMOVE/RELOCATE DEWATERING PRACTICES AS NEEDED.	1
4. COMPLETE STABILIZATION IN ACCORDANCE WITH THE PLANS.	2
SUBTOTAL DAYS: 14	

STAGE 2 (MAIN STEM, APPROXIMATELY STA 5+50 TO APPROXIMATELY STA 32+80)	STAGE 2 APPROXIMATE DAYS (BY STAGE)
1. ONCE APPROVAL HAS BEEN OBTAINED FROM THE INSPECTOR, COMPLETE PROPOSED WORK IN STAGE 2 INCLUDING EARTHWORK OPERATIONS AND INSTALLATION OF PROPOSED STRUCTURES. REMOVE THE HAUL ROAD AS NEEDED TO COMPLETE PROPOSED GRADING IN ACCORDANCE WITH THE PLANS. INSTALL WOOD IN POOLS AND THE FLOODPLAIN AT THE DIRECTION OF THE COUNTY.	57
2. AFTER THE AREA HAS BEEN STABILIZED AND WITH APPROVAL FROM THE SEDIMENT CONTROL INSPECTOR, SHUTDOWN AND REMOVE/RELOCATE CWD PUMP AROUND AND DEWATERING PRACTICES AS NEEDED.	1
3. COMPLETE PERMANENT STABILIZATION IN ACCORDANCE WITH THE PLANS. INSTALL PLANT MATERIAL AS INDICATED ON THE PLANTING PLAN.*	10
SUBTOTAL DAYS: 68	
TOTAL DAYS: 111	

NOTES:
1. ONCE AREA IS 95% STABILIZED AND WITH SEDIMENT CONTROL INSPECTOR APPROVAL, REMOVE ANY REMAINING EROSION AND SEDIMENT CONTROL AND STABILIZE ANY AREAS DISTURBED. REMOVE STABILIZED CONSTRUCTION ENTRANCES AND MOT DEVICES. RESTORE PAVEMENT TO EQUAL OR BETTER THAN PRE–CONSTRUCTION CONDITIONS.
2. *ALL PLANT MATERIAL CAN BE INSTALLED AFTER CONSTRUCTION IS COMPETE USING LOW DISTURBANCE METHODS. ANY AREAS DISTURBED DURING PLANTING SHALL BE IMMEDIATELY STABILIZED. PLANTINGS MUST ALSO OCCUR DURING THE APPROPRIATE CALENDAR PERIOD AS SPECIFIED ON THE PLANS.

SEDIMENT CONTROL LEGEND

LIMIT OF DISTURBANCE — LOD

LOD/HIGH VISIBILITY FENCE — LOD — HVF —

REINFORCED SILT FENCE — RSF —

CWD PUMP AROUND/DEWATERING PIPE

CWD PUMP AROUND/DEWATERING PUMP [P]

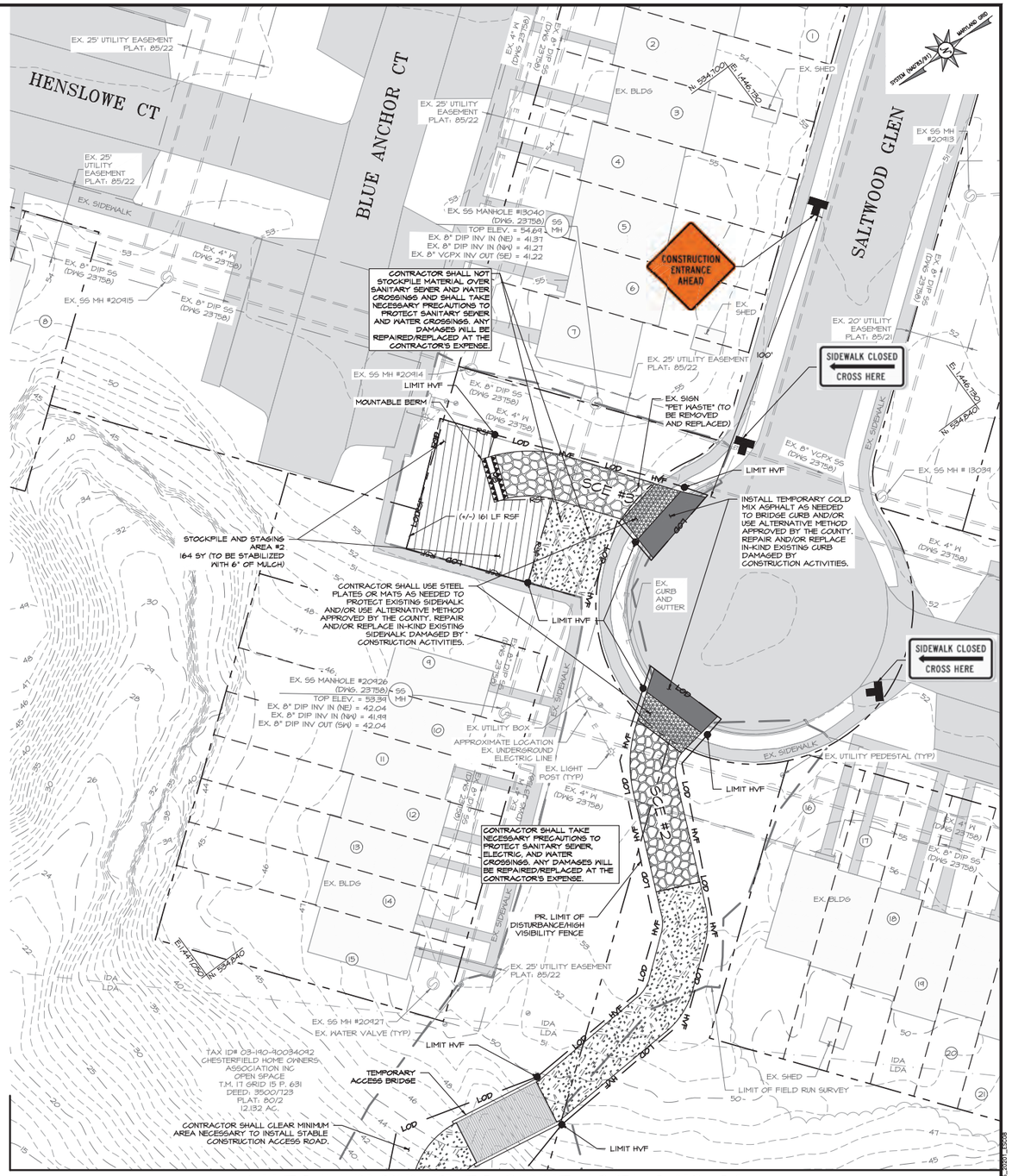
STABILIZED CONSTRUCTION ENTRANCE SCE

CONSTRUCTION ACCESS ROAD (MULCH)

MOUNTABLE BERM

TEMPORARY SIGN

TEMPORARY ACCESS BRIDGE


HENSLOWE CT
BLUE ANCHOR CT
SALTWOOD GLEN
EX. 25' UTILITY EASEMENT PLAT: 85/22
EX. SHED
EX. BLDG
EX. 55 MH #20913
EX. 55 MANHOLE #13040 (DWG. 23758)
TOP ELEV. = 54.68
EX. 8" DIP INV IN (NE) = 41.31
EX. 8" DIP INV IN (NW) = 41.27
EX. 8" VCPX INV OUT (SE) = 41.22
CONSTRUCTION ENTRANCE AHEAD
CONTRACTOR SHALL NOT STOCKPILE MATERIAL OVER SANITARY SEWER AND WATER CROSSINGS AND SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT SANITARY SEWER AND WATER CROSSINGS. ANY DAMAGES WILL BE REPAIRED/REPLACED AT THE CONTRACTOR'S EXPENSE.
EX. 20' UTILITY EASEMENT PLAT: 85/21
SIDEWALK CLOSED CROSS HERE
EX. 55 MH #20914
LIMIT HVF
MOUNTABLE BERM
EX. SIGN "PET WASTE" (TO BE REMOVED AND REPLACED)
EX. 8" VCPX 55 (DWG 23758)
EX. 55 MH # 13039
INSTALL TEMPORARY COLD MIX ASPHALT AS NEEDED TO BRIDGE CURB AND/OR USE ALTERNATIVE METHOD APPROVED BY THE COUNTY. REPAIR AND/OR REPLACE IN-KIND EXISTING CURB DAMAGED BY CONSTRUCTION ACTIVITIES.
STOCKPILE AND STAGING AREA #2 164 SY (TO BE STABILIZED WITH 6" OF MULCH)
(+/-) 161 LF RSF
CONTRACTOR SHALL USE STEEL PLATES OR MATS AS NEEDED TO PROTECT EXISTING SIDEWALK AND/OR USE ALTERNATIVE METHOD APPROVED BY THE COUNTY. REPAIR AND/OR REPLACE IN-KIND EXISTING SIDEWALK DAMAGED BY CONSTRUCTION ACTIVITIES.
EX. CURB AND GUTTER
EX. 55 MANHOLE #20926 (DWG. 23758)
TOP ELEV. = 53.34
EX. 8" DIP INV IN (NE) = 42.04
EX. 8" DIP INV IN (NW) = 41.98
EX. 8" DIP INV OUT (SW) = 42.04
EX. UTILITY BOX APPROXIMATE LOCATION EX. UNDERGROUND ELECTRIC LINE
EX. LIGHT POST (TYP)
EX. SIDEWALK
EX. UTILITY PEDESTAL (TYP)
CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT SANITARY SEWER, ELECTRIC, AND WATER CROSSINGS. ANY DAMAGES WILL BE REPAIRED/REPLACED AT THE CONTRACTOR'S EXPENSE.
PR. LIMIT OF DISTURBANCE/HIGH VISIBILITY FENCE
EX. BLDG
EX. 25' UTILITY EASEMENT PLAT: 85/22
EX. 55 MH #20927
EX. WATER VALVE (TYP)
TAX ID# 03-190-90034042
CHESTERFIELD HOME OWNERS ASSOCIATION INC
OPEN SPACE
T.M. 17 GRID 15 P. 681
DEED: 3500/123
PLAT: 80/2
12.132 AC.
TEMPORARY ACCESS BRIDGE
CONTRACTOR SHALL CLEAR MINIMUM AREA NECESSARY TO INSTALL STABLE CONSTRUCTION ACCESS ROAD.
EX. SHED
LIMIT OF FIELD RUN SURVEY
EX. 4" W (DWG 23758)
EX. 8" DIP 55 (DWG 23758)
EX. 8" DIP 56 (DWG 23758)
EX. 55 MH #20915
EX. 4" W (DWG 23758)
EX. 8" DIP 55 (DWG 23758)
EX. 8" DIP 55 (DWG 23758)
EX. 4" W (DWG 23758)
EX. 4" W (DWG 23758)
EX. 8" DIP 55

STANDARDS AND SPECIFICATIONS FOR SOIL PREPARATION, TOPSOILING, AND SOIL AMENDMENTS

A. SOIL PREPARATION

1. TEMPORARY STABILIZATION
   a. SEEDBED PREPARATION CONSISTS OF LOOSENING SOIL TO A DEPTH OF 3 TO 5 INCHES BY MEANS OF SUITABLE AGRICULTURAL OR CONSTRUCTION EQUIPMENT, SUCH AS DISK HARROWS OR CHISEL PLOWS OR RIPPERS MOUNTED ON CONSTRUCTION EQUIPMENT. AFTER THE SOIL IS LOOSENED, IT MUST NOT BE ROLLED OR DRAGGED SMOOTH BUT LEFT IN THE ROUGHENED CONDITION. SLOPES 3:1 OR FLATTER ARE TO BE TRACKED WITH RIDGES RUNNING PARALLEL TO THE CONTOUR OF THE SLOPE.
   b. APPLY FERTILIZER AND LIME AS PRESCRIBED ON THE PLANS.
   c. INCORPORATE LIME AND FERTILIZER INTO THE TOP 3 TO 5 INCHES OF SOIL BY DISKING OR OTHER SUITABLE MEANS.

2. PERMANENT STABILIZATION
   a. A SOIL TEST IS REQUIRED FOR ANY EARTH DISTURBANCE OF 5 ACRES OR MORE. THE MINIMUM SOIL CONDITIONS REQUIRED FOR PERMANENT VEGETATIVE ESTABLISHMENT ARE:
   i. SOIL PH BETWEEN 6.0 AND 7.0.
   ii. SOLUBLE SALTS LESS THAN 500 PARTS PER MILLION (PPM).
   iii. SOIL CONTAINS LESS THAN 40 PERCENT CLAY BUT ENOUGH FINE GRAINED MATERIAL (GREATER THAN 30 PERCENT SILT PLUS CLAY) TO PROVIDE THE CAPACITY TO HOLD A MODERATE AMOUNT OF MOISTURE. AN EXCEPTION: IF LOVEGRASS WILL BE PLANTED, THEN A SANDY SOIL (LESS THAN 30 PERCENT SILT PLUS CLAY) WOULD BE ACCEPTABLE.
   iv. SOIL CONTAINS 1.5 PERCENT MINIMUM ORGANIC MATTER BY WEIGHT.
   v. SOIL CONTAINS SUFFICIENT PORE SPACE TO PERMIT ADEQUATE ROOT PENETRATION.
   b. APPLICATION OF AMENDMENTS OR TOPSOIL IS REQUIRED IF ON-SITE SOILS DO NOT MEET THE ABOVE CONDITIONS.
   c. GRADED AREAS MUST BE MAINTAINED IN A TRUE AND EVEN GRADE AS SPECIFIED ON THE APPROVED PLAN, THEN SCARIFIED OR OTHERWISE LOOSENED TO A DEPTH OF 3 TO 5 INCHES.
   d. APPLY SOIL AMENDMENTS AS SPECIFIED ON THE APPROVED PLAN OR AS INDICATED BY THE RESULTS OF A SOIL TEST.
   e. MIX SOIL AMENDMENTS INTO THE TOP 3 TO 5 INCHES OF SOIL BY DISKING OR OTHER SUITABLE MEANS. RAKE LAWN AREAS TO SMOOTH THE SURFACE, REMOVE LARGE OBJECTS LIKE STONES AND BRANCHES, AND READY THE AREA FOR SEED APPLICATION. LOOSEN SURFACE SOIL BY DRAGGING WITH A HEAVY CHAIN OR OTHER EQUIPMENT TO ROUGHEN THE SURFACE WHERE SITE CONDITIONS WILL NOT PERMIT NORMAL SEEDBED PREPARATION. TRACK SLOPES 3:1 OR FLATTER WITH TRACKED EQUIPMENT LEAVING THE SOIL IN AN IRREGULAR CONDITION WITH RIDGES RUNNING PARALLEL TO THE CONTOUR OF THE SLOPE. LEAVE THE TOP 1 TO 3 INCHES OF SOIL LOOSE AND FRIABLE. SEEDBED LOOSENING MAY BE UNNECESSARY ON NEWLY DISTURBED AREAS.

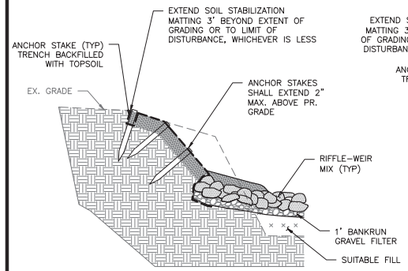
B. TOPSOILING

1. TOPSOIL IS PLACED OVER PREPARED SUBSOIL PRIOR TO ESTABLISHMENT OF PERMANENT VEGETATION. THE PURPOSE IS TO PROVIDE A SUITABLE SOIL MEDIUM FOR VEGETATIVE GROWTH. SOILS OF CONCERN HAVE LOW MOISTURE CONTENT, LOW NUTRIENT LEVELS, LOW PH, MATERIALS TOXIC TO PLANTS, AND/OR UNACCEPTABLE SOIL GRADATION.
2. TOPSOIL SALVAGED FROM AN EXISTING SITE MAY BE USED PROVIDED IT MEETS THE STANDARDS AS SET FORTH IN THESE SPECIFICATIONS. TYPICALLY, THE DEPTH OF TOPSOIL TO BE SALVAGED FOR A GIVEN SOIL TYPE CAN BE FOUND IN THE REPRESENTATIVE SOIL PROFILE SECTION IN THE SOIL SURVEY PUBLISHED BY USDA-NRCS.
3. TOPSOILING IS LIMITED TO AREAS HAVING 2:1 OR FLATTER SLOPES WHERE:
   a. THE TEXTURE OF THE EXPOSED SUBSOIL/PARENT MATERIAL IS NOT ADEQUATE TO PRODUCE VEGETATIVE GROWTH.
   b. THE SOIL MATERIAL IS SO SHALLOW THAT THE ROOTING ZONE IS NOT DEEP ENOUGH TO SUPPORT PLANTS OR FURNISH CONTINUING SUPPLIES OF MOISTURE AND PLANT NUTRIENTS.
   c. THE ORIGINAL SOIL TO BE VEGETATED CONTAINS MATERIAL TOXIC TO PLANT GROWTH.
   d. THE SOIL IS SO ACIDIC THAT TREATMENT WITH LIMESTONE IS NOT FEASIBLE.
4. AREAS HAVING SLOPES STEEPER THAN 2:1 REQUIRE SPECIAL CONSIDERATION AND DESIGN.
5. TOPSOIL SPECIFICATIONS: SOIL TO BE USED AS TOPSOIL MUST MEET THE FOLLOWING CRITERIA:
   a. TOPSOIL MUST BE A LOAM, SANDY LOAM, CLAY LOAM, SILT LOAM, SANDY CLAY LOAM, OR LOAMY SAND. OTHER SOILS MAY BE USED IF RECOMMENDED BY AN AGRONOMIST OR SOIL SCIENTIST AND APPROVED BY THE APPROPRIATE APPROVAL AUTHORITY. TOPSOIL MUST NOT BE A MIXTURE OF CONTRASTING TEXTURED SUBSOILS AND MUST CONTAIN LESS THAN 5 PERCENT BY VOLUME OF CINDERS, STONES, SLAG, COARSE FRAGMENTS, GRAVEL, STICKS, ROOTS, TRASH, OR OTHER MATERIALS LARGER THAN 1½ INCHES IN DIAMETER.
   b. TOPSOIL MUST BE FREE OF NOXIOUS PLANTS OR PLANT PARTS SUCH AS BERMUDA GRASS, QUACK GRASS, JOHNSON GRASS, NUT SEDGE, POISON IVY, THISTLE, OR OTHERS AS SPECIFIED.
   c. TOPSOIL SUBSTITUTES OR AMENDMENTS, AS RECOMMENDED BY A QUALIFIED AGRONOMIST OR SOIL SCIENTIST AND APPROVED BY THE APPROPRIATE APPROVAL AUTHORITY, MAY BE USED IN LIEU OF NATURAL TOPSOIL.
6. TOPSOIL APPLICATION
   a. EROSION AND SEDIMENT CONTROL PRACTICES MUST BE MAINTAINED WHEN APPLYING TOPSOIL.
   b. UNIFORMLY DISTRIBUTE TOPSOIL IN A 5 TO 8 INCH LAYER AND LIGHTLY COMPACT TO A MINIMUM THICKNESS OF 4 INCHES. SPREADING IS TO BE PERFORMED IN SUCH A MANNER THAT SODDING OR SEEDING CAN PROCEED WITH A MINIMUM OF ADDITIONAL SOIL PREPARATION AND TILLAGE. ANY IRREGULARITIES IN THE SURFACE RESULTING FROM TOPSOILING OR OTHER OPERATIONS MUST BE CORRECTED IN ORDER TO PREVENT THE FORMATION OF DEPRESSIONS OR WATER POCKETS.
   c. TOPSOIL MUST NOT BE PLACED IF THE TOPSOIL OR SUBSOIL IS IN A FROZEN OR MUDDY CONDITION, WHEN THE SUBSOIL IS EXCESSIVELY WET OR IN A CONDITION THAT MAY OTHERWISE BE DETRIMENTAL TO PROPER GRADING AND SEEDBED PREPARATION.

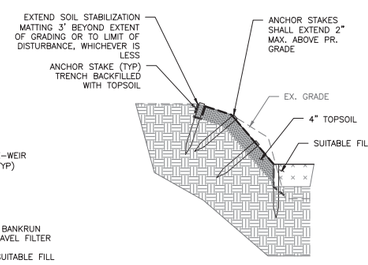
C. SOIL AMENDMENTS (FERTILIZER AND LIME SPECIFICATIONS)

1. SOIL TESTS MUST BE PERFORMED TO DETERMINE THE EXACT RATIOS AND APPLICATION RATES FOR BOTH LIME AND FERTILIZER ON SITES HAVING DISTURBED AREAS OF 5 ACRES OR MORE. SOIL ANALYSIS MAY BE PERFORMED BY A RECOGNIZED PRIVATE OR COMMERCIAL LABORATORY. SOIL SAMPLES TAKEN FOR ENGINEERING PURPOSES MAY ALSO BE USED FOR CHEMICAL ANALYSES.
2. FERTILIZERS MUST BE UNIFORM IN COMPOSITION, FREE FLOWING AND SUITABLE FOR ACCURATE APPLICATION BY APPROPRIATE EQUIPMENT. MANURE MAY BE SUBSTITUTED FOR FERTILIZER WITH PRIOR APPROVAL FROM THE APPROPRIATE APPROVAL AUTHORITY. FERTILIZERS MUST ALL BE DELIVERED TO THE SITE FULLY LABELED ACCORDING TO THE APPLICABLE LAWS AND MUST BEAR THE NAME, TRADE NAME OR TRADEMARK AND WARRANTY OF THE PRODUCER.
3. LIME MATERIALS MUST BE GROUND LIMESTONE (HYDRATED OR BURNT LIME MAY BE SUBSTITUTED EXCEPT WHEN HYDROSEEDING) WHICH CONTAINS AT LEAST 50 PERCENT TOTAL OXIDES (CALCIUM OXIDE PLUS MAGNESIUM OXIDE). LIMESTONE MUST BE GROUND TO SUCH FINENESS THAT AT LEAST 50 PERCENT WILL PASS THROUGH A #100 MESH SIEVE AND 98 TO 100 PERCENT WILL PASS THROUGH A #20 MESH SIEVE.
4. LIME AND FERTILIZER ARE TO BE EVENLY DISTRIBUTED AND INCORPORATED INTO THE TOP 3 TO 5 INCHES OF SOIL BY DISKING OR OTHER SUITABLE MEANS.
5. WHERE THE SUBSOIL IS EITHER HIGHLY ACIDIC OR COMPOSED OF HEAVY CLAYS, SPREAD GROUND LIMESTONE AT THE RATE OF 4 TO 8 TONS/ACRE (200-400 POUNDS PER 1,000 SQUARE FEET) PRIOR TO THE PLACEMENT OF TOPSOIL.

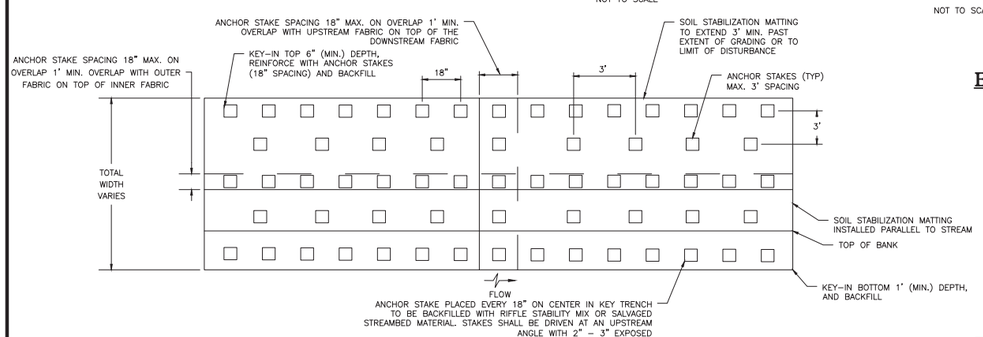
NOTE (MODIFICATION OF STANDARDS AND SPECIFICATIONS FOR SOIL PREPARATION, TOPSOILING, AND SOIL AMENDMENTS 6b): IRREGULARITIES IN THE SURFACE SHALL BE ALLOWED WITHIN REAS DESIGNATED FOR FLOODPLAIN MICROTOPOGRAPHY.



TYPICAL SECTION VIEW
NOT TO SCALE



TYPICAL SECTION VIEW
(NON-WEIR AREAS)
NOT TO SCALE



NOTES:
1. ALL SLOPES GREATER THAN 3:1 AND/OR ADDITIONAL AREAS AT THE COUNTY'S DIRECTION SHALL BE STABILIZED WITH 4 INCHES OF TOPSOIL AND SOIL STABILIZATION MATTING INSTEAD OF TOPSOIL.
2. SOIL STABILIZATION MATTING SHALL BE A BIODEGRADABLE WOVEN MATTING OF COIR MADE FROM HIGH STRENGTH COCONUT FIBER.
3. SOIL STABILIZATION MATTING SHALL BE A MINIMUM OF 0.35 INCHES THICK, WITH A MINIMUM WEIGHT OF 20.6 OUNCES PER SQUARE YARD.
4. AREAS TO BE COVERED WITH SOIL STABILIZATION MATTING SHALL BE RAKED TO GRADE, AND ANY ROCKS OR OTHER DEBRIS LARGER THAN 2 IN. SHALL BE REMOVED. SEEDING SHALL BE APPLIED PER THE MIXES AND RATES SPECIFIED ON THE PLANS, AND STRAW MULCH SHALL BE PLACED IMMEDIATELY AFTER SEEDING.

PLAN VIEW
NOT TO SCALE

SOIL STABILIZATION MATTING DETAILS

NOT TO SCALE

ANNE ARUNDEL SOIL CONSERVATION DISTRICT DETAILS AND SPECIFICATIONS FOR VEGETATIVE ESTABLISHMENT

FOLLOWING INITIAL SOIL DISTURBANCES OR REDISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN THREE CALENDAR DAYS FOR THE SURFACE OF ALL PERIMETER CONTROLS, DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND ALL SLOPES GREATER THAN 3 HORIZONTAL TO 1 VERTICAL (3:1) AND SEVEN DAYS FOR ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.

1. PERMANENT SEEDING:

A. SOIL TESTS: LIME AND FERTILIZER WILL BE APPLIED PER SOIL TESTS RESULTS FOR SITES GREATER THAN 5 ACRES. SOIL TESTS WILL BE DONE AT COMPLETION OF INITIAL ROUGH GRADING OR AS RECOMMENDED BY THE SEDIMENT CONTROL INSPECTOR. RATES AND ANALYSES WILL BE PROVIDED TO THE GRADING INSPECTOR AS WELL AS THE CONTRACTOR.

OCCURRENCE OF ACID SULFATE SOILS (GRAYISH BLACK COLOR) WILL REQUIRE COVERING WITH A MINIMUM OF 12 INCHES OF CLEAN SOIL WITH 6 INCHES MINIMUM CAPPING OF TOP SOIL. NO STOCKPILING OF MATERIAL IS ALLOWED. IF NEEDED, SOIL TESTS SHOULD BE DONE BEFORE AND AFTER A 6-WEEK INCUBATION PERIOD TO ALLOW OXIDATION OF SULFATES.

THE MINIMUM SOIL CONDITIONS REQUIRED FOR PERMANENT VEGETATIVE ESTABLISHMENT ARE:

a. SOIL PH SHALL BE BETWEEN 6.0 AND 7.0.
b. SOLUBLE SALTS SHALL BE LESS THAN 500 PARTS PER MILLION (PPM).
c. THE SOIL SHALL CONTAIN LESS THAN 40% CLAY BUT ENOUGH FINE GRAINED MATERIAL (> 30% SILT PLUS CLAY) TO PROVIDE THE CAPACITY TO HOLD A MODERATE AMOUNT OF MOISTURE. AN EXCEPTION IS IF LOVEGRASS OR SERECIA LESPEDEZA IS TO BE PLANTED, THEN A SANDY SOIL (< 30% SILT PLUS CLAY) WOULD BE ACCEPTABLE.
d. SOIL SHALL CONTAIN 1.5% MINIMUM ORGANIC MATTER BY WEIGHT.
e. SOIL MUST CONTAIN SUFFICIENT PORE SPACE TO PERMIT ADEQUATE ROOT PENETRATION.
f. IF THESE CONDITIONS CANNOT BE MET BY SOILS ON SITE, ADDING TOPSOIL IS REQUIRED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SOIL PREPARATION, TOPSOILING AND SOIL AMENDMENTS FROM THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL OR AMENDMENTS MADE AS RECOMMENDED BY A CERTIFIED AGRONOMIST.

B. SEEDBED PREPARATION: AREA TO BE SEEDED SHALL BE LOOSE AND FRIABLE TO A DEPTH OF AT LEAST 3-5 INCHES. THE TOP LAYER SHALL BE LOOSENED BY RAKING, DISKING OR OTHER ACCEPTABLE MEANS BEFORE SEEDING OCCURS. FOR SITES LESS THAN 5 ACRES, APPLY 100 POUNDS DOLOMITIC LIMESTONE AND 21 POUNDS OF 10-10-10 FERTILIZER PER 1,000 SQUARE FEET. APPLY DISK LIME AND FERTILIZER INTO THE SOIL TO A DEPTH OF AT LEAST 3-5 INCHES ON SLOPES FLATTER THAN 3:1.

C. SEEDING: APPLY 5-6 POUNDS PER 1,000 SQUARE FEET OF TALL FESCUE BETWEEN FEBRUARY 1 AND APRIL 30 OR BETWEEN AUGUST 15 AND OCTOBER 31. APPLY SEED UNIFORMLY ON A MOIST FIRM SEEDBED WITH A CYCLONE SEEDER, CULTIPACKER SEEDER OR HYDROSEEDER (SLURRY INCLUDES SEEDS AND FERTILIZER, RECOMMENDED ON STEEP SLOPES ONLY). MAXIMUM SEED DEPTH SHOULD BE 1/4 INCH IN CLAYEY SOILS AND 1/2 INCH IN SANDY SOILS WHEN USING OTHER THAN THE HYDROSEEDER METHOD. IRRIGATE WHERE NECESSARY TO SUPPORT ADEQUATE GROWTH UNTIL VEGETATION IS FIRMLY ESTABLISHED. IF OTHER SEED MIXES ARE TO BE USED, SELECT FROM TABLE B3 AND B5 OF THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL.

D. MULCHING: MULCH SHALL BE APPLIED TO ALL SEEDED AREAS IMMEDIATELY AFTER SEEDING. DURING THE TIME PERIODS WHEN SEEDING IS NOT PERMITTED, MULCH SHALL BE APPLIED IMMEDIATELY AFTER GRADING. MULCH SHALL BE UNROTTED, UNCHOPPED, SMALL GRAIN STRAW APPLIED AT A RATE OF 2 TONS PER ACRE OR 90 POUNDS PER 1,000 SQUARE FEET (2 BALES). APPLY MULCH TO ACHIEVE A UNIFORM DISTRIBUTION AND DEPTH SO THAT THE SOIL SURFACE IS NOT EXPOSED. IF A MULCH-ANCHORING TOOL IS USED, APPLY 2.5 TONS PER ACRE. MULCH MATERIALS SHALL BE RELATIVELY FREE OF ALL KINDS OF WEEDS AND SHALL BE COMPLETELY FREE OF PROHIBITED NOXIOUS WEEDS. SPREAD MULCH UNIFORMLY, MECHANICALLY OR BY HAND, TO A DEPTH OF 1-2 INCHES.

E. SECURING STRAW MULCH: STRAW MULCH SHALL BE SECURED IMMEDIATELY FOLLOWING MULCH APPLICATION TO MINIMIZE MOVEMENT BY WIND OR WATER. THE FOLLOWING METHODS ARE PERMITTED:

i. USE A MULCH-ANCHORING TOOL WHICH IS DESIGNED TO PUNCH AND ANCHOR MULCH INTO THE SOIL SURFACE TO A MINIMUM DEPTH OF 2 INCHES. THIS IS THE MOST EFFECTIVE METHOD FOR SECURING MULCH, HOWEVER, IT IS LIMITED TO RELATIVELY FLAT AREAS WHERE EQUIPMENT CAN OPERATE SAFELY.
ii. WOOD CELLULOSE FIBER MAY BE USED FOR ANCHORING STRAW. APPLY THE FIBER BINDER AT A NET DRY WEIGHT OF 750 POUNDS PER ACRE. IF MIXED WITH WATER, USE 50 POUNDS OF WOOD CELLULOSE FIBER PER 100 GALLONS OF WATER.
iii. LIQUID BINDERS MAY BE USED. APPLY AT HIGHER RATES AT THE EDGES WHERE WIND CATCHES MULCH, SUCH AS IN VALLEYS AND ON CRESTS OF SLOPES. THE REMAINDER OF THE AREA SHOULD APPEAR UNIFORM AFTER BINDER APPLICATION. BINDERS LISTED IN THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL OR APPROVED EQUAL SHALL BE APPLIED AT RATES RECOMMENDED BY THE MANUFACTURERS.
iv. LIGHTWEIGHT PLASTIC NETTING MAY BE USED TO SECURE MULCH. THE NETTING WILL BE STAPLED TO THE GROUND ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

2. TEMPORARY SEEDING:
   LIME: 100 POUNDS OF DOLOMITIC LIMESTONE PER 1,000 SQUARE FEET.
   FERTILIZER: 15 POUNDS OF 10-10-10 PER 1,000 SQUARE FEET.
   SEED: PERENNIAL RYE - 0.92 POUNDS PER 1,000 SQUARE FEET (FEBRUARY 1 THROUGH APRIL 30 OR AUGUST 15 THROUGH OCTOBER 31).
   MILLET - 0.92 POUNDS PER 1,000 SQUARE FEET (MAY 1 THROUGH AUGUST 15).
   MULCH: SAME AS 1 D AND E ABOVE.

3. NO FILLS MAY BE PLACED ON FROZEN GROUND. ALL FILL IS TO BE PLACED IN APPROXIMATELY HORIZONTAL LAYERS, EACH LAYER HAVING A LOOSE THICKNESS OF NOT MORE THAN 8 INCHES. ALL COMPACTION REQUIREMENTS ARE IN ACCORDANCE TO ANNE ARUNDEL COUNTY STANDARD SPECIFICATIONS FOR CONSTRUCTION AS WELL AS THE AA COUNTY DESIGN MANUAL AND STANDARD DETAILS. FILLS FOR POND EMBANKMENTS SHALL BE COMPACTED AS PER MD-378 CONSTRUCTION SPECIFICATIONS. ALL OTHER FILLS SHALL BE COMPACTED SUFFICIENTLY SO AS TO BE STABLE AND PREVENT EROSION AND SLIPPAGE.

4. PERMANENT SOD:

INSTALLATION OF SOD SHOULD FOLLOW PERMANENT SEEDING DATES. SEEDBED PREPARATION FOR SOD SHALL BE AS NOTED IN SECTION (B) ABOVE. PERMANENT SOD IS TO BE TALL FESCUE, STATE APPROVED SOD; LIME AND FERTILIZER PER PERMANENT SEEDING SPECIFICATIONS AND LIGHTLY IRRIGATE SOIL PRIOR TO LAYING SOD. SOD IS TO BE LAID ON THE CONTOUR WITH ALL ENDS TIGHTLY ABUTTING. JOINTS ARE TO BE STAGGERED BETWEEN ROWS. WATER AND ROLL OR TAMP SOD TO INSURE POSITIVE ROOT CONTACT WITH THE SOIL. ALL SLOPES STEEPER THAN 3:1, AS SHOWN, ARE TO BE PERMANENTLY SODDED OR PROTECTED WITH AN APPROVED EROSION CONTROL NETTING. ADDITIONAL WATERING FOR ESTABLISHMENT MAY BE REQUIRED. SOD IS NOT TO BE INSTALLED ON FROZEN GROUND. SOD SHALL NOT BE TRANSPLANTED WHEN MOISTURE CONTENT (DRY OR WET) AND/OR EXTREME TEMPERATURE MAY ADVERSELY AFFECT ITS SURVIVAL. IN THE ABSENCE OF ADEQUATE RAINFALL, IRRIGATION SHOULD BE PERFORMED TO ENSURE ESTABLISHMENT OF SOD.

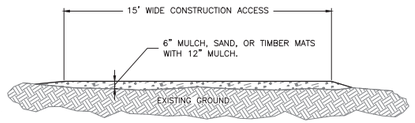
5. MINING OPERATIONS:

SEDIMENT CONTROL PLANS FOR MINING OPERATIONS MUST INCLUDE THE FOLLOWING SEEDING DATES AND MIXTURES:

FOR SEEDING DATES OF FEBRUARY 1 THROUGH APRIL 30 AND AUGUST 15 THROUGH OCTOBER 31, USE SEED MIXTURE OF TALL FESCUE AT THE RATE OF 2 POUNDS PER 1,000 SQUARE FEET AND SERICEA LESPEDEZA AT THE MINIMUM RATE OF 0.5 POUNDS PER 1,000 SQUARE FEET.

6. TOPSOIL SHALL BE APPLIED AS PER THE STANDARD AND SPECIFICATIONS FOR SOIL PREPARATION, TOPSOILING, AND SOIL AMENDMENTS FROM THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL.

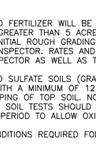
7. USE OF THESE VEGETATIVE ESTABLISHMENT SPECIFICATIONS DOES NOT PRECLUDE THE PERMITTEE OR CONTRACTOR FROM MEETING ALL OF THE REQUIREMENTS SET FORTH IN THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL.



CONSTRUCTION ACCESS ROAD

NOT TO SCALE

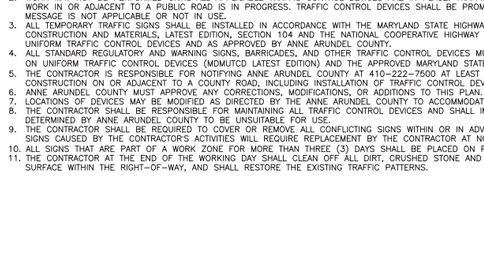
NOTES:
1. UPON COMPLETION OF CONSTRUCTION, MULCH MAY BE INCORPORATED INTO THE PERMANENT STABILIZATION OF THE SITE. A MAXIMUM OF 3 INCHES OF MULCH CAN REMAIN AT THE LOCATION OF THE CONSTRUCTION ACCESS ROAD, THE REMAINDER MAY BE PLACED IN FLOODPLAIN AREAS TO A MAXIMUM DEPTH OF 3 INCHES AT THE DIRECTION OF THE COUNTY. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL OTHER MATERIALS OFF SITE.
2. TIMBER MATS SHALL BE IN ACCORDANCE WITH THE WETLAND PROTECTION MATTING DETAIL PROVIDED ON DWG ES-09/SHEET 52 OR APPROVED EQUIVALENT.
3. THE CONTRACTOR SHALL REPLENISH MULCH AS DIRECTED BY THE COUNTY DURING CONSTRUCTION TO MAINTAIN MINIMUM DIMENSIONS AND TO PREVENT MUD, WATER, CONSTRUCTION DEBRIS AND OTHER MATERIALS FROM ACCUMULATING ON THE CONSTRUCTION ACCESS ROAD.
4. MATS WITH 12" OF MULCH UNDERNEATH MUST BE UTILIZED AS SHOWN ON THE PLANS AND WHEN THE CONSTRUCTION ACCESS ROAD CROSSES OVERTOP OF EXISTING WETLANDS OR WITHIN 5' OF A UTILITY. MATS MAY NOT BE REQUIRED OVERTOP OF EXISTING WETLANDS IF THE CONTRACTOR SUITABLY OPERATES EQUIPMENT TO PREVENT DAMAGE TO WETLANDS AND OBTAINS WRITTEN APPROVAL FROM THE MDE INSPECTOR PRIOR TO PERFORMING ANY WORK.
5. THE ACCESS ROAD IN THE EXISTING CHANNEL SHALL CONSIST OF SAND PLACED TO THE EXISTING CHANNEL TOP OF BANK AT LEAST 15' WIDE.
6. MULCH SHALL NOT BE USED FOR THE CONSTRUCTION ACCESS ROAD WITHIN INTERMITTENT AND PERENNIAL WATERS OF THE U.S. IN ACCORDANCE WITH USACE GUIDANCE.
7. THE CONTRACTOR MAY ELECT TO INSTALL AN UNDERDRAIN IN THE HAUL ROAD TO CONVEY STORM FLOW. THE UNDERDRAIN SHALL CONSIST OF A PERFORATED PIPE WITH A GRAVEL TRENCH.



NOTE:
1. ANCHOR STAKES SHALL BE TAPERED 18" TO 24" LONG WOODEN STAKES CONSISTING OF STANDARD 2" X 4" WOODEN BOARDS CUT DIAGONALLY.

ANCHOR STAKE DETAILS

NOT TO SCALE



SECTION VIEW
NOT TO SCALE

HAUL ROAD DETAIL

NOT TO SCALE

TEMPORARY TRAFFIC CONTROL NOTES

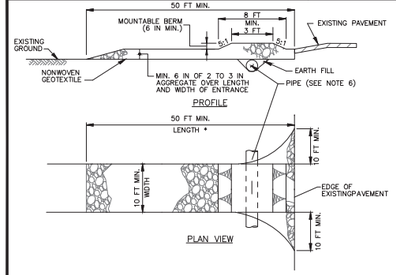
1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR PERFORMING WORK ON OR ADJACENT TO A PUBLIC ROAD TO PROVIDE, INSTALL, AND MAINTAIN APPROPRIATE TRAFFIC CONTROL DEVICES, AS WELL AS ANY ADDITIONAL TRAFFIC CONTROL DEVICES THAT MAY BE REQUIRED TO ENSURE THE SAFE AND EFFICIENT MOVEMENT OF TRAFFIC AND PEDESTRIANS THROUGH OR AROUND THE WORK AREA AND TO PROVIDE THE REQUIRED PROTECTION FOR THE SAFETY OF ROAD WORKERS.
2. WORK MAY NOT BE PERFORMED UNTIL ALL APPLICABLE TRAFFIC CONTROL DEVICES ARE IN PLACE. TRAFFIC CONTROL DEVICES MUST BE IN PLACE ANY TIME WORK IN OR ADJACENT TO A PUBLIC ROAD IS IN PROGRESS. TRAFFIC CONTROL DEVICES SHALL BE PROMPTLY REMOVED OR COVERED WHENEVER THE MESSAGE IS NOT APPLICABLE OR NOT IN USE.
3. ALL TEMPORARY TRAFFIC SIGNS SHALL BE INSTALLED IN ACCORDANCE WITH THE MARYLAND STATE HIGHWAY ADMINISTRATION STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS, LATEST EDITION, SECTION 104 AND THE NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM 350, MARYLAND MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND AS APPROVED BY ANNE ARUNDEL COUNTY.
4. ALL STANDARD REGULATORY AND WARNING SIGNS, BARRICADES, AND OTHER TRAFFIC CONTROL DEVICES MUST BE IN COMPLIANCE WITH THE MARYLAND MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MDMUTCD LATEST EDITION) AND THE APPROVED MARYLAND STATE HIGHWAY ADMINISTRATION PRODUCTS LIST.
5. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING ANNE ARUNDEL COUNTY AT 410-222-7500 AT LEAST THREE (3) WORKING DAYS IN ADVANCE OF ANY DISRUPTION OF OR ADJACENT TO A COUNTY ROAD, INCLUDING INSTALLATION OF TRAFFIC CONTROL DEVICES.
6. ANNE ARUNDEL COUNTY MUST APPROVE ANY CORRECTIONS, MODIFICATIONS, OR ADDITIONS TO THIS PLAN.
7. LOCATIONS OF DEVICES MAY BE MODIFIED AS DIRECTED BY THE ANNE ARUNDEL COUNTY TO ACCOMMODATE FIELD CONDITIONS.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL TRAFFIC CONTROL DEVICES AND SHALL IMMEDIATELY REPLACE ANY WHICH ARE MISSING OR DETERMINED BY ANNE ARUNDEL COUNTY TO BE UNSUITABLE FOR USE.
9. THE CONTRACTOR SHALL BE REQUIRED TO COVER OR REMOVE ALL CONFLICTING SIGNS WITHIN OR IN ADVANCE OF WORK ZONE, ANY DAMAGE TO EXISTING SIGNS CAUSED BY THE CONTRACTOR'S ACTIVITIES WILL REQUIRE REPLACEMENT BY THE CONTRACTOR AT NO COST TO THE COUNTY.
10. ALL SIGNS THAT ARE PART OF A WORK ZONE FOR MORE THAN THREE (3) DAYS SHALL BE PLACED ON POSTS.
11. THE CONTRACTOR AT THE END OF THE WORKING DAY SHALL CLEAN OFF ALL DIRT, CRUSHED STONE AND ALL CONSTRUCTION MATERIAL FROM THE PAVEMENT SURFACE WITHIN THE RIGHT-OF-WAY, AND SHALL RESTORE THE EXISTING TRAFFIC PATTERNS.

BEST MANAGEMENT PRACTICES FOR WORKING IN NON TIDAL WETLANDS, WETLAND BUFFERS, WATERWAYS AND 100 YEAR FLOODPLAINS

1. NO EXCESS FILL, CONSTRUCTION MATERIAL, OR DEBRIS SHALL BE STOCKPILED OR STORED IN NON TIDAL WETLANDS, NON TIDAL WETLAND BUFFERS, WATERWAYS OR THE 100-YEAR FLOODPLAIN.
2. PLACE MATERIALS IN A LOCATION AND MANNER WHICH DOES NOT ADVERSELY IMPACT SURFACE OR SUBSURFACE WATER FLOW INTO OR OUT OF NON TIDAL WETLANDS, NON TIDAL WETLAND BUFFERS, WATERWAYS OR THE 100 YEAR FLOODPLAIN.
3. DO NOT USE EXCAVATED MATERIAL AS BACK FILL IF IT CONTAINS WASTE METAL PRODUCTS, UNSIGHTLY DEBRIS, TOXIC MATERIAL, OR ANY OTHER DELETERIOUS SUBSTANCE. IF ADDITIONAL BACK FILL IS REQUIRED, USE CLEAN MATERIAL FREE OF WASTE METAL PRODUCTS, UNSIGHTLY DEBRIS, TOXIC MATERIAL, OR ANY OTHER DELETERIOUS SUBSTANCE.
4. PLACE HEAVY EQUIPMENT ON MATS OR SUITABLY OPERATE THE EQUIPMENT TO PREVENT DAMAGE TO NON TIDAL WETLANDS, NON TIDAL WETLAND BUFFERS, OR WATERWAYS OR THE 100 YEAR FLOOD PLAIN.
5. REPAIR AND MAINTAIN ANY SERVICEABLE STRUCTURE OR FILL SO THERE IS NO PERMANENT LOSS OF NON TIDAL WETLANDS, NON TIDAL WETLAND BUFFERS, OR WATERWAYS, OR PERMANENT MODIFICATION OF THE 100 YEAR FLOOD PLAIN IN EXCESS OF THAT LOST UNDER THE ORIGINALLY AUTHORIZED STRUCTURE OR FIL

DETAIL B-1 STABILIZED CONSTRUCTION ENTRANCE

STANDARD SYMBOL: SCE



CONSTRUCTION SPECIFICATIONS

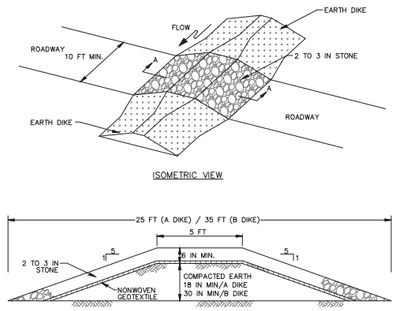
1. PLACE STABILIZED CONSTRUCTION ENTRANCE IN ACCORDANCE WITH THE APPROVED PLAN. VEHICLES MUST TRAVEL OVER THE ENTIRE LENGTH OF THE SCE. USE MINIMUM LENGTH OF 50 FEET (*30 FEET FOR SINGLE RESIDENCE LOT). USE MINIMUM WIDTH OF 10 FEET. FLARE SCE 10 FEET MINIMUM AT THE EXISTING ROAD TO PROVIDE A TURNING RADIUS.
2. PIPE ALL SURFACE WATER FLOWING TO OR DIVERTED TOWARD THE SCE UNDER THE ENTRANCE, MAINTAINING POSITIVE DRAINAGE. PROTECT PIPE INSTALLED THROUGH THE SCE WITH A MOUNTABLE BERM WITH 5:1 SLOPES AND A MINIMUM OF 12 INCHES OF STONE OVER THE PIPE. PROVIDE PIPE AS SPECIFIED ON APPROVED PLAN. WHEN THE SCE IS LOCATED AT A HIGH SPOT AND HAS NO DRAINAGE TO CONVEY, A PIPE IS NOT NECESSARY. A MOUNTABLE BERM IS REQUIRED WHEN SCE IS NOT LOCATED AT A HIGH SPOT.
3. PREPARE SUBGRADE AND PLACE NONWOVEN GEOTEXTILE, AS SPECIFIED IN SECTION H-1 MATERIALS.
4. PLACE CRUSHED AGGREGATE (2 TO 3 INCHES IN SIZE) OR EQUIVALENT RECYCLED CONCRETE (WITHOUT REBAR) AT LEAST 6 INCHES DEEP OVER THE LENGTH AND WIDTH OF THE SCE.
5. MAINTAIN ENTRANCE IN A CONDITION THAT MINIMIZES TRACKING OF SEDIMENT. ADD STONE OR MAKE OTHER REPAIRS AS CONDITIONS DEMAND TO MAINTAIN CLEAN SURFACE, MOUNTABLE BERM, AND SPECIFIED DIMENSIONS. IMMEDIATELY REMOVE STONE AND/OR SEDIMENT SPILLED, DROPPED, OR TRACKED ONTO ADJACENT ROADWAY BY VACUUMING, SCRAPING, AND/OR SWEEPING. WASHING ROADWAY TO REMOVE MUD TRACKED ONTO PAVEMENT IS NOT ACCEPTABLE UNLESS WASH WATER IS DIRECTED TO AN APPROVED SEDIMENT CONTROL PRACTICE.

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL C-8 MOUNTABLE BERM

STANDARD SYMBOL: MB



CONSTRUCTION SPECIFICATIONS

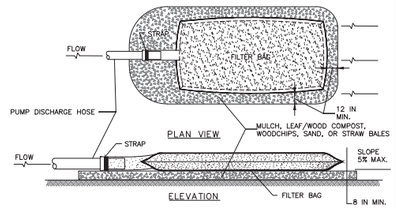
1. USE MINIMUM WIDTH OF 10 FEET TO ALLOW FOR VEHICULAR PASSAGE.
2. PLACE NONWOVEN GEOTEXTILE, AS SPECIFIED IN SECTION H-1 MATERIALS, OVER THE EARTH MOUND PRIOR TO PLACING STONE.
3. PLACE 2 TO 3 INCH STONE OR EQUIVALENT RECYCLED CONCRETE AT LEAST 6 INCHES DEEP OVER THE LENGTH AND WIDTH OF THE MOUNTABLE BERM.
4. MAINTAIN LINE, GRADE, AND CROSS SECTION. ADD STONE OR MAKE OTHER REPAIRS AS CONDITIONS DEMAND TO MAINTAIN SPECIFIED DIMENSIONS. REMOVE ACCUMULATED SEDIMENT AND DEBRIS. MAINTAIN POSITIVE DRAINAGE.

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL F-4 FILTER BAG

STANDARD SYMBOL: FB



CONSTRUCTION SPECIFICATIONS

1. TIGHTLY SEAL SLEEVE AROUND THE PUMP DISCHARGE HOSE WITH A STRAP OR SIMILAR DEVICE.
2. PLACE FILTER BAG ON SUITABLE BASE (E.G., MULCH, LEAF/WOOD COMPOST, WOODCHIPS, SAND, OR STRAW BALES) LOCATED ON A LEVEL OR 5% MAXIMUM SLOPING SURFACE. DISCHARGE TO A STABILIZED AREA. EXTEND BASE A MINIMUM OF 12 INCHES FROM EDGES OF BAG.
3. CONTROL PUMPING RATE TO PREVENT EXCESSIVE PRESSURE WITHIN THE FILTER BAG IN ACCORDANCE WITH THE MANUFACTURER RECOMMENDATIONS. AS THE BAG FILLS WITH SEDIMENT, REDUCE PUMPING RATE.
4. REMOVE AND PROPERLY DISPOSE OF FILTER BAG UPON COMPLETION OF PUMPING OPERATIONS OR AFTER BAG HAS REACHED CAPACITY, WHICHEVER OCCURS FIRST. SPREAD THE DEWATERED SEDIMENT FROM THE BAG IN AN APPROVED UPLAND AREA AND STABILIZE WITH SEED AND MULCH BY THE END OF THE WORK DAY. RESTORE THE SURFACE AREA BENEATH THE BAG TO ORIGINAL CONDITION UPON REMOVAL OF THE DEVICE.
5. USE NONWOVEN GEOTEXTILE WITH DOUBLE STITCHED SEAMS USING HIGH STRENGTH THREAD. SIZE SLEEVE TO ACCOMMODATE A MAXIMUM 4 INCH DIAMETER PUMP DISCHARGE HOSE. THE BAG MUST BE MANUFACTURED FROM A NONWOVEN GEOTEXTILE THAT MEETS OR EXCEEDS MINIMUM AVERAGE ROLL VALUES (MARV) FOR THE FOLLOWING:

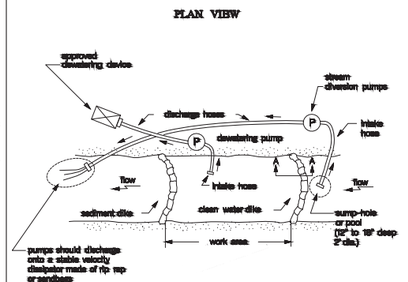
GRAB TENSILE	250 LB	ASTM D-4632
PUNCTURE	150 LB	ASTM D-4833
FLOW RATE	70 GAL/MIN/FT²	ASTM D-4491
PERMITTIVITY (SEC^{-1})	1.2 SEC^{-1}	ASTM D-4491
UV RESISTANCE	70% STRENGTH @ 500 HOURS	ASTM D-4355
APPARENT OPENING SIZE (AOS)	0.15-0.18 MM	ASTM D-4751
SEAM STRENGTH	90%	ASTM D-4632

6. REPLACE FILTER BAG IF BAG CLOGS OR HAS RIPS, TEARS, OR PUNCTURES. DURING OPERATION KEEP CONNECTION BETWEEN PUMP HOSE AND FILTER BAG WATER TIGHT. REPLACE BEDDING IF IT BECOMES DISPLACED.

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

Maryland's Guidelines To Waterway Construction
DETAIL 1.2: PUMP-AROUND PRACTICE

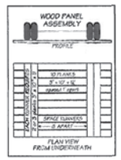


TEMPORARY DEWATERING CONSTRUCTION MEASURES | REVISED NOVEMBER 2007 (MODIFIED) | MARYLAND DEPARTMENT OF THE ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

WETLAND PROTECTION MATTING DETAIL

SCALE: NONE

1. MINIMIZE SPACING BETWEEN PANELS OR PALLETS. CONNECT WITH QUICK LINKS OR OTHER HEAVY-DUTY CONNECTORS FOR EXTRA STABILITY. (SOME WOOD PALLETS ARE DESIGNED TO INTERCONNECT DURING INSTALLATION.
2. IF ADDITIONAL TRACTION IS NEEDED, USE EXPANDED METAL GRATING OR SIMILAR MATERIALS ON TOP OF THE WOOD PANELS OR PALLETS.
3. SIZE WOOD PANELS AND PALLETS TO MEET ANTICIPATED LOADS, SOIL STRENGTH, AND INSTALLATION EQUIPMENT. YOU MAY NEED ADDITIONAL SIZE ON VERY WEAK SOILS WITH LOW BEARING STRENGTH (E.G., MUCK OR PEAT) TO SPREAD WEIGHT OVER A LARGER AREA.

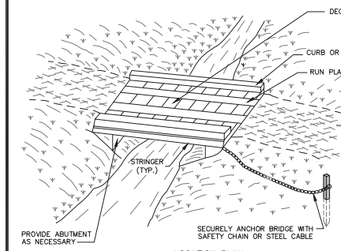


1. USE 3-INCH THICK BY 10-INCH WIDE BY 12-FEET LONG LUMBER FOR PLANKS. ALIGN PLANKS PARALLEL TO EACH OTHER.
2. NAIL 2 OR 3 BOARDS, EACH MEASURING 3 INCHES BY 10 INCHES BY 9 FEET, PERPENDICULAR TO THE PLANKS (USE RING-SHANK OR SPIRAL SPIKES). THESE ARE RUNNERS.
3. LEAVE A 1-INCH GAP BETWEEN THE PLANKS TO ALLOW WATER TO RUN THROUGH. USE AN AIR GUN OR COUNTERSUNK BOLTS TO REDUCE NAIL WITHDRAWAL DURING USE.
4. ADD EYE HOOKS AND LOOPED CABLES OR OTHER MATERIALS TO THE WOOD PANEL. THIS FACILITATES LIFTING AND INTERCONNECTION ONCE THEY ARE INSTALLED.

NOTE: WETLAND PROTECTION MATTING TO BE UNDERLAIN WITH 12" MINIMUM OF MULCH

DETAIL H-4-1 TEMPORARY ACCESS BRIDGE

STANDARD SYMBOL: TB



NOTE:
TIME OF YEAR RESTRICTIONS DO NOT APPLY TO THE CONSTRUCTION OR REMOVAL OF A TEMPORARY ACESS BRIDGE UNLESS THERE IS DISTURBANCE TO THE STREAM CHANNEL.

1 OF 2

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL H-4-1 TEMPORARY ACCESS BRIDGE

STANDARD SYMBOL: TB

CONSTRUCTION SPECIFICATIONS

1. CONSTRUCT TEMPORARY BRIDGE STRUCTURE AT OR ABOVE THE BANK ELEVATION TO PREVENT IMPACTS FROM FLOATING MATERIALS AND DEBRIS.
2. PLACE ABUTMENTS PARALLEL TO, AND ON, STABLE BANKS.
3. CONSTRUCT BRIDGE TO SPAN ENTIRE CHANNEL UNLESS OTHERWISE INDICATED ON APPROVED PLAN.
4. USE STRINGERS CONSISTING OF LOGS, SAWN TIMBER, PRESTRESSED CONCRETE BEAMS, METAL BEAMS, OR OTHER APPROVED MATERIALS.
5. SELECT DECKING MATERIALS TO PROVIDE SUFFICIENT STRENGTH TO SUPPORT THE ANTICIPATED LOAD. PLACE ALL DECKING MEMBERS PERPENDICULAR TO THE STRINGERS, BUTT TIGHTLY, AND SECURELY FASTEN. DECKING MATERIALS MUST BE BUTTED TIGHTLY TO PREVENT ANY SOIL MATERIAL TRACKED ONTO THE BRIDGE FROM FALLING INTO THE WATERWAY BELOW.
6. SECURELY FASTEN OPTIONAL RUN PLANKING FOR THE LENGTH OF THE SPAN. PROVIDE A RUN PLANK FOR EACH TRACK OF THE EQUIPMENT WHEELS. ALTHOUGH RUN PLANKS ARE OPTIONAL, THEY MAY BE NECESSARY TO PROPERLY DISTRIBUTE LOADS.
7. INSTALL CURBS THE ENTIRE LENGTH OF THE OUTER SIDES OF THE DECK TO PREVENT SEDIMENT FROM ENTERING THE STREAM CHANNEL.
8. ANCHOR BRIDGE SECURELY AT ONLY ONE END USING STEEL CABLE OR CHAIN. ANCHORING AT ONLY ONE END WILL PREVENT CHANNEL OBSTRUCTION IN THE EVENT THAT FLOODWATERS FLOAT THE BRIDGE. ACCEPTABLE ANCHORS ARE LARGE TREES, LARGE BOULDERS, OR DRIVEN STEEL POSTS. ANCHOR MUST BE SUFFICIENT TO PREVENT THE BRIDGE FROM FLOATING DOWNSTREAM.
9. AREAS DISTURBED DURING BRIDGE INSTALLATION AND\OR REMOVAL MUST NOT BE LEFT UNSTABILIZED OVERNIGHT UNLESS THE RUNOFF IS DIRECTED TO AN APPROVED SEDIMENT CONTROL DEVICE.
10. STABILIZE APPROACH TO BRIDGE AND KEEP FREE OF EROSION. CLEAN SEDIMENT FROM DECKING AND CURBS DAILY BY SCRAPING, SWEEPING, AND/OR VACUUMING. ENSURE THAT DECKING AND CURBS REMAIN TIGHTLY BUTTED WITHOUT GAPS. REMOVE DEBRIS TRAPPED BY BRIDGE. MAINTAIN AREAS ADJACENT TO CROSSING TO CONTINUOUSLY MEET REQUIREMENTS FOR ADEQUATE VEGETATIVE ESTABLISHMENT IN ACCORDANCE WITH SECTION B-4 VEGETATIVE STABILIZATION.
11. AFTER THE TEMPORARY CROSSING IS NO LONGER NEEDED, REMOVE IT WITHIN 14 CALENDAR DAYS. IF SUBJECT TO THE USE DESIGNATION CLOSURE, REMOVE AT THE END OF CLOSURE PERIOD. PROTECT STREAM BANKS DURING BRIDGE REMOVAL AND STABILIZE ALL DISTURBED AREAS WITH EROSION CONTROL MATTING. ACCOMPLISH REMOVAL OF THE BRIDGE AND CLEAN UP OF THE AREA WITHOUT CONSTRUCTION EQUIPMENT WORKING IN THE WATERWAY CHANNEL. STORE ALL REMOVED MATERIALS IN AN APPROVED STAGING AREA.

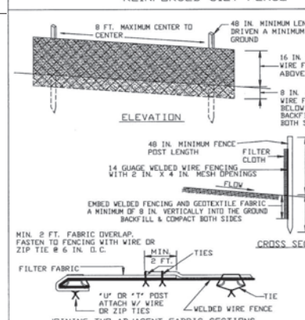
2 OF 2

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

REINFORCED SILT FENCE

STANDARD SYMBOL: RSF



CONSTRUCTION SPECIFICATIONS

1. Metal fence post shall be a minimum of 48 inches long, driven 16 inches minimum into the ground and no more than 8 feet apart. Post shall be standard T or U section weighing not less than 1.00 pound per linear foot. Reinforcement shall be 14 gauge welded wire fencing with 2 inch X 4 inch mesh openings.
2. Geotextile shall be fastened securely to each fence post with wire ties or zip ties at top and mid section. Where ends of geotextile fabric come together, they shall be overlapped, folded and wire tied or zip tied to post to prevent sediment bypass.
3. Use a woven geotextile, as specified in section H-1 materials, and fasten to the upslope side of the fence posts with wire or zip ties at top and midsection. The Manufacturer's certification that the fabric meets the requirements in section H-1 must be made available to the inspection/enforcement authority.
4. Extend both ends of reinforced silt fence a minimum of five (5) horizontal feet upslope at 45 degrees to the main fence alignment to prevent runoff from going around the ends.
5. Renove accumulated sediment and debris when bulges develop in the reinforced silt fence fabric or when sediment reaches 25% of the fence height. Replace geotextile if torn. If undermining occurs, reinstall fence.

ANNE ARUNDEL SOIL CONSERVATION DISTRICT	2015	

REINFORCED SILT FENCE

Design Criteria

Reinforced Silt Fence Design Constraints

Average Slope Steepness	Maximum Slope Length	Maximum Silt Fence Length
Flatter than 50:1 (<2%)	300 feet*	Unlimited
50:1 to 10:1 (2-10%)	125 feet	1,000 feet
10:1 to 5:1 (10-20%)	100 feet	750 feet
5:1 (>20%)	40 feet	250 feet

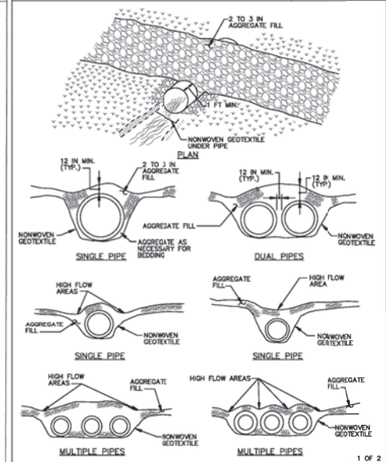
*Maximum slope length is unlimited on the Hydrolic Soil Group (HSG) "A" soils

1. The use of Reinforced Silt Fence must conform to the design constraints listed above.
2. The area downgrade of the Reinforced Silt Fence must be undisturbed ground.
3. Reinforced Silt Fence must be placed along the contour.
4. Reinforced Silt Fence should be used with caution in areas where rocky soils may prevent trenching.
5. Extend both ends of reinforced silt fence a minimum of five (5) horizontal feet upslope and 45 degrees to the main fence alignment to prevent runoff from going around the edges

ANNE ARUNDEL SOIL CONSERVATION DISTRICT	2015	

DETAIL H-4-2 TEMPORARY ACCESS CULVERT

STANDARD SYMBOL: CV



1 OF 2

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL H-4-2 TEMPORARY ACCESS CULVERT

STANDARD SYMBOL: CV

CONSTRUCTION SPECIFICATIONS

1. CONSTRUCTION OR REMOVAL OF A TEMPORARY ACCESS CULVERT WILL NOT BE PERMITTED DURING THE FOLLOWING PERIODS:

USE I AND IP	MARCH 1 -- JUNE 15
USE I	JUNE 1 -- SEPTEMBER 30 AND DECEMBER 16 -- MARCH 14
USE II AND IIP	OCTOBER 1 -- APRIL 30
USE IV	MARCH 1 -- MAY 31
SAV* (ALL FLOWING STREAMS)	APRIL 15 -- OCTOBER 15

*SUBMERGED AQUATIC VEGETATION

2. EXTEND THE CULVERT(S) A MINIMUM OF ONE FOOT BEYOND THE UPSTREAM AND DOWNSTREAM TOE OF THE AGGREGATE PLACED AROUND THE CULVERT.
3. PLACE NONWOVEN GEOTEXTILE ON THE STREAM BED AND STREAM BANKS PRIOR TO PLACEMENT OF THE PIPE CULVERT(S) AND AGGREGATE. COVER THE STREAM BED WITH THE GEOTEXTILE AND EXTEND IT A MINIMUM SIX INCHES AND A MAXIMUM OF ONE FOOT BEYOND THE END OF THE CULVERT AND BEDDING MATERIAL. USE NONWOVEN GEOTEXTILE AS SPECIFIED IN SECTION H-1 MATERIALS. GEOTEXTILE REDUCES SETTLEMENT AND IMPROVES CROSSING STABILITY.
4. PLACE CULVERT(S) ON THE NATURAL STREAM BED GRADE TO MINIMIZE INTERFERENCE WITH FISH PASSAGE.
5. COVER THE CULVERT WITH A MINIMUM OF ONE FOOT OF WASHED AGGREGATE. FOR MULTIPLE CULVERTS PROVIDE AT LEAST 12 INCHES OF COMPACTED AGGREGATE FILL BETWEEN CULVERTS.
6. STABILIZE ALL AREAS DISTURBED DURING CULVERT INSTALLATION WITHIN 24 HOURS OF THE DISTURBANCE IN ACCORDANCE WITH STANDARDS FOR PERMANENT STABILIZATION, SECTION B-4-5, OR TEMPORARY STABILIZATION, SECTION B-4-4, AS APPLICABLE.
7. STABILIZE APPROACH TO CROSSING AND KEEP FREE OF EROSION. REPLACE DISPLACED STONE, AND MAINTAIN HIGH FLOW AREAS. REMOVE DEBRIS TRAPPED BY CULVERT. REPLACE DAMAGED PIPE(S). MAINTAIN AREAS ADJACENT TO CROSSING TO CONTINUOUSLY MEET REQUIREMENTS FOR ADEQUATE VEGETATIVE ESTABLISHMENT IN ACCORDANCE WITH SECTION B-4 VEGETATIVE STABILIZATION.
8. AFTER THE TEMPORARY CROSSING IS NO LONGER NEEDED, REMOVE IT WITHIN 14 CALENDAR DAYS. IF SUBJECT TO THE USE DESIGNATION CLOSURE, REMOVE AT THE END OF CLOSURE PERIOD. PROTECT STREAM BANKS DURING CULVERT REMOVAL AND STABILIZE ALL DISTURBED AREAS WITH EROSION CONTROL MATTING. ACCOMPLISH REMOVAL OF THE CULVERT AND CLEAN UP OF THE AREA WITHOUT CONSTRUCTION EQUIPMENT WORKING IN THE WATERWAY CHANNEL. STORE ALL REMOVED MATERIALS IN AN APPROVED STAGING AREA.

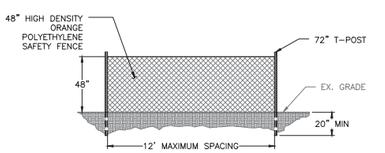
2 OF 2

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

BEST MANAGEMENT PRACTICES FOR WORKING IN NON TIDAL WETLANDS, WETLAND BUFFERS, WATERWAYS AND 100 YEAR FLOODPLAINS

1. NO EXCESS FILL, CONSTRUCTION MATERIAL, OR DEBRIS SHALL BE STOCKPILED OR STORED IN NON TIDAL WETLANDS, NON TIDAL WETLAND BUFFERS, WATERWAYS OR THE 100-YEAR FLOODPLAIN.
2. PLACE MATERIALS IN A LOCATION AND MANNER WHICH DOES NOT ADVERSELY IMPACT SURFACE OR SUBSURFACE WATER FLOW INTO OR OUT OF NON TIDAL WETLANDS, NON TIDAL WETLAND BUFFERS, WATERWAYS OR THE 100 YEAR FLOODPLAIN.
3. DO NOT USE EXCAVATED MATERIAL AS BACK FILL IF IT CONTAINS WASTE METAL PRODUCTS, UNSIGHTLY DEBRIS, TOXIC MATERIAL, OR ANY OTHER DELETERIOUS SUBSTANCE. IF ADDITIONAL BACK FILL IS REQUIRED, USE CLEAN MATERIAL FREE OF WASTE METAL PRODUCTS, UNSIGHTLY DEBRIS, TOXIC MATERIAL, OR ANY OTHER DELETERIOUS SUBSTANCE.
4. PLACE HEAVY EQUIPMENT ON MATS OR SUITABLY OPERATE THE EQUIPMENT TO PREVENT DAMAGE TO NON TIDAL WETLANDS, NON TIDAL WETLAND BUFFERS, OR WATERWAYS OR THE 100 YEAR FLOOD PLAIN.
5. REPAIR AND MAINTAIN ANY SERVICEABLE STRUCTURE OR FILL SO THERE IS NO PERMANENT LOSS OF NON TIDAL WETLANDS, NON TIDAL WETLAND BUFFERS, OR WATERWAYS, OR PERMANENT MODIFICATION OF THE 100 YEAR FLOOD PLAIN IN EXCESS OF THAT LOST UNDER THE ORIGINALLY AUTHORIZED STRUCTURE OR FILL.
6. RECTIFY ANY NON TIDAL WETLANDS, WETLAND BUFFERS, WATERWAYS OR 100 YEAR FLOOD PLAIN TEMPORARILY IMPACTED BY ANY CONSTRUCTION.
7. ALL STABILIZATION IN THE NON TIDAL WETLAND AND NON TIDAL WETLAND BUFFER SHALL CONSIST OF THE FOLLOWING SPECIES: ANNUAL RYEGRASS(LOLIUM MULTIFLORUM), MILLET(SETARIA ITALICA), BARLEY(HORDEUM SP.), OATS (UNIOLA SP), AND/OR RYE (SECALE CEREALE). THESE SPECIES WILL ALLOW FOR THE STABILIZATION OF THE SITE WHILE ALSO ALLOWING FOR THE VOLUNTARY REVEGETATION OF NATURAL WETLAND SPECIES. OTHER NON PERSISTENT VEGETATION MAY BE ACCEPTABLE, BUT MUST BE APPROVED BY THE NON TIDAL WETLANDS AND WATERWAYS DIVISION. KENTUCKY 31 FESCUE SHALL NOT BE UTILIZED IN WETLAND OR BUFFER AREAS. THE AREA SHOULD BE SEEDED AND MULCHED TO REDUCE EROSION AFTER CONSTRUCTION ACTIVITIES HAVE BEEN COMPLETED.
8. AFTER INSTALLATION HAS BEEN COMPLETED, MAKE POST CONSTRUCTION GRADES AND ELEVATIONS THE SAME AS THE ORIGINAL GRADES AND ELEVATIONS IN TEMPORARILY IMPACTED AREAS.
9. TO PROTECT AQUATIC SPECIES, IN STREAM WORK IS PROHIBITED AS DETERMINED BY THE CLASSIFICATION OF THE STREAM: USE I WATERS.
10. STORMWATER RUNOFF FROM IMPERVIOUS SURFACES SHALL BE CONTROLLED TO PREVENT THE WASHING OF DEBRIS INTO THE WATERWAY.
11. CULVERTS SHALL BE CONSTRUCTED AND ANY RIP RAP PLACED SO AS NOT TO OBSTRUCT THE MOVEMENT OF AQUATIC SPECIES, UNLESS THE PURPOSE OF THE ACTIVITY IS TO IMPOUND WATER.



HIGH VISIBILITY FENCE DETAIL

NOT TO SCALE

NOTES:
1. INSTALL HIGH VISIBILITY FENCE IN LOCATIONS SHOWN ON PLANS.
2. T-POST SHALL BE SPACED A MAXIMUM OF 12' O/C.
3. THE HIGH VISIBILITY FENCE SHOULD BE FASTENED SECURELY TO THE T-POSTS WITH WIRE OR ZIP TIES.
4. THE FENCING MUST REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION; ANY CHANGE OF THE PROTECTIVE FENCING MUST BE APPROVED.

CARE OF WATER DURING CONSTRUCTION

1. CLEAR WATER DIVERSIONS FROM POINT SOURCES MAY BE OMITTED IF NO BASE FLOW IS PRESENT.
2. BECAUSE OF SEASONAL VARIATIONS IN FLOW, THE SIZE OF PUMP, AND THE SIZE AND TYPE OF PIPING NECESSARY TO CONVEY CLEAR WATER FOR ANY PUMPED CLEAR WATER DIVERSIONS, SHALL BE DETERMINED BY THE CONTRACTOR AND APPROVED BY THE SEDIMENT CONTROL INSPECTOR. CARE SHOULD BE TAKEN BY THE CONTRACTOR AS TO NOT OVER OR UNDERSIZE THE PUMP/PIPING NECESSARY TO CONVEY ANY BASE FLOW.
3. DIVERSION PIPES, PUMPS, SUMP PITS, AND ASSOCIATED SEDIMENT FILTRATION DEVICES SHALL BE FIELD LOCATED BY THE CONTRACTOR AND ARE SHOWN ON THE PLANS TO ILLUSTRATE POTENTIAL ALIGNMENTS AND PLACEMENT.
4. WITH THE SEDIMENT CONTROL INSPECTORS APPROVAL, ANY DIVERSION PIPES, PUMPS, SUMP PITS, AND ASSOCIATED SEDIMENT FILTRATION DEVICES MAY BE RELOCATED WITHIN THE LIMIT OF DISTURBANCE TO ACCOMMODATE CONSTRUCTION ACTIVITIES AT NO ADDITIONAL COST.
5. THE CONTRACTOR SHALL SUFFICIENTLY DEWATER THE WORK AREA BEFORE COMMENCING ANY GRADING OPERATIONS. ADDITIONAL SUMP PITS, AT NO ADDITIONAL COST, MAY BE NECESSARY AT LOCATIONS WHERE GROUNDWATER IS INFILTRATING THE WORK AREA.
6.
7. DEWATERING OF THE WORK AREA MAY REQUIRE ADDITIONAL TREATMENT BEYOND AN APPROVED DEWATERING PRACTICE TO REDUCE TURBIDITY IN THE DISCHARGE TO RECEIVING WATERS.
8. ANY FUEL SHALL BE STORED ABOVE THE 100-YR FLOOD ELEVATION.
9. THE CONTRACTOR SHALL ENSURE THAT ALL SEDIMENT CONTROLS ARE IN WORKING CONDITION AT THE END OF EACH WORKING DAY TO PREVENT SEDIMENT LADEN MATERIAL FROM DISCHARGING FROM THE WORK AREA.

EXCAVATION NOTES

1. AT A MINIMUM ANY SATURATED SEDIMENT TO BE REMOVED SHALL BE PARTIALLY DEWATERED ON-SITE BEFORE ANY TRANSPORT ACTIVITY.
2. EXCAVATED STREAM BED MATERIAL SHALL BE SAVED AND STOCKPILED SEPARATELY ON SITE, AND REUSED WHERE APPROPRIATE. ALL SALVAGED STREAMBED MATERIAL MUST BE APPROVED BY THE COUNTY.
3. UNUSABLE EXCAVATED STREAM BED MATERIAL SHALL BE TRANSPORTED TO A DISPOSAL SITE IN LINED TRUCKS.
4. THE DISPOSAL SITE SHALL HAVE AN ACTIVE GRADING PERMIT.
5. CONTRACTOR SHALL KEEP STREET FREE OF ANY EXCAVATED MATERIAL. IF NECESSARY, CONTRACTOR MAY BE REQUIRED TO PERFORM ROUTINE STREET SWEEPING AND/OR STREET CLEANING.

ES-09

90% CONSTRUCTION DRAWINGS

BayLand Consultants & Designers, Inc.
"Integrating Engineering and Environment"
7455 New Ridge Road, Suite T Phone: (410) 694-9401
Hanover, Maryland 21076 Fax: (410) 694-9105
www.baylandinc.com
BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE	APPROVED DATE
CHIEF ENGINEER	PROJECT MANAGER
APPROVED DATE	APPROVED DATE
DEPUTY DIRECTOR	CHIEF, RIGHT OF WAY

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET

MATCHLINE REFER TO SHEET 54/DWG LS-02

MARYLAND GRID SYSTEM (NAD83/91)

HOG NECK ROAD

ROCK CREEK

TAX ID# 03-000-40031216
SHANNON HACKMANN &
CHRISTOPHER HACKMANN
8130 HOG NECK RD
T.M. 17 GRID 16 P. 485
DEED: 20500/178
PLAT: 3814/680
0.520 AC.

EX. CONCRETE FLARED END SECTION (FES 1)
TOP ELEV. = 50.88
EX. 54" RCP OUT = 47.54

EX. STRUCTURE

EX. ADDRESS POST AND NO TRESPASSING SIGN

EX. CONCRETE FLARED END SECTION (FES 2)
TOP ELEV. = 49.73
EX. 53"x34" RCP INV IN = 46.43

EX. ADDRESS POST

ONE APPROX. CLEARANCE = 18.3'

EX. PUBLIC UTILITY EASEMENT
DEED: 8548\451

EX. MAILBOX

EX. FIBER BOX

EX. CURB AND GUTTER

EX. OVERHEAD ELECTRIC LINE (TYP)

EX. UTILITY POLE (TYP)

EX. DRIVEWAY

EX. GUARDRAIL (TYP)

EX. 36" CONCRETE BOX CULVERT (DWG. 53072)

EX. 8'X3' CONCRETE BOX CULVERT (DWG. 53072)

HA 2 EX. A.A.C.O. TYPE 'A' HEADWALL (DWG. 53072)
TOP ELEV. = 51.81
EX. 36" CONCRETE BOX CULVERT INV IN = 47.77
EX. 8' X 3' CONCRETE BOX CULVERT INV IN = 46.70

EX. FIRE HYDRANT

HA 1 EX. A.A.C.O. TYPE 'A' HEADWALL (DWG. 53072)
TOP ELEV. = 53.12
EX. 36" CONCRETE BOX CULVERT INV OUT = 48.80
EX. 8' X 3' CONCRETE BOX CULVERT INV OUT = 47.94

EX. DRIVEWAY

N 532,180
E 1,444,000

N 532,280
E 1,444,280

EX. TREELINE (TYP)

EX. BLDG

EX. PARKING LOT

EX. BLDG

TAX ID# 03-000-33444085
FLAGSHIP MD PROPCO LLC
8110 HOG NECK RD
T.M. 17 GRID 16 P. 90
DEED: 34237/199
PLAT: E107/23
1.600 AC.

EX. PRIVATE 40 USE-IN-COMMON, ACCESS, AND UTILITY EASEMENT
PLAT: 283\15

EX. FOREST CONSERVATION AREA
PLAT: 283\15

TAX ID# 03-190-90041463
CHATTERLEIGH LTD PTNSHP
FLOOD PLAIN
T.M. 17 GRID 16 P. 640
DEED: 3062/888
PLAT: 92/44
3.060 AC.

TAX ID# 03-190-90044252
CHESTERFIELD HOME OWNERS ASSN INC.
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
3.713 AC.

ADAPTIVE MANAGEMENT PATH TO REMAIN, NO PLANTING OR SEEDING (TYP)

EX. STORM DRAIN EASEMENT
PLAT: 283\15

LOD

HVF

TR 1

TR 2

TR 3

TR 4

TR 5

TR 6

TR 7

TR 33

TR 34

PR. LIMIT OF DISTURBANCE/HIGH VISIBILITY FENCE

EX. SPECIMEN TREE (TYP)

EX. RIPRAP TO REMAIN (TYP)

EX. UTILITY EASEMENT
PLAT: 8458\446

TAX ID# 03-000-12838000
ANNE ARUNDEL COUNTY
8126 HOG NECK RD
T.M. 17 GRID 16 P. 498
DEED: 8548/446
0.280 AC.

PERMANENT STABILIZATION

PR. BASELINE OF CONSTRUCTION/ALIGNMENT

EX. EPHEMERAL CHANNEL

1+00 2+00 3+00 3+50 4+00 4+50 5+00 5+50

ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST PLANTING (TYP)

PR. VALLEY WIDE WEIR

ZONE C: FC MID-ATLANTIC MESIC MIXED FOREST PLANTING (TYP)

NO WOODY PLANTINGS; APPLY SEED CONSISTENT WITH ZONE

TAX ID# 03-000-40221048
JOSEPH R MCDEVITT &
ANNMARIE G MCDEVITT
8110R HOG NECK RD
T.M. 17 GRID 16 P. 90
DEED: 38848/184
PLAT: E107/23
1.920 AC.

EX. BLDG

GENERAL COMMON ELEMENT
PLAT: 107\23

EX. SS MANHOLE #16465 (DWG. 17305) SS MH
TOP ELEV. = 41.62
EX. 10" DIP INV IN = 35.50
EX. 10" DIP INV OUT = 35.22
EX. 8" PVC INV IN (N) = 35.67
EX. 8" PVC INV IN (SE) = 35.52

EX. 15' SEWER EASEMENT (DWG 26774)

EX. UNK SS

EX. PARKING LOT

TAX ID# 03-190-90041462
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
4.961 AC.

EX. 10" DIP SS (DWG. 11059)

EX. 4" PVC SS CLEANOUT

EX. CONCRETE WALL

EX. SS MANHOLE #16466 (DWG. 17305) SS MH
TOP ELEV. = 48.44
EX. 10" DIP INV IN = 37.06
EX. 10" DIP INV OUT = 36.94

EX. BLDG

EX. 15" CMP SD

METAL FLARED END SECTION (FES 3)
TOP ELEV. = 44.88
EX. 15" CMP INV IN = 43.52

EX. 10" DIP SS (DWG. 11059)

EX. DRIVEWAY

TAX ID# 03-000-90045462
EDWARD G ANDERSON
& ANGELA M ANDERSON
8042 ELIZABETH RD
T.M. 17 GRID 16 P. 92
DEED: 15647/416
PLAT: 3422/281
0.884 AC.

HA 3 EX. A.A.C.O. TYPE 'X' HEADWALL
TOP ELEV. = 46.42
EX. 53"x34" RCP INV IN = 41.22
EX. 53"x34" RCP INV IN = 41.19

EX. 53"x34" RCP SD

EX. 53"x34" RCP SD

N 532,380
E 1,444,250

TAX ID# 03-000-40011127
JAMES L WILLIAMS
8106 HOG NECK RD
T.M. 17 GRID 16 P. 618
DEED: 31042/149
PLAT: 2484/746
0.890 AC.

STREAM PLANTING KEY

ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST PLANTING

ZONE C: FC MID-ATLANTIC MESIC MIXED FOREST PLANTING

PERMANENT STABILIZATION

WOODY/NON-WOODY PLANTING BREAK

PLANTING PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

LS-01

90% CONSTRUCTION DRAWINGS

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	53 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
PLANTING PLAN
COUNCIL DISTRICT 3

J:\5_20201_ROCK_CREEK_STREAM_RESTORATION\00 Files\Sheet Files\5_20201_PLN101

STREAM PLANTING KEY

ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST PLANTING

ZONE B: FC COASTAL PLAIN OAK FLOODPLAIN FOREST PLANTING

ZONE C: FC MID-ATLANTIC MESIC MIXED FOREST PLANTING

WOODY/NON-WOODY PLANTING BREAK

MARYLAND GRID & SYSTEM (NAD'83/91)

TAX ID# 03-190-90044252
CHESTERFIELD HOME OWNERS ASSN INC
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
3.713 AC.

N: 539,400
E: 1,446,750

PR. OPEN PIPES 1 & 2

EX. OPEN PIPE (OP 3)
TOP ELEV. = 43.11
EX. 18" CMP INV OUT = 41.59

EX. OPEN PIPE (OP 4)
TOP ELEV. = 43.41
EX. 21" CMP INV OUT = 41.57

EX. OPEN PIPE (OP 1)
TOP ELEV. = 35.48
EX. 18" CMP INV IN = 34.51

EX. OPEN PIPE (OP 2)
TOP ELEV. = 36.48
EX. 21" CMP INV IN = 34.67

EX. 18" CMP SD

EX. 21" CMP SD

EX. 15" CMP SD

EX. 8" PVC SS (DWG. 26781)

EX. TREELINE (TYP)

EX. BLDG

EX. SHED

EX. PARKING LOT

EX. 25' UTILITY EASEMENT
PLAT: 95\24

EX. SS MANHOLE #22260 (DWG. 26781)
TOP ELEV. = 51.12
EX. 8" PVC INV IN = 51.54
EX. 8" PVC INV OUT = 51.07

EX. 8" PVC SS (DWG. 26781)

ZONE B: FC COASTAL PLAIN OAK FLOODPLAIN FOREST PLANTING (TYP)

EX. SS MANHOLE #22259 (DWG. 26781)
TOP ELEV. = 38.78
EX. 8" PVC INV IN = 30.32
EX. 8" DIP INV OUT = 30.14

PR. LIMIT OF DISTURBANCE/HIGH VISIBILITY FENCE

ZONE C: FC MID-ATLANTIC MESIC MIXED FOREST PLANTING (TYP)

EX. SPECIMEN TREE (TYP)

TR B

PR. BASELINE OF CONSTRUCTION/ALIGNMENT

ROCK CREEK

EX. 8" PVC SS (DWG. 26781)

EX. 10" DIP SS

TAX ID# 03-190-90041463
CHATTERLEIGH LTD PTNSHP
FLOOD PLAIN
T.M. 17 GRID 16 P. 640
DEED: 3062/888
PLAT: 92/44
3.060 AC.

EX. 15' SEWER EASEMENT (DWG 26774)

N: 539,400
E: 1,446,000

NO WOODY PLANTINGS; APPLY SEED CONSISTENT WITH ZONE

ADAPTIVE MANAGEMENT PATH TO REMAIN, NO PLANTING OR SEEDING (TYP)

EX. SS MANHOLE #16465 (DWG. 17035)
TOP ELEV. = 41.62
EX. 10" DIP INV IN = 35.50
EX. 10" DIP INV OUT = 35.22
EX. 8" PVC INV IN (N) = 35.67
EX. 8" PVC INV IN (SE) = 35.52

EX. SS MANHOLE #16464 (DWG. 17035)
TOP ELEV. = 39.88
EX. 10" DIP INV IN = 28.68
EX. 10" DIP INV OUT = 28.60
EX. 8" PVC INV IN = 29.13

PR. VALLEY WIDE WEIR (TYP)

NO WOODY PLANTINGS; APPLY SEED CONSISTENT WITH ZONE

EX. SS MANHOLE #16463 (DWG. 17034)
TOP ELEV. = 34.57
EX. 10" DIP INV IN = 26.17
EX. 10" DIP INV OUT = 26.13

NO WOODY PLANTINGS; APPLY SEED CONSISTENT WITH ZONE

TAX ID# 03-190-90044220
CHESTERFIELD HOME OWNERS ASSN INC
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
2.907 AC.

ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST PLANTING (TYP)

TAX ID# 03-190-90041462
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
4.961 AC.

E: 1,444,000
N: 539,700

TAX ID# 03-000-90045962
EDWARD G ANDERSON
& ANGELA M ANDERSON
8042 ELIZABETH RD
T.M. 17 GRID 16 P. 42
DEED: 15647/416
PLAT: 3422/287
0.884 AC.

EX. DWY

TAX ID# 03-242-90229288
CREEKSIDE HMOWNRS ASSOC INC
CREEKSIDE DR
T.M. 17 GRID 16 P. 425
DEED: 26429/1
PLAT: 284/5
1.240 AC.

MATCHLINE REFER TO SHEET 53/DWG LS-01

MATCHLINE REFER TO SHEET 55/DWG LS-03

PLANTING PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

LS-02

90% CONSTRUCTION DRAWINGS

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF, ENGINEER
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY: CMS/SC	8/13/25
SHEET NO.	54 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
PLANTING PLAN
COUNCIL DISTRICT 3

25_20201_ROCK CREEK_PROJ\DESIGN\CAD Files\Sheet Files\LS_20201_PLN102

MATCHLINE REFER TO SHEET 54/DWG LS-02

MATCHLINE REFER TO SHEET 56/DWG LS-04

ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST PLANTING (TYP)

ZONE B: FC COASTAL PLAIN OAK FLOODPLAIN FOREST PLANTING (TYP)

ZONE C: FC MID-ATLANTIC MESIC MIXED FOREST PLANTING (TYP)

PR. BASELINE OF CONSTRUCTION/ALIGNMENT

ADAPTIVE MANAGEMENT PATH TO REMAIN, NO PLANTING OR SEEDING (TYP)

PR. VALLEY WIDE WEIR (TYP)

PR. RIFFLE-WEIR (TYP)

PR. TRIBUTARY 1

TRIBUTARY 1

ROCK CREEK

EX. SPECIMEN TREE (TYP)

EX. FOREST CONSERVATION EASEMENT PLAT: 32749

EX. FOREST CONSERVATION AREA (OPEN SPACE/RECREATIONAL AREA) PLAT: 33710

EX. SWM FACILITY AND OUTFALL CHANNEL TO BE RETROFIT BY OTHERS*

EX. RIPRAP TO BE INSTALLED BY OTHERS*

EX. HEADWALL TO BE INSTALLED BY OTHERS*

NO WOODY PLANTINGS; APPLY SEED CONSISTENT WITH ZONE

PR. LIMIT OF DISTURBANCE/HIGH VISIBILITY FENCE

EX. 15' SEWER EASEMENT (DWG 26719)

EX. SD MANHOLE TO BE INSTALLED BY OTHERS*

EX. SD RISER TO BE INSTALLED BY OTHERS*

EX. PARKING LOT

EX. BLDG

EX. DRIVEWAY

EX. TREELINE (TYP)

EX. PERPETUAL EASEMENT FOR DRAINAGE FACILITY PLAT: 32749

EX. RIPRAP TO REMAIN (TYP)

EX. A.A.CO. TYPE 'B' HEADWALL (HW 3) TOP ELEV. = 45.45 EX. 21" RCP INV IN = 42.03

EX. SS MANHOLE #16462 (DWG. 17034) (SS MH) TOP ELEV. = 31.61 EX. 10" DIP INV IN = 22.03 EX. 10" DIP INV OUT = 21.46

EX. SS MANHOLE # 16461 (DWG. 17034) (SS MH) TOP ELEV. = 25.40 EX. 10" DIP INV IN = 17.90 EX. 10" DIP INV OUT = 17.78

TAX ID# 03-190-90041462
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
4.961 AC.

TAX ID# 03-190-90044220
CHESTERFIELD HOME OWNERS ASSN INC
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
2.907 AC.

TAX ID# 03-247-90242954
ELIZABETH PLACE II HOA INC
OPEN SPACE#1/REC AREA#1/
FOREST CONSERV AREA
T.M. 17 GRID 16 P. 302
DEED: 30263/204
0.483 AC.

TAX ID# 03-247-90234207
ELIZABETH PLACE HOA INC
OPEN SPACE
T.M. 17 GRID 16 P. 44
DEED: 21259/402
PLAT: 32749
0.578 AC.

TAX ID# 03-000-04878490
GNS ASSETS LLC
8844 FT SMALLWOOD RD
T.M. 17 GRID 16 P. 95
DEED: 18087/182
3.80 AC.

TAX ID# 03-000-13860700
VINCENT R HENITT SR
& JAQUELINE L HENITT
8842 FORT SMALLWOOD RD
T.M. 17 GRID 16 P. 480
DEED: 4925/881
1.000 AC.

N 533,850 E 1,448,800

N 534,250 E 1,448,450

STREAM PLANTING KEY

ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST PLANTING

ZONE B: FC COASTAL PLAIN OAK FLOODPLAIN FOREST PLANTING

ZONE C: FC MID-ATLANTIC MESIC MIXED FOREST PLANTING

WOODY/NON-WOODY PLANTING BREAK

PLANTING PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

LS-03

90% CONSTRUCTION DRAWINGS

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Hanover, Maryland 21076
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Fax: (410) 694-9105
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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE	CHIEF ENGINEER	APPROVED DATE	PROJECT MANAGER
APPROVED DATE	DEPUTY DIRECTOR	APPROVED DATE	CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SG	8/13/25
SHEET NO.	55 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
PLANTING PLAN
COUNCIL DISTRICT 3

J:\5_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\5_20201_PLN.dwg

MATCHLINE REFER TO SHEET 55/DWG LS-03

MATCHLINE REFER TO SHEET 57/DWG LS-05

TAX ID# 03-190-90044252
CHESTERFIELD HOME OWNERS ASSN INC.
RECREATION AREA
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
3.713 AC.

SS MANHOLE #22303
(DWG. 26782)
TOP ELEV. = 37.64
EX. 8" PVC INV OUT = 26.76

EX. 25' UTILITY EASEMENT
PLAT: 92/44

EX. 12" CMP
EX. 8" PVC

EX. 25' NON-TIDAL WETLAND BUFFER (TYP)

EX. NON-TIDAL WETLAND (TYP)

EX. SPECIMEN TREE (TYP)

N: 594,000
E: 1,448,350

FES 2
METAL FLARED END SECTION
TOP ELEV. = 19.42
EX. 12" CMP INV IN = 18.37

NO WOODY PLANTINGS; APPLY SEED CONSISTENT WITH ZONE

TAX ID# 03-190-90041463
CHATTERLEIGH LTD PTNSHP
FLOOD PLAIN
T.M. 17 GRID 16 P. 640
DEED: 3062/888
PLAT: 92/44
3.060 AC.

TAX ID# 03-190-90041508
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
2.580 AC.

ADAPTIVE MANAGEMENT PATH TO REMAIN, NO PLANTING OR SEEDING (TYP)

EX. SS MANHOLE #16459
(DWG. 17033)
TOP ELEV. = 17.28
EX. 10" DIP INV IN = 9.61
EX. 10" DIP INV OUT = 9.51

NO WOODY PLANTINGS; APPLY SEED CONSISTENT WITH ZONE

E: 1,447,600
N: 594,360

EX. 15' SEWER EASEMENT
(DWG 26779)

EX. 10" DIP SS

EX. SS MANHOLE #16460
(DWG. 17034)
TOP ELEV. = 20.10
EX. 10" DIP INV IN = 11.56
EX. 10" DIP INV OUT = 11.34
EX. 8" PVC INV IN = 12.43

PR. LIMIT OF DISTURBANCE/HIGH VISIBILITY FENCE

NO WOODY PLANTINGS; APPLY SEED CONSISTENT WITH ZONE

ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST PLANTING (TYP)

ZONE D: FC NON-TIDAL BALD CYPRESS TUPELO FOREST PLANTING (TYP)

PR. BASELINE OF CONSTRUCTION/ALIGNMENT

ZONE B: FC COASTAL PLAIN OAK FLOODPLAIN FOREST PLANTING (TYP)

PR. VALLEY WIDE WEIR (TYP)

ROCK CREEK

TAX ID# 03-000-13860700
VINCENT R HEWITT SR
& JACQUELINE L HEWITT
8892 FORT SMALLWOOD RD
T.M. 17 GRID 16 P. 480
DEED: 4825/881
1.000 AC

TAX ID# 03-190-90041462
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 16 P. 640
DEED: 3864/40
PLAT: 92/44
4.961 AC.

TAX ID# 03-190-90034092
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

TAX ID# 03-000-28477200
PAUL R STAMMER &
LAURA A STAMMER
8882 FT SMALLWOOD RD
T.M. 17 GRID 16 P. 342
DEED: 6564/683
4.780 AC.

E: 1,448,350
N: 594,150

EX. BLDG

TAX ID# 03-308-90084865
LEE GORSCHE &
STEPHANIE GORSCHE
1101 GALLATIN WAY
T.M. 17 GRID 10 P. 100
DEED: 33644/297
PLAT: 166/46
0.224 AC.

TAX ID# 03-308-90084866
ARSEAN HOOMAN
1103 GALLATIN WAY
T.M. 17 GRID 10 P. 100
DEED: 24125/44
PLAT: 194/21
0.171 AC.

EX. SHED

STREAM PLANTING KEY

- ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST PLANTING
- ZONE D: FC NON-TIDAL BALD CYPRESS TUPELO FOREST PLANTING
- ZONE B: FC COASTAL PLAIN OAK FLOODPLAIN FOREST PLANTING
- WOODY/NON-WOODY PLANTING BREAK

PLANTING PLAN

SCALE: 1" = 20'

0 10 20 40
1 INCH = 20 FEET

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE		APPROVED DATE	
CHIEF ENGINEER		PROJECT MANAGER	
APPROVED DATE		APPROVED DATE	
DEPUTY DIRECTOR		CHIEF, RIGHT OF WAY	

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY: CMS/SG	8/13/25
SHEET NO.	56 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
PLANTING PLAN
COUNCIL DISTRICT 3

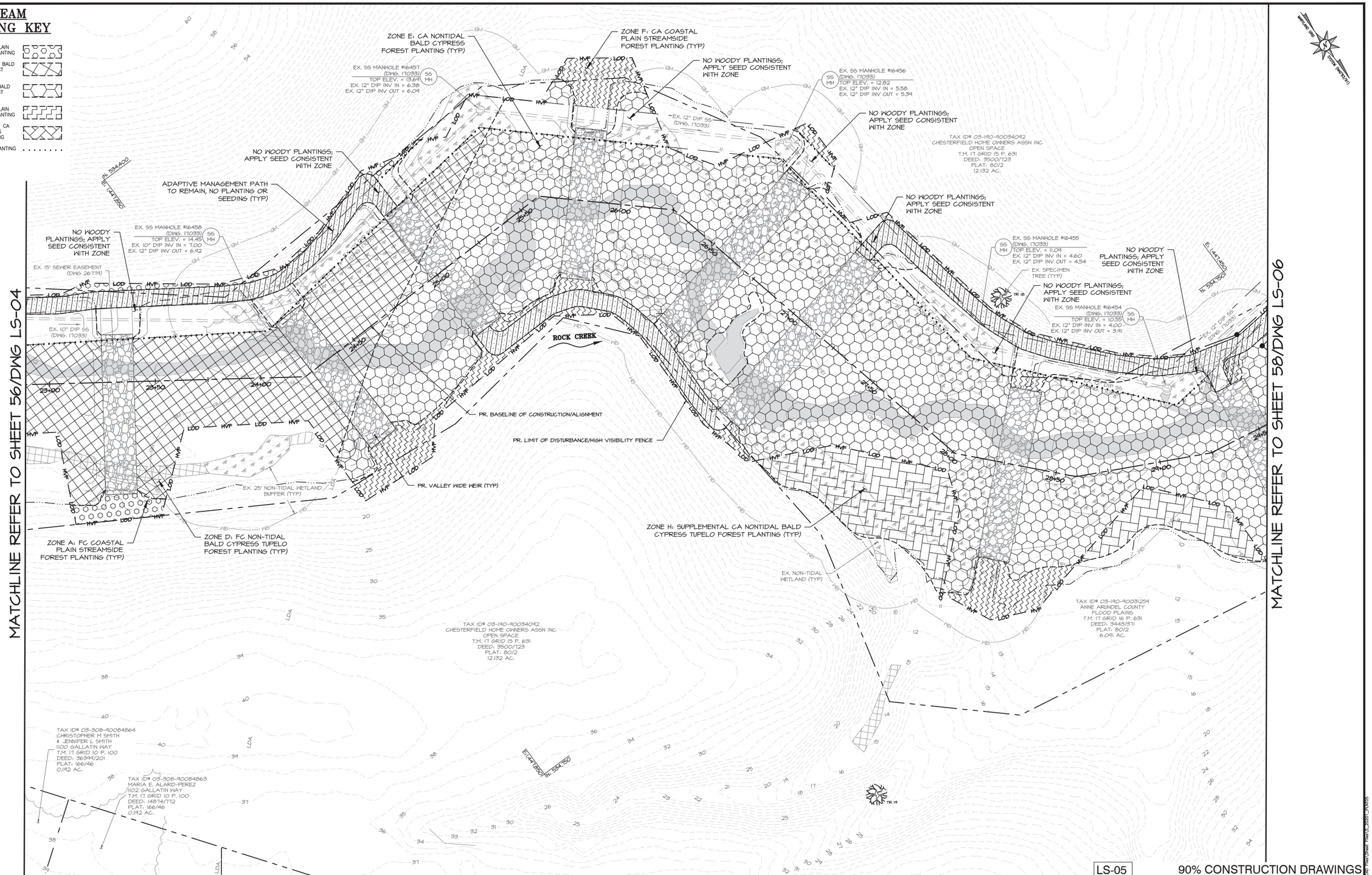
LS-04

90% CONSTRUCTION DRAWINGS

Z:\5_20201_ROCK_CREEK_STREAM_RESTORATION\DWG Files\Sheet Files\5_20201_PLN104

STREAM PLANTING KEY

- ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST PLANTING
- ZONE D: FC NON-TIDAL BALD CYPRESS TUPELO FOREST PLANTING
- ZONE E: CA NONTIDAL BALD CYPRESS TUPELO FOREST PLANTING
- ZONE F: CA COASTAL PLAIN STREAMSIDE FOREST PLANTING
- ZONE H: SUPPLEMENTAL CA NONTIDAL BALD CYPRESS TUPELO FOREST PLANTING
- WOODY/NON-WOODY PLANTING BREAK



PLANTING PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE	CHIEF ENGINEER	APPROVED DATE	PROJECT MANAGER
APPROVED DATE	DEPUTY DIRECTOR	APPROVED DATE	CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	57 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
PLANTING PLAN
COUNCIL DISTRICT 3

LS-05

90% CONSTRUCTION DRAWINGS

MATCHLINE REFER TO SHEET 57/DWG LS-05

MATCHLINE REFER TO SHEET 59/DWG LS-07

TAX ID# 03-190-90034092
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

N: 594,100
E: 1,447,350

ZONE H: SUPPLEMENTAL CA NONTIDAL BALD CYPRESS TUPELO FOREST PLANTING (TYP)

NO WOODY PLANTINGS; APPLY SEED CONSISTENT WITH ZONE

EX. SS MANHOLE #16453
(DWG. 17033)
TOP ELEV. = 10.41
EX. 12" DIP INV IN = 3.50
EX. 12" DIP INV OUT = 3.31

EX. SS MANHOLE #14652
(DWG. 17032)
TOP ELEV. = 10.77
EX. 12" DIP INV IN = 1.30
EX. 12" DIP INV OUT = 1.01

EX. 15' SEWER EASEMENT
(DWG. 26719)

EX. 12" DIP SS
(DWG. 17033)

EX. 12" DIP SS
(DWG. 17032)

TAX ID# 03-190-90031254
ANNE ARUNDEL COUNTY
FLOOD PLAINS
T.M. 17 GRID 16 P. 631
DEED: 3443/311
PLAT: 80/2
6.041 AC.

PR. BASELINE OF CONSTRUCTION/ALIGNMENT

ZONE G: CA MID-ATLANTIC MESIC MIXED FOREST PLANTING (TYP)

TAX ID# 03-190-90031260
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/02
6.235 AC.

E: 1,448,900
N: 595,100

EX. SS MANHOLE #16451
(DWG. 17032)
TOP ELEV. = 6.31
EX. 12" DIP INV IN = -0.32
EX. 12" DIP INV OUT = -0.44

PR. VALLEY WIDE WEIR (TYP)

ROCK CREEK

ZONE E: CA NONTIDAL BALD CYPRESS TUPELO FOREST PLANTING (TYP)

EX. NON-TIDAL WETLAND (TYP)

ZONE A SHFA SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD FIRM NO. 24003C0064F

ADAPTIVE MANAGEMENT PATH TO REMAIN, NO PLANTING OR SEEDING (TYP)

PR. LIMIT OF DISTURBANCE/ HIGH VISIBILITY FENCE

PR. RIFFLE GRADE CONTROL (TYP)

ZONE F: CA COASTAL PLAIN STREAMSIDE FOREST PLANTING (TYP)

EX. 25' NON-TIDAL WETLAND BUFFER (TYP)

TAX ID# 03-190-90034092
CHESTERFIELD HOME OWNERS ASSN INC
OPEN SPACE
T.M. 17 GRID 15 P. 631
DEED: 3500/123
PLAT: 80/2
12.132 AC.

EXTENSION N: 595,100

LS-06

90% CONSTRUCTION DRAWINGS

STREAM PLANTING KEY

- ZONE E: CA NONTIDAL BALD CYPRESS TUPELO FOREST PLANTING
- ZONE F: CA COASTAL PLAIN STREAMSIDE FOREST PLANTING
- ZONE G: CA MID-ATLANTIC MESIC MIXED FOREST PLANTING
- ZONE H: SUPPLEMENTAL CA NONTIDAL BALD CYPRESS TUPELO FOREST PLANTING
- WOODY/NON-WOODY PLANTING BREAK

PLANTING PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET

Consultants & Designers, Inc.
"Integrating Engineering and Environment"
7455 New Ridge Road, Suite T
Hanover, Maryland 21076
Phone: (410) 694-9401
Fax: (410) 694-9105
www.baylandinc.com
BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF ENGINEER
APPROVED DATE — PROJECT MANAGER
APPROVED DATE — DEPUTY DIRECTOR
APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	58 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
PLANTING PLAN
COUNCIL DISTRICT 3

2/5/2026 J:\ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\LS_20501_PLAN.dwg

STREAM PLANTING KEY

ZONE G: FC MID-ATLANTIC MESIC MIXED FOREST PLANTING

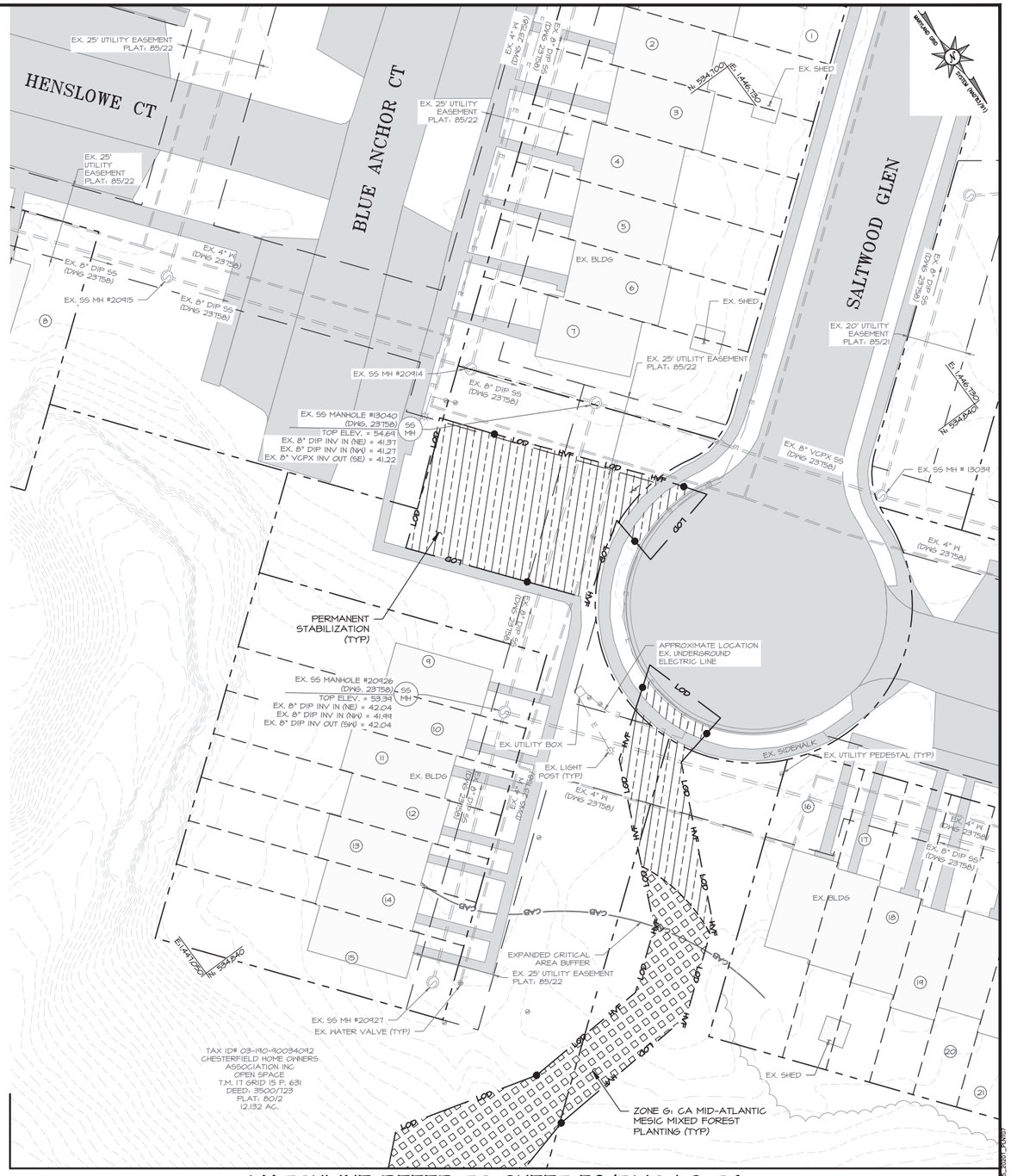
PERMANENT STABILIZATION

PLANTING PLAN

SCALE: 1" = 20'

0 10 20 40

1 INCH = 20 FEET



MATCHLINE REFER TO SHEET 58/DWG LS-06

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE		APPROVED DATE	
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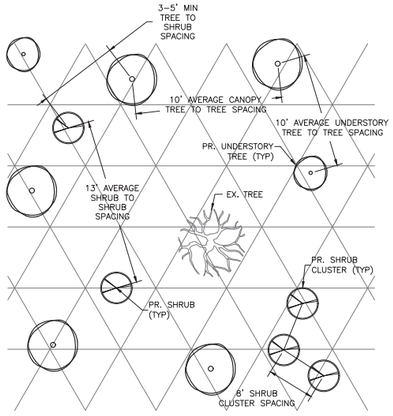
SCALE:	1" = 20'
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	59 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
PLANTING PLAN
COUNCIL DISTRICT 3

LS-07 90% CONSTRUCTION DRAWINGS

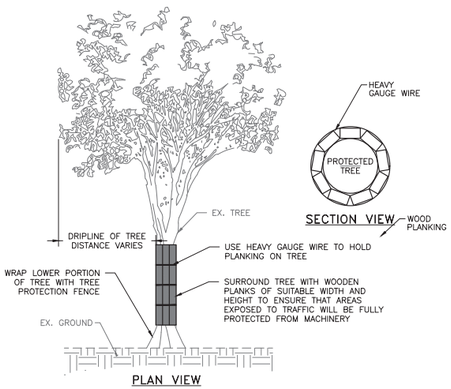
GENERAL PLANTING NOTES

1. ALL PLANT MATERIALS SHALL BE NURSERY GROWN AND SHALL CONFORM TO AMERICAN ASSOCIATION OF NURSERYMEN, INC. STANDARDS.
2. CONTRACTOR IS RESPONSIBLE TO VERIFY ALL UTILITY LOCATIONS PRIOR TO PLANTING MATERIAL. IF CONFLICTS ARISE, THE ENGINEER MUST BE NOTIFIED PRIOR TO ANY GROUND BREAKING.
3. TREES AND SHRUBS SHALL BE PLANTED BETWEEN MARCH 1 TO JUNE 15 AND FROM SEPTEMBER 15 TO DECEMBER 15. SUPPLEMENTAL WATERING MAY BE NECESSARY TO ENSURE PLANT ESTABLISHMENT DURING EXTENDED PERIODS OF DRY CONDITIONS. PLANTING MAY BE CONTINUED DURING THE WINTER MONTHS PROVIDING THERE IS NO FROST IN THE GROUND AND FROST FREE TOPSOIL PLANTING MIXTURES ARE USED.
4. HERBACEOUS PLUGS AND QUARTS SHALL BE PLANTED BETWEEN MARCH 15 AND MAY 15 OR BETWEEN SEPTEMBER 15 AND OCTOBER 31, UNLESS OTHERWISE DIRECTED BY THE COUNTY.
5. NO CONTAINER–GROWN MATERIAL SHALL BE PLANTED IF NOT ACCLIMATED TO THE CURRENT WEATHER CONDITIONS. CONTRACTOR IS RESPONSIBLE FOR GENERAL MAINTENANCE INCLUDING WATERING.
6. ALL PLANTING MATERIAL AND PLANTING METHODS SHALL CONFORM TO CONSTRUCTION SPECIFICATIONS AND DETAILS.
7. ALL DISTURBED AREAS NOT EXPLICITLY HATCHED FOR REPLANTING SHALL BE STABILIZED IN ACCORDANCE WITH STANDARD PERMANENT STABILIZATION METHODS.



TYPICAL 30'X30' NATURALIZED PLANTING DETAIL

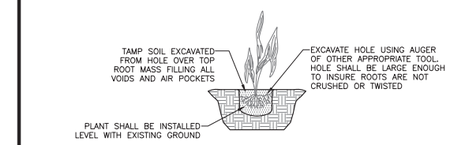
NOT TO SCALE



NOTE:
1. DO NOT NAIL OR STAPLE INTO TREE TRUNK.

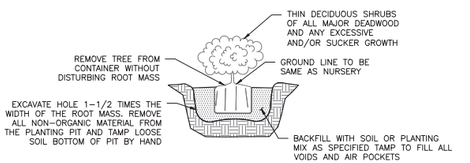
TREE PLANKING DETAIL

NOT TO SCALE



HERBACEOUS PLANTING – PLUG

NOT TO SCALE

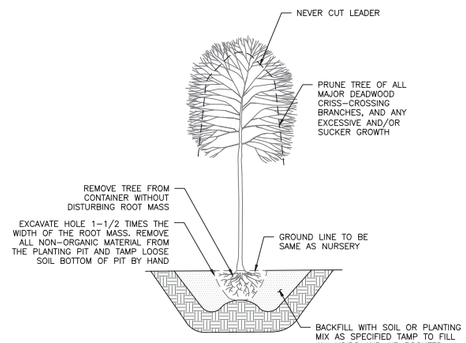


SHRUB PLANTING – CONTAINER GROWN

NOT TO SCALE

HERBACEOUS PLANTING – QUART

NOT TO SCALE



TREE PLANTING – CONTAINER GROWN

NOT TO SCALE

ANNE ARUNDEL SOIL CONSERVATION DISTRICT DETAILS AND SPECIFICATIONS FOR VEGETATIVE ESTABLISHMENT

FOLLOWING INITIAL SOIL DISTURBANCES OR REDISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN THREE CALENDAR DAYS FOR THE SURFACE OF ALL PERIMETER CONTROLS, DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND ALL SLOPES GREATER THAN 3 HORIZONTAL TO 1 VERTICAL (3:1) AND SEVEN DAYS FOR ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.

1. PERMANENT SEEDING:

A. SOIL TESTS: LIME AND FERTILIZER WILL BE APPLIED PER SOIL TESTS RESULTS FOR SITES GREATER THAN 5 ACRES. SOIL TESTS WILL BE DONE AT COMPLETION OF INITIAL ROUGH GRADING OR AS RECOMMENDED BY THE SEDIMENT CONTROL INSPECTOR. RATES AND ANALYSES WILL BE PROVIDED TO THE GRADING INSPECTOR AS WELL AS THE CONTRACTOR.

OCCURRENCE OF ACID SULFATE SOILS (GRAYISH BLACK COLOR) WILL REQUIRE COVERING WITH A MINIMUM OF 12 INCHES OF CLEAN SOIL WITH 6 INCHES MINIMUM CAPPING OF TOP SOIL. NO STOCKPILING OF MATERIAL IS ALLOWED. IF NEEDED, SOIL TESTS SHOULD BE DONE BEFORE AND AFTER A 6–WEEK INCUBATION PERIOD TO ALLOW OXIDATION OF SULFATES.

THE MINIMUM SOIL CONDITIONS REQUIRED FOR PERMANENT VEGETATIVE ESTABLISHMENT ARE:

a. SOIL PH SHALL BE BETWEEN 6.0 AND 7.0.
b. SOLUBLE SALTS SHALL BE LESS THAN 500 PARTS PER MILLION (PPM).
c. THE SOIL SHALL CONTAIN LESS THAN 40% CLAY BUT ENOUGH FINE GRAINED MATERIAL (> 30% SILT PLUS CLAY) TO PROVIDE THE CAPACITY TO HOLD A MODERATE AMOUNT OF MOISTURE. AN EXCEPTION IS IF LOVEGRASS OR SERECIA LESPEDEZA IS TO BE PLANTED, THEN A SANDY SOIL (< 30% SILT PLUS CLAY) WOULD BE ACCEPTABLE.
d. SOIL SHALL CONTAIN 1.5% MINIMUM ORGANIC MATTER BY WEIGHT.
e. SOIL MUST CONTAIN SUFFICIENT PORE SPACE TO PERMIT ADEQUATE ROOT PENETRATION.
f. IF THESE CONDITIONS CANNOT BE MET BY SOILS ON SITE, ADDING TOPSOIL IS REQUIRED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SOIL PREPARATION, TOPSOILING AND SOIL AMENDMENTS FROM THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL OR AMENDMENTS MADE AS RECOMMENDED BY A CERTIFIED AGRONOMIST.

B. SEEDBED PREPARATION: AREA TO BE SEEDED SHALL BE LOOSE AND FRIABLE TO A DEPTH OF AT LEAST 3–5 INCHES. THE TOP LAYER SHALL BE LOOSENED BY RAKING, DISKING OR OTHER ACCEPTABLE MEANS BEFORE SEEDING OCCURS. FOR SITES LESS THAN 5 ACRES, APPLY 100 POUNDS DOLOMITIC LIMESTONE AND 21 POUNDS OF 10–10–10 FERTILIZER PER 1,000 SQUARE FEET. HARROW OR DISK LIME AND FERTILIZER INTO THE SOIL TO A DEPTH OF AT LEAST 3–5 INCHES ON SLOPES FLATTER THAN 3:1.

C. SEEDING: APPLY 5–6 POUNDS PER 1,000 SQUARE FEET OF TALL FESCUE BETWEEN FEBRUARY 1 AND APRIL 30 OR BETWEEN AUGUST 15 AND OCTOBER 31. APPLY SEED UNIFORMLY ON A MOIST FIRM SEEDBED WITH A CYCLONE SEEDER, CULTIPACKER SEEDER OR HYDROSEEDER (SLURRY INCLUDES SEEDS AND FERTILIZER, RECOMMENDED ON STEEP SLOPES ONLY). MAXIMUM SEED DEPTH SHOULD BE 1/4 INCH IN CLAYEY SOILS AND 1/2 INCH IN SANDY SOILS WHEN USING OTHER THAN THE HYDROSEEDER METHOD. IRRIGATE WHERE NECESSARY TO SUPPORT ADEQUATE GROWTH UNTIL VEGETATION IS FIRMLY ESTABLISHED. IF OTHER SEED MIXES ARE TO BE USED, SELECT FROM TABLE B3 AND B5 OF THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL.

D. MULCHING: MULCH SHALL BE APPLIED TO ALL SEEDED AREAS IMMEDIATELY AFTER SEEDING. DURING THE TIME PERIODS WHEN SEEDING IS NOT PERMITTED, MULCH SHALL BE APPLIED IMMEDIATELY AFTER GRADING. MULCH SHALL BE UNROTTED, UNCHOPPED, SMALL GRAIN STRAW APPLIED AT A RATE OF 2 TONS PER ACRE OR 90 POUNDS PER 1,000 SQUARE FEET (2 BALES). APPLY MULCH TO ACHIEVE A UNIFORM DISTRIBUTION AND DEPTH SO THAT THE SOIL SURFACE IS NOT EXPOSED. IF A MULCH–ANCHORING TOOL IS USED, APPLY 2.5 TONS PER ACRE. MULCH MATERIALS SHALL BE RELATIVELY FREE OF ALL KINDS OF WEEDS AND SHALL BE COMPLETELY FREE OF PROHIBITED NOXIOUS WEEDS. SPREAD MULCH UNIFORMLY, MECHANICALLY OR BY HAND, TO A DEPTH OF 1–2 INCHES.

E. SECURING STRAW MULCH: STRAW MULCH SHALL BE SECURED IMMEDIATELY FOLLOWING MULCH APPLICATION TO MINIMIZE MOVEMENT BY WIND OR WATER. THE FOLLOWING METHODS ARE PERMITTED:

i. USE A MULCH–ANCHORING TOOL WHICH IS DESIGNED TO PUNCH AND ANCHOR MULCH INTO THE SOIL SURFACE TO A MINIMUM DEPTH OF 2 INCHES. THIS IS THE MOST EFFECTIVE METHOD FOR SECURING MULCH, HOWEVER, IT IS LIMITED TO RELATIVELY FLAT AREAS WHERE EQUIPMENT CAN OPERATE SAFELY.
ii. WOOD CELLULOSE FIBER MAY BE USED FOR ANCHORING STRAW. APPLY THE FIBER BINDER AT A NET DRY WEIGHT OF 750 POUNDS PER ACRE. IF MIXED WITH WATER, USE 50 POUNDS OF WOOD CELLULOSE FIBER PER 100 GALLONS OF WATER.
iii. LIQUID BINDERS MAY BE USED. APPLY AT HIGHER RATES AT THE EDGES WHERE WIND CATCHES MULCH, SUCH AS IN VALLEYS AND ON CRESTS OF SLOPES. THE REMAINDER OF THE AREA SHOULD APPEAR UNIFORM AFTER BINDER APPLICATION. BINDERS LISTED IN THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL OR APPROVED EQUAL SHALL BE APPLIED AT RATES RECOMMENDED BY THE MANUFACTURERS.
iv. LIGHTWEIGHT PLASTIC NETTING MAY BE USED TO SECURE MULCH. THE NETTING WILL BE STAPLED TO THE GROUND ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

2. TEMPORARY SEEDING:
LIME: 100 POUNDS OF DOLOMITIC LIMESTONE PER 1,000 SQUARE FEET.
FERTILIZER: 15 POUNDS OF 10–10–10 PER 1,000 SQUARE FEET.
SEED: PERENNIAL RYE – 0.92 POUNDS PER 1,000 SQUARE FEET (FEBRUARY 1 THROUGH APRIL 30 OR AUGUST 15 THROUGH OCTOBER 31).
MILLET – 0.92 POUNDS PER 1,000 SQUARE FEET (MAY 1 THROUGH AUGUST 15).
MULCH: SAME AS 1 D AND E ABOVE.

3. NO FILLS MAY BE PLACED ON FROZEN GROUND. ALL FILL IS TO BE PLACED IN APPROXIMATELY HORIZONTAL LAYERS, EACH LAYER HAVING A LOOSE THICKNESS OF NOT MORE THAN 8 INCHES. ALL COMPACTION REQUIREMENTS ARE IN ACCORDANCE TO ANNE ARUNDEL COUNTY STANDARD SPECIFICATIONS FOR CONSTRUCTION AS WELL AS THE AA COUNTY DESIGN MANUAL AND STANDARD DETAILS. FILLS FOR POND EMBANKMENTS SHALL BE COMPACTED AS PER MD–378 CONSTRUCTION SPECIFICATIONS. ALL OTHER FILLS SHALL BE COMPACTED SUFFICIENTLY SO AS TO BE STABLE AND PREVENT EROSION AND SLIPPAGE.

4. PERMANENT SOD:

INSTALLATION OF SOD SHOULD FOLLOW PERMANENT SEEDING DATES. SEEDBED PREPARATION FOR SOD SHALL BE AS NOTED IN SECTION (B) ABOVE. PERMANENT SOD IS TO BE TALL FESCUE, STATE APPROVED SOD; LIME AND FERTILIZER PER PERMANENT SEEDING SPECIFICATIONS AND LIGHTLY IRRIGATE SOIL PRIOR TO LAYING SOD. SOD IS TO BE LAID ON THE CONTOUR WITH ALL ENDS TIGHTLY ABUTTING. JOINTS ARE TO BE STAGGERED BETWEEN ROWS. WATER AND ROLL OR TAMP SOD TO INSURE POSITIVE ROOT CONTACT WITH THE SOIL. ALL SLOPES STEEPER THAN 3:1, AS SHOWN, ARE TO BE PERMANENTLY SODDED OR PROTECTED WITH AN APPROVED EROSION CONTROL NETTING. ADDITIONAL WATERING FOR ESTABLISHMENT MAY BE REQUIRED. SOD IS NOT TO BE INSTALLED ON FROZEN GROUND. SOD SHALL NOT BE TRANSPLANTED WHEN MOISTURE CONTENT (DRY OR WET) AND/OR EXTREME TEMPERATURE MAY ADVERSELY AFFECT ITS SURVIVAL. IN THE ABSENCE OF ADEQUATE RAINFALL, IRRIGATION SHOULD BE PERFORMED TO ENSURE ESTABLISHMENT OF SOD.

5. MINING OPERATIONS:

SEDIMENT CONTROL PLANS FOR MINING OPERATIONS MUST INCLUDE THE FOLLOWING SEEDING DATES AND MIXTURES:

FOR SEEDING DATES OF FEBRUARY 1 THROUGH APRIL 30 AND AUGUST 15 THROUGH OCTOBER 31, USE SEED MIXTURE OF TALL FESCUE AT THE RATE OF 2 POUNDS PER 1,000 SQUARE FEET AND SERICEA LESPEDEZA AT THE MINIMUM RATE OF 0.5 POUNDS PER 1,000 SQUARE FEET.

6. TOPSOIL SHALL BE APPLIED AS PER THE STANDARD AND SPECIFICATIONS FOR SOIL PREPARATION, TOPSOILING, AND SOIL AMENDMENTS FROM THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL.

7. USE OF THESE VEGETATIVE ESTABLISHMENT SPECIFICATIONS DOES NOT PRECLUDE THE PERMITTEE OR CONTRACTOR FROM MEETING ALL OF THE REQUIREMENTS SET FORTH IN THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL.

PERMANENT SEEDING SUMMARY

NO.	SPECIES	APPLICATION RATE (lb/ac)	SEEDING DATES	SEEDING DEPTHS	MIX 8 FERTILIZER RATE (10–10–10) MIX 11 FERTILIZER RATE (20–10–10) N	P2O5	K2O	LIME RATE
HARDINESS ZONE (FROM FIGURE B.3): 7a SEED MIXTURE (FROM TABLE B.5)								
8	TALL FESCUE	100	2/15 – 4/30 8/15 – 10/31	1/2" – 1"	45 lb/ac (1.0 lb/ 1000 sf)	45 lb/ac (1.0 lb/ 1000 sf)	45 lb/ac (1.0 lb/ 1000 sf)	2 tons/ac (90 lb/ 1000 sf)
11	CREEPING RED FESCUE CHEWINGS FESCUE KENTUCKY BLUEGRASS	30 30 20	2/15 – 4/30 8/15 – 10/31	1/2" – 1"	90 lb/ac (2.0 lb/ 1000 sf)	45 lb/ac (1.0 lb/ 1000 sf)	45 lb/ac (1.0 lb/ 1000 sf)	2 tons/ac (90 lb/ 1000 sf)

NOTES:
1. SEEDING RATES FOR THE WARM–SEASON GRASSES ARE IN POUNDS OF PURE LIVE SEED (PLS). ACTUAL PLANTING RATES SHALL BE ADJUSTED TO REFLECT PERCENT SEED GERMINATION AND PURITY, AS TESTED. ADJUSTMENTS ARE USUALLY NOT NEEDED FOR THE COOL–SEASON GRASSES. SEEDING RATES LISTED ABOVE ARE FOR TEMPORARY SEEDINGS, WHEN PLANTED ALONE. WHEN PLANTED AS A NURSE CROP WITH PERMANENT SEED MIXES, USE 1/3 OF THE SEEDING RATE LISTED ABOVE FOR BARLEY, OATS, AND WHEAT. FOR SMALLER–SEEDED GRASSES (ANNUAL RYEGRASS, PEARL MILLET, FOXTAIL MILLET), DO NOT EXCEED MORE THAN 5% (BY WEIGHT) OF THE OVERALL PERMANENT SEEDING MIX. CEREAL RYE GENERALLY SHOULD NOT BE USED AS A NURSE CROP, UNLESS PLANTING WILL OCCUR IN VERY LATE FALL BEYOND THE SEEDING DATES FOR OTHER TEMPORARY SEEDINGS. CEREAL RYE HAS ALLELOPATHIC PROPERTIES THAT INHIBIT THE GERMINATION AND GROWTH OF OTHER PLANTS. IF IT MUST BE USED AS A NURSE CROP, SEED AT 1/3 OF THE RATE LISTED ABOVE. OATS ARE THE RECOMMENDED NURSE CROP FOR WARM–SEASON GRASSES.
2. FOR SANDY SOILS, PLANT SEEDS AT TWICE THE DEPTH LISTED ABOVE.
3. THE PLANTING DATES LISTED ARE AVERAGES FOR EACH ZONE AND MAY REQUIRE ADJUSTMENT TO REFLECT LOCAL CONDITIONS, ESPECIALLY NEAR THE BOUNDARIES OF THE ZONE.

STANDARDS AND SPECIFICATIONS FOR SEEDING AND MULCHING

A. SEEDING

1. SPECIFICATIONS
   a. ALL SEED MUST MEET THE REQUIREMENTS OF THE MARYLAND STATE SEED LAW. ALL SEED MUST BE SUBJECT TO RE–TESTING BY A RECOGNIZED SEED LABORATORY. ALL SEED USED MUST HAVE BEEN TESTED WITHIN THE 6 MONTHS IMMEDIATELY PRECEDING THE DATE OF SOWING SUCH MATERIAL ON ANY PROJECT. REFER TO TABLE B.4 REGARDING THE QUALITY OF SEED. SEED TAGS MUST BE AVAILABLE UPON REQUEST TO THE INSPECTOR TO VERIFY TYPE OF SEED AND SEEDING RATE.
   b. MULCH ALONE MAY BE APPLIED BETWEEN THE FALL AND SPRING SEEDING DATES ONLY IF THE GROUND IS FROZEN. THE APPROPRIATE SEEDING MIXTURE MUST BE APPLIED WHEN THE GROUND THAWS.
   c. INOCULANTS: THE INOCULANT FOR TREATING LEGUME SEED IN THE SEED MIXTURES MUST BE A PURE CULTURE OF NITROGEN FIXING BACTERIA PREPARED SPECIFICALLY FOR THE SPECIES. INOCULANTS MUST NOT BE USED LATER THAN THE DATE INDICATED ON THE CONTAINER. ADD FRESH INOCULANTS AS DIRECTED ON THE PACKAGE. USE FOUR TIMES THE RECOMMENDED RATE WHEN HYDROSEEDING. NOTE: IT IS VERY IMPORTANT TO KEEP INOCULANT AS COOL AS POSSIBLE UNTIL USED. TEMPERATURES ABOVE 75 TO 80 DEGREES FAHRENHEIT CAN WEAKEN BACTERIA AND MAKE THE INOCULANT LESS EFFECTIVE.
   d. SOD OR SEED MUST NOT BE PLACED ON SOIL WHICH HAS BEEN TREATED WITH SOIL STERILANTS OR CHEMICALS USED FOR WEED CONTROL UNTIL SUFFICIENT TIME HAS ELAPSED (14 DAYS MIN.) TO PERMIT DISSIPATION OF PHYTO–TOXIC MATERIALS.
2. APPLICATION
   a. DRY SEEDING: THIS INCLUDES USE OF CONVENTIONAL DROP OR BROADCAST SPREADERS.
      i. INCORPORATE SEED INTO THE SUBSOIL AT THE RATES PRESCRIBED ON TEMPORARY SEEDING TABLE B.1, PERMANENT SEEDING TABLE B.3, OR SITE–SPECIFIC SEEDING SUMMARIES.
      ii. APPLY SEED IN TWO DIRECTIONS, PERPENDICULAR TO EACH OTHER. APPLY HALF THE SEEDING RATE IN EACH DIRECTION. ROLL THE SEEDED AREA WITH A WEIGHTED ROLLER TO PROVIDE GOOD SEED TO SOIL CONTACT.
   b. DRILL OR CULTIPACKER SEEDING: MECHANIZED SEEDERS THAT APPLY AND COVER SEED WITH SOIL.
      i. CULTIPACKING SEEDERS ARE REQUIRED TO BURY THE SEED IN SUCH A FASHION AS TO PROVIDE AT LEAST 1/4 INCH OF SOIL COVERING. SEEDBED MUST BE FIRM AFTER PLANTING.
      ii. APPLY SEED IN TWO DIRECTIONS, PERPENDICULAR TO EACH OTHER. APPLY HALF THE SEEDING RATE IN EACH DIRECTION.
   c. HYDROSEEDING: APPLY SEED UNIFORMLY WITH HYDROSEEDER (SLURRY INCLUDES SEED AND FERTILIZER).
      i. IF FERTILIZER IS BEING APPLIED AT THE TIME OF SEEDING, THE APPLICATION RATES SHOULD NOT EXCEED THE FOLLOWING: NITROGEN, 100 POUNDS PER ACRE TOTAL OF SOLUBLE NITROGEN; P205 (PHOSPHOROUS), 200 POUNDS PER ACRE; K20 (POTASSIUM), 200 POUNDS PER ACRE.
      ii. LIME: USE ONLY GROUND AGRICULTURAL LIMESTONE (UP TO 3 TONS PER ACRE MAY BE APPLIED BY HYDROSEEDING). NORMALLY, NOT MORE THAN 2 TONS ARE APPLIED BY HYDROSEEDING AT ANY ONE TIME. DO NOT USE BURNT OR HYDRATED LIME WHEN HYDROSEEDING.
      iii. MIX SEED AND FERTILIZER ON SITE AND SEED IMMEDIATELY AND WITHOUT INTERRUPTION.
      iv. WHEN HYDROSEEDING DO NOT INCORPORATE SEED INTO THE SOIL.

B. MULCHING

1. MULCH MATERIALS (IN ORDER OF PREFERENCE)
   a. STRAW CONSISTING OF THOROUGHLY THRESHED WHEAT, RYE, OAT, OR BARLEY AND REASONABLY BRIGHT IN COLOR. STRAW IS TO BE FREE OF NOXIOUS WEED SEEDS AS SPECIFIED IN THE MARYLAND SEED LAW AND NOT MUSTY, MOLDY, CAKED, DECAYED, OR EXCESSIVELY DUSTY. NOTE: USE ONLY STERILE STRAW MULCH IN AREAS WHERE ONE SPECIES OF GRASS IS DESIRED.
   b. WOOD CELLULOSE FIBER MULCH (WCFM) CONSISTING OF SPECIALLY PREPARED WOOD CELLULOSE PROCESSED INTO A UNIFORM FIBROUS PHYSICAL STATE.
      i. WCFM IS TO BE DYED GREEN OR CONTAIN A GREEN DYE IN THE PACKAGE THAT WILL PROVIDE AN APPROPRIATE COLOR TO FACILITATE VISUAL INSPECTION OF THE UNIFORMLY SPREAD SLURRY.
      ii. WCFM, INCLUDING DYE, MUST CONTAIN NO GERMINATION OR GROWTH INHIBITING FACTORS.
      iii. WCFM MATERIALS ARE TO BE MANUFACTURED AND PROCESSED IN SUCH A MANNER THAT THE WOOD CELLULOSE FIBER MULCH WILL REMAIN IN UNIFORM SUSPENSION IN WATER UNDER AGITATION AND WILL BLEND WITH SEED, FERTILIZER AND OTHER ADDITIVES TO FORM A HOMOGENEOUS SLURRY. THE MULCH MATERIAL MUST FORM A BLOTTER–LIKE GROUND COVER, ON APPLICATION, HAVING MOISTURE ABSORPTION AND PERCOLATION PROPERTIES AND MUST COVER AND HOLD GRASS SEED IN CONTACT WITH THE SOIL WITHOUT INHIBITING THE GROWTH OF THE GRASS SEEDLINGS.
      iv. WCFM MATERIAL MUST NOT CONTAIN ELEMENTS OR COMPOUNDS AT CONCENTRATION LEVELS THAT WILL BE PHYTO–TOXIC.
      v. WCFM MUST CONFORM TO THE FOLLOWING PHYSICAL REQUIREMENTS: FIBER LENGTH OF APPROXIMATELY 10 MILLIMETERS, DIAMETER APPROXIMATELY 1 MILLIMETER, PH RANGE OF 4.0 TO 8.5, ASH CONTENT OF 1.6 PERCENT MAXIMUM AND WATER HOLDING CAPACITY OF 90 PERCENT MINIMUM.
2. APPLICATION
   a. APPLY MULCH TO ALL SEEDED AREAS IMMEDIATELY AFTER SEEDING.
   b. WHEN STRAW MULCH IS USED, SPREAD IT OVER ALL SEEDED AREAS AT THE RATE OF 2 TONS PER ACRE TO A UNIFORM LOOSE DEPTH OF 1 TO 2 INCHES. APPLY MULCH TO ACHIEVE A UNIFORM DISTRIBUTION AND DEPTH SO THAT THE SOIL SURFACE IS NOT EXPOSED. WHEN USING A MULCH ANCHORING TOOL, INCREASE THE APPLICATION RATE TO 2.5 TONS PER ACRE.
   c. WOOD CELLULOSE FIBER USED AS MULCH MUST BE APPLIED AT A NET DRY WEIGHT OF 1500 POUNDS PER ACRE. MIX THE WOOD CELLULOSE FIBER WITH WATER TO ATTAIN A MIXTURE WITH A MAXIMUM OF 50 POUNDS OF WOOD CELLULOSE FIBER PER 100 GALLONS OF WATER.
3. ANCHORING
   a. PERFORM MULCH ANCHORING IMMEDIATELY FOLLOWING APPLICATION OF MULCH TO MINIMIZE LOSS BY WIND OR WATER. THIS MAY BE DONE BY ONE OF THE FOLLOWING METHODS (LISTED BY PREFERENCE), DEPENDING UPON THE SIZE OF THE AREA AND EROSION HAZARD:
      i. A MULCH ANCHORING TOOL IS A TRACTOR DRAWN IMPLEMENT DESIGNED TO PUNCH AND ANCHOR MULCH INTO THE SOIL SURFACE A MINIMUM OF 2 INCHES. THIS PRACTICE IS MOST EFFECTIVE ON LARGE AREAS, BUT IS LIMITED TO FLATTER SLOPES WHERE EQUIPMENT CAN OPERATE SAFELY. IF USED ON SLOPING LAND, THIS PRACTICE SHOULD FOLLOW THE CONTOUR.
      ii. WOOD CELLULOSE FIBER MAY BE USED FOR ANCHORING STRAW. APPLY THE FIBER BINDER AT A NET DRY WEIGHT OF 750 POUNDS PER ACRE. MIX THE WOOD CELLULOSE FIBER WITH WATER AT A MAXIMUM OF 50 POUNDS OF WOOD CELLULOSE FIBER PER 100 GALLONS OF WATER.
      iii. SYNTHETIC BINDERS SUCH AS ACRYLIC DLR (AGRO–TACK), DCA–70, PETROSET, TERRA TAX II, TERRATACK AR OR OTHER APPROVED EQUAL MAY BE USED. FOLLOW APPLICATION RATES AS SPECIFIED BY THE MANUFACTURER. APPLICATION OF LIQUID BINDERS NEEDS TO BE HEAVIER AT THE EDGES WHERE WIND CATCHES MULCH, SUCH AS IN VALLEYS AND ON CRESTS OF BANKS. USE OF ASPHALT BINDERS IS STRICTLY PROHIBITED.
      iv. LIGHTWEIGHT PLASTIC NETTING MAY BE STAPLED OVER THE MULCH ACCORDING TO MANUFACTURER RECOMMENDATIONS. NETTING IS USUALLY AVAILABLE IN ROLLS 4 TO 15 FEET WIDE AND 300 TO 3,000 FEET LONG.

TEMPORARY SEEDING SUMMARY

NO.	SPECIES	APPLICATION RATE (lb/ac)	SEEDING DATES	SEEDING DEPTHS	FERTILIZER RATE (10–20–20)	LIME RATE
HARDINESS ZONE (FROM FIGURE B.3): 7a SEED MIXTURE (FROM TABLE B.1)						
1	ANNUAL RYEGRASS	40 (1lb/1000 sf)	2/15 – 4/30 8/15 – 11/30	0.5"	436 lb/ac (10 lb/1000 sf)	2 tons/ac (90 lb/1000 sf)
2	BARLEY	96 (2.2lb/1000 sf)	2/15 – 4/30 8/15 – 11/30	0.5"		
3	OATS	72 (1.7lb/1000 sf)	2/15 – 4/30 8/15 – 11/30	0.5"		
4	RYE	112 (2.8lb/1000 sf)	2/15 – 4/30 8/15 – 11/30	0.5"		
5	FOXTAIL MILLET	30 (0.7lb/1000 sf)	5/1 – 8/14	0.5"		

LS-08

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED ____ DATE ____ CHIEF ENGINEER
APPROVED ____ DATE ____ DEPUTY DIRECTOR
APPROVED ____ DATE ____ PROJECT MANAGER
APPROVED ____ DATE ____ CHIEF, RIGHT OF WAY

SCALE: AS SHOWN
DESIGNED BY: MKS 8/13/25
DRAWN BY: MG/KM 8/13/25
CHECKED BY: CMS/SG 8/13/25
SHEET NO. 60 OF 63
CONTRACT NO. B553802

ROCK CREEK STREAM RESTORATION
PLANTING DETAILS
COUNCIL DISTRICT 3

25_20201_ROCK_CREEK_STREAM_RESTORATION/CAD Files/Sheet Files/S_20201_PLN001

ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST PLANTING SCHEDULE – 57,482 SF INCLUDING 17,879 SF OF HERBACEOUS ONLY AREA

BOTANICAL NAME/ TECHNICAL DESCRIPTION	COMMON NAME	INDICATOR STATUS	SIZE	TYPE	MIN SPACING/LOCATION	QUANTITY
OVERSTORY TREES						
BETULA NIGRA	RIVER BIRCH	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	95
DIOSPYROS VIRGINIANA	COMMON PERSIMMON	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	25
NYSSA SYLVATICA	BLACK GUM	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	65
QUERCUS BICOLOR	SWAMP WHITE OAK	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	70
QUERCUS MICHAUXII	SWAMP CHESTNUT OAK	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	45
QUERCUS PHELLOS	WILLOW OAK	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	55
ULMUS AMERICANA	AMERICAN ELM	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	50
UNDERSTORY TREES						
ASIMINA TRILOBA	PAW PAW	FAC	1–2 FT	12" MIN DEEP TREE POT OR #2 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE IN GROUPS OF 3	60
CARPINUS CAROLINIANA	IRONWOOD	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	65
CERCIS CANADENSIS	EASTERN REDBUD	FACU	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	15
CORNUS FLORIDA	FLOWERING DOGWOOD	FACU	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	15
ILEX OPACA	AMERICAN HOLLY	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	65
SHRUBS						
CLETHRA ALNIFOLIA	COASTAL SWEETPEPPERBUSH	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	50
LINDERA BENZOIN	SPICEBUSH	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	75
VIBURNUM DENTATUM	SOUTHERN ARROWWOOD	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	50
HERBACEOUS						
SEEDING						
NATIVE SEED MIX (ERNMX 154 OR EQUIVALENT)	NATIVE FLOODPLAIN SEED MIX	N/A	N/A	SEED	THROUGHOUT ZONE	37.0 LBS
CHAMAECRISTA FASCICULATA	PARTRIDGE PEA	FACU	N/A	SEED	THROUGHOUT ZONE	0.5 LB
COVER/NURSE CROP, SEE TABLE FOR RATE & DATES					THROUGHOUT ZONE	N/A

ZONE B: FC COASTAL PLAIN OAK FLOODPLAIN FOREST PLANTING SCHEDULE – 16,446 SF INCLUDING 5,512 SF OF HERBACEOUS ONLY AREA

BOTANICAL NAME/ TECHNICAL DESCRIPTION	COMMON NAME	INDICATOR STATUS	SIZE	TYPE	MIN SPACING/LOCATION	QUANTITY
CANOPY TREES						
BETULA NIGRA	RIVER BIRCH	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	15
NYSSA SYLVATICA	BLACK GUM	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	15
QUERCUS BICOLOR	SWAMP WHITE OAK	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	18
QUERCUS MICHAUXII	SWAMP CHESTNUT OAK	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	35
QUERCUS PAGODA	CHERRYBARK OAK	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	15
QUERCUS PALUSTRIS	PIN OAK	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	35
QUERCUS PHELLOS	WILLOW OAK	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	35
QUERCUS LYRATA	OVERCUP OAK	OBL	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	15
ULMUS AMERICANA	AMERICAN ELM	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	15
UNDERSTORY TREES						
ASIMINA TRILOBA	PAW PAW	FAC	1–2 FT	12" MIN DEEP TREE POT OR #2 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE IN GROUPS OF 3	16
CARPINUS CAROLINIANA	IRONWOOD	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	55
ILEX OPACA	AMERICAN HOLLY	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	18
SHRUBS						
EUONYMUS AMERICANUS	STRAWBERRY BUSH	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	16
ILEX VERTICILLATA	WINTERBRRY	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	22
LINDERA BENZOIN	SPICEBUSH	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	22
VIBURNUM DENTATUM	SOUTHERN ARROWWOOD	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	16
HERBACEOUS						
QUARTS						
ATHYRIUM FILIX–FEMINA	LADY FERN	NI	6–12 IN.	4" POT	RANDOM AT A MIN OF 3' O.C. IN PARTIAL TO FULL SHADE	20
ONOCLEA SENSIBILIS	SENSITIVE FERN	FACW	6–12 IN.	4" POT	RANDOM AT A MIN OF 3' O.C. IN PARTIAL TO FULL SHADE	20
SEEDING						
NATIVE FLOODPLAIN SEED MIX (ERNMX 154 OR EQUIVALENT)	NATIVE FLOODPLAIN SEED MIX	N/A	N/A	SEED	THROUGHOUT ZONE	26.5 LB
COVER/NURSE CROP, SEE TABLE FOR RATE & DATES						

ZONE C: FC MID–ATLANTIC MESIC MIXED FOREST PLANTING SCHEDULE – 24,764 SF INCLUDING 8,619 SF HERBACEOUS ONLY AREA

BOTANICAL NAME/ TECHNICAL DESCRIPTION	COMMON NAME	INDICATOR STATUS	SIZE	TYPE	MIN SPACING/LOCATION	QUANTITY
OVERSTORY TREES						
CARYA GLABRA	PIGNUT HICKORY	FACU	1–2 FT	12" MIN DEEP TREE POT OR #2 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	8
CARYA TOMENTOSA	MOCKERNUT HICKORY	FACU	1–2 FT	12" MIN DEEP TREE POT OR #2 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	8
FAGUS GRANDIFOLIA	AMERICAN BEECH	FACU	1–2 FT	12" MIN DEEP TREE POT OR #2 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	30
NYSSA SYLVATICA	BLACK GUM	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	8
QUERCUS ALBA	WHITE OAK	FACU	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	50
QUERCUS COCCINEA	SCARLET OAK	NI	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	8
QUERCUS FALCATA	SOUTHERN RED OAK	FACU	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	50
QUERCUS RUBRA	NORTHERN RED OAK	FACU	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	20
QUERCUS VELUTINA	BLACK OAK	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	8
SASSAFRAS ALBIDUM	SASSAFRAS	FACU	1–2 FT	12" MIN DEEP TREE POT OR #2 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	8
UNDERSTORY TREES						
ASIMINA TRILOBA	PAW PAW	FAC	1–2 FT	12" MIN DEEP TREE POT OR #2 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE IN GROUPS OF 3	24
CARPINUS CAROLINIANA	IRONWOOD	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	8
CORNUS FLORIDA	FLOWERING DOGWOOD	FACU	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	8
ILEX OPACA	AMERICAN HOLLY	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	32
SHRUBS						
EUONYMUS AMERICANUS	STRAWBERRY BUSH	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	20
VACCINIUM CORYMNBOSUM	HIGHBUSH BLUEBERRY	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	8
VACCINIUM ANGUSTIFOLIUM	LOW BUSH BLUEBERRY	FACU	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	8
VIBURNUM ACERIFOLIUM	MAPLE LEAF VIBURNUM	FACU	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	20
VIBURNUM DENTATUM	SOUTHERN ARROWWOOD	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC THROUGHOUT ZONE	20
HERBACEOUS						
QUARTS						
ATHYRIUM FILIX–FEMINA	LADY FERN	NI	6–12 IN.	4" POT	RANDOM AT A MIN OF 3' O.C. IN PARTIAL TO FULL SHADE	15
POLYSTICHUM ACROSTICHOIDES	CHRISTMAS FERN	FACU	6–12 IN.	4" POT	RANDOM AT A MIN OF 3' O.C. IN PARTIAL TO FULL SHADE	15
SEEDING						
NATIVE UPLAND SEED MIX (ERNMX 140 OR EQUIVALENT)	NATIVE UPLAND SEED MIX	N/A	N/A	SEED	THROUGHOUT ZONE	16.0 LBS
COVER/NURSE CROP, SEE TABLE FOR RATE & DATES					THROUGHOUT ZONE	NA

ZONE D: FC NONTIDAL BALD CYPRESS TUPELO FOREST PLANTING SCHEDULE – 108,255 SF INCLUDING 76,486 SF OF HERBACEOUS ONLY AREA

BOTANICAL NAME/ TECHNICAL DESCRIPTION	COMMON NAME	INDICATOR STATUS	SIZE	TYPE	MIN SPACING/LOCATION	QUANTITY
CANOPY TREES						
NYSSA BIFLORA	SWAMP TUPELO	OBL	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS TO 3" OF WATER	44
NYSSA SYLVATICA	BLACK GUM	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS	16
PIINUS TAEDA	LOBLOLLY PINE	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS	8
QUERCUS MICHAUXII	SWAMP CHESTNUT OAK	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS	8
NYSSA SYLVATICA	BLACK GUM	FAC	1/2" CAL & 4–5 FT	#5 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS	28
TAXODIUM DISTICHUM	BALD CYPRESS	OBL	1/2" CAL & 4–5 FT	#5 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS TO 3" OF WATER	48
UNDERSTORY TREES						
ILEX OPACA	AMERICAN HOLLY	FAC	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC AT HIGHER ELEVATIONS IN ZONE	12
MAGNOLIA VIRGINIANA	SWEETBAY MAGNOLIA	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC ABOVE INUNDATED AREAS	12
SHRUBS						
CLETHA ALNIFOLIA	SWEETPEPPERBUSH	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC ABOVE INUNDATED AREAS	22
ILEX VERTICILLATA	WINTERBERRY	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC ABOVE INUNDATED AREAS	22
ITEA VIRGINICA	VIRGINIA SWEETSPIRE	OBL	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC ABOVE INUNDATED AREAS	22
VIBURNUM DENTATUM	SOUTHERN ARROWWOOD	FACW	1–2 FT	#1 CONTAINER	NATURALIZED AT 13' OC ABOVE INUNDATED AREAS	22
HERBACEOUS						
QUARTS						
OSMUNDA CINNAMOMEA	CINNAMON FERN	FACW	6–12 IN.	4" POT	RANDOM AT 3' O.C. ABOVE INUNDATED AREAS	20
OSMUNDA REGALIS	ROYAL FERN	OBL	6–12 IN.	4" POT	RANDOM AT 3' O.C. ABOVE INUNDATED AREAS	20
WOODWARDIA AEREOLATA	NETTED CHAIN FERN	OBL	6–12 IN.	4" POT	RANDOM AT 3' O.C. ABOVE INUNDATED AREAS	20
SEEDING						
NATIVE SEED MIX (ERNMX 131 OR EQUIVALENT)	NATIVE WETLAND SEED MIX	N/A	N/A	SEED	THROUGHOUT ZONE	38.0 LBS
COVER/NURSE CROP, SEE TABLE FOR RATE & DATES		N/A	N/A	SEED	ABOVE INUNDATED AREAS	SEE TABLE FOR RATES

LS-09

90% CONSTRUCTION DRAWINGS

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BAYLAND JOB NO. 5_20201

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE CHIEF ENGINEER	APPROVED DATE PROJECT MANAGER	SCALE: AS SHOWN	
		DESIGNED BY: MKS	8/13/25
		DRAWN BY: MG/KM	8/13/25
		CHECKED BY:CMS/SC	8/13/25
APPROVED DATE DEPUTY DIRECTOR	APPROVED DATE CHIEF, RIGHT OF WAY	SHEET NO. 61 OF 63	
		CONTRACT NO. B553802	

ROCK CREEK STREAM RESTORATION
PLANTING DETAILS
COUNCIL DISTRICT 3

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ZONE E: CA NONTIDAL BALD CYPRESS TUPELO FOREST PLANTING SCHEDULE – 66,882 SF INCLUDING 28,212 SF OF HERBACEOUS ONLY AREA

BOTANICAL NAME/ TECHNICAL DESCRIPTION	COMMON NAME	INDICATOR STATUS	TYPE	MIN SPACING/LOCATION	QUANTITY	CREDIT TOTAL, SF
LANDSCAPE STOCK						
CANOPY TREES – 3/4" CALIPER					SF CREDIT PER UNIT =	100
NYSSA BIFLORA	SWAMP TUPELO	OBL	#5 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS TO 3" OF WATER	65	6,500
NYSSA SYLVATICA	BLACK GUM	FAC	#5 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS	70	7,000
PIINUS TAEDA	LOBLOLLY PINE	FAC	#5 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS	10	1,000
QUERCUS MICHAUXII	SWAMP CHESTNUT OAK	FACW	#5 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS	12	1,200
TAXODIUM DISTICHUM	BALD CYPRESS	OBL	#5 CONTAINER	NATURALIZED AT 10' OC ABOVE INUNDATED AREAS TO 3" OF WATER	70	7,000
					CANOPY TREE CREDIT	36.6%
UNDERSTORY TREES – 3/4" CALIPER					SF CREDIT PER UNIT =	75
ILEX OPACA	AMERICAN HOLLY	FAC	#5 CONTAINER	NATURALIZED AT 8.5' OC AT HIGHER ELEVATIONS IN ZONE	16	1,200
MAGNOLIA VIRGINIANA	SWEETBAY MAGNOLIA	FACW	#5 CONTAINER	NATURALIZED AT 8'5' OC ABOVE INUNDATED AREAS	16	1,200
					UNDERSTORY TREE CREDIT	3.9%
LARGE SHRUBS – 36" CONTAINERIZED					SF CREDIT PER UNIT =	50
ILEX VERTICILATTA	WINTERBERRY	FACW	#3 CONTAINER	NATURALIZED AT 7' OC ABOVE INUNDATED AREAS	31	1,550
VIBURNUM DENTATUM	SOUTHERN ARROWWOOD	FAC	#1 CONTAINER	NATURALIZED AT 7' OC ABOVE INUNDATED AREAS	31	1,550
					LARGE SHRUB CREDIT	5.0%
SMALL SHRUBS – 18" CONTAINERIZED					SF CREDIT PER UNIT =	25
CLETHA ALNIFOLIA	SWEETPEPPERBUSH	FACW	#1 CONTAINER	NATURALIZED AT 5' OC ABOVE INUNDATED AREAS	31	775
ITEA VIRGINICA	VIRGINIA SWEETSPIRE	OBL	#1 CONTAINER	NATURALIZED AT 5' OC ABOVE INUNDATED AREAS	31	775
					SMALL SHRUB CREDIT	2.5%
HERBACEOUS						
QUARTS, 6–12" HEIGHT					SF CREDIT PER UNIT =	2
OSMUNDA CINNAMOMEA	CINNAMON FERN	FACW	4" POT	RANDOM AT 3' O.C. ABOVE INUNDATED AREAS	15	30
OSMUNDA REGALIS	ROYAL FERN	OBL	4" POT	RANDOM AT 3' O.C. ABOVE INUNDATED AREAS	15	30
WOODWARDIA AEREOLATA	NETTED CHAIN FERN	OBL	4" POT	RANDOM AT 3' O.C. ABOVE INUNDATED AREAS	15	30
SEEDING					SF CREDIT BASED ON AREA COVERED	
NATIVE SEED MIX (ERNMX 131 OR EQUIVALENT)	NATIVE WETLAND SEED MIX	N/A	SEED	THROUGHOUT ZONE	40.0 LB	32,147
COVER/NURSE CROP		N/A	SEED	ABOVE INUNDATED AREAS	SEE TABLE FOR RATE & DATES	N/A
					HERBACEOUS CREDIT*	52.0%
					ZONE C TOTAL: 428	61,987

ZONE F: CA COASTAL PLAIN STREAMSIDE FOREST PLANTING SCHEDULE – 13,687 SF INCLUDING 2,743 SF HERBACEOUS ONLY AREA

BOTANICAL NAME/ TECHNICAL DESCRIPTION	COMMON NAME	INDICATOR STATUS	TYPE	MIN SPACING/LOCATION	QUANTITY	CREDIT TOTAL, SF
LANDSCAPE STOCK						
CANOPY TREES – 3/4" CALIPER					SF CREDIT PER UNIT =	100
BETULA NIGRA	RIVER BIRCH	FACW	#3 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	24	2400
QUERCUS BICOLOR	SWAMP WHITE OAK	FACW	#5 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	12	1200
QUERCUS MICHAUXII	SWAMP CHESTNUT OAK	FACW	#5 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	6	600
QUERCUS PHELLOS	WILLOW OAK	FACW	#7 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	6	600
ULMUS AMERICANA	AMERICAN ELM	FAC	#5 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	8	800
					CANOPY TREE CREDIT	37.4%
UNDERSTORY TREES – 3/4" CALIPER					SF CREDIT PER UNIT =	75
ASIMINA TRILOBA	PAW PAW	FAC	12" MIN DEEP TREE POT OR #2 CONT, 18–24" HT, NOT AVAIL AS 3/4" CAL	NATURALIZED AT 8.5' OC THROUGHOUT ZONE	12	900
CARPINUS CAROLINIANA	IRONWOOD	FAC	#5 CONTAINER	NATURALIZED AT 8.5' OC THROUGHOUT ZONE	10	750
CERCIS CANADENSIS	EASTERN REDBUD	FACU	#5 CONTAINER	NATURALIZED AT 8.5' OC THROUGHOUT ZONE	4	300
CORNUS FLORIDA	FLOWERING DOGWOOD	FACU	#5 CONTAINER	NATURALIZED AT 8.5' OC THROUGHOUT ZONE	5	375
ILEX OPACA	AMERICAN HOLLY	FAC	#5 CONTAINER	NATURALIZED AT 8.5' OC THROUGHOUT ZONE	12	900
					UNDERSTORY TREE CREDIT	21.6%
LARGE SHRUBS – 36" CONTAINERIZED					SF CREDIT PER UNIT =	50
LINDERA BENZOIN	SPICEBUSH	FACW	#2 CONTAINER	NATURALIZED AT 7' OC THROUGHOUT ZONE	18	900
VIBURNUM DENTATUM	SOUTHERN ARROWWOOD	FAC	#1 CONTAINER	NATURALIZED AT 7' OC THROUGHOUT ZONE	18	900
					LARGE SHRUB CREDIT	6.0%
SMALL SHRUBS –18" CONTAINERIZED					SF CREDIT PER UNIT =	25
CLETHRA ALNIFOLIA	COASTAL SWEETPEPPERBUSH	FACW	#1 CONTAINER	NATURALIZED AT 5' OC THROUGHOUT ZONE	15	375
					SMALL SHRUB CREDIT	2.5%
HERBACEOUS					SF CREDIT PER UNIT =	2
SEEDING					SF CREDIT BASED ON AREA COVERED	
NATIVE SEED MIX (ERNMX 154 OR EQUIVALENT)	NATIVE FLOODPLAIN SEED MIX	N/A	N/A	THROUGHOUT ZONE	8.0 LB	3963
CHAMAECRISTA FASCICULATA	PARTRIDGE PEA	FACU	N/A	N/A	0.5 LB	0
COVER/NURSE CROP		N/A	SEED	ABOVE INUNDATED AREAS	SEE TABLE FOR RATE & DATES	N/A
					HERBACEOUS CREDIT*	26.5%
					ZONE D TOTAL: 150	14,963

ZONE G: CA MID–ATLANTIC MESIC MIXED FOREST PLANTING SCHEDULE – 8,481 SF

BOTANICAL NAME/ TECHNICAL DESCRIPTION	COMMON NAME	INDICATOR STATUS	TYPE	MIN SPACING/LOCATION	QUANTITY	CREDIT TOTAL, SF
LANDSCAPE STOCK						
CANOPY TREES – 3/4" CALIPER					SF CREDIT PER UNIT =	100
CARYA GLABRA	PIGNUT HICKORY	FACU	12" MIN DEEP TREE POT OR #2 CONT, 18–24" HT, NOT AVAIL AS 3/4" CAL	NATURALIZED AT 10' OC THROUGHOUT ZONE	4	400
CARYA TOMENTOSA	MOCKERNUT HICKORY	FACU	12" MIN DEEP TREE POT OR #2 CONT, 18–24" HT, NOT AVAIL AS 3/4" CAL	NATURALIZED AT 10' OC THROUGHOUT ZONE	2	200
FAGUS GRANDIFOLIA	AMERICAN BEECH	FACU	#3 CONT, >36" HT, NOT AVAIL AS 3/4" CAL	NATURALIZED AT 10' OC THROUGHOUT ZONE	8	800
NYSSA SYLVATICA	BLACK GUM	FAC	#5 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	4	400
QUERCUS ALBA	WHITE OAK	FACU	#5 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	20	2000
QUERCUS COCCINEA	SCARLET OAK	NI	#7 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	4	400
QUERCUS FALCATA	SOUTHERN RED OAK	FACU	#7 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	16	1600
QUERCUS RUBRA	NORTHERN RED OAK	FACU	#7 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	4	400
QUERCUS VELUTINA	BLACK OAK	FAC	#7 CONTAINER	NATURALIZED AT 10' OC THROUGHOUT ZONE	4	400
SASSAFRAS ALBIDUM	SASSAFRAS	FACU	12" MIN DEEP TREE POT OR #2 CONT, 18–24" HT, NOT AVAIL AS 3/4" CAL	NATURALIZED AT 10' OC THROUGHOUT ZONE	4	400
					CANOPY TREE CREDIT	68.1%
UNDERSTORY TREES – 3/4" CALIPER					SF CREDIT PER UNIT =	75
ASIMINA TRILOBA	PAW PAW	FAC	12" MIN DEEP TREE POT OR #2 CONT, 18–24" HT, NOT AVAIL AS 3/4" CAL	NATURALIZED AT 8.5' OC THROUGHOUT ZONE	6	450
CARPINUS CAROLINIANA	IRONWOOD	FAC	#5 CONTAINER	NATURALIZED AT 8.5' OC THROUGHOUT ZONE	5	375
CORNUS FLORIDA	FLOWERING DOGWOOD	FACU	#5 CONTAINER	NATURALIZED AT 8.5' OC THROUGHOUT ZONE	5	375
ILEX OPACA	AMERICAN HOLLY	FAC	#5 CONTAINER, 5' HT, NOT AVAIL AS 3/4" CAL	NATURALIZED AT 8.5' OC THROUGHOUT ZONE	10	750
					UNDERSTORY TREE CREDIT	19.0%
LARGE SHRUBS – 36" CONTAINERIZED					SF CREDIT PER UNIT =	50
VACCINIUM CORYMNBOSUM	HIGHBUSH BLUEBERRY	FACW	#3 CONTAINER	NATURALIZED AT 7' OC THROUGHOUT ZONE	4	200
VIBURNUM DENTATUM	SOUTHERN ARROWWOOD	FAC	#1 CONTAINER	NATURALIZED AT 7' OC THROUGHOUT ZONE	6	300
					LARGE SHRUB CREDIT	4.9%
SMALL SHRUBS –18" CONTAINERIZED					SF CREDIT PER UNIT =	25
EUONYMUS AMERICANUS	STRAWBERRY BUSH	FAC	#2 CONTAINER	NATURALIZED AT 5' OC THROUGHOUT ZONE	6	150
VACCINIUM ANGUSTIFOLIUM	LOW BUSH BLUEBERRY	FACU	#3 CONTAINER	NATURALIZED AT 5' OC THROUGHOUT ZONE	4	100
VIBURNUM ACERIFOLIUM	MAPLE LEAF VIBURNUM	FACU	#3 CONTAINER	NATURALIZED AT 5' OC THROUGHOUT ZONE	4	100
					SMALL SHRUB CREDIT	3.4%
QUARTS, 6–12" HEIGHT					SF CREDIT PER UNIT =	2
POLYSTICHUM ACROSTICHOIDES	CHRISTMAS FERN	FACU	4" CONTAINER	RANDOM AT 24" OC THROUGHOUT ZONE	25	50
SEEDING					SF CREDIT BASED ON AREA COVERED	
NATIVE SEED MIX (ERNMX 140 OR EQUIVALENT)	NATIVE UPLAND SEED MIX	N/A	SEED	THROUGHOUT ZONE	5.0 LB	1255
COVER/NURSE CROP		N/A	SEED	ABOVE INUNDATED AREAS	SEE TABLE FOR RATE & DATES	N/A
					HERBACEOUS CREDIT*	12.7%
					ZONE D TOTAL: 134	10,280

ZONE H: SUPPLEMENTAL CA NONTIDAL BALD CYPRESS TUPELO FOREST PLANTING SCHEDULE –16,283 SF

BOTANICAL NAME/ TECHNICAL DESCRIPTION	COMMON NAME	INDICATOR STATUS	TYPE	SPACING	QUANTITY	CREDIT TOTAL, SF
FLEXIBLE STOCK (450 WOODY PLANTS/ACRE)						
CANOPY TREES – MIN 1/2" CALIPER					SF CREDIT PER UNIT =	96.8
NYSSA BIFLORA	SWAMP TUPELO	OBL	#5 CONTAINER	RANDOM AT 10' OC ABOVE INUNDATED AREAS TO 3" OF WATER	10	968
NYSSA SYLVATICA	BLACK GUM	FAC	#5 CONTAINER	RANDOM AT 10' OC ABOVE INUNDATED AREAS	14	1,355
TAXODIUM DISTICHUM	BALD CYPRESS	OBL	#5 CONTAINER	RANDOMAT 10' OC ABOVE INUNDATED AREAS TO 3" OF WATER	24	2,323
UNDERSTORY TREES – MIN 1/2" CALIPER					SF CREDIT PER UNIT =	96.8
MAGNOLIA VIRGINIANA	SWEETBAY MAGNOLIA	FACW	#3 CONTAINER	RANDOM AT 8'5" OC ABOVE INUNDATED AREAS	6	581
				ZONE G TOTAL:	54	5,227

LS-10

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ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

REVISED DATE	BY

APPROVED DATE — CHIEF, ENGINEER	APPROVED DATE — PROJECT MANAGER
APPROVED DATE — DEPUTY DIRECTOR	APPROVED DATE — CHIEF, RIGHT OF WAY

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
DRAWN BY: MG/KM	8/13/25
CHECKED BY:CMS/SC	8/13/25
SHEET NO.	62 OF 63
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
PLANTING DETAILS
COUNCIL DISTRICT 3

P:\5_20201_ROCK_CREEK_STREAM_RESTORATION\100 Tree\Sheet Files\5_20201_PLN1004

NATIVE FLOODPLAIN SEED MIX COMPOSITION

% COMPOSITION	BOTANICAL NAME	COMMON NAME
20.00%	ELYMUS VIRGINICUS	VIRGINIA WILDRYE
15.00%	SORGHASTRUM NUTANS	INDIANGRASS
14.60%	PANICUM CLANDESTINUM	TIOGA DEERTONGUE
14.00%	ANDROPOGON GERARDII	BIG BLUESTEM
10.00%	CAREX VULPINOIDEA	FOX SEDGE
6.30%	CAREX LURIDA	LURID SEDGE
6.30%	CAREX SCOPARIA	BLUNT BROOM SEDGE
3.00%	VERBENA HASTATA	BLUE VERVAIN
2.00%	JUNCUS EFFUSUS	SOFT RUSH
2.00%	ZIZIA AUREA	GOLDEN ALEXANDERS
1.90%	ASCLEPIAS INCARNATA	SWAMP MILKWEED
1.00%	VERBENA URTICIFOLIA	WHITE VERVAIN
0.60%	EUPATORIUM PERFOLIATUM	BONESET
0.50%	SOLIDAGO RUGOSA	WRINKLELEAF GOLDENROD
0.40%	ASTER NOVAE-ANGLIAE	NEW ENGLAND ASTER
0.40%	ASTER PUNICEUS	PURPLESTEM ASTER
0.40%	MONARDA FISTULOSA	WILD BERGAMOT
0.30%	MIMULUS RINGENS	SQUARE STEMMED MONKEYFLOWER
0.30%	SCIRPUS ATROVIRENS	GREEN BULRUSH
0.30%	SCIRPUS CYPERINUS	WOOLGRASS
0.20%	ASTER LANCEOLATUS	LANCE LEAVED ASTER
0.20%	LOBELIA SIPHILITICA	GREAT BLUE LOBELIA
0.20%	LYCOPUS AMERICANUS	AMERICAN WATER HOREHOUND
0.10%	EUTHAMIA GRAMINIFOLIA	GRASSLEAF GOLDENROD

NATIVE UPLAND SEED MIX COMPOSITION

% COMPOSITION	BOTANICAL NAME	COMMON NAME
49.40%	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM
18.50%	ELYMUS VIRGINICUS	VIRGINIA WILDRYE
9.50%	ECHINACEA PURPUREA	PURPLE CONEFLOWER
6.50%	ELYMUS HYSTRIX	BOTTLEBRUSH GRASS
3.00%	RUDBECKIA HIRTA	BLACKEYED SUSAN
2.00%	CHAMAECRISTA FASCICULATA	PARTRIDGE PEA
1.80%	HELIOPSIS HELIANTHOIDES	OXEYE SUNFLOWER
1.00%	PENSTEMON DIGITALIS	TALL WHITE BEARDTONGUE
1.00%	ZIZIA AUREA	GOLDEN ALEXANDERS
0.70%	LIATRIS SPICATA	MARSH BLAZING STAR
0.60%	ASTER MACROPHYLLUS	BIGLEAF ASTER
0.60%	BAPTISIA AUSTRALIS	BLUE FALSE INDIGO
0.50%	ANEMONE CANADENSIS	CANADIAN ANEMONE
0.50%	GAURA BIENNIS	BIENNIAL BEEBLOSSOM
0.50%	LESPEDEZA CAPITATA	ROUNDHEAD LESPEDEZA
0.50%	RUDBECKIA TRILOBA	BROWNEYED SUSAN
0.40%	ASCLEPIAS TUBEROSA	BUTTERFLY MILKWEED
0.40%	ASTER PILOSUS	HEATH ASTER
0.30%	ASCLEPIAS SYRIACA	COMMON MILKWEED
0.30%	MONARDA FISTULOSA	WILD BERGAMOT
0.30%	PYCNANTHEMUM INCANUM	HOARY MOUNTAINMINT
0.30%	SOLIDAGO BICOLOR	WHITE GOLDENROD
0.30%	SOLIDAGO NEMORALIS	GRAY GOLDENROD
0.30%	TRADESCANTIA OHIENSIS	OHIO SPIDERWORT
0.20%	AQUILEGIA CANADENSIS	EASTERN COLUMBINE
0.20%	ASTER PRENANTHOIDES	ZIGZAG ASTER
0.20%	SOLIDAGO JUNCEA	EARLY GOLDENROD
0.10%	PENSTEMON HIRSUTUS	HAIRY BEARDTONGUE
0.10%	PENSTEMON LAEVIGATUS	APPALACHIAN BEARDTONGUE

NATIVE WETLAND SEED MIX COMPOSITION

% COMPOSITION	BOTANICAL NAME	COMMON NAME
27.60%	CAREX LURIDA	LURID SEDGE
22.50%	CAREX SCOPARIA	BLUNT BROOM SEDGE
22.50%	CAREX VULPINOIDEA	FOX SEDGE
6.00%	SPARGANIUM AMERICANUM	EASTERN BUR REED
5.00%	ELYMUS VIRGINICUS	VIRGINIA WILDRYE
4.00%	VERBENA HASTATA	BLUE VERVAIN
3.00%	JUNCUS EFFUSUS	SOFT RUSH
2.00%	ASCLEPIAS INCARNATA	SWAMP MILKWEED
1.50%	GLYCERIA STRIATA	FOWL MANNAGRASS
1.00%	ASTER LANCEOLATUS	LANCE LEAVED ASTER
1.00%	EUPATORIUM PERFOLIATUM	BONESET
1.00%	SCIRPUS VALIDUS	SOFTSTEM BULRUSH
0.70%	SOLIDAGO RUGOSA	WRINKLELEAF GOLDENROD
0.50%	CAREX STIPATA	AWL SEDGE
0.50%	LYCOPUS AMERICANUS	AMERICAN WATER HOREHOUND
0.50%	SCIRPUS CYPERINUS	WOOLGRASS
0.30%	MIMULUS RINGENS	SQUARE STEMMED MONKEYFLOWER
0.20%	ALISMA SUBCORDATUM	MUD PLANTAIN
0.20%	CAREX STRICTA	TUSSOCK SEDGE

COVER/NURSE CROP SEED TABLE

BOTANICAL NAME	COMMON NAME	SEEDING DATE
SECALE CEREAL	CEREAL RYE	11/1-2/28
AVENA SATIVA	GRAIN OATS	3/1-4/30
SETARIA ITALICA	FOXTAIL MILLET	5/1-8/31
LOLIUM MULTFLORUM	ANNUAL RYEGRASS	9/1-10/31

ANNE ARUNDEL COUNTY OFFICE OF PLANNING & ZONING
FOREST CONSERVATION EXEMPTION & CRITICAL AREA COMPLIANCE CALCULATIONS

NOT FOR CONTRACTOR USE

FOREST CONSERVATION EXEMPTION

TOTAL FORESTED LOD OUTSIDE OF CRITICAL AREA	186,975	SF
STAND F1		
GROSS LOD WITHIN STAND	129,707	SF
DEDUCTION FOR STREAM CHANNEL W/O TREES	11,124	SF
NET LOD WITHIN STAND	118,583	SF
TREE DENSITY	180	TREES/ACRE
EQUIVALENT TREES REMOVED	490	TREES
STAND F2		
GROSS LOD WITHIN STAND	57,268	SF
DEDUCTION FOR STREAM CHANNEL W/O TREES	5,686	SF
NET LOD WITHIN STAND	51,582	SF
TREE DENSITY	345	TREES/ACRE
EQUIVALENT TREES REMOVED	409	TREES
TOTAL EQUIVALENT TREES REMOVED BASED ON AREA	899	TREES

FSD STAND SUMMARY

STAND	NUMBER OF PLOTS	MEAN TREES/ACRE
F1	2	180
F2	2	345

FOREST CONSERVATION EXEMPTION TREE PLANTING SUMMARY

ZONE	NUMBER OF TREES	
ZONE A: FC COASTAL PLAIN STREAMSIDE FOREST	625	TREES
ZONE B: FC COASTAL PLAIN OAK FLOODPLAIN FOREST	287	TREES
ZONE C: FC MID-ATLANTIC MESIC MIXED FOREST	270	TREES
ZONE D: FC NONTIDAL BALD CYPRESS TUPELO FOREST (QUANTITY EXCLUDES CA CREDIT TREE PLANTINGS)	100	TREES
TOTAL	1,282	TREES
FC REQUIREMENT MET	YES	
EXCESS TREE PLANTING TO BE CREDITED TO CRITICAL AREA MITIGATION (1/2 CALIPER BAL CYPRESS & BLACK GUMS IN ZONE D)	76	TREES

CRITICAL AREA MITIGATION CALCULATIONS

CATEGORY	AREA	
TOTAL DISTURBANCE IN THE BUFFER	99,433	SF
STREAM RESTORATION MITIGATION:DISTURBANCE RATIO	1:1	
TOTAL FOREST DISTURBANCE OUTSIDE THE BUFFER	0	SF
TOTAL MITIGATION REQUIRED	99,433	SF

CRITICAL AREA MITIGATION SUMMARY

CATEGORY	CREDIT	
TOTAL MITIGATION REQUIRED	99,433	SF
LANDSCAPE STOCK		
ZONE E: CA NONTIDAL BALD CYPRESS TUPELO FOREST	61,987	SF
ZONE F: CA COASTAL PLAIN STREAMSIDE FOREST	14,963	SF
ZONE G: CA MID-ATLANTIC MESIC MIXED FOREST	10,280	SF
FLEXIBLE STOCK		
ZONE H: CA SUPPLEMENTAL CA NONTIDAL BALD CYPRESS TUPELO FOREST	5,227	SF
EXCESS FOREST CONSERVATION EXEMPTION PLANTING CREDIT		
76 WOODY PLANTS AT 96.8 SF/PLANT (SEE FORES CONSERVATION EXEPTION TREE PLANTING SUMMARY	7,357	SF
TOTAL	99,814	SF
CRITICAL AREA REQUIREMENT MET	YES	

LS-11

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APPROVED DATE _____ DEPUTY DIRECTOR
APPROVED DATE _____ CHIEF, RIGHT OF WAY

SCALE:	AS SHOWN
DESIGNED BY: MKS	8/13/25
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CHECKED BY:CMS/SC	8/13/25
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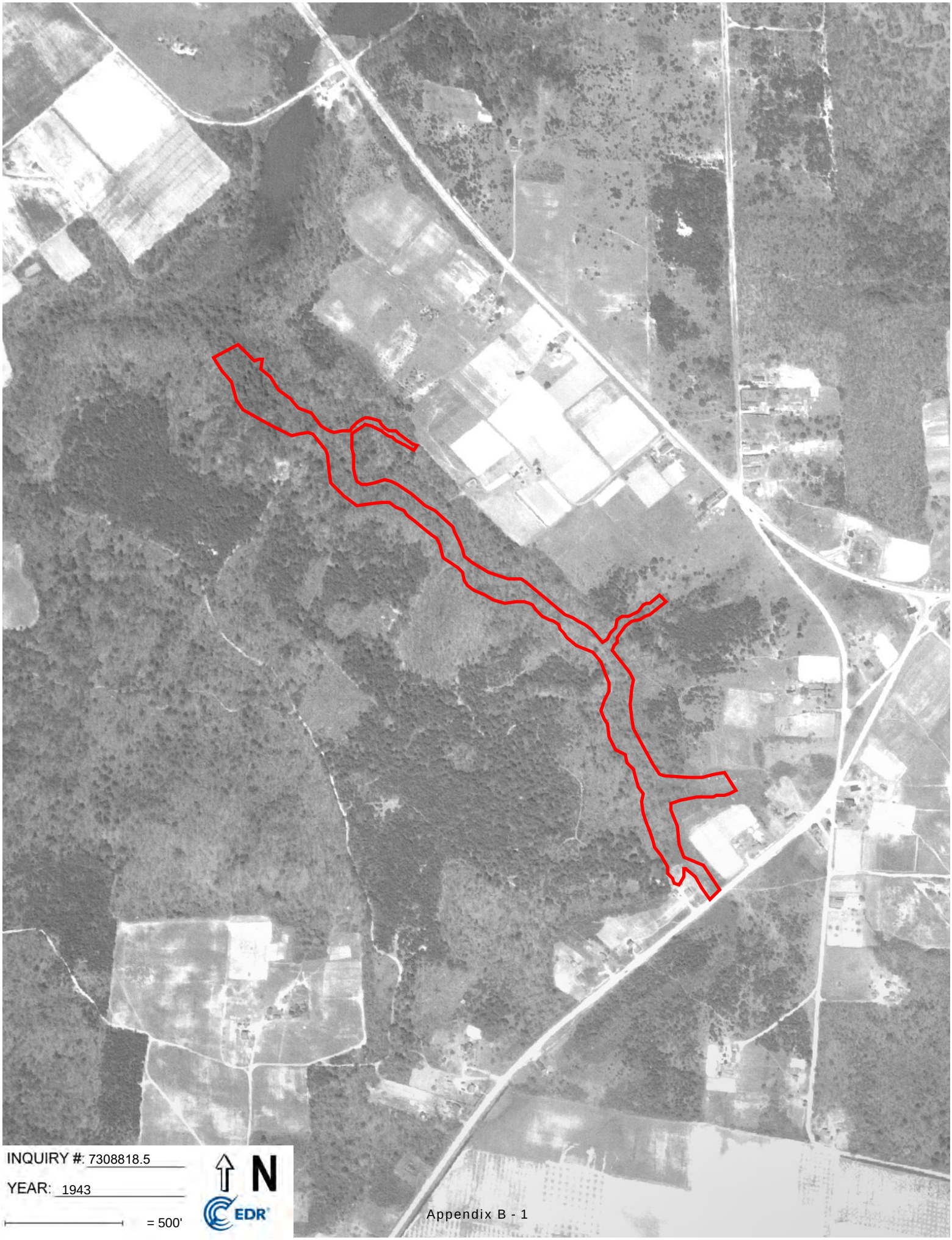
CONTRACT NO.	B553802

ROCK CREEK STREAM RESTORATION
PLANTING DETAILS
COUNCIL DISTRICT 3

215_20201_ROCK_CREEK_STREAM_RESTORATION\CAD Files\Sheet Files\S_20201_P_CN1102

APPENDIX B

Historic Aerial Photographs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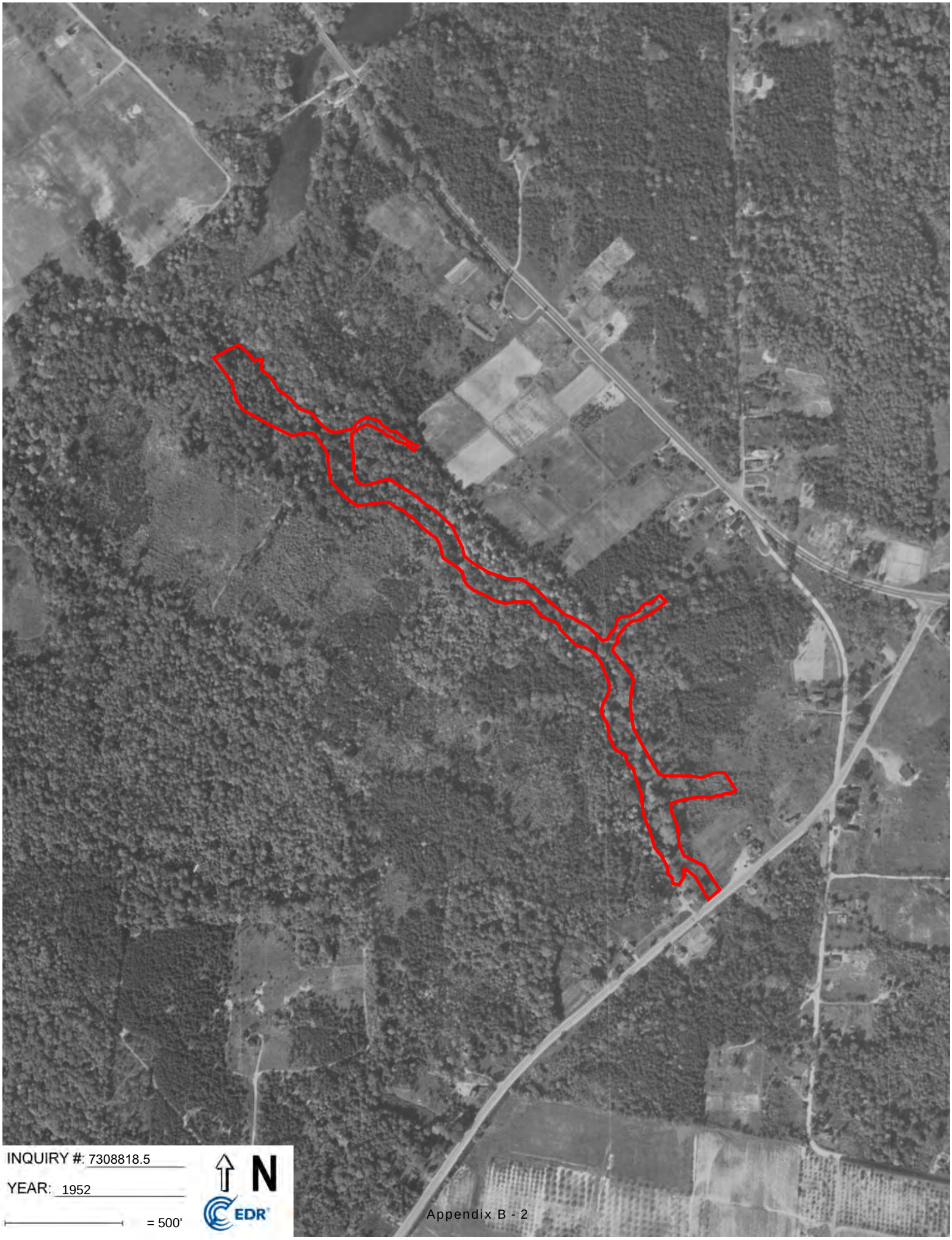
EDR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EDR

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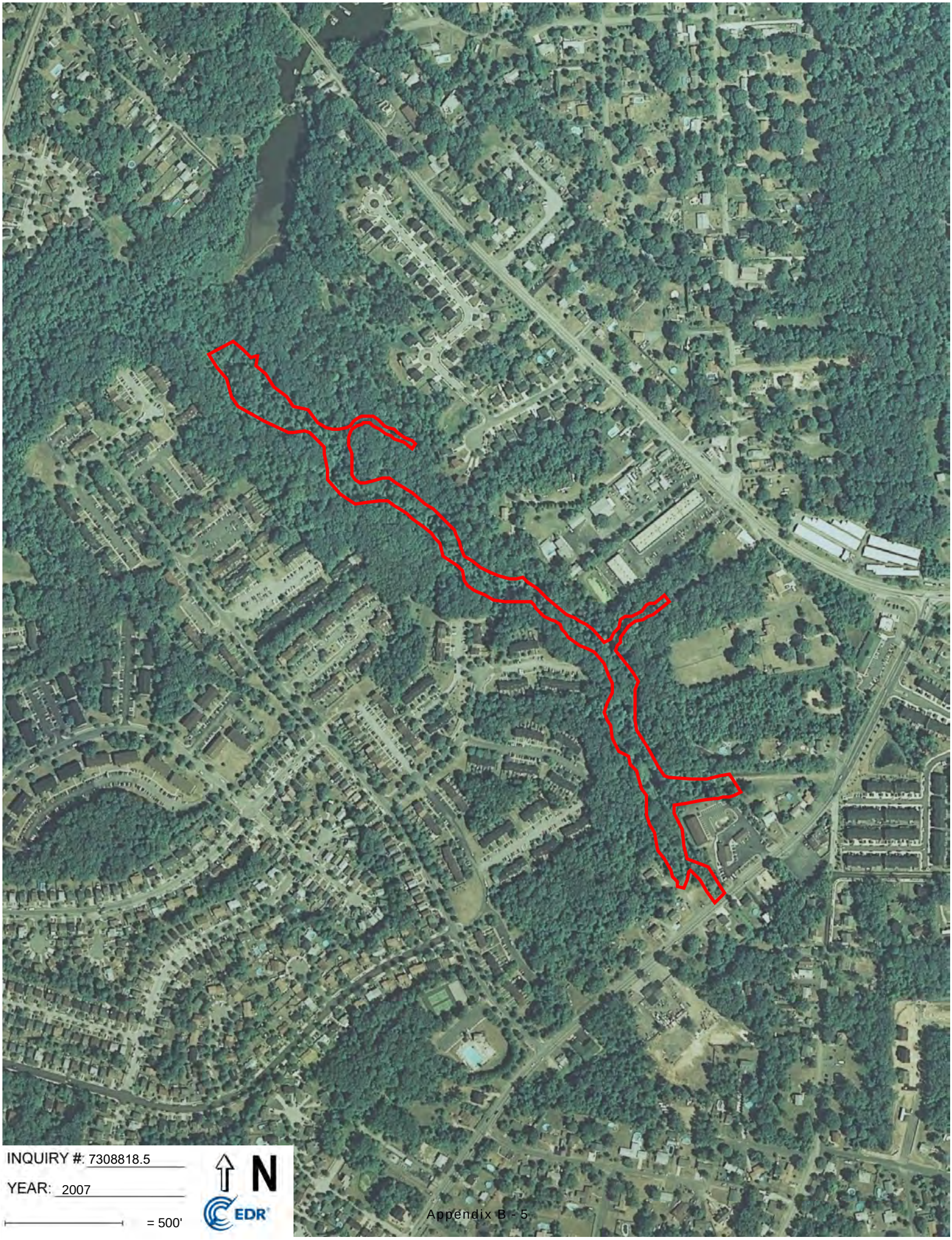
= 500'
N
EDR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YEAR: 2007
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EDR

INQUIRY #: 7308818.5
YEAR: 2018
= 500'
N
EDR

APPENDIX C

Wetland Delineation Report

ANNE ARUNDEL COUNTY
MARYLAND

Prepared for:

Anne Arundel County
Bureau of Watershed
Protection and Restoration

Rock Creek Stream Restoration
Wetland Delineation
Report

February 2024

Prepared by:

BayLand Consultants & Designers, Inc.

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Attachment B – Site Photographs

1. INTRODUCTION

1.1. Project Background

The Anne Arundel County (the County) National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer (MS4) permit requires the County to achieve nutrient and sediment reductions equivalent to the treatment of 20 percent of pre-1985 impervious surface areas within the 5-year permit term to help meet Total Maximum Daily Loads (TMDL) established for the waters within the Chesapeake Bay watershed. To meet the requirements of the NPDES MS4 permit, the County Bureau of Watershed Protection and Restoration (BWPR) is seeking to treat runoff from developed areas and repair stream instability problems. Due to cumulative effects of urban development within the watershed, the subject site, located in Pasadena, Maryland, was targeted for potential opportunities to achieve MS4 credits for impervious treatment and pollutant load reductions to achieve TMDLs through stream stabilization and stormwater management (SWM) retrofits.

BWPR contracted BayLand Consultants & Designers, Inc. (BayLand) to provide engineering analysis and design services for the Rock Creek Stream Restoration Project (hereafter referred to as the Project). The Project is intended to provide stream stabilization in actively eroding channels, riparian wetland establishment and reconnection with riparian wetlands wherever feasible to maximize water quality credit for the County's MS4 permit. Additionally, unmanaged storm drain outfalls contributing to downstream instability will be stabilized to provide additional water quality benefits.

As part of the design process, BayLand has conducted a wetland delineation to identify existing wetlands and "Waters of the U.S." (WUS) to determine not only potential impacts associated with the restoration work but also to identify opportunities for enhancement and restoration during the design process. Field delineation work was performed in April 2023.

1.2. General Study Area

The Project is located in Pasadena, Maryland, east of the intersection of Paul T. Pitcher Memorial Hwy (MD Route-100) and Governor Ritchie Hwy (Route-2) (Figure C-1). The Project is comprised of an 8.5 acre Study Area in the Patapsco River watershed of the Rock Creek drainage basin. The site is located northwest of Hog Neck Road in the stream valley between Fort Smallwood Road and Tower Bridge Roads. A sanitary sewer right of way runs along the valley of the Study Area. The Study Area extends downstream from a culvert at Hog Neck Road. The total Project Study Area is comprised of approximately 4,100 linear feet of stream valley.

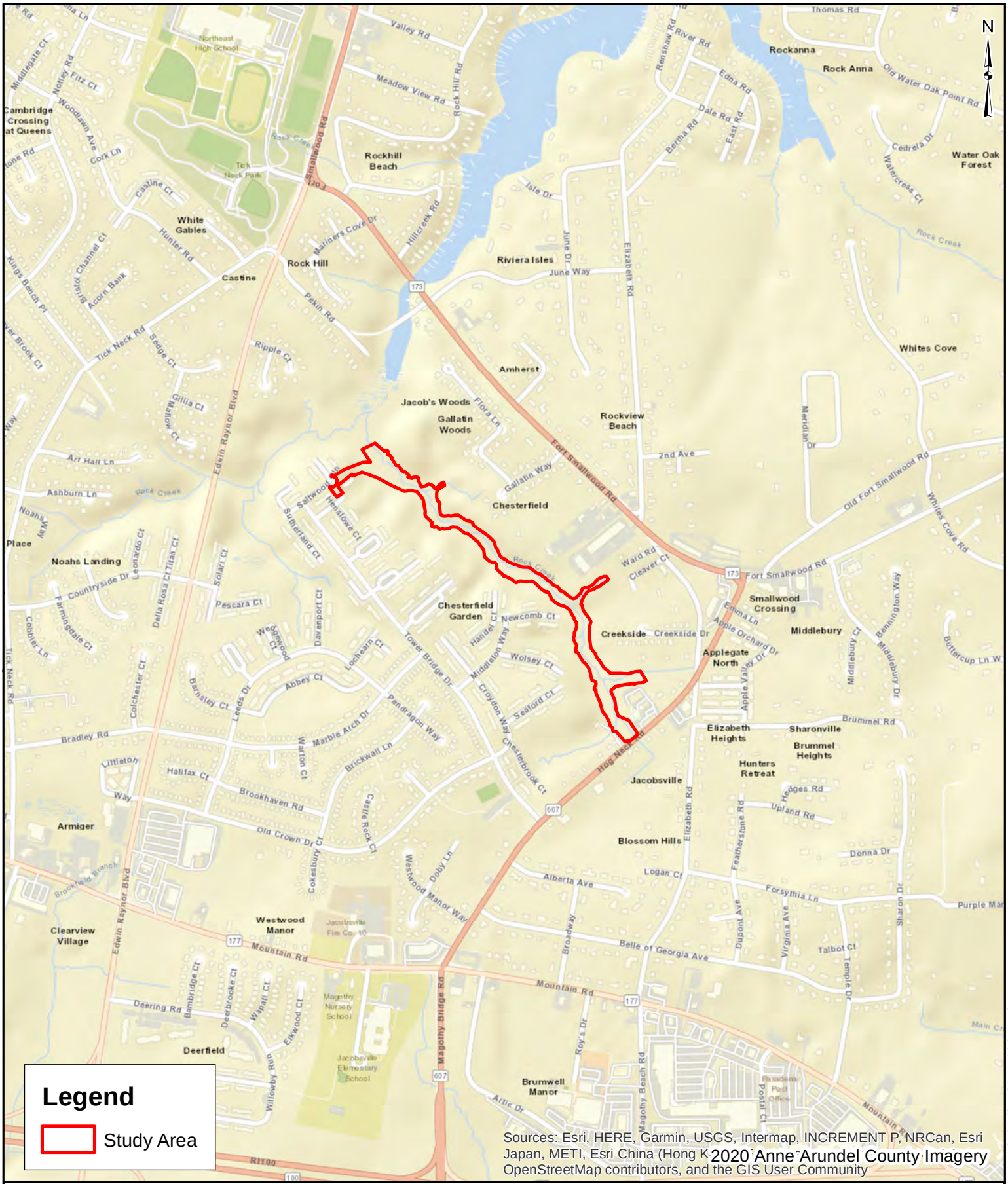

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Figure C-1
Rock Creek Stream Restoration Vicinity Map

P:\5_20201_Rock Creek Stream Restoration\GIS\NR\C-1_Vicinity.mxd

1.3. Wetland Delineation

Under Section 404 of the Clean Water Act, WUS and the subset of aquatic habitats including wetlands are regulated by the U.S. Army Corps of Engineers (USACE) and the Maryland Department of the Environment (MDE). The current standard wetland definition is as follows:

> *The CE (Federal Register 1982) and the EPA (Federal Register 1980) jointly define wetlands as: Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.*

Within this definition three diagnostic characteristics are cited as typical indicators of wetland conditions. Current delineation protocol is to utilize the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987) in conjunction with the appropriate *Regional Supplement to the Corps of Engineers Wetland Delineation Manual* (USACE, 2010). Wetlands have the following three characteristics:

Hydrology: Wetland hydrology is present if the area is inundated either permanently or periodically at mean water depth of less than 6.6 feet or the soil is saturated within 12 inches of the surface for at least 12.5 percent of the growing season. Evidence for such conditions includes not only the presence of hydrophytic vegetation and hydric soils but also visual identification of saturation or inundation, drift lines, drainage patterns, water marks, sediment deposition, water-stained organic material, and oxidized rhizospheres.

Hydric Soils: Soils are present and have been classified as hydric or they possess characteristics that are associated with prolonged inundation and/or saturation. Soils exposed to such conditions undergo a chemical transformation resulting from oxygen deprivation. The transformation known as reduction causes soils to develop dull, gray soil coloration. In general, soil matrices classified by the Munsell Soil Color Charts as having a chroma of less than 1.0 if redoximorphic mottling is absent or less than 2.0 if mottling is present are characterized as hydric soils.

Hydrophytic Vegetation: The prevalent vegetation consists of macrophytes that are typically adapted to areas having hydrologic and soil conditions described above. Hydrophytic species, due to morphological, physiological and/or reproductive adaptations, can persist in anaerobic soil conditions.

1.4. Wetland Classification

Wetlands are commonly classified according to the Cowardin Classification which categorizes them based on a hierarchical system of descriptors (Cowardin et al., 1979). Using this system, wetlands are first categorized into general groups or systems based on broad hydrologic source. Most wetlands encountered within stream restoration study

areas are palustrine wetlands which are all nontidal wetlands and estuarine wetlands which are tidal wetlands with reduced salinity from freshwater dilution. Further, classification is based on factors including dominant vegetative cover, water regime, substrate, and water chemistry.

1.5. Stream Classification

Jurisdictional stream limits for both MDE and USACE include channels that contain intermittent to perennial flow. Lateral stream limits are defined by the 'Ordinary High-Water Mark' (33 CFR 328.3(e)). In this region, the 'Ordinary High-Water Mark' typically approximates flow conditions during a one- to two-year storm event as these flood events carry enough flow and occur frequently enough to be critical channel forming events. Jurisdictional stream limits for the Study Area were based on a combination of detailed geomorphic assessment data, surveyed topographic data, and field assessment completed during wetland investigations.

2. METHODS

2.1. Published Information Review

A review of readily available published information was conducted to become familiar with existing site conditions (Table C-1). Data and mapping sources were then utilized to prepare exhibits to aid in completion of the subsequent field investigations.

Table C-1 – References for Identification of Wetlands

Document	Date	Source
USGS 7.5' Topographic Maps	1969, photorevised 1974	U.S. Geological Survey Map Locator *https://store.usgs.gov/map-locator*
FEMA Flood Maps, Anne Arundel County Maryland	2015	Federal Emergency Management Agency (FEMA) *https://msc.fema.gov/portal*
Soil Survey Geographic (SSURGO) Database for Anne Arundel County, Maryland	2023	USDA, Natural Resources Conservation Service (NRCS) Web Soil Survey *https://websoilsurvey.sc.egov.usda.gov*
MD DNR wetland mapping for Anne Arundel County, Maryland	2023	State of MD Mapping & GIS Data Portal/iMAP, *http://data.imap.maryland.gov*
National Wetlands Inventory Map for Anne Arundel County, Maryland	2019	State of MD Mapping & GIS Data Portal/iMAP, *http://data.imap.maryland.gov*
Aerial Photography	2018, 2011, 2007, 1994, 1981, 1974, 1952, 1943	Environmental Data Resources, Inc.
Aerial Photography	2020	Anne Arundel County GIS *http://gis-world2.aacounty.org/ silverlightviewer/?Viewer=WERS*

2.2. Field Investigation

BayLand is applying the 1987 *Corps of Engineers Wetland Delineation Manual* and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region Version 2.0*. Fieldwork was performed using the level 2 routine determination methodology requiring field data collection and delineation. The three-parameter approach necessitates that all three parameters (hydrology, hydrophytic vegetation, and hydric soils) must be evident for the area to be classified as a wetland. When one or more parameters have been significantly disturbed (atypical) by human activity, a determination on whether the disturbed parameter(s) existed prior to the disturbance must be made based on other evidence. In these cases, the conditions that previously characterized the site are considered to be present (USACE, 2010; Environmental Laboratory, 1987).

Wetland hydrology indicators are categorized in four groups based on the strength of evidence of inundation and/or saturation (Table C-2). USACE further classifies hydrology indicators as primary or secondary indicators based on their reliability within the applicable region. Primary hydrology indicators are strong signs such as inundation or saturation and only one is required to be present to meet the hydrology parameter. In the absence of a primary indicator, two secondary indicators are necessary to satisfy the hydrology parameter.

Table C-2 – Wetland Hydrology Groups

Group	Observation/Evidence	Primary/Secondary
A	Direct observation of inundation or soil saturation	Primary
B	Evidence of recent inundation	Primary & Secondary
C	Evidence of current or recent soil saturation	Primary & Secondary
D	Evidence from other site conditions/data	Secondary

Source: USACE, Engineer Research & Development Center, Wetland Regulatory Assistance Program. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic & Gulf Coastal Plain Region Version 2.0

Hydric soil conditions resulting from extended periods of inundation and/or saturation can be identified through field examination of the soil profile. Chemical transformations and physical translocation of elements including iron and manganese are caused by anaerobic conditions. These conditions cause reduction which not only changes soil to a grayish color but also converts these elements to a more water-soluble form. As a result, hydric soils can be expected to be dull or gray in color, which is known as a reduced or depleted matrix. Hydric soils often contain areas of brighter coloration, called redoximorphic concentrations. Such concentrations result from soil exposure to oxygen during periodic drying or diffusion from live roots. Anaerobic soils can also reduce sulfur compounds causing a distinct hydrogen sulfide odor under hydric conditions. Dark soils caused by slow rates of organic matter decomposition under saturated conditions are also hydric soil indicators.

Hydric soil indicators are generally classified into three categories based on soil texture (Table C-3). Within each group there are approximately 10 to 20 indicators, and regional

USACE delineation supplements indicate which indicators are applicable to the particular area of work.

Table C-3 – Hydric Soil Groups	
Abbreviation	**Soil Type**
A	All soils
S	Sandy soils
F	Loamy and clayey soils

Source: USACE, Engineer Research & Development Center, Wetland Regulatory Assistance Program. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic & Gulf Coastal Plain Region Version 2.0

The presence of hydrophytic vegetation is based on relative dominance of hydrophytes within the overall plant community. For determination, species composition, approximate coverage within each vegetative stratum and wetland indicator statuses are assessed. Wetland indicator status is based upon the USACE's 2018 Wetland Plant List (USACE, 2020). Table C-4 lists the indicator status abbreviations and definitions.

Table C-4 – Wetland Plant Indicator Definitions	
Indicator Status	**Definition**
OBL	Almost always occurs in wetlands
FACW	Usually occur in wetlands
FAC	Occurs in wetlands and non-wetlands
FACU	Usually occurs in non-wetlands, but may occur in wetlands
UPL	Almost never occurs in wetlands

Source: U.S. Army Corps of Engineers 2018. National Wetland Plant List, version 3.4, http://wetland-plants.usace.army.mil/

Delineated areas were flagged with pink 'Wetland Delineation' ribbon. Flags were labeled consecutively and areas continuing offsite were labeled as such. Data point locations were identified with a pink flag. All flagging was located with a Trimble S5 and/or S6 Robotic Total Station by BayLand during the topographic survey of the site.

3. RESULTS

3.1. Published Information

3.1.1. Hydrology & Topography

The Study Area is located in the west central region of the Northern Coastal Plain (Major Land Resource Area 149A) of the North Atlantic Slope Diversified Farming Region (Land Resource Region S, USACE, 2010). This region is characterized by marine sedimentary rock and alluvial deposits. Topography is rolling to nearly level with mixed pine and hardwood forests (USACE, 2010). The Rock Creek sub-watershed drains to tidal portions of the Patapsco River near its confluence with the Chesapeake Bay (Figure C-1). Rock Creek is a tributary to the Patapsco River separated by steep, rolling topography. The Rock Creek project is comprised of approximately 4,100 linear feet of stream valley (Figure C-1). The total drainage area to the bottom of the Study Area is approximately 330 acres. As promulgated in Code of Maryland Regulations (COMAR 26.08.02.08), all of the reaches within the Study Area are designated as “Use I” waters (MDE website, 2023). “Use I” designated streams are described as Water Contact Recreation and Protection of Nontidal Warmwater Aquatic Life. The closure period for “Use I” designated waters is March 1 through June 15, inclusive of any year.

The Study Area varies in elevation from approximately two feet in a couple of isolated scour holes at the downstream end to 54 feet above mean sea level and generally drains from southeast to northwest (Figure C-2). Federal Emergency Management Agency (FEMA) map panel 24003C0069F, effective February 18, 2015, indicates that no FEMA floodplain boundary is mapped onsite (FEMA, 2015, Figure C-3). National Wetlands Inventory (NWI) mapping shows a palustrine wetland at the downstream/northern end of the Study Area (Figure C-4). Similarly, DNR wetland mapping also shows a palustrine wetland at the downstream end of the Study Area (Figure C-5).

3.1.2. Soils

Site soils within the Study Area consist of 5 soil series (SSURGO, 2023) (Table C-5, Figure C-6). Table C-5 provides a general description of each soil series as well its USDA hydric rating which is the percentage of a map unit that meets the criteria of hydric soils (SSURGO, 2023). Soils include Evesboro and Galestown soils (EVC), Patapsco-Evesboro-Fort Mott complex (PeB), Patapsco-Evesboro-Fort Mott complex (PfB), Sassafras and Croom soils (SME) and Zekiah and Issue soils (ZBA).

Table C-5 – Study Area Soils				
Abbr.	**Soil Series**	**General Description**	**Slopes (%)**	**Hydric Rating (%)**
EVC	Evesboro and Galestown soils	Excessively drained, loamy sand	0-5	0
PeB	Patapsco-Evesboro-Fort Mott complex	Somewhat excessively drained, loamy sand	0-5	0
PfB	Patapsco-Evesboro-Fort Mott complex	Somewhat excessively drained, sand	0-5	0
SME	Sassafras and Croom soils	Well drained, fine sandy loam	15-25	5
ZBA	Zekiah and Issue soils	Poorly drained, silt loam	0-2	61

Source: SSURGO/USDA Web Soil Survey, 2023, http://websoilsurvey.nrcs.usda.gov/app/

2,000 1,000 0 2,000 Feet

1" = 2000'

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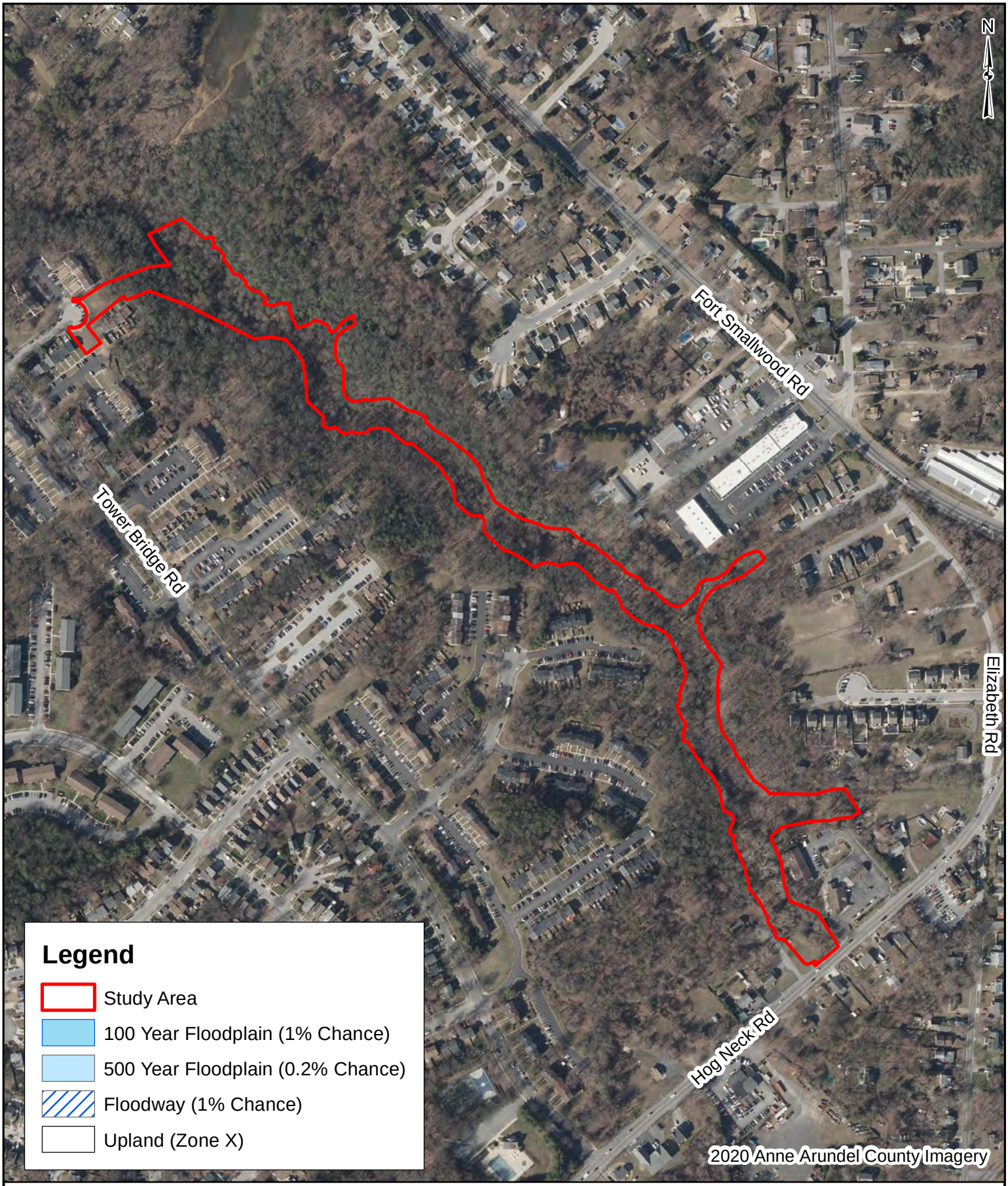
Website: www.baylandinc.com

Figure C-2
Rock Creek Stream Restoration
USGS Topographic Map

P:\5_20201_Rock Creek Stream Restoration\GIS\NRIC-2_USGS.mxd



400 200 0 400 Feet

1" = 400'

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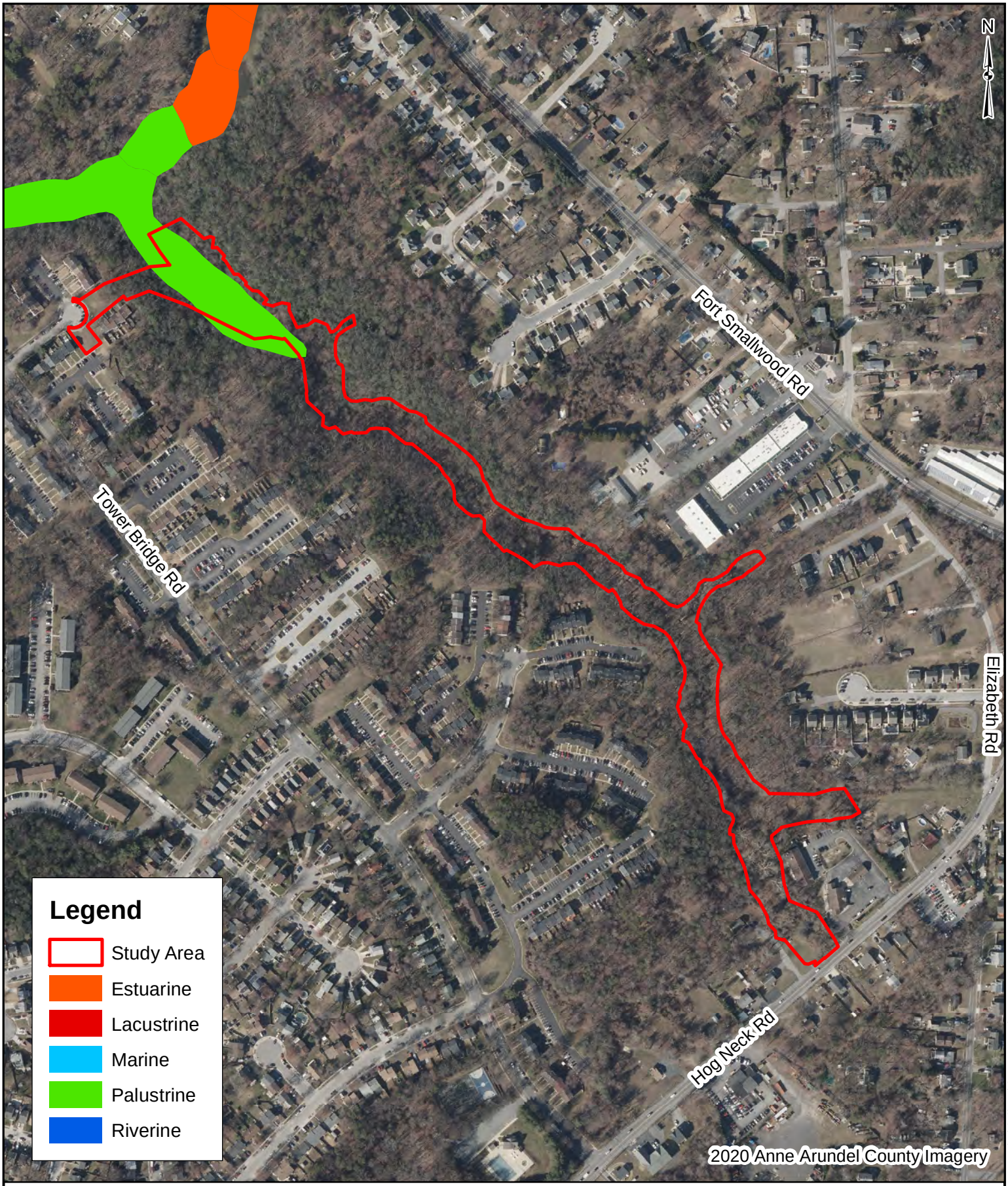
Figure C-3
Rock Creek
Stream Restoration
FEMA Floodplain Map

P:\5_20201_Rock Creek Stream Restoration\GIS\NR\C-3_FEMA.mxd



400 200 0 400 Feet

1" = 400'

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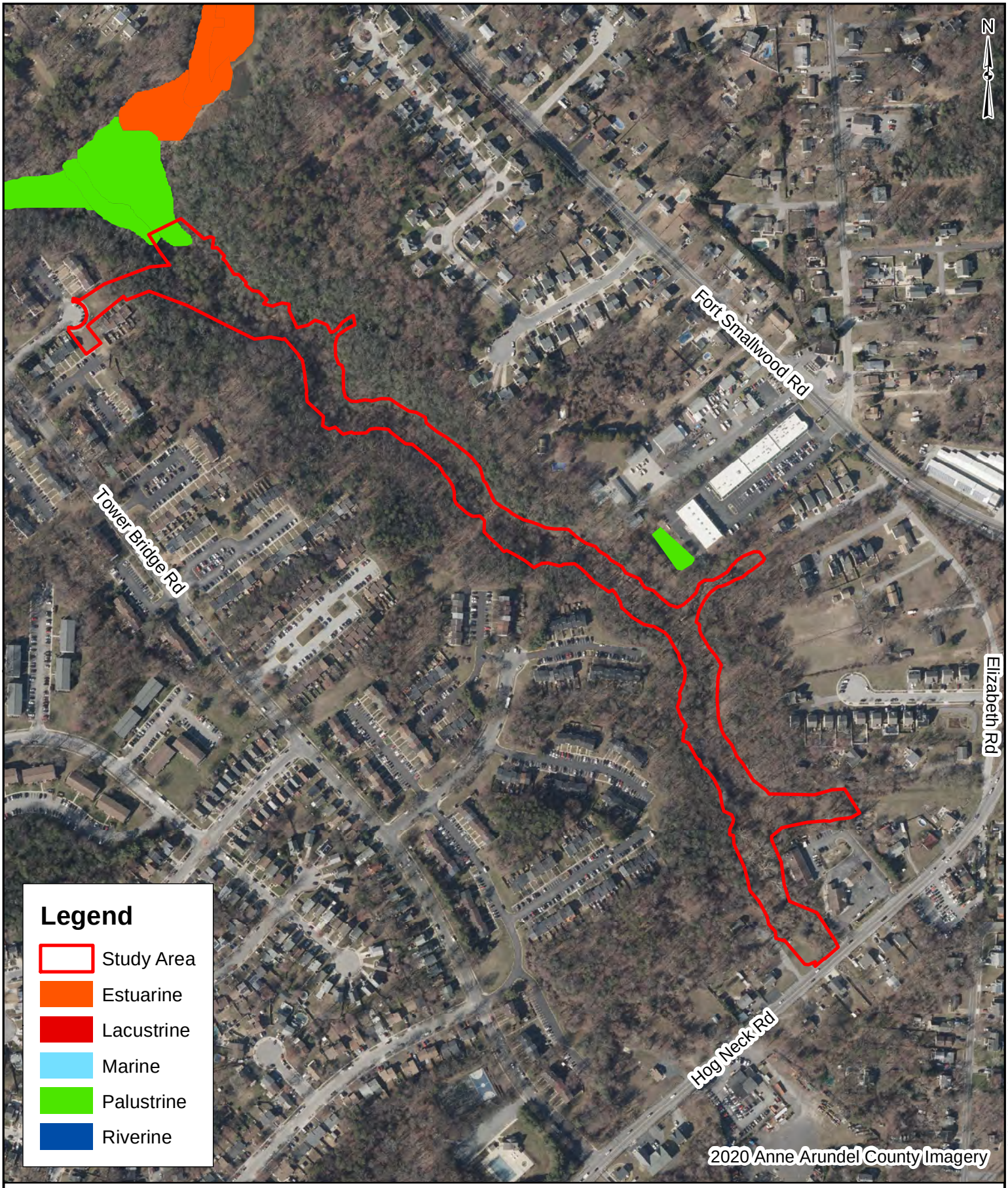
Figure C-4
Rock Creek
Stream Restoration
NWI Wetlands Map

P:\5_20201_Rock Creek Stream Restoration\GIS\NRI\C-4_NWI.mxd



400 200 0 400 Feet

1" = 400'

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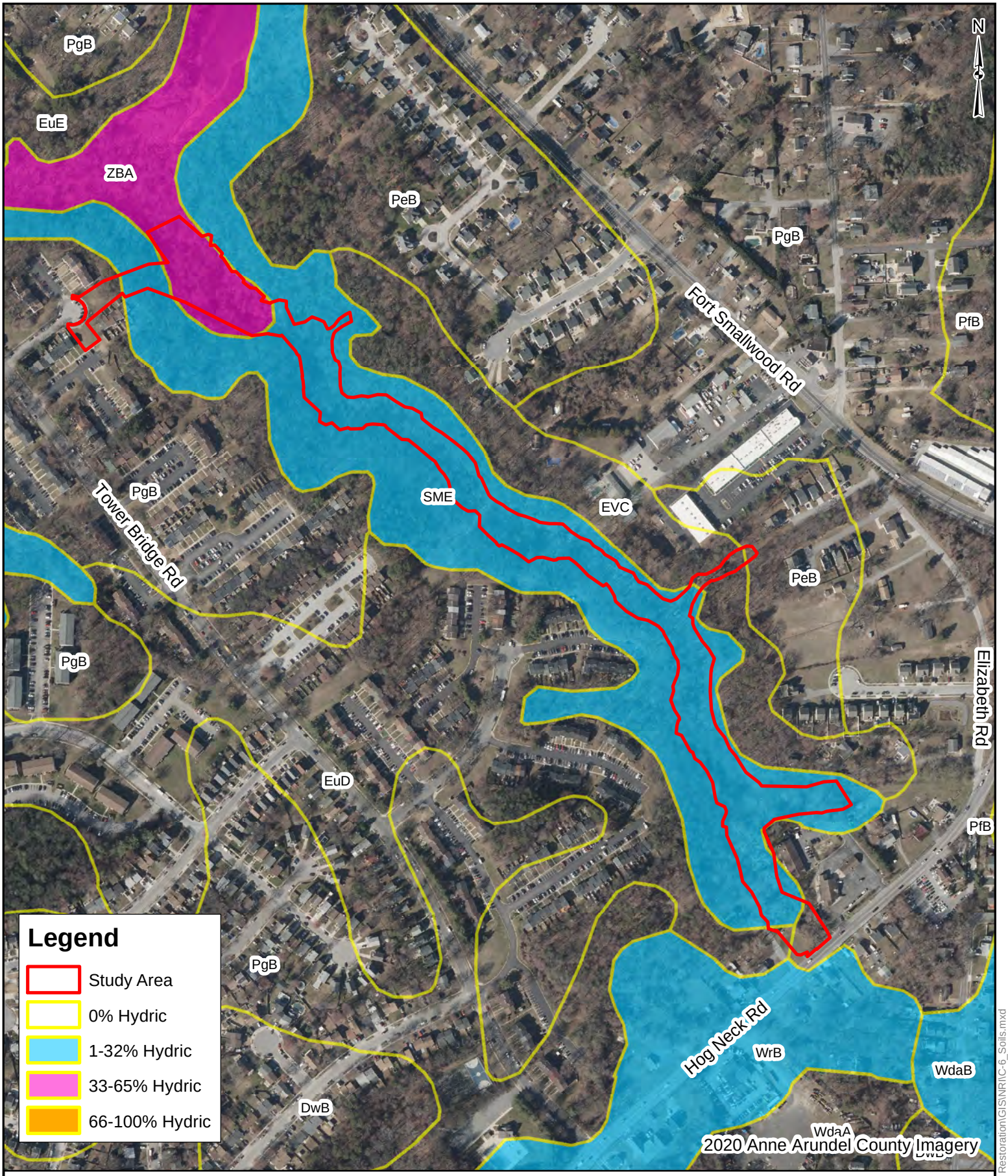
Figure C-5
Rock Creek
Stream Restoration
DNR Wetlands Map

P:\5_20201_Rock Creek Stream Restoration\GIS\NR\C-5_DNR.mxd



400 200 0 400 Feet

1" = 400'

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Figure C-6
Rock Creek
Stream Restoration
Soils Map

P:\5_20201_Rock Creek Stream Restoration\GIS\NR\C-6_Soils.mxd

3.1.3. Vegetation

Based on a review of aerial photography, the Study Area lies within a highly developed watershed. Most development in the watershed consists of high-density residential land use, with the majority of watershed development occurring between the late 1970s and early 1980s (Environmental Data Resources; U.S. Geological Survey Earth Explorer) Undeveloped areas in the watershed are generally forested likely due to the presence of steep slopes and other protected resources that prevented development. The Study Area is currently comprised of a mix of forest and brush.

3.2. Field Investigations

3.2.1. Overview

The Project wetland delineation was performed in April of 2023. Climatic and hydrologic conditions preceding and during delineation work were drier for the time of year. Plans depicting the extent of jurisdictional streams and wetlands are attached in Figures C-7a and C-7b. Representative datasheets are enclosed in Attachment A and select photographs are enclosed in Attachment B. Wetlands are summarized in Table C-6.

Legend

- Study Area
- Ephemeral Channel
- Intermittent Stream Channel
- Perennial Stream Channel
- Non-tidal Wetlands
- Delineation Datapoints
- 2021 AA GIS Parcels
- 2021 AA GIS Storm Outfalls
- 2019 AA GIS Sewer Manholes
- 2019 AA GIS Sewer Mains
- 2020 AA GIS 1' Contours

Trib 1 to Rock Creek

Rock Creek

Trib to Rock Creek

Ex culvert

Matchline Refer to Figure C-7b

CREEKSIDE DR

NEWCOMB COURT

WOLSEY COURT

HOG NECK ROAD

N

100 50 0 100 200 Feet

1" = 100'

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Figure C-7a
Rock Creek
Stream Restoration
Wetland Plans

P15_20201_Rock Creek Stream Restoration\GIS\NRTC-7a_Rock_Creek_Wetland_Plans_US.mxd

Legend

- Study Area
- Ephemeral Channel
- Intermittent Stream Channel
- Perennial Stream Channel
- Non-tidal Wetlands
- Delineation Datapoints
- 2021 AA GIS Parcels
- 2021 AA GIS Storm Outfalls
- 2019 AA GIS Sewer Manholes
- 2019 AA GIS Sewer Mains
- 2020 AA GIS 1' Contours

Rock Creek

Continues offsite

Continues offsite

Continues offsite

Continues offsite

Continues offsite

Continues offsite

WL-01
WL-02
WL-03
WL-04
WL-05
WL-06
WL-07
WL-08
WL-09
WL-10
WL-11
WL-12
WL-13
WL-14
WL-15
WL-16
WL-17
WL-18
WL-19

DP_C_Up
DP_C_Wet
DP_P_Wet
DP_P_Up
DP_N_Wet
DP_N_Up
DP_L_Up
DP_L_Wet
DP_I_Wet
DP_I_Up
DP_F_Up
DP_F_Wet

Matchline Refer to Figure C-7a

HANDEL CT
DORESHIRE CT
CHADWICK CT
SALTWOOD GLN

100 50 0 100 200 Feet

1" = 100'

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Figure C-7b
Rock Creek
Stream Restoration
Wetland Plans

P:\5_20201_Rock Creek Stream Restoration\GIS\NRIC-7b_Rock_Creek_Wetland_Plans_DS.mxd

3.2.2. Field Delineation Results

The Rock Creek Stream Restoration Study Area includes approximately 4,100 linear feet of stream valley with the valley bottom ranging in width from 65 to 180 feet. There are an several small ephemeral tributaries that range from 18 feet at the narrowest section to 115 feet wide at their valley bottoms; none of these contain wetlands. Although not regulated by MDE or USACE, the Study Area contains 1,803 linear feet of ephemeral channels that are largely concentrated in the at the upstream end of Rock Creek and in the side tributaries (Photos 23 & 24). An intermittent section of approximately 572 linear feet is a part of the main channel, starting approximately 150 feet downstream of the first tributary where it continues to below the second main tributary (Tributary 1) (Photo 21). A few other intermittent sections are located farther down the valley for a total of 641 linear feet. The channel transitions to perennial about a third of the way downstream from the top of the Study Area where the channel continues for approximately 2,407 linear feet (Photos 17 – 20 & 22). Downstream areas contain most of the wetlands, anastomosed channels, and former flow paths, as well as seeps from the base of the hillsides that contribute to channel hydrology. Other perennial channels contribute to a total of 3,035 linear feet of perennial channel.

Except for the most downstream portions that have a substantial amount of deposited sediment (generally beginning near WL-14, Photo 18), vertical incision along the entire stream has isolated the channel from its floodplain thus significantly reducing channel overflow events as a wetland hydrology source (Photos 2, 4, 17 - 22). Typical hydrology indicators observed in wetland areas include Surface Water (A1), High Water Table (A2), Saturation (A3), Water Marks (B1), Water-Stained Leaves (B9), Hydrogen Sulfide Odor (C1), Presence of Reduced Iron (C4), Sparsely Vegetated Concave Surface (B8), Drainage Patterns (B10), Moss Trim Lines (B16), Geomorphic Position (D2), and FAC-Neutral Test (D5).

Delineated wetlands are in two mapped soil series. WL-1 through WL-11 and portions of WL-12 and WL-17 are in SME (Sassafras and Croom soils) which has a hydric soil rating of five percent. Part of WL-12 and WL-17 and all of WL-13 through WL-19 are in ZBA (Zekiah and Issue soils) which has a hydric rating of 61%. Soil test pits yielded profiles generally consistent with soil mapping (Photos 7 - 10). Textures were predominately sandy to clay loams, often with muck near the surface. Wetland profiles begin at the surface and continue to a depth of at least 12 to 14 inches. The most common hydric soils indicators found in the field were Hydrogen Sulfide (A4), Depleted Below Dark Surface (A11), Sandy Mucky Mineral (S1) and Sandy Redox (S5) (Photos 7 & 9).

While some areas outside of delineated wetlands, along the sanitary sewer right-of-way, sometimes had wet soils, they did not exhibit hydric soil indicators. Wetland DP L-UP was performed in such an area to demonstrate that soil characteristics did not meet hydric criteria (Photo 6).

Vegetation is fairly consistent throughout the wetland areas though the canopy is slightly more open toward the downstream wetlands (Photos 1-3, 5, 12, 14 & 15). Wetlands classified as forested contain overstory and/or understory species within and in the vicinity of the wetland. While one was classified as emergent, lack shading and woody vegetation. Typical species observed in and near wetlands include *Acer rubrum* (red maple), *Ilex opaca*, (American holly), and *Nyssa sylvatica* (black gum), in the overstory, and *Carpinus caroliniana* (ironwood), *Ilex opaca*, and *Lindera benzoin* (spicebush) *Magnolia virginiana* (sweet bay) and *Viburnum* sp. (arrowwood and blackhaw) in the understory and shrub layers. Herbaceous vegetation included *Glyceria striata* (fowl mannagrass), *Carex* sp. (sedge sp.), *Viola sororia* (common blue violet), *Onoclea sensibilis* (sensitive fern), *Impatiens capensis* (orange jewelweed) as well as *Smilax rotundifolia* (greenbrier) as well as *Toxicodendron radicans* (eastern poison ivy). Invasive species included *Microstegium vimineum* (Japanese stiltgrass), *Ficaria verna* (lesser celandine), *Rosa multiflora* (multiflora rose), *Berberis thunbergia* (Japanese barberry) and *Celastrus orbiculatus* (oriental bittersweet). More herbaceous vegetation is expected to be present later in the growing season in wetlands along the channel. Hydrophytic vegetation determinations were made based on both the dominance test and the prevalence index.

Table C-6 – Wetland Summary

Wetland	Type	Area (ft^2)	Area (acres)	Wetland	Type	Area (ft^2)	Area (acres)
WL-01	PFO*	2,428	0.06	WL-11	PFO	357	0.01
WL-02	PFO	37	<0.01	WL-12	PFO	788	0.02
WL-03	PFO	774	0.02	WL-13	PFO	2,318	0.05
WL-04	PEM*	47	<0.01	WL-14	PFO	584	0.01
WL-05	PFO	623	0.01	WL-15	PFO	3,525	0.08
WL-06	PFO	399	<0.01	WL-16	PFO	158	<0.01
WL-07	PFO	9256	<0.21	WL-17	PFO	2,451	0.06
WL-08	PFO	3988	<0.01	WL-18	PFO	4,990	0.11
WL-09	PFO	229	<0.01	WL-19	PFO	3,606	0.08
WL-10	PFO	357	<0.01	**TOTAL**		**37,094**	**0.85**

** PFO- Palustrine Forested, PEM- Palustrine Emergent*

4. Summary

Wetlands and WUS as shown on the enclosed Wetland Delineation Plans (Figure C-7 a-b) were delineated based upon hydrology, soils, and vegetation, as per the *1987 USACE Delineation Manual and Version 2.0 of the Atlantic and Gulf Coastal Plain Region Regional Supplement*. Jurisdictional areas are associated with Rock Creek, a tributary to the Patapsco River near Pasadena, Maryland. The delineation was completed in April 2023. Most identified wetlands classify as PFO, although three palustrine emergent (PEM) wetlands are present. The total delineated area consists of 0.85 acres of nontidal wetlands, approximately 3,000 linear feet of perennial stream channel, 650 linear feet of intermittent stream channel, and 1,800 linear feet of ephemeral channel. A delineation summary is provided in Table C-7.

Table C-7 – Overall Delineation Summary	
Wetland Area (ft^2)	37,094
Wetland Area (acres)	0.85
Perennial Stream Length (LF)	3,035
Perennial Stream Area (ft^2)	26,935
Intermittent Stream Length (LF)	641
Intermittent Stream Area (ft^2)	6,566
Ephemeral Stream Length (LF)	1,803
Ephemeral Stream Area (ft^2)	11,394

At the time of this report, conditions have not been verified by MDE or USACE. Any disturbance to these resources will require verification and regulatory approval prior to initiation of work.

5. References

Anne Arundel County. 2020. Planimetric GIS data. Annapolis, MD. *http://gis-world2.aacounty.org/ silverlightviewer/?Viewer=WERS*

COMAR 26.08.02.08. Title 26 Department of the Environment Subtitle. 08 Water Pollution. Chapter 02 Water Quality, Section 08 Stream Segment Designations. Annotated Code of Maryland. Secretary of State, Division of State Documents. Maryland.

Cowardin, L.M., V. Carter, F. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deep Water Habitats of the United States. United States Fish and Wildlife Service, Washington, DC.

Environmental Data Resources, Inc. 2018, 2011, 2007, 1994, 1981, 1974, 1952, 1943. Rock Creek Stream Restoration. Inquiry Number: 7308818.5

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. United States Department of the Army, Waterways Experiment Station, Vicksburg, MS.

Federal Emergency Management Agency (FEMA); National Flood Insurance Program (NFIP). Panel 24003C0069F. Effective Date [2/18/2015]. Retrieved from *https://msc.fema.gov/portal/home*

Maryland Department of Natural Resources Wetland Mapping for Anne Arundel County, 2019. MD iMAP. *http://mdimap.us/arcgis/services*

National Wetlands Inventory Map for Anne Arundel County, 2019. MD iMAP. *http://mdimap.us/arcgis/services*

Soil Survey Geographic (SSURGO), 2020. Database for Anne Arundel County, Maryland USDA, Natural Resource Conservation Service (NRCS). *https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx*

U.S. Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0). Vicksburg, MS.

U.S. Army Corps of Engineers (USACE). 2020. National Wetland Plant List, Version 3.5). *U.S. Army Corps of Engineers 2020. National Wetland Plant List, version 3.5, http://wetland-plants.usace.army.mil/*

U.S. Geological Survey (USGS). 1969 photorevised 1974. USGS 7.5' Map Locator website. *https://store.usgs.gov*

Attachment A: Wetland Datasheets

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-19-2023

Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: C-up

Investigator(s): Bill LaBarre, Esther Young, Jason Traband Section, Township, Range: Pasadena

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 534191.1673' Long: 1448179.6018' Datum: NAD83

Soil Map Unit Name: Sassafras and Croom Soils NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: C-up

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	30	Yes	FAC
2. *Carpinus caroliniana*	15	Yes	FAC
3. *Quercus phellos*	5	No	FACW
4.			
5.			
6.			
7.			
8.			
	50	=Total Cover	
50% of total cover: 25		20% of total cover:	10
Sapling/Shrub Stratum (Plot size: 15)			
1. *Carpinus caroliniana*	30	Yes	FAC
2. *Viburnum prunifolium*	15	Yes	FACU
3. *Ligustrum obtusifolium*	10	No	UPL
4.			
5.			
6.			
7.			
8.			
	55	=Total Cover	
50% of total cover: 28		20% of total cover:	11
Herb Stratum (Plot size: 5)			
1. *Ficaria verna*	88	Yes	FAC
2. *Onoclea sensibilis*	5	No	FACW
3. *Lonicera japonica*	3	No	FACU
4. *Parthenocissus quinquefolia*	2	No	FACU
5. *Toxicodendron radicans*	2	No	FAC
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	=Total Cover	
50% of total cover: 50		20% of total cover:	20
Woody Vine Stratum (Plot size: 30)			
1. *Rosa multiflora*	15	Yes	FACU
2. *Celastrus orbiculatus*	10	Yes	FACU
3. *Smilax rotundifolia*	2	No	FAC
4.			
5.			
	27	=Total Cover	
50% of total cover: 14		20% of total cover:	6

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 57.1% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	167	x 3 =	501
FACU species	45	x 4 =	180
UPL species	10	x 5 =	50
Column Totals:	232 (A)		751 (B)
Prevalence Index = B/A =			3.24

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: C-up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 6/4	70	7.5YR 3/2	26	D	M		
			10YR 2/1	2	D	M		
			7.5YR 5/6	2	C	M		Distinct redox concentrations
10-14	10YR 3/2	98	5YR 4/6	2	C	M		Prominent redox concentrations
14-18	10YR 4/2	97	7.5YR 4/6	3	C	M		Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-19-2023

Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: C-wet

Investigator(s): Bill LaBarre, Esther Young, Jason Traband Section, Township, Range: Pasadena

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 534171.0057' Long: 1448162.6810' Datum: NAD83

Soil Map Unit Name: Sassafras and Croom Soils NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- X Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- X Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 7
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 7

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: C-wet

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	70	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	70	=Total Cover	
50% of total cover: 35		20% of total cover:	14
Sapling/Shrub Stratum (Plot size: 15)			
1. *Carpinus caroliniana*	20	Yes	FAC
2. *Magnolia virginiana*	15	Yes	FACW
3. *Viburnum prunifolium*	15	Yes	FACU
4.			
5.			
6.			
7.			
8.			
	50	=Total Cover	
50% of total cover: 25		20% of total cover:	10
Herb Stratum (Plot size: 5)			
1. *Carex blanda*	5	Yes	FAC
2. *Onoclea sensibilis*	5	Yes	FACW
3. *Toxicodendron radicans*	5	Yes	FAC
4. *Parthenocissus quinquefolia*	2	No	FACU
5. *Persicaria maculosa*	1	No	FACW
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	18	=Total Cover	
50% of total cover: 9		20% of total cover:	4
Woody Vine Stratum (Plot size: 30)			
1. *Rosa multiflora*	2	Yes	FACU
2. *Celastrus orbiculatus*	2	Yes	FACU
3. *Vitis riparia*	1	Yes	FACW
4.			
5.			
	5	=Total Cover	
50% of total cover: 3		20% of total cover:	1

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 10 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 70.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	22	x 2 =	44
FAC species	100	x 3 =	300
FACU species	21	x 4 =	84
UPL species	0	x 5 =	0
Column Totals:	143 (A)		428 (B)
Prevalence Index = B/A =			2.99

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: C-wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-3	7.5YR 2.5/2	100					Mucky Loam/Clay	Organics
3-7	7.5YR 3/2	100					Loamy/Clayey	
7-14	10YR 3/2	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) (**MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

The presence of a reduced matrix within 12" of the soil surface indicates that this soil is hydric based on the hydric soil definition: "a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part".

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-21-2023

Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: F-up

Investigator(s): Bill LaBarre, Jason Traband Section, Township, Range: Pasadena

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 535125.5738' Long: 1447152.5688' Datum: NAD83

Soil Map Unit Name: Zekiah and Issue Soils NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): 12.1
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: F-up

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	30	Yes	FAC
2. *Liriodendron tulipifera*	15	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
	45	=Total Cover	
50% of total cover: 23		20% of total cover:	9
Sapling/Shrub Stratum (Plot size: 15)			
1. *Lindera benzoin*	7	Yes	FACW
2. *Nyssa sylvatica*	5	Yes	FAC
3. *Viburnum prunifolium*	5	Yes	FACU
4. *Ilex opaca*	5	Yes	FAC
5. *Clethra alnifolia*	2	No	FACW
6.			
7.			
8.			
	24	=Total Cover	
50% of total cover: 12		20% of total cover:	5
Herb Stratum (Plot size: 5)			
1. *Ficaria verna*	30	Yes	FAC
2. *Tridens flavus*	10	No	FACU
3. *Viola sororia*	5	No	FAC
4. *Rosa multiflora*	3	No	FACU
5. *Lonicera japonica*	2	No	FACU
6. *Viburnum prunifolium*	2	No	FACU
7. *Glyceria striata*	1	No	OBL
8. *Berberis thunbergii*	1	No	UPL
9. *Impatiens capensis*	1	No	FACW
10. *Parthenocissus quinquefolia*	1	No	FACU
11. *Toxicodendron radicans*	1	No	FAC
12. *Carex blanda*	1	No	FAC
	58	=Total Cover	
50% of total cover: 29		20% of total cover:	12
Woody Vine Stratum (Plot size: 30)			
1. *Smilax rotundifolia*	3	Yes	FAC
2. *Rosa multiflora*	2	Yes	FACU
3. *Celastrus orbiculatus*	2	Yes	FACU
4.			
5.			
	7	=Total Cover	
50% of total cover: 4		20% of total cover:	2

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 10 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	1	x 1 =	1
FACW species	10	x 2 =	20
FAC species	80	x 3 =	240
FACU species	42	x 4 =	168
UPL species	1	x 5 =	5
Column Totals:	134 (A)		434 (B)
Prevalence Index = B/A =			3.24

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: F-up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-3	10YR 7/3	93	7.5YR 5/6	5	C	M	Sandy	Prominent redox concentrations
			5YR 4/6	2	C	M		Prominent redox concentrations
3-15	10YR 3/2	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) (**MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-21-2023
Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: F-wet
Investigator(s): Bill LaBarre, Jason Traband Section, Township, Range: Pasadena
Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 1
Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 535092.4696' Long: 1447122.7097' Datum: NAD83
Soil Map Unit Name: Zekiah and Issue Soils NWI classification: PFO
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- ____ Saturation (A3)
- X Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15) **(LRR U)**
- ____ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- X Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- X Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ____ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 4
Water Table Present?	Yes X	No ____	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 4

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Surface water in channels only

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: F-wet

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*			FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Viburnum dentatum*	15	Yes	FAC
2. *Lindera benzoin*	5	Yes	FACW
3. *Viburnum prunifolium*	5	Yes	FACU
4.			
5.			
6.			
7.			
8.			
	25 =Total Cover		
50% of total cover: 13	20% of total cover: 5		
Herb Stratum (Plot size: 5)			
1. *Carex intumescens*	25	Yes	FACW
2. *Carex stipata*	15	Yes	OBL
3. *Ficaria verna*	10	No	FAC
4. *Lindera benzoin*	5	No	FACW
5. *Rosa multiflora*	4	No	FACU
6. *Celastrus orbiculatus*	3	No	FACU
7. *Viola sororia*	3	No	FAC
8. *Glyceria striata*	3	No	OBL
9. *Ranunculus sceleratus*	2	No	OBL
10. *Galium tinctorium*	1	No	FACW
11.			
12.			
	71 =Total Cover		
50% of total cover: 36	20% of total cover: 15		
Woody Vine Stratum (Plot size: 30)			
1. *Smilax rotundifolia*	5	Yes	FAC
2.			
3.			
4.			
5.			
	5 =Total Cover		
50% of total cover: 3	20% of total cover: 1		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	36	x 2 =	72
FAC species	33	x 3 =	99
FACU species	12	x 4 =	48
UPL species	0	x 5 =	0
Column Totals:	101 (A)		239 (B)

Prevalence Index = B/A = 2.37

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: F-wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1.5	10YR 2/2	55	10YR 6/2	41			Mucky Sand	
			7.5YR 2.5/2	4				
1.5-10	10YR 2/1	95	7.5YR 3/2	5	C	M	Mucky Loam/Clay	Faint redox concentrations
10-16	10YR 6/2	97	2.5YR 4/8	3	C	PL	Sandy	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-21-2023

Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: I-up

Investigator(s): Bill LaBarre, Jason Traband Section, Township, Range: Pasadena

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 534997.3188' Long: 1447304.6883 Datum: NAD83

Soil Map Unit Name: Zekiah and Issue Soils NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Sandy point bar between stream and WL I

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): 13
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: I-up

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Liriodendron tulipifera*	20	Yes	FACU
2. *Acer rubrum*	10	Yes	FAC
3. *Ilex opaca*	5	No	FAC
4.			
5.			
6.			
7.			
8.			
	35	=Total Cover	
50% of total cover: 18	20% of total cover: 7		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Ilex opaca*	10	Yes	FAC
2. *Acer rubrum*	5	Yes	FAC
3. *Lindera benzoin*	5	Yes	FACW
4.			
5.			
6.			
7.			
8.			
	20	=Total Cover	
50% of total cover: 10	20% of total cover: 4		
Herb Stratum (Plot size: 5)			
1. *Ficaria verna*	48	Yes	FAC
2. *Viola sororia*	10	Yes	FAC
3. *Poa pratensis*	8	No	FACU
4. *Lindera benzoin*	7	No	FACW
5. *Carex blanda*	5	No	FAC
6. *Ilex opaca*	5	No	FAC
7. *Rosa multiflora*	5	No	FACU
8. *Celastrus orbiculatus*	5	No	FACU
9. *Trifolium pratense*	3	No	FACU
10. *Berberis thunbergii*	2	No	UPL
11. *Juncus effusus*	1	No	OBL
12. *Parthenocissus quinquefolia*	1	No	FACU
	100	=Total Cover	
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: 30)			
1. *Rosa multiflora*	20	Yes	FACU
2. *Celastrus orbiculatus*	5	Yes	FACU
3.			
4.			
5.			
	25	=Total Cover	
50% of total cover: 13	20% of total cover: 5		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	1	x 1 =	1
FACW species	12	x 2 =	24
FAC species	98	x 3 =	294
FACU species	67	x 4 =	268
UPL species	2	x 5 =	10
Column Totals:	180 (A)		597 (B)
Prevalence Index = B/A =			3.32

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: I-up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/3	50	10YR 5/3	45	D	M	Sandy	
			5YR 3/4	3	C	PL		Distinct redox concentrations
			5YR 4/6	2	C	PL		Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) (**MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-21-2023
Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: I-wet
Investigator(s): Bill LaBarre, Jason Traband Section, Township, Range: Pasadena
Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 0
Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 535016.6364' Long: 1447304.4029' Datum: NAD83
Soil Map Unit Name: Zekiah and Issue Soils NWI classification: PFO
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- X Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15) **(LRR U)**
- X Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- X Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ____ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 2
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: I-wet

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Ilex opaca*	60	Yes	FAC
2. *Liriodendron tulipifera*	5	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
	65	=Total Cover	
50% of total cover: 33		20% of total cover: 13	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Lindera benzoin*	10	Yes	FACW
2. *Ilex opaca*	3	Yes	FAC
3. *Rosa multiflora*	1	No	FACU
4. *Ligustrum obtusifolium*	1	No	UPL
5.			
6.			
7.			
8.			
	15	=Total Cover	
50% of total cover: 8		20% of total cover: 3	
Herb Stratum (Plot size: 5)			
1. *Glyceria striata*	10	Yes	OBL
2. *Microstegium vimineum*	5	Yes	FAC
3. *Impatiens capensis*	3	No	FACW
4. *Celastrus orbiculatus*	1	No	FACU
5. *Acer rubrum*	1	No	FAC
6. *Ranunculus sceleratus*	1	No	OBL
7. *Viola sororia*	1	No	FAC
8. *Podophyllum peltatum*	1	No	FACU
9.			
10.			
11.			
12.			
	23	=Total Cover	
50% of total cover: 12		20% of total cover: 5	
Woody Vine Stratum (Plot size: 30)			
1. *Rosa multiflora*	2	No	FACU
2. *Lonicera japonica*	1	No	FACU
3.			
4.			
5.			
	3	=Total Cover	
50% of total cover: 2		20% of total cover: 1	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	11	x 1 =	11
FACW species	13	x 2 =	26
FAC species	70	x 3 =	210
FACU species	11	x 4 =	44
UPL species	1	x 5 =	5
Column Totals:	106 (A)		296 (B)
Prevalence Index = B/A =			2.79

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: l-wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 6/2	60	10YR 3/2	40			Mucky Sand	
7-12	10YR 7/2	95	5YR 4/4	5			Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- X Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-21-2023

Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: L-up

Investigator(s): Bill LaBarre, Jason Traband Section, Township, Range: Pasadena

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 3

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 534780.7668' Long: 1447433.0600' Datum: NAD83

Soil Map Unit Name: Sassafras and Croom Soils NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Pipeline/sewer path

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 0.1
Water Table Present?	Yes ____	No x	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No x	Depth (inches): ____

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Seep from from bottom of hillside over compacted loamy sand. Upland datapoint purposefully chosen in this area to show wetland characteristics were not present despite surface water presence.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: L-up

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	40	Yes	FAC
2. *Liriodendron tulipifera*	20	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
	60	=Total Cover	
50% of total cover: 30		20% of total cover:	12
Sapling/Shrub Stratum (Plot size: 15)			
1. *Viburnum prunifolium*	15	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	15	=Total Cover	
50% of total cover: 8		20% of total cover:	3
Herb Stratum (Plot size: 5)			
1. *Equisetum arvense*	3	Yes	FAC
2. *Microstegium vimineum*	3	Yes	FAC
3. *Toxicodendron radicans*	3	Yes	FAC
4. *Cinna arundinacea*	1	No	FACW
5. *Onoclea sensibilis*	1	No	FACW
6. *Woodwardia areolata*	1	No	OBL
7. *Viburnum prunifolium*	1	No	FACU
8.			
9.			
10.			
11.			
12.			
	13	=Total Cover	
50% of total cover: 7		20% of total cover:	3
Woody Vine Stratum (Plot size: 30)			
1. *Rosa multiflora*	2	Yes	FACU
2. *Celastrus orbiculatus*	2	Yes	FACU
3. *Parthenocissus quinquefolia*	1	Yes	FACU
4.			
5.			
	5	=Total Cover	
50% of total cover: 3		20% of total cover:	1

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 44.4% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	1	x 1 =	1
FACW species	2	x 2 =	4
FAC species	49	x 3 =	147
FACU species	41	x 4 =	164
UPL species	0	x 5 =	0
Column Totals:	93 (A)		316 (B)
Prevalence Index = B/A =			3.40

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: L-up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 5/1	100					Mucky Sand	High organic content
1-2.5	10YR 5/1	100					Sandy	Low organics
2.5-6	2.5Y 6/3	100					Sandy	Compacted
6-16	10YR 7/4	90	N 4/	10			Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

AAD - no reaction

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-21-2023

Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: L-wet

Investigator(s): Bill LaBarre, Jason Traband Section, Township, Range: Pasadena

Landform (hillside, terrace, etc.): Hillslope to Floodplain Local relief (concave, convex, none): None Slope (%): 3-0

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 534791.6298' Long: 1447413.0551' Datum: NAD83

Soil Map Unit Name: Sassafras and Croom Soils NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Majority of WL lies within the floodplain with some hillslope area

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- X Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- X Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- X Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 0.1
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: L-wet

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	30	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	30 =Total Cover		
50% of total cover: 15	20% of total cover: 6		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Lindera benzoin*	30	Yes	FACW
2. *Viburnum dentatum*	10	Yes	FAC
3. *Alnus serrulata*	10	Yes	FACW
4.			
5.			
6.			
7.			
8.			
	50 =Total Cover		
50% of total cover: 25	20% of total cover: 10		
Herb Stratum (Plot size: 5)			
1. *Glyceria striata*	15	Yes	OBL
2. *Eupatorium perfoliatum*	10	Yes	FACW
3. *Onoclea sensibilis*	7	No	FACW
4. *Viola sororia*	5	No	FAC
5. *Carex atlantica*	2	No	FACW
6. *Rumex crispus*	1	No	FAC
7.			
8.			
9.			
10.			
11.			
12.			
	40 =Total Cover		
50% of total cover: 20	20% of total cover: 8		
Woody Vine Stratum (Plot size: 30)			
1. *Rosa multiflora*	10	Yes	FACU
2. *Toxicodendron radicans*	3	Yes	FAC
3.			
4.			
5.			
	13 =Total Cover		
50% of total cover: 7	20% of total cover: 3		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 87.5% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	59	x 2 =	118
FAC species	49	x 3 =	147
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	133 (A)		320 (B)
Prevalence Index = B/A =			2.41

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: L-wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/1	100					Mucky Loam/Clay	
4-7	10YR 2/1	70	10YR 5/1	30			Mucky Loam/Clay	
7-12	10YR 5/1	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Positive AAD reaction

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-21-23

Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: N-up

Investigator(s): Bill LaBarre, Jason Traband Section, Township, Range: Pasadena

Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 3

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 534504.3340' Long: 1447653.7487' Datum: NAD83

Soil Map Unit Name: Sassafras and Croom Soils NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Open area, pipeline/sewer access path

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: N-up

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Liriodendron tulipifera*	40	Yes	FACU
2. *Acer rubrum*	20	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	60	=Total Cover	
50% of total cover: 30		20% of total cover:	12
Sapling/Shrub Stratum (Plot size: 15)			
1. *Viburnum prunifolium*	5	Yes	FACU
2. *Ilex opaca*	4	Yes	FAC
3. *Rosa multiflora*	4	Yes	FACU
4.			
5.			
6.			
7.			
8.			
	13	=Total Cover	
50% of total cover: 7		20% of total cover:	3
Herb Stratum (Plot size: 5)			
1. *Tridens flavus*	15	Yes	FACU
2. *Viola sororia*	10	Yes	FAC
3. *Onoclea sensibilis*	3	No	FACW
4. *Microstegium vimineum*	1	No	FAC
5. *Toxicodendron radicans*	1	No	FAC
6. *Rosa multiflora*	1	No	FACU
7. *Parthenocissus quinquefolia*	1	No	FACU
8.			
9.			
10.			
11.			
12.			
	32	=Total Cover	
50% of total cover: 16		20% of total cover:	7
Woody Vine Stratum (Plot size: 30)			
1. *Smilax rotundifolia*	2	No	FAC
2. *Rosa multiflora*	1	No	FACU
3.			
4.			
5.			
	3	=Total Cover	
50% of total cover: 2		20% of total cover:	1

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 42.9% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	3	x 2 =	6
FAC species	38	x 3 =	114
FACU species	67	x 4 =	268
UPL species	0	x 5 =	0
Column Totals:	108 (A)		388 (B)
Prevalence Index = B/A =			3.59

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: N-up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-0.5	7.5YR 3/1	100					Sandy	
0.5-18	7.5YR 6/1	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-21-2023
Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: N-wet
Investigator(s): Bill LaBarre, Jason Traband Section, Township, Range: Pasadena
Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 1
Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 534532.9142' Long: 1447644.4831' Datum: NAD83
Soil Map Unit Name: Sassafras and Croom Soils NWI classification: PFO
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15) **(LRR U)**
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- X Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- X Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- X Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ____ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 1
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Surface water present in flowpaths only

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: N-wet

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	50	Yes	FAC
2. *Nyssa sylvatica*	10	No	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	60	=Total Cover	
50% of total cover: 30		20% of total cover:	12
Sapling/Shrub Stratum (Plot size: 15)			
1. *Ilex opaca*	15	Yes	FAC
2. *Viburnum dentatum*	10	Yes	FAC
3. *Viburnum prunifolium*	5	No	FACU
4.			
5.			
6.			
7.			
8.			
	30	=Total Cover	
50% of total cover: 15		20% of total cover:	6
Herb Stratum (Plot size: 5)			
1. *Glyceria striata*	10	Yes	OBL
2. *Viola sororia*	5	Yes	FAC
3. *Juncus effusus*	3	Yes	OBL
4. *Carex vulpinoidea*	3	Yes	FACW
5. *Juncus effusus*	3	Yes	OBL
6. *Eleocharis tenuis*	2	No	FACW
7. *Onoclea sensibilis*	2	No	FACW
8. *Lonicera japonica*	2	No	FACU
9. *Rosa multiflora*	2	No	FACU
10. *Solidago rugosa*	1	No	FAC
11.			
12.			
	33	=Total Cover	
50% of total cover: 17		20% of total cover:	7
Woody Vine Stratum (Plot size: 30)			
1. *Celastrus orbiculatus*	2	No	FACU
2.			
3.			
4.			
5.			
	2	=Total Cover	
50% of total cover: 1		20% of total cover:	1

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	16	x 1 =	16
FACW species	7	x 2 =	14
FAC species	91	x 3 =	273
FACU species	11	x 4 =	44
UPL species	0	x 5 =	0
Column Totals:	125 (A)		347 (B)
Prevalence Index = B/A =			2.78

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: N-wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	7.5YR 5/2	70	7.5YR 3/2	30			Sandy	Mucky
1-16	10YR 8/1	95	7.5YR 5/8	5	C	M	Sandy	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Clay

Depth (inches): 18

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Restrictive Layer found in some locatons throughout WL N - varies from exposed on the surface to depth of 18"

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-21-2023

Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: P-up

Investigator(s): Bill LaBarre, Jason Traband Section, Township, Range: Pasadena

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 534718.0891' Long: 1447630.5589' Datum: NAD83

Soil Map Unit Name: Sassafras and Croom Soils NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No x	Depth (inches): ____
Water Table Present?	Yes ____	No x	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No x	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: P-up

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	50	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	50	=Total Cover	
50% of total cover: 25		20% of total cover:	10
Sapling/Shrub Stratum (Plot size: 15)			
1. *Lindera benzoin*	15	Yes	FACW
2. *Clethra alnifolia*	5	Yes	FACW
3. *Ilex verticillata*	3	No	FACW
4.			
5.			
6.			
7.			
8.			
	23	=Total Cover	
50% of total cover: 12		20% of total cover:	5
Herb Stratum (Plot size: 5)			
1. *Ficaria verna*	55	Yes	FAC
2. *Microstegium vimineum*	30	Yes	FAC
3. *Rosa multiflora*	3	No	FACU
4. *Tridens flavus*	3	No	FACU
5. *Toxicodendron radicans*	2	No	FAC
6. *Dichanthelium clandestinum*	1	No	FACW
7.			
8.			
9.			
10.			
11.			
12.			
	94	=Total Cover	
50% of total cover: 47		20% of total cover:	19
Woody Vine Stratum (Plot size: 30)			
1. *Rosa multiflora*	15	Yes	FACU
2. *Celastrus orbiculatus*	3	No	FACU
3. *Smilax rotundifolia*	2	No	FAC
4. *Lonicera japonica*	1	No	FACU
5.			
	21	=Total Cover	
50% of total cover: 11		20% of total cover:	5

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	24	x 2 =	48
FAC species	139	x 3 =	417
FACU species	25	x 4 =	100
UPL species	0	x 5 =	0
Column Totals:	188 (A)		565 (B)
Prevalence Index = B/A =			3.01

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: P-up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 6/3	60	10YR 3/2	35	D	M	Sandy	
			2.5YR 3/4	5	C	PL		Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

7.5YR 3/4 more prevelant with depth

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Rock Creek Stream Restoration City/County: Anne Arundel Sampling Date: 4-21-2023

Applicant/Owner: Anne Arundel County Department of Public Works State: MD Sampling Point: P-wet

Investigator(s): Bill LaBarre, Jason Traband Section, Township, Range: Pasadena

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 534726.0987' Long: 1447653.6667' Datum: NAD83

Soil Map Unit Name: Sassafras and Croom Soils NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15) **(LRR U)**
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- X Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- X Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ FAC-Neutral Test (D5)
- ____ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 3
Water Table Present?	Yes X	No ____	Depth (inches): 5
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 3

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Surface water in channels only

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: P-wet

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	40	Yes	FAC
2. *Ilex opaca*	20	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	60	=Total Cover	
50% of total cover: 30		20% of total cover:	12
Sapling/Shrub Stratum (Plot size: 15)			
1. *Magnolia virginiana*	10	Yes	FACW
2. *Ilex opaca*	10	Yes	FAC
3. *Viburnum prunifolium*	6	Yes	FACU
4. *Lindera benzoin*	2	No	FACW
5. *Viburnum dentatum*	2	No	FAC
6.			
7.			
8.			
	30	=Total Cover	
50% of total cover: 15		20% of total cover:	6
Herb Stratum (Plot size: 5)			
1. *Microstegium vimineum*	40	Yes	FAC
2. *Ficaria verna*	20	Yes	FAC
3. *Viola sororia*	10	No	FAC
4. *Glyceria striata*	6	No	OBL
5. *Carex stipata*	3	No	OBL
6. *Ranunculus sceleratus*	1	No	OBL
7. *Impatiens capensis*	1	No	FACW
8. *Dichanthelium clandestinum*	1	No	FACW
9. *Juncus effusus*	1	No	OBL
10.			
11.			
12.			
	83	=Total Cover	
50% of total cover: 42		20% of total cover:	17
Woody Vine Stratum (Plot size: 30)			
1. *Celastrus orbiculatus*	3	Yes	FACU
2. *Rosa multiflora*	2	Yes	FACU
3. *Lonicera japonica*	1	No	FACU
4.			
5.			
	6	=Total Cover	
50% of total cover: 3		20% of total cover:	2

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	11	x 1 =	11
FACW species	14	x 2 =	28
FAC species	142	x 3 =	426
FACU species	12	x 4 =	48
UPL species	0	x 5 =	0
Column Totals:	179 (A)		513 (B)
Prevalence Index = B/A =			2.87

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: P-wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 6/2	65	10YR 3/1	35	C	M	Sandy	Distinct redox concentrations
3-12	7.5YR 3/1	100					Mucky Loam/Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- X Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Attachment B: Site Photographs

Site Photographs

Photo 1 – Typical forested wetland vegetation, wetland WL-19; Datapoint F-wet

Photo 2 – Typical upland vegetation, between the stream and WL-19 near the downstream portion of the project; Datapoint F-up

Photo 3 – WL-08, showing typical hillslope seeps flowing into former channels; Datapoint P-wet

Photo 4 – Upland between hillslope and stream near WL-08, Ficaria verna (lesser celandine) is abundant; Datapoint P-up

Photo 5 – Water from the southwestern slope seeps into the former floodplain at WL-13; Datapoint L-wet

Photo 6 – Upland area at WL-13: Datapoint L-up

Photo 7 – Sandy soil in the top changes to mucky loam below, wetland WL-08; Datapoint P-wet

Photo 8 – Sandy soils likely deposited by out-of-bank events, upland near WL-08; Datapoint P-up

Photo 9 – WL-13, showing mucky loam in the upper profile (0-4"), with sandy soils below (7" and below); Datapoint L-wet

Photo 10 – Mucky sand (0-1") overlies compacted sandy layers below, upland plot near WL-13; Datapoint L-up

Photo 11 – Wetland WL-4, a small depressional feature

Photo 12 – Wetland WL-3 is close to WL-1 and WL-2, which are likely former flow paths

Photo 13 – A small channel can be seen forming where it flows out of wetland WL-11

Photo 14 – In an area with several long depressional features - WL-02

Photo 15 – WL-17 is typical for wetlands on the stream right side of the valley; long, linear seeps flow into the stream margins; Datapoint I-wet

Photo 16 – Looking up towards a channel that flows out of WL-05 (WL-05 is barely visible in the background)

Photo 17 – The incised channel is often lower than the root systems

Photo 18 – The incised channel has accumulated sediments in many downstream portions

Photo 19 – Near the middle of the stream reach showing an exposed manhole

Photo 20 – Manholes are exposed in several areas

Photo 21 – A large scour area with downed trees near Tributary 2

Photo 22 – Several large trees have fallen across the channel near the upstream portion of the perennial section

Photo 23 – Facing upstream in the highest ephemeral portion; the upstream ephemeral sections of the stream are relatively broad and flat with sand and accumulated debris

Photo 24 – Facing downstream from near the same location as photo 23; the ephemeral sections also have rip-rap in several locations

APPENDIX D

Trilogy Letters (USFWS, DNR, and MHT Project Review Responses) and FSD Data

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127

In Reply Refer To: 05/16/2025 14:14:49 UTC
Project code: 2025-0084063
Project Name: Rock Creek Stream Restoration

Federal Nexus: yes
Federal Action Agency (if applicable): Army Corps of Engineers

Subject: Technical assistance for 'Rock Creek Stream Restoration'

Dear Tom Barnum:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on May 16, 2025, for 'Rock Creek Stream Restoration' (here forward, Project). This project has been assigned Project Code 2025-0084063 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements may not be complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project.

Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key (Dkey), invalidates this letter. ***Answers to certain questions in the DKey commit the project proponent to implementation of conservation measures that must be followed for the ESA determination to remain valid. Note that conservation measures for northern long-eared bat and tricolored bat may differ. If both bat species are present in the action area and the key suggests more conservative measures for one of the species for your project, the Project may need to apply the most conservative measures in order to avoid adverse effects. If unsure which conservation measures should be applied, please contact the appropriate Ecological Services Field Office***

Determination for the Northern Long-Eared Bat and Tricolored Bat

Based upon your IPaC submission and a standing analysis completed by the Service, your project has reached the following effect determination(s):

Species	Listing Status	Determination
Northern Long-eared Bat (*Myotis septentrionalis*)	Endangered	NLAA
Tricolored Bat (*Perimyotis subflavus*)	Proposed Endangered	No effect

Federal agencies must consult with U.S. Fish and Wildlife Service under section 7(a)(2) of the Endangered Species Act (ESA) when an action *may affect* a listed species. Tricolored bat is proposed for listing as endangered under the ESA, but not yet listed. For actions that may affect a proposed species, agencies cannot consult, but they can *confer* under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed species is listed. Should the tricolored bat be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the tricolored bat range that previously received a NE or NLAA determination from the key to confirm that the determination is still accurate.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination key for the northern long-eared bat and tricolored bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Monarch Butterfly *Danaus plexippus* Proposed Threatened

You may coordinate with our Office to determine whether the Action may cause prohibited take of the animal species listed above. Note that if a new species is listed that may be affected by the identified action before it is complete, additional review is recommended to ensure compliance with the Endangered Species Act.

Next Steps

Consultation with the Service is necessary. The project has a federal nexus (e.g., Federal funds, permit, etc.), but you are not the federal action agency or its designated (in writing) non-federal representative. Therefore, the ESA consultation status is incomplete and no project activities should occur until consultation between the Service and the Federal action agency (or designated non-federal representative), is completed.

As the federal agency or designated non-federal representative deems appropriate, they should submit their determination of effects to the Service by doing the following.

1. Log into IPaC using an agency email account and click on My Projects, click "Search by record locator" to find this Project using **872-162162435**. (Alternatively, the originator of the project in IPaC can add the agency representative to the project by using the Add Member button on the project home page.)

2. Review the answers to the Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key to ensure that they are accurate.
3. Click on Review/ Finalize to convert the ‘not likely to adversely affect’ technical assistance letter to a concurrence letter. Download the concurrence letter for your files if needed.

If no changes occur with the Project or there are no updates on listed species, no further consultation/coordination for this project is required for the northern long-eared bat. However, the Service recommends that project proponents re-evaluate the Project in IPaC if: 1) the scope, timing, duration, or location of the Project changes (includes any project changes or amendments); 2) new information reveals the Project may impact (positively or negatively) federally listed species or designated critical habitat; or 3) a new species is listed, or critical habitat designated. If any of the above conditions occurs, additional coordination with the Service should take place before project implements any changes which are final or commits additional resources.

If you have any questions regarding this letter or need further assistance, please contact the Chesapeake Bay Ecological Services Field Office and reference Project Code 2025-0084063 associated with this Project.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

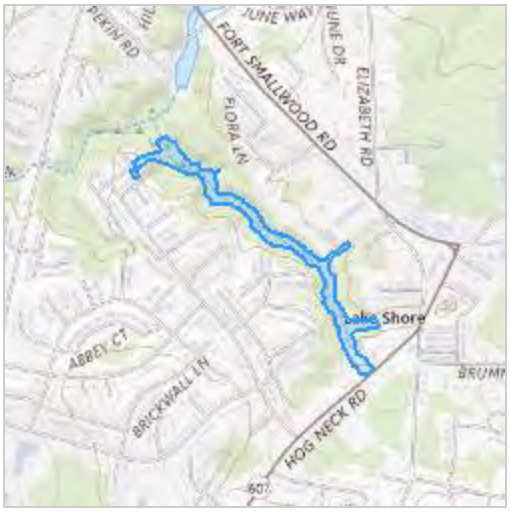
Rock Creek Stream Restoration

2. Description

The following description was provided for the project 'Rock Creek Stream Restoration':

> Restore a segment of Rock Creek to reduce downstream sediment and nutrient export.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.1318621,-76.51957113501592,14z



DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of “may affect, but not likely to adversely affect” for a least one species covered by this determination key.

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of listed bats or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. Is the action area wholly within Zone 2 of the year-round active area for northern long-eared bat and/or tricolored bat?

   Automatically answered
   No

3. Does the action area intersect Zone 1 of the year-round active area for northern long-eared bat and/or tricolored bat?

   Automatically answered
   No

4. Does any component of the action involve leasing, construction or operation of wind turbines? Answer 'yes' if the activities considered are conducted with the intention of gathering survey information to inform the leasing, construction, or operation of wind turbines.

   Note: For federal actions, answer ‘yes’ if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

   No

5. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Yes

6. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

   No

7. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

   Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

   No

8. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

   No

9. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

   No

10. [Semantic] Is the action area located within 0.5 miles of a known bat hibernaculum? Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered

    No

11. Does the action area contain any winter roosts or caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating bats?

    No

12. Will the action cause effects to a bridge?

    Note: Covered bridges should be considered as bridges in this question.

    No

13. Will the action result in effects to a culvert or tunnel at any time of year?

    No

14. Are trees present within 1000 feet of the action area?

    Note: If there are trees within the action area that are of a sufficient size to be potential roosts for bats answer "Yes". If unsure, additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

15. Does the action include the intentional exclusion of bats from a building or structure?

    Note: Exclusion is conducted to deny bats' entry or reentry into a building. To be effective and to avoid harming bats, it should be done according to established standards. If your action includes bat exclusion and you are unsure whether northern long-eared bats or tricolored bats are present, answer "Yes." Answer "No" if there are no signs of bat use in the building/structure. If unsure, contact your local Ecological Services Field Office to help assess whether northern long-eared bats or tricolored bats may be present. Contact a Nuisance Wildlife Control Operator (NWCO) for help in how to exclude bats from a structure safely without causing harm to the bats (to find a NWCO certified in bat standards, search the Internet using the search term "National Wildlife Control Operators Association bats"). Also see the White-Nose Syndrome Response Team's guide for bat control in structures.

    No

16. Does the action involve removal, modification, or maintenance of a human-made structure (barn, house, or other building) **known or suspected to contain roosting bats?**

    No

17. Will the action cause construction of one or more new roads open to the public?

    For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

    No

18. Will the action include or cause any construction or other activity that is reasonably certain to increase average night-time traffic permanently or temporarily on one or more existing roads? **Note:** For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.). .

    No

19. Will the action include or cause any construction or other activity that is reasonably certain to increase the number of travel lanes on an existing thoroughfare?

    For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

    No

20. Will the proposed Action involve the creation of a new water-borne contaminant source (e.g., leachate pond, pits containing chemicals that are not NSF/ANSI 60 compliant)?

    Note: For information regarding NSF/ANSI 60 please visit https://www.nsf.org/knowledge-library/nsf-ansi-standard-60-drinking-water-treatment-chemicals-health-effects

    No

21. Will the proposed action involve the creation of a new point source discharge from a facility other than a water treatment plant or storm water system?

    No

22. Will the action include drilling or blasting?

    No

23. Will the action involve military training (e.g., smoke operations, obscurant operations, exploding munitions, artillery fire, range use, helicopter or fixed wing aircraft use)?

    No

24. Will the proposed action involve the use of herbicides or other pesticides other than herbicides (e.g., fungicides, insecticides, or rodenticides)?

    No

25. Will the action include or cause activities that are reasonably certain to cause chronic or intense nighttime noise (above current levels of ambient noise in the area) in suitable summer habitat for the northern long-eared bat or tricolored bat during the active season?

    Chronic noise is noise that is continuous or occurs repeatedly again and again for a long time. Sources of chronic or intense noise that could cause adverse effects to bats may include, but are not limited to: road traffic; trains; aircraft; industrial activities; gas compressor stations; loud music; crowds; oil and gas extraction; construction; and mining.

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    No

26. Does the action include, or is it reasonably certain to cause, the use of permanent or temporary artificial lighting within 1000 feet of suitable northern long-eared bat or tricolored bat roosting habitat?

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    No

27. Will the action include tree cutting or other means of knocking down or bringing down trees, tree topping, or tree trimming?

    Yes

28. Will the proposed action occur exclusively in an already established and currently maintained utility right-of-way?

    No

29. Does the action include emergency cutting or trimming of hazard trees in order to remove an imminent threat to human safety or property? See hazard tree note at the bottom of the key for text that will be added to response letters

    Note: A "hazard tree" is a tree that is an immediate threat to lives, public health and safety, or improved property.

    No

30. Does the project intersect with the 0- 9.9% forest density category?

    Automatically answered
    No

31. Does the project intersect with the 10.0- 19.9% forest density category map?

    Automatically answered
    No

32. Does the project intersect with the 20.0- 29.9% forest density category map?

    Automatically answered
    No

33. Does the project intersect with the 30.0- 100% forest density category map?

    Automatically answered
    Yes

34. Will the action cause trees to be cut, knocked down, or otherwise brought down across an area greater than 100 acres in total extent?

    No

35. Will the proposed action result in the use of prescribed fire?

    Note: If the prescribed fire action includes other activities than application of fire (e.g., tree cutting, fire line preparation) please consider impacts from those activities within the previous representative questions in the key. This set of questions only considers impacts from flame and smoke.

    No

36. Does the action area intersect the northern long-eared bat species list area?

    Automatically answered
    Yes

37. [Semantic] Is the action area located within 0.5 miles of radius of an entrance/opening to any known NLEB hibernacula? Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

38. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats? **Note:** The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

39. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats?

    Automatically answered
    No

40. [Semantic] Is the action area located within 150 feet of a documented northern long-eared bat roost site?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.Have you contacted the appropriate agency to determine if your action is within 150 feet of any documented northern long-eared bat roosts?

    Note: A document with links to Natural Heritage Inventory databases and other state-specific sources of information on the locations of northern long-eared bat roosts is available here. Location information for northern long-eared bat roosts is generally kept in state natural heritage inventory databases – the availability of this data varies by state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited.

    Automatically answered
    No

41. Is suitable summer habitat for the northern long-eared bat present within 1000 feet of project activities?
    If unsure, answer "Yes."

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

42. Has a presence/probable absence summer bat survey targeting the northern long-eared bat following the Service's Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines been conducted within the project area?

    No

43. Are any of the trees proposed for cutting or other means of knocking down, bringing down, topping, or trimming suitable for northern long-eared bat roosting (i.e., live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities)?

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    No

44. Does the action area intersect the tricolored bat species list area?

    Automatically answered
    Yes

45. [Semantic] Is the action area located within 0.5 miles of radius of an entrance/opening to any known tricolored bat hibernacula? Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

46. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats? **Note:** The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

47. Has a presence/probable absence bat survey targeting the tricolored bat and following the Service's Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines been conducted within the project area?

    No

48. Is suitable summer habitat for the tricolored bat present within 1000 feet of project activities?
    (If unsure, answer ""Yes."")

    Note: If there are trees within the action area that may provide potential roosts for tricolored bats (e.g., clusters of leaves in live and dead deciduous trees, Spanish moss (Tillandsia usneoides), clusters of dead pine needles of large live pines) answer ""Yes."" For a complete definition of suitable summer habitat for the tricolored bat, please see Appendix A in the Service's Range-wide Indiana Bat and Northern long-eared Bat Survey Guidelines.

    No

49. Do you have any documents that you want to include with this submission?

    No

PROJECT QUESTIONNAIRE

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

8.6

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Tom Barnum
Address: 7455 New Ridge Road
City: Hanover
State: MD
Zip: 21076
Email tbarnum@baylandinc.com
Phone: 4106946401

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Army Corps of Engineers

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127

In Reply Refer To: 04/16/2025 15:35:54 UTC
Project Code: 2025-0084063
Project Name: Rock Creek Stream Restoration

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

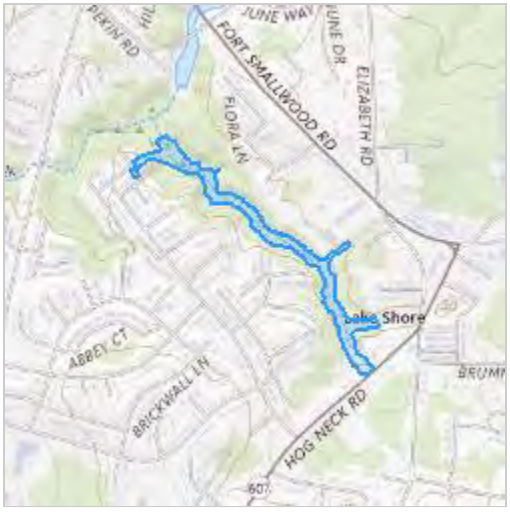
This species list is provided by:

Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
(410) 573-4599

PROJECT SUMMARY

Project Code: 2025-0084063
Project Name: Rock Creek Stream Restoration
Project Type: Modification Stream or Waterbody
Project Description: Restore a segment of Rock Creek to reduce downstream sediment and nutrient export.
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.1318621,-76.51957113501592,14z



Counties: Anne Arundel County, Maryland

ENDANGERED SPECIES ACT SPECIES

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1S
- PFO1A
- PSS1/EM1A

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Tom Barnum
Address: 7455 New Ridge Road
City: Hanover
State: MD
Zip: 21076
Email tbarnum@baylandinc.com
Phone: 4106946401

May 13, 2025

Mr. Jason Traband
BayLand Consultants & Designers, Inc.
7455 New Ridge Road
Suite T
Hanover, Maryland 21076

RE: Environmental Review for Rock Creek Stream Restoration, Pasadena, Anne Arundel County, Maryland.

Dear Mr. Traband:

The Wildlife and Heritage Service has determined that there are no official State or Federal records for listed plant or animal species within the delineated area shown on the map provided. However, our remote analysis suggests that the forested area on this property provides habitat for Forest Interior Dwelling Birds. Many species of forest interior breeding birds are declining in Maryland. This group of bird species requires large, contiguous blocks of forest to successfully breed. Most FIDS are neotropical migrants; these long distance migratory birds breed in North America and winter in Central and South America. The declines in FIDS have been attributed largely to the loss and fragmentation of forests in the eastern United States due to urbanization, agriculture and some forest management practices.

The key to maintaining suitable breeding habitat for FIDS, and halting or reversing their declines, is the protection of extensive, unbroken forested areas throughout the region. Riparian forests are particularly important habitat for several FIDS that breed on the Coastal Plain. The conservation of this habitat is mandated within the Chesapeake Bay Critical Area and must be addressed by the project plan. Specifically, if FIDS habitat is present, the following guidelines could be incorporated into the project plan (as applicable):

1) Do not remove or disturb forest habitat during April-August, the breeding season for most FIDS - this seasonal restriction may be expanded to February-August if certain early nesting FIDS (e.g., Barred Owl) are present;
2) Avoid creating canopy openings, and maintain the complexity of forest structure along the stream; and
3) Retain snags and retain woody debris on the forest floor.

The Critical Area Commission's document "A Guide to the Conservation of Forest Interior Dwelling Birds in the Chesapeake Bay Critical Area" provides details on development standards and information about mitigation for projects where impacts to FIDS habitat cannot be totally avoided. Mitigation plantings for impacts to FIDS habitat may be required under the local government's Critical Area Program. The amount of mitigation required is generally based in whether the guidelines listed above are followed.

Please be sure to let us know if the limits of proposed disturbance or overall site boundaries change and we will provide you with an updated evaluation. Thank you for allowing us the opportunity to review this project. If you should have any further questions regarding this information, please contact me at lori.byrne@maryland.gov or at (410) 260-8573.

Sincerely,

Lori A. Byrne,
Environmental Review Coordinator
Wildlife and Heritage Service
MD Dept. of Natural Resources

ER# 2025.0873.aa
Cc: C. Jones, CAC

MARYLAND HISTORICAL TRUST

PROJECT REVIEW FORM

Request for Comments from the Maryland Historical Trust/ MDSHPO on State and Federal Undertakings

RECEIVED
MAY 09 2023
BY:

MHT USE ONLY
Date Received: F COE
Log Number: DLN 20230196 66

Project Name	Rock Creek Stream Restoration	County	Anne Arundel

Primary Contact:

Contact Name	Jason Traband	Company/Agency	Bayland Consultants & Designers
Mailing Address	7455 New Ridge Road, Suite T		
City	Hanover	State	Maryland
Zip	21076		
Email	jtraband@baylandinc.com	Phone Number	+1 (410) 694-9401
Ext.	N/A		

Project Location:

Address	0.25 miles east of the intersection of Fort Smallwood Rd and Hog Neck Rd	City/Vicinity	Pasadena
Coordinates (if known): Latitude	39.1331	Longitude	-76.5218
Waterway	Rock Creek		

Project Description:

List federal and state sources of funding, permits, or other assistance (e.g. Bond Bill Loan of 2013, Chapter #; HUD/ CDBG; MDE/COE permit; etc.).	Agency Type	Agency/Program/Permit Name	Project/Permit/Tracking Number (if applicable)
	Federal	USACE/MDE for Joint Permit	TBD
	State	Anne Arundel County Soil Conservation	TBD

This project includes (check all applicable): ☐ New Construction ☐ Demolition ☐ Remodeling/Rehabilitation
☐ State or Federal Rehabilitation Tax Credits ☒ Excavation/Ground Disturbance ☒ Shoreline/Waterways/Wetlands

Other\Additional Description: Stream restoration of a segment of Rock Creek and tributaries, stormwater outfall stabilizaton

Known Historic Properties:

This project involves properties (check all applicable): ☐ Listed in the National Register ☐ Subject to an easement held by MHT
☐ Included in the Maryland Inventory of Historic Properties ☐ Designated historic by a local government
☐ Previously subject to archeological investigations

Property Identification Name: Approx 1/4 mile upstream of AA-2120

Attachments:

All attachments are required. Incomplete submittals may result in delays or be returned without comment.

☒ Aerial photograph or USGS Quad Map section with location and boundaries of project clearly marked.
☒ Project Description, Scope of Work, Site Plan, and\or Construction Drawings.
☒ Photographs (print or digital) showing the project site including images of all buildings and structures.
☒ Description of past and present land uses in project area (wooded, mined, developed, agricultural uses, etc).

MHT Determination:

☒ There are **NO HISTORIC PROPERTIES** in the area of potential effect
☐ The project will have **NO EFFECT** on historic properties
☐ The project will have **NO ADVERSE EFFECT** on historic properties
☐ The project will have **NO ADVERSE EFFECT WITH CONDITIONS**
☐ The project will have **ADVERSE EFFECTS** on historic properties
☐ **MHT REQUESTS ADDITIONAL INFORMATION**

MHT Reviewer: Dixie Henry Date: 5/10/2023

Submit printed copy of form and all attachments by mail to: Beth Cole, MHT, 100 Community Place, Crownsville, MD 21032

Revised 6/21/2013

Field Sampling Data Sheet

Property Name: Rock Creek Stream Restoration

Stand # F2

Plot # 1 Date: 24-Feb-23

Size Class of Trees Within the Sample Plot 1/10 acre

Tree species	2-5.9" dbh	6-9.9" dbh	10-17.9" dbh	18-29.9" dbh	>30" dbh
Acer rubrum	1	1	2		
Magnolia virginiana	5				
Ilex opaca	14	3			
Nyssa sylvatica	2		3		
Pinus virginiana			2		
Number of Trees per Size class	22	4	7	0	0

Stand # F2

Plot # 2 Date: 24-Apr-23

Size Class of Trees Within the Sample Plot 1/10 acre

Tree species	2-5.9" dbh	6-9.9" dbh	10-17.9" dbh	18-29.9" dbh	>30" dbh
Nyssa sylvatica	2	6	3		
Ilex opaca	19	1			
Liriodendron tulipfiera		1			
Acer rubrum		2	1		
Morus alba	1				
Number of Trees per Size class	22	10	4	0	0

Field Sampling Data Sheet

Property Name: Rock Creek Stream Restoration

Stand # F1

Plot # 3 Date: 24-Feb-23

Size Class of Trees Within the Sample Plot 1/10 acre

Tree species	2-5.9" dbh	6-9.9" dbh	10-17.9" dbh	18-29.9" dbh	>30" dbh
Nyssa sylvatica		2	3		
Carya tomentosa	2				
Juglans nigra			1	1	
Liriodendron tulipifera			1		
Liquidambar styraciflua	1				
Platanus occidnetalis			1		
Number of Trees per Size class	3	2	6	1	0

Stand # F1

Plot # 4 Date: 24-Apr-23

Size Class of Trees Within the Sample Plot 1/10 acre

Tree species	2-5.9" dbh	6-9.9" dbh	10-17.9" dbh	18-29.9" dbh	>30" dbh
Platanus occidentalis					3
Betula lenta	1				
Juglans nigra	3				
Robinia pseudoacacia	1				
Pyrus calleryana	4				
Tilia americana	1				
Liquidambar styraciflua	2				
Cercis canadensis	3				
Ilex opaca	1				
Prunus serotina	1				
Acer rubrum		1			
Liriodendron tulipifera	3				
Number of Trees per Size class	20	1	0	0	3

APPENDIX E

Site Photographs

RC-1

Upstream Limits

Existing flared end section discharging on left bank

Facing downstream in channel

Existing rock structure facing downstream

Facing downstream in channel.

RC-2

Facing downstream in channel

Facing upstream in headcut in channel

Existing open pipes discharging on left bank

Exposed sanitary sewer pipe

Typical sanitary sewer easement

Debris jam

Exposed sewer manhole in channel

Exposed sewer manhole in channel

RC-3

Facing downstream in channel

Facing downstream in floodplain

Facing downstream in channel

Existing rock structure facing downstream

Typical sanitary sewer easement

RC-4

Headlwall at upstream end

Upstream channel limits

Facing upstream in channel

Debris in channel

Confluence with RC-2 with exposed sanitary sewer pipe and debris

APPENDIX F

Existing Condition Hydrologic Computations

TR-55 DESIGN COMPUTATIONS

By: MDG
Date: 7/19/2023
Check:
Date:

Project Name: Rock Creek
County: Anne Arundel
Drainage Area: Overall DA
Stream UseClass: I (T = 24 hrs.)

Project Number: 5_20201

Existing:
Proposed:
Ultimate:

WEIGHTED RUNOFF CURVE NUMBER

Soil Group	Land Use or Zoning No.	Description	% Imperv.	RCN Table 2-2	RCN Figure 2-3	RCN Figure 2-4	Area (Acre)	RCN x Area
A	11	Urban district - commercial/business	85	89			18.70	1664.34
C	11	Urban district - commercial/business	85	94			8.53	802.23
D	11	Urban district - commercial/business	85	95			0.60	56.90
A	12	Urban district - industrial	72	81			3.06	247.91
A	3	Open Space (good) - grass >75%		39			1.53	59.56
C	3	Open Space (good) - grass >75%		74			0.45	33.23
D	16	Residential - 1/2 acre	25	85			0.45	38.66
A	16	Residential - 1/2 acre	25	54			88.85	4798.13
C	16	Residential - 1/2 acre	25	80			16.13	1290.38
A	14	Residential - 1/4 acre	38	61			16.17	986.39
C	14	Residential - 1/4 acre	38	83			1.70	141.37
C	13	Residential - 1/8 acre or less	65	90			4.63	417.07
A	13	Residential - 1/8 acre or less	65	77			44.61	3435.25
A	17	Residential - 1 acre	20	51			13.34	680.09
C	17	Residential - 1 acre	20	79			4.02	317.42
A	18	Residential - 2 acre	12	46			5.83	268.22
C	18	Residential - 2 acre	12	77			1.43	110.34
A	4	Imperv. - paved parking lots,roofs,drives	100	98			26.54	2600.96
C	4	Imperv. - paved parking lots,roofs,drives	100	98			2.88	281.88
D	4	Imperv. - paved parking lots,roofs,drives	100	98			0.12	11.46
A	99	Water		100			0.64	63.77
D	99	Water		100			0.16	15.62
C	99	Water		100			0.00	0.47
A	65	Woods - (good)		30			37.62	1128.55
C	65	Woods - (good)		70			29.13	2038.89
D	65	Woods - (good)		77			2.79	214.64
					Total Square Miles:	0.51549	Total Acres:	329.91	21703.74
					Weighted RCN:	65.79	Use:	66	

TIME OF CONCENTRATION

ID	Type of Flow			L(ft.)	n	A	WP	Slope (Percent)	Vel. (fps)	Time (Hours)
	Sheet Flow									
A - B	10 Woods - dense			100.00	0.800			2.2		0.591
	Shallow Concentrated Flow									
B - C	paved	x	unpaved	306.85				1.5	1.95	0.044
	paved		unpaved							
	Concentrated Flow*									
C - D	2 Gutter Flow, d (ft) =	0.67		276.16	0.013	11.22	34.18	1.3	6.14	0.012
D - E	3 Pipe Flow, D (in) =	15.00		262.87	0.012	1.23	3.93	6.4	14.44	0.005
E - F	1 Channel Flow, d (ft) =	1.00		94.04	0.080	10.50	17.17	0.1	0.42	0.062
F - G	3 Pipe Flow, D (in) =	21.00		849.57	0.012	2.41	5.50	1.8	9.50	0.025
G - H	1 Channel Flow, d (ft) =	1.64		625.77	0.050	14.63	14.37	2.6	4.82	0.036
H - I	3 Pipe Flow, D (in) =	30.00		329.54	0.012	4.91	7.85	2.7	14.99	0.006
I - J	1 Channel Flow, d (ft) =	1.94		4572.02	0.050	19.05	16.27	1.3	3.70	0.343
									Total	**1.123**

*assumed gutter cross-slope as 2%

TR-55 DESIGN COMPUTATIONS

By: ADI
Date: 9/19/2023
Check:
Date:

Project Name: Rock Creek
County: Anne Arundel
Drainage Area: DA-A(MS/TRIB2 Confluence)
Stream UseClass: I (T = 24 hrs.)

Project Number: 5_20201

Existing:
Proposed:
Ultimate:

WEIGHTED RUNOFF CURVE NUMBER

Soil Group	Land Use or Zoning No.	Description	% Imperv.	RCN Table 2-2	RCN Figure 2-3	RCN Figure 2-4	Area (Acre)	RCN x Area
A	11	Urban district - commercial/business	85	89			11.47	1020.70
C	11	Urban district - commercial/business	85	94			8.53	802.23
D	11	Urban district - commercial/business	85	95			0.60	56.90
A	12	Urban district - industrial	72	81			3.06	247.91
A	3	Open Space (good) - grass >75%		39			1.10	43.06
C	3	Open Space (good) - grass >75%		74			0.45	33.23
A	16	Residential - 1/2 acre	25	54			88.85	4798.13
C	16	Residential - 1/2 acre	25	80			16.13	1290.38
D	16	Residential - 1/2 acre	25	85			0.45	38.66
A	14	Residential - 1/4 acre	38	61			4.72	287.97
C	14	Residential - 1/4 acre	38	83			1.70	141.37
A	13	Residential - 1/8 acre or less	65	77			34.66	2668.83
C	13	Residential - 1/8 acre or less	65	90			3.81	342.54
A	17	Residential - 1 acre	20	51			8.73	445.31
C	17	Residential - 1 acre	20	79			4.02	317.42
A	18	Residential - 2 acre	12	46			4.80	220.92
C	18	Residential - 2 acre	12	77			1.43	110.34
A	4	Imperv. - paved parking lots,roofs,drives	100	98			22.55	2209.51
C	4	Imperv. - paved parking lots,roofs,drives	100	98			2.88	281.88
D	4	Imperv. - paved parking lots,roofs,drives	100	98			0.12	11.46
A	99	Water		100			0.52	51.69
C	99	Water		100			0.00	0.47
D	99	Water		100			0.16	15.62
A	65	Woods - (good)		30			23.42	702.66
C	65	Woods - (good)		70			13.54	947.57
D	65	Woods - (good)		77			1.06	81.90
					Total Square Miles:	0.40433	Total Acres: 258.77	17168.69
					Weighted RCN:	66.35	Use: 66	

TIME OF CONCENTRATION

ID	Type of Flow			L(ft.)	n	A	WP	Slope (Percent)	Vel. (fps)	Time (Hours)
	Sheet Flow									
A - B	10 Woods - dense			100.00	0.800			2.2		0.591
	Shallow Concentrated Flow									
B - C	paved	x	unpaved	306.85				1.5	1.95	0.044
	paved		unpaved							
	Concentrated Flow*									
C - D	2 Gutter Flow, d (ft) =	0.67		276.16	0.013	11.22	34.18	1.3	6.14	0.012
D - E	3 Pipe Flow, D (in) =	15.00		262.87	0.012	1.23	3.93	6.4	14.44	0.005
E - F	1 Channel Flow, d (ft) =	1.00		94.04	0.080	10.50	17.17	0.1	0.42	0.062
F - G	3 Pipe Flow, D (in) =	21.00		849.57	0.012	2.41	5.50	1.8	9.50	0.025
G - H	1 Channel Flow, d (ft) =	1.64		625.77	0.050	14.63	14.37	2.6	4.82	0.036
H - I	3 Pipe Flow, D (in) =	30.00		329.54	0.012	4.91	7.85	2.7	14.99	0.006
I - J	1 Channel Flow, d (ft) =	1.94		4156.38	0.050	19.05	16.27	1.3	3.70	0.312
									Total	**1.092**

*assumed gutter cross-slope as 2%

TR-55 DESIGN COMPUTATIONS

By: ADI
Date: 7/19/2023
Check:
Date:

Project Name: Rock Creek
County: Anne Arundel
Drainage Area: DA-B
Stream UseClass: I (T = 24 hrs.)

Project Number: 5_20201

Existing:
Proposed:
Ultimate:

WEIGHTED RUNOFF CURVE NUMBER

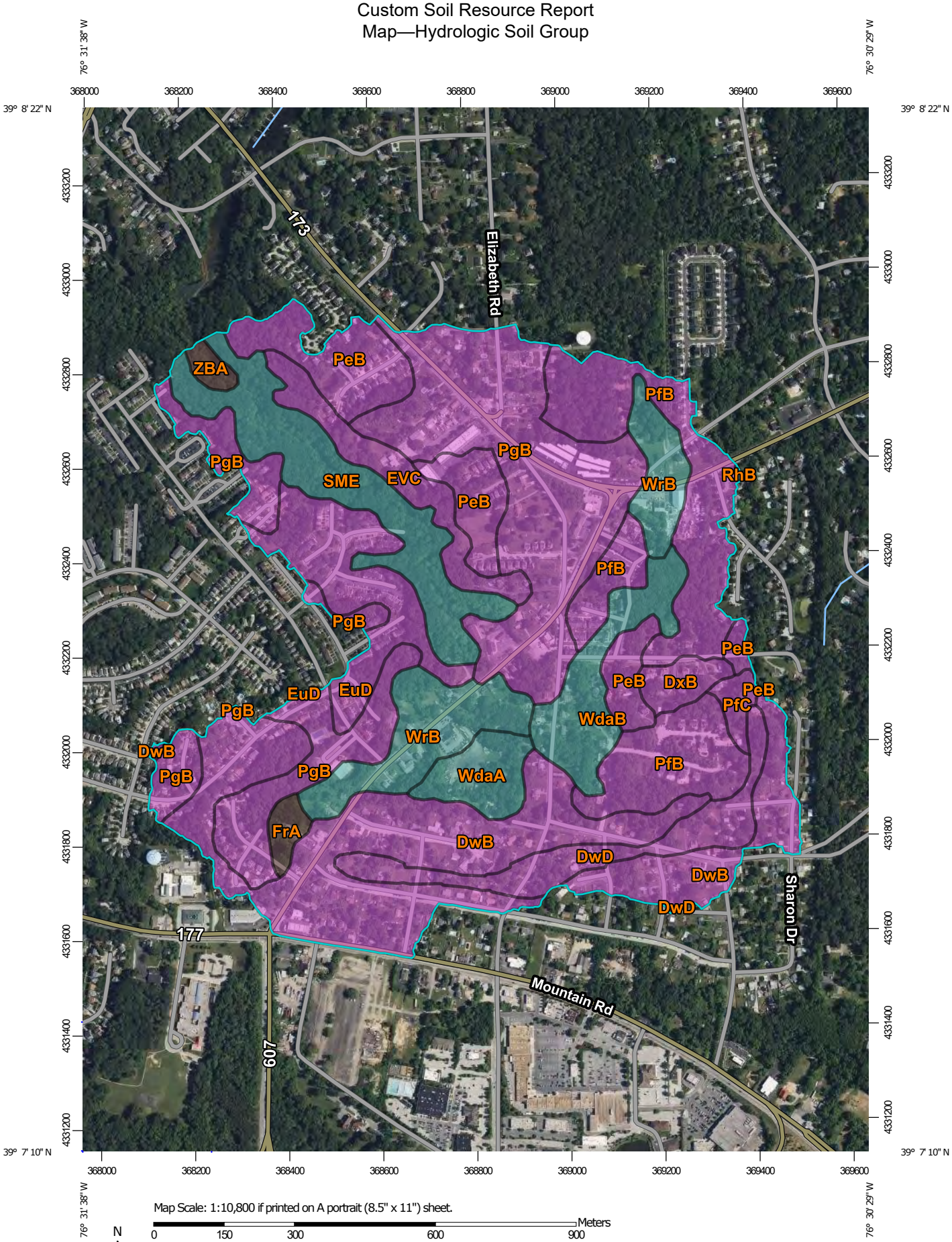
Soil Group	Land Use or Zoning No.	Description	% Imperv.	RCN Table 2-2	RCN Figure 2-3	RCN Figure 2-4	Area (Acre)	RCN x Area
A	11	Urban district - commercial/business	85	89			0.09	8.40
C	11	Urban district - commercial/business	85	94			0.00	0.00
D	11	Urban district - commercial/business	85	95			0.00	0.00
A	12	Urban district - industrial	72	81			0.00	0.00
A	3	Open Space (good) - grass >75%		39			0.04	1.44
C	3	Open Space (good) - grass >75%		74			0.00	0.00
D	16	Residential - 1/2 acre	25	85			0.00	0.00
A	16	Residential - 1/2 acre	25	54			0.00	0.00
C	16	Residential - 1/2 acre	25	80			0.00	0.00
A	14	Residential - 1/4 acre	38	61			0.40	24.18
C	14	Residential - 1/4 acre	38	83			0.00	0.00
C	13	Residential - 1/8 acre or less	65	90			0.00	0.00
A	13	Residential - 1/8 acre or less	65	77			2.03	156.19
A	17	Residential - 1 acre	20	51			0.00	0.00
C	17	Residential - 1 acre	20	79			0.00	0.00
A	18	Residential - 2 acre	12	46			1.03	47.30
C	18	Residential - 2 acre	12	77			0.00	0.00
A	4	Imperv. - paved parking lots,roofs,drives	100	98			0.88	86.34
C	4	Imperv. - paved parking lots,roofs,drives	100	98			0.00	0.00
D	4	Imperv. - paved parking lots,roofs,drives	100	98			0.00	0.00
A	99	Water		100			0.00	0.00
D	99	Water		100			0.00	0.00
C	99	Water		100			0.00	0.00
A	65	Woods - (good)		30			2.53	75.78
C	65	Woods - (good)		70			0.26	17.97
D	65	Woods - (good)		77			0.00	0.00
				Total Square Miles:	0.01133	Total Acres:	7.25	417.60
				Weighted RCN:	57.62	Use:	58	

TIME OF CONCENTRATION

ID	Type of Flow				L(ft.)	n	A	WP	Slope (Percent)	Vel. (fps)	Time (Hours)
	Sheet Flow										
A - B	5	Grass - short			100.00	0.150			5.5		0.107
	Shallow Concentrated Flow										
B - C		paved	x	unpaved	45.41				1.1	1.69	0.007
C - D	x	paved		unpaved	233.98				0.2	0.94	0.069
		paved		unpaved							
	Concentrated Flow*										
D - E	1	Channel Flow, d (ft) =	0.20		495.10	0.050	0.56	3.65	2.7	1.41	0.098
E - F	1	Channel Flow, d (ft) =	0.15		378.45	0.050	0.67	4.95	5.2	1.78	0.059
										Total	**0.341**

*assumed gutter cross-slope as 2%

Custom Soil Resource Report
Map—Hydrologic Soil Group



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Anne Arundel County, Maryland
Survey Area Data: Version 21, Sep 14, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 21, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DwB	Downer-Hammonton-Urban land complex, 0 to 5 percent slopes	A	63.4	19.2%
DwD	Downer-Hammonton-Urban land complex, 5 to 15 percent slopes	A	14.1	4.3%
DxB	Downer-Phalanx complex, 2 to 5 percent slopes	A	4.0	1.2%
EuD	Evesboro-Galestown-Urban land complex, 5 to 15 percent slopes	A	19.2	5.8%
EVC	Evesboro and Galestown soils, 5 to 10 percent slopes	A	10.9	3.3%
FrA	Fallsington-Urban land complex, 0 to 2 percent slopes	B/D	2.4	0.7%
PeB	Patapsco-Evesboro-Fort Mott complex, 0 to 5 percent slopes	A	24.1	7.3%
PfB	Patapsco-Fort Mott complex, 0 to 5 percent slopes	A	42.5	12.9%
PfC	Patapsco-Fort Mott complex, 5 to 10 percent slopes	A	2.4	0.7%
PgB	Patapsco-Fort Mott-Urban land complex, 0 to 5 percent slopes	A	76.4	23.2%
RhB	Russett-Christiana-Hambrook complex, 0 to 5 percent slopes	C	0.1	0.0%
SME	Sassafras and Croom soils, 15 to 25 percent slopes	C	25.2	7.6%
WdaA	Woodstown sandy loam, 0 to 2 percent slopes, Northern Coastal Plain	C	7.5	2.3%
WdaB	Woodstown sandy loam, 2 to 5 percent slopes, Northern Coastal Plain	C	13.6	4.1%
WrB	Woodstown-Urban land complex, 0 to 5 percent slopes	C	22.5	6.8%
ZBA	Zekiah and Issue soils, 0 to 2 percent slopes, frequently flooded	B/D	1.7	0.5%
Totals for Area of Interest			**329.9**	**100.0%**

WinTR-20 Printed Page File Beginning of Input Data List
C:\Users\Meghan\Desktop\TR20\Rock Creek\SubDAs\EX 12 24hr Rock Creek DA A.inp

```
WinTR-20: version 3.30                  0         0         .1        0         ,
Rock Creek Stream Restoration

SUB-AREA:
          TribDA    Outlet    GAGE      0.404     66.       1.092



STORM ANALYSIS:
          p1-12     GAGE                2.25      rtp1-12   2
          p2-12     GAGE                2.73      rtp2-12   2
          p5-12     GAGE                3.47      rtp5-12   2
          p10-12    GAGE                4.10      rtp10-12  2
          p25-24    GAGE                6.15      rtp25-24  2
          p50-24    GAGE                7.25      rtp50-24  2
          p100-24   GAGE                8.49      rtp100-24 2
          p200-24   GAGE                9.89      rtp200-24 2
          p500-24   GAGE                12.03     rtp500-24 2




DIMENSIONLESS UNIT HYDROGRAPH:
                    0.0       0.11100   0.35600   0.65500   0.89600
                    1.00000   0.92900   0.82800   0.73700   0.65600
                    0.58400   0.52100   0.46500   0.41500   0.37100
                    0.33100   0.29600   0.26500   0.23700   0.21200
                    0.19000   0.17000   0.15300   0.13800   0.12300
                    0.10900   0.09700   0.08600   0.07600   0.06600
                    0.05700   0.04900   0.04100   0.03300   0.02700
                    0.02400   0.02100   0.01800   0.01500   0.01300
                    0.01200   0.01100   0.00900   0.00800   0.00800
                    0.00600   0.00600   0.00500   0.00500   0.0


RAINFALL DISTRIBUTION:
           rtp1-12            0.1
                    0.0000    0.0029    0.0058    0.0088    0.0117
                    0.0146    0.0175    0.0204    0.0233    0.0263
                    0.0292    0.0321    0.0350    0.0379    0.0408
                    0.0438    0.0467    0.0496    0.0525    0.0554
                    0.0583    0.0613    0.0642    0.0671    0.0700
                    0.0729    0.0758    0.0788    0.0817    0.0846
                    0.0875    0.0928    0.0980    0.1033    0.1086
                    0.1139    0.1191    0.1244    0.1297    0.1349
                    0.1402    0.1455    0.1507    0.1560    0.1613
                    0.1666    0.1714    0.1763    0.1811    0.1860
                    0.1909    0.2008    0.2107    0.2205    0.2304
                    0.2403    0.2609    0.2814    0.3143    0.3663
                    0.5000    0.6337    0.6857    0.7186    0.7391
                    0.7597    0.7696    0.7795    0.7893    0.7992
                    0.8091    0.8140    0.8189    0.8237    0.8286
                    0.8334    0.8387    0.8440    0.8493    0.8545
                    0.8598    0.8651    0.8703    0.8756    0.8809
                    0.8861    0.8914    0.8967    0.9020    0.9072
                    0.9125    0.9154    0.9183    0.9212    0.9242
                    0.9271    0.9300    0.9329    0.9358    0.9387
                    0.9417    0.9446    0.9475    0.9504    0.9533
                    0.9562    0.9592    0.9621    0.9650    0.9679
                    0.9708    0.9737    0.9767    0.9796    0.9825
                    0.9854    0.9883    0.9912    0.9942    0.9971
                    1.0000
           rtp2-12            0.1
                    0.0000    0.0029    0.0058    0.0087    0.0115
                    0.0144    0.0173    0.0202    0.0231    0.0260
                    0.0289    0.0318    0.0346    0.0375    0.0404
                    0.0433    0.0462    0.0491    0.0520    0.0548
                    0.0577    0.0606    0.0635    0.0664    0.0693
                    0.0722    0.0751    0.0779    0.0808    0.0837
                    0.0866    0.0918    0.0970    0.1022    0.1074
                    0.1125    0.1177    0.1229    0.1281    0.1333
                    0.1385    0.1437    0.1489    0.1541    0.1592
                    0.1644    0.1693    0.1743    0.1792    0.1841
                    0.1890    0.1987    0.2084    0.2182    0.2279
                    0.2376    0.2590    0.2803    0.3140    0.3672
```

0.5000 0.6328 0.6860 0.7197 0.7410
0.7624 0.7721 0.7818 0.7916 0.8013
0.8110 0.8159 0.8208 0.8257 0.8307
0.8356 0.8408 0.8459 0.8511 0.8563
0.8615 0.8667 0.8719 0.8771 0.8823
0.8875 0.8926 0.8978 0.9030 0.9082
0.9134 0.9163 0.9192 0.9221 0.9249
0.9278 0.9307 0.9336 0.9365 0.9394
0.9423 0.9452 0.9480 0.9509 0.9538
0.9567 0.9596 0.9625 0.9654 0.9682
0.9711 0.9740 0.9769 0.9798 0.9827
0.9856 0.9885 0.9913 0.9942 0.9971
1.0000
rtp5-12 0.1
0.0000 0.0030 0.0059 0.0089 0.0119
0.0149 0.0178 0.0208 0.0238 0.0268
0.0297 0.0327 0.0357 0.0387 0.0416
0.0446 0.0476 0.0506 0.0535 0.0565
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0.0744 0.0773 0.0803 0.0833 0.0863
0.0892 0.0943 0.0994 0.1044 0.1095
0.1145 0.1196 0.1246 0.1297 0.1348
0.1398 0.1449 0.1499 0.1550 0.1601
0.1651 0.1702 0.1753 0.1804 0.1854
0.1905 0.2004 0.2103 0.2202 0.2302
0.2401 0.2629 0.2858 0.3213 0.3752
0.5000 0.6248 0.6787 0.7142 0.7371
0.7599 0.7698 0.7798 0.7897 0.7996
0.8095 0.8146 0.8196 0.8247 0.8298
0.8349 0.8399 0.8450 0.8501 0.8551
0.8602 0.8652 0.8703 0.8754 0.8804
0.8855 0.8905 0.8956 0.9006 0.9057
0.9108 0.9137 0.9167 0.9197 0.9227
0.9256 0.9286 0.9316 0.9346 0.9375
0.9405 0.9435 0.9465 0.9494 0.9524
0.9554 0.9584 0.9613 0.9643 0.9673
0.9703 0.9732 0.9762 0.9792 0.9822
0.9851 0.9881 0.9911 0.9941 0.9970
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0.0312 0.0343 0.0374 0.0405 0.0436
0.0467 0.0499 0.0530 0.0561 0.0592
0.0623 0.0654 0.0686 0.0717 0.0748
0.0779 0.0810 0.0841 0.0873 0.0904
0.0935 0.0986 0.1037 0.1088 0.1139
0.1189 0.1240 0.1291 0.1342 0.1393
0.1444 0.1495 0.1546 0.1597 0.1648
0.1699 0.1751 0.1803 0.1855 0.1907
0.1959 0.2060 0.2161 0.2263 0.2364
0.2466 0.2701 0.2936 0.3295 0.3826
0.5000 0.6174 0.6705 0.7064 0.7299
0.7534 0.7636 0.7737 0.7839 0.7940
0.8041 0.8093 0.8145 0.8197 0.8249
0.8301 0.8352 0.8403 0.8454 0.8505
0.8556 0.8607 0.8658 0.8709 0.8760
0.8811 0.8861 0.8912 0.8963 0.9014
0.9065 0.9096 0.9127 0.9159 0.9190
0.9221 0.9252 0.9283 0.9314 0.9346
0.9377 0.9408 0.9439 0.9470 0.9501
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WinTR-20 Printed Page File End of Input Data List

Rock Creek Stream Restoration

Name of printed page file:
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STORM p1-12

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.404	GAGE	0.233		7.13	13.0	32.24
OUTLET	0.404		0.233		7.13	13.0	32.24

STORM p2-12

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.404	GAGE	0.421		6.93	27.4	67.71
OUTLET	0.404		0.421		6.93	27.4	67.71

STORM p5-12

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.404	GAGE	0.784		6.90	56.8	140.64
OUTLET	0.404		0.784		6.90	56.8	140.64

STORM p10-12

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.404	GAGE	1.146		6.98	85.2	210.98
OUTLET	0.404		1.146		6.98	85.2	210.98

STORM p25-24

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.404	GAGE	2.552		12.82	169.7	420.06
OUTLET	0.404		2.552		12.82	169.7	420.06

STORM p50-24

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.404	GAGE	3.402		12.85	221.2	547.56
OUTLET	0.404		3.402		12.85	221.2	547.56

STORM p100-24

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.404	GAGE	4.412		12.83	277.9	687.95
OUTLET	0.404		4.412		12.83	277.9	687.95

STORM p200-24

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.404	GAGE	5.602		12.86	338.6	838.10
OUTLET	0.404		5.602		12.86	338.6	838.10

STORM p500-24

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.404	GAGE	7.491		12.83	426.6	1056.05
OUTLET	0.404		7.491		12.83	426.6	1056.05

Area or Reach Identifier	Drainage Area (sq mi)	Peak Flow by Storm p1-12 (cfs)	p2-12 (cfs)	p5-12 (cfs)	p10-12 (cfs)	p25-24 (cfs)
TribDA	0.404	13.0	27.4	56.8	85.2	169.7
OUTLET	0.404	13.0	27.4	56.8	85.2	169.7

Area or Reach Identifier	Drainage Area (sq mi)	Peak Flow by Storm p50-24 (cfs)	p100-24 (cfs)	p200-24 (cfs)	p500-24 (cfs)	(cfs)
TribDA	0.404	221.2	277.9	338.6	426.6	
OUTLET	0.404	221.2	277.9	338.6	426.6	

WinTR-20 Printed Page File Beginning of Input Data List
C:\Users\Harry\Desktop\EX_12_24hr_Rock_Creek_DUH_FINAL.inp

WinTR-20: version 3.30 0 0 .1 0 ,
Rock Creek Stream Restoration

SUB-AREA:
TribDA Outlet GAGE .01133 58. .341

STORM ANALYSIS:
p1-12 GAGE 2.25 rtp1-12 2
p2-12 GAGE 2.73 rtp2-12 2
p5-12 GAGE 3.47 rtp5-12 2
p10-12 GAGE 4.10 rtp10-12 2
p25-24 GAGE 6.15 rtp25-24 2
p50-24 GAGE 7.25 rtp50-24 2
p100-24 GAGE 8.49 rtp100-24 2
p200-24 GAGE 9.89 rtp200-24 2
p500-24 GAGE 12.03 rtp500-24 2

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0.0577 0.0606 0.0635 0.0664 0.0693
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0.1890 0.1987 0.2084 0.2182 0.2279
0.2376 0.2590 0.2803 0.3140 0.3672
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0.9134 0.9163 0.9192 0.9221 0.9249
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GLOBAL OUTPUT:
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WinTR-20 Printed Page File End of Input Data List

Rock Creek Stream Restoration

Name of printed page file:
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STORM p1-12

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)

TribDA	0.011	GAGE	0.042	7.07	0.1	11.34	
OUTLET	0.011		0.042	7.07	0.1	11.34	

STORM p2-12

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
TribDA	0.011	GAGE	0.187	6.57	0.5	44.09	
OUTLET	0.011		0.187	6.57	0.5	44.09	

STORM p5-12

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
TribDA	0.011	GAGE	0.436	6.48	1.5	134.71	
OUTLET	0.011		0.436	6.48	1.5	134.71	

STORM p10-12

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
TribDA	0.011	GAGE	0.706	6.39	2.7	238.39	
OUTLET	0.011		0.706	6.39	2.7	238.39	

STORM p25-24

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
TribDA	0.011	GAGE	1.844	12.32	6.6	586.04	
OUTLET	0.011		1.844	12.32	6.6	586.04	

STORM p50-24

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.011	GAGE	2.572	12.31	9.1	801.55	
OUTLET	0.011		2.572	12.31	9.1	801.55	

STORM p100-24

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.011	GAGE	3.465	12.32	11.7	1036.01	
OUTLET	0.011		3.465	12.32	11.7	1036.01	

STORM p200-24

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.011	GAGE	4.536	12.32	14.6	1285.14	
OUTLET	0.011		4.536	12.32	14.6	1285.14	

STORM p500-24

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
TribDA	0.011	GAGE	6.276	12.28	18.6	1638.15	
OUTLET	0.011		6.276	12.28	18.6	1638.15	

Area or Reach Identifier	Drainage Area (sq mi)	Peak Flow by Storm p1-12 (cfs)	p2-12 (cfs)	p5-12 (cfs)	p10-12 (cfs)	p25-24 (cfs)
TribDA	0.011	0.1	0.5	1.5	2.7	6.6
OUTLET	0.011	0.1	0.5	1.5	2.7	6.6

Area or Reach Identifier	Drainage Area (sq mi)	Peak Flow by Storm p50-24 (cfs)	p100-24 (cfs)	p200-24 (cfs)	p500-24 (cfs)
TribDA	0.011	9.1	11.7	14.6	18.6
OUTLET	0.011	9.1	11.7	14.6	18.6

```
WinTR-20 Printed Page File      Beginning of Input Data List
C:\Users\Meghan\Desktop\TR20\Rock Creek\EX 12 24hr Rock Creek DUH FINAL.inp

WinTR-20: version 3.30                  0         0         1.0       0         ,
Rock Creek Stream Restoration

SUB-AREA:
          OverallDA Outlet    GAGE      0.52      66.       1.123     NN



STORM ANALYSIS:
          p1-12     GAGE                2.25      rtp1-12   2
          p2-12     GAGE                2.73      rtp2-12   2
          p5-12     GAGE                3.47      rtp5-12   2
          p10-12    GAGE                4.10      rtp10-12  2
          p25-24    GAGE                6.15      rtp25-24  2
          p50-24    GAGE                7.25      rtp50-24  2
          p100-24   GAGE                8.49      rtp100-24 2
          p200-24   GAGE                9.89      rtp200-24 2
          p500-24   GAGE                12.03     rtp500-24 2




DIMENSIONLESS UNIT HYDROGRAPH:
                    0.0       0.11100   0.35600   0.65500   0.89600
                    1.00000   0.92900   0.82800   0.73700   0.65600
                    0.58400   0.52100   0.46500   0.41500   0.37100
                    0.33100   0.29600   0.26500   0.23700   0.21200
                    0.19000   0.17000   0.15300   0.13800   0.12300
                    0.10900   0.09700   0.08600   0.07600   0.06600
                    0.05700   0.04900   0.04100   0.03300   0.02700
                    0.02400   0.02100   0.01800   0.01500   0.01300
                    0.01200   0.01100   0.00900   0.00800   0.00800
                    0.00600   0.00600   0.00500   0.00500   0.0


RAINFALL DISTRIBUTION:
           rtp1-12            0.1
                    0.0000    0.0029    0.0058    0.0088    0.0117
                    0.0146    0.0175    0.0204    0.0233    0.0263
                    0.0292    0.0321    0.0350    0.0379    0.0408
                    0.0438    0.0467    0.0496    0.0525    0.0554
                    0.0583    0.0613    0.0642    0.0671    0.0700
                    0.0729    0.0758    0.0788    0.0817    0.0846
                    0.0875    0.0928    0.0980    0.1033    0.1086
                    0.1139    0.1191    0.1244    0.1297    0.1349
                    0.1402    0.1455    0.1507    0.1560    0.1613
                    0.1666    0.1714    0.1763    0.1811    0.1860
                    0.1909    0.2008    0.2107    0.2205    0.2304
                    0.2403    0.2609    0.2814    0.3143    0.3663
                    0.5000    0.6337    0.6857    0.7186    0.7391
                    0.7597    0.7696    0.7795    0.7893    0.7992
                    0.8091    0.8140    0.8189    0.8237    0.8286
                    0.8334    0.8387    0.8440    0.8493    0.8545
                    0.8598    0.8651    0.8703    0.8756    0.8809
                    0.8861    0.8914    0.8967    0.9020    0.9072
                    0.9125    0.9154    0.9183    0.9212    0.9242
                    0.9271    0.9300    0.9329    0.9358    0.9387
                    0.9417    0.9446    0.9475    0.9504    0.9533
                    0.9562    0.9592    0.9621    0.9650    0.9679
                    0.9708    0.9737    0.9767    0.9796    0.9825
                    0.9854    0.9883    0.9912    0.9942    0.9971
                    1.0000
           rtp2-12            0.1
                    0.0000    0.0029    0.0058    0.0087    0.0115
                    0.0144    0.0173    0.0202    0.0231    0.0260
                    0.0289    0.0318    0.0346    0.0375    0.0404
                    0.0433    0.0462    0.0491    0.0520    0.0548
                    0.0577    0.0606    0.0635    0.0664    0.0693
                    0.0722    0.0751    0.0779    0.0808    0.0837
                    0.0866    0.0918    0.0970    0.1022    0.1074
                    0.1125    0.1177    0.1229    0.1281    0.1333
                    0.1385    0.1437    0.1489    0.1541    0.1592
                    0.1644    0.1693    0.1743    0.1792    0.1841
                    0.1890    0.1987    0.2084    0.2182    0.2279
                    0.2376    0.2590    0.2803    0.3140    0.3672
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0.5000 0.6328 0.6860 0.7197 0.7410
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0.8615 0.8667 0.8719 0.8771 0.8823
0.8875 0.8926 0.8978 0.9030 0.9082
0.9134 0.9163 0.9192 0.9221 0.9249
0.9278 0.9307 0.9336 0.9365 0.9394
0.9423 0.9452 0.9480 0.9509 0.9538
0.9567 0.9596 0.9625 0.9654 0.9682
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rtp5-12 0.1
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0.0297 0.0327 0.0357 0.0387 0.0416
0.0446 0.0476 0.0506 0.0535 0.0565
0.0595 0.0625 0.0654 0.0684 0.0714
0.0744 0.0773 0.0803 0.0833 0.0863
0.0892 0.0943 0.0994 0.1044 0.1095
0.1145 0.1196 0.1246 0.1297 0.1348
0.1398 0.1449 0.1499 0.1550 0.1601
0.1651 0.1702 0.1753 0.1804 0.1854
0.1905 0.2004 0.2103 0.2202 0.2302
0.2401 0.2629 0.2858 0.3213 0.3752
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0.7599 0.7698 0.7798 0.7897 0.7996
0.8095 0.8146 0.8196 0.8247 0.8298
0.8349 0.8399 0.8450 0.8501 0.8551
0.8602 0.8652 0.8703 0.8754 0.8804
0.8855 0.8905 0.8956 0.9006 0.9057
0.9108 0.9137 0.9167 0.9197 0.9227
0.9256 0.9286 0.9316 0.9346 0.9375
0.9405 0.9435 0.9465 0.9494 0.9524
0.9554 0.9584 0.9613 0.9643 0.9673
0.9703 0.9732 0.9762 0.9792 0.9822
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1.0000

rtp50-24 0.1

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0.7999 0.8043 0.8087 0.8131 0.8175
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0.8363 0.8392 0.8421 0.8450 0.8479
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0.9465 0.9481 0.9496 0.9511 0.9527

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          0.9695    0.9710    0.9725    0.9740    0.9756
          0.9771    0.9786    0.9801    0.9817    0.9832
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          0.0238    0.0254    0.0270    0.0286    0.0302
          0.0318    0.0334    0.0349    0.0365    0.0381
          0.0397    0.0413    0.0429    0.0445    0.0461
          0.0477    0.0492    0.0508    0.0524    0.0540
          0.0556    0.0572    0.0588    0.0604    0.0619
          0.0635    0.0651    0.0667    0.0683    0.0699
          0.0715    0.0731    0.0747    0.0762    0.0778
          0.0794    0.0810    0.0826    0.0842    0.0858
          0.0874    0.0889    0.0905    0.0921    0.0937
          0.0953    0.0983    0.1013    0.1044    0.1074
          0.1104    0.1134    0.1164    0.1194    0.1225
          0.1255    0.1285    0.1315    0.1345    0.1375
          0.1406    0.1436    0.1466    0.1496    0.1526
          0.1556    0.1587    0.1617    0.1647    0.1677
          0.1707    0.1737    0.1768    0.1798    0.1828
          0.1858    0.1903    0.1948    0.1993    0.2038
          0.2083    0.2127    0.2172    0.2217    0.2262
          0.2307    0.2352    0.2397    0.2441    0.2486
          0.2531    0.2577    0.2623    0.2670    0.2716
          0.2762    0.2850    0.2939    0.3028    0.3116
          0.3205    0.3402    0.3598    0.3878    0.4256
          0.5000    0.5744    0.6122    0.6402    0.6598
          0.6795    0.6884    0.6972    0.7061    0.7150
          0.7238    0.7284    0.7330    0.7377    0.7423
          0.7469    0.7514    0.7559    0.7603    0.7648
          0.7693    0.7738    0.7783    0.7828    0.7873
          0.7917    0.7962    0.8007    0.8052    0.8097
          0.8142    0.8172    0.8202    0.8232    0.8263
          0.8293    0.8323    0.8353    0.8383    0.8413
          0.8444    0.8474    0.8504    0.8534    0.8564
          0.8594    0.8625    0.8655    0.8685    0.8715
          0.8745    0.8775    0.8806    0.8836    0.8866
          0.8896    0.8926    0.8956    0.8987    0.9017
          0.9047    0.9063    0.9079    0.9095    0.9111
          0.9126    0.9142    0.9158    0.9174    0.9190
          0.9206    0.9222    0.9238    0.9253    0.9269
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          0.9365    0.9381    0.9396    0.9412    0.9428
          0.9444    0.9460    0.9476    0.9492    0.9508
          0.9523    0.9539    0.9555    0.9571    0.9587
          0.9603    0.9619    0.9635    0.9651    0.9666
          0.9682    0.9698    0.9714    0.9730    0.9746
          0.9762    0.9778    0.9794    0.9809    0.9825
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rtp200-24           0.1
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          0.0165    0.0182    0.0198    0.0215    0.0231
          0.0248    0.0264    0.0281    0.0297    0.0314
          0.0330    0.0347    0.0363    0.0380    0.0396
          0.0413    0.0429    0.0446    0.0462    0.0479
          0.0495    0.0512    0.0528    0.0545    0.0561
          0.0578    0.0594    0.0611    0.0627    0.0644
          0.0660    0.0677    0.0693    0.0710    0.0726
          0.0743    0.0759    0.0776    0.0792    0.0809
          0.0825    0.0842    0.0858    0.0875    0.0891
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          0.0990    0.1022    0.1053    0.1085    0.1116
          0.1148    0.1180    0.1211    0.1243    0.1274
          0.1306    0.1338    0.1369    0.1401    0.1432
          0.1464    0.1496    0.1527    0.1559    0.1590
          0.1622    0.1654    0.1685    0.1717    0.1749
          0.1780    0.1812    0.1843    0.1875    0.1907
          0.1938    0.1984    0.2030    0.2075    0.2121
          0.2167    0.2212    0.2258    0.2304    0.2349
          0.2395    0.2441    0.2487    0.2532    0.2578
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          0.2624    0.2671    0.2718    0.2765    0.2812
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          0.3304    0.3499    0.3693    0.3964    0.4320
          0.5000    0.5680    0.6036    0.6307    0.6501
          0.6696    0.6785    0.6874    0.6963    0.7052
          0.7141    0.7188    0.7235    0.7282    0.7329
          0.7376    0.7422    0.7468    0.7513    0.7559
          0.7605    0.7651    0.7696    0.7742    0.7788
          0.7833    0.7879    0.7925    0.7970    0.8016
          0.8062    0.8093    0.8125    0.8157    0.8188
          0.8220    0.8251    0.8283    0.8315    0.8346
          0.8378    0.8410    0.8441    0.8473    0.8504
          0.8536    0.8568    0.8599    0.8631    0.8662
          0.8694    0.8726    0.8757    0.8789    0.8820
          0.8852    0.8884    0.8915    0.8947    0.8978
          0.9010    0.9026    0.9043    0.9059    0.9076
          0.9092    0.9109    0.9125    0.9142    0.9158
          0.9175    0.9191    0.9208    0.9224    0.9241
          0.9257    0.9274    0.9290    0.9307    0.9323
          0.9340    0.9356    0.9373    0.9389    0.9406
          0.9422    0.9439    0.9455    0.9472    0.9488
          0.9505    0.9521    0.9538    0.9554    0.9571
          0.9587    0.9604    0.9620    0.9637    0.9653
          0.9670    0.9686    0.9703    0.9719    0.9736
          0.9752    0.9769    0.9785    0.9802    0.9819
          0.9835    0.9852    0.9868    0.9885    0.9901
          0.9918    0.9934    0.9951    0.9967    0.9984
          1.0000
rtp500-24           0.1
          0.0000    0.0017    0.0034    0.0052    0.0069
          0.0086    0.0103    0.0121    0.0138    0.0155
          0.0172    0.0190    0.0207    0.0224    0.0241
          0.0259    0.0276    0.0293    0.0310    0.0327
          0.0345    0.0362    0.0379    0.0396    0.0414
          0.0431    0.0448    0.0465    0.0483    0.0500
          0.0517    0.0534    0.0552    0.0569    0.0586
          0.0603    0.0620    0.0638    0.0655    0.0672
          0.0689    0.0707    0.0724    0.0741    0.0758
          0.0776    0.0793    0.0810    0.0827    0.0845
          0.0862    0.0879    0.0896    0.0913    0.0931
          0.0948    0.0965    0.0982    0.1000    0.1017
          0.1034    0.1068    0.1101    0.1135    0.1169
          0.1202    0.1236    0.1269    0.1303    0.1337
          0.1370    0.1404    0.1438    0.1471    0.1505
          0.1538    0.1572    0.1606    0.1639    0.1673
          0.1706    0.1740    0.1774    0.1807    0.1841
          0.1875    0.1908    0.1942    0.1975    0.2009
          0.2043    0.2089    0.2136    0.2183    0.2230
          0.2277    0.2324    0.2370    0.2417    0.2464
          0.2511    0.2558    0.2604    0.2651    0.2698
          0.2745    0.2793    0.2841    0.2888    0.2936
          0.2984    0.3074    0.3164    0.3254    0.3344
          0.3434    0.3624    0.3813    0.4071    0.4399
          0.5000    0.5601    0.5929    0.6187    0.6376
          0.6566    0.6656    0.6746    0.6836    0.6926
          0.7016    0.7064    0.7112    0.7159    0.7207
          0.7255    0.7302    0.7349    0.7396    0.7442
          0.7489    0.7536    0.7583    0.7630    0.7676
          0.7723    0.7770    0.7817    0.7864    0.7911
          0.7957    0.7991    0.8025    0.8058    0.8092
          0.8125    0.8159    0.8193    0.8226    0.8260
          0.8294    0.8327    0.8361    0.8394    0.8428
          0.8462    0.8495    0.8529    0.8562    0.8596
          0.8630    0.8663    0.8697    0.8731    0.8764
          0.8798    0.8831    0.8865    0.8899    0.8932
          0.8966    0.8983    0.9000    0.9018    0.9035
          0.9052    0.9069    0.9087    0.9104    0.9121
          0.9138    0.9155    0.9173    0.9190    0.9207
          0.9224    0.9242    0.9259    0.9276    0.9293
          0.9311    0.9328    0.9345    0.9362    0.9380
          0.9397    0.9414    0.9431    0.9448    0.9466
          0.9483    0.9500    0.9517    0.9535    0.9552
          0.9569    0.9586    0.9604    0.9621    0.9638
          0.9655    0.9673    0.9690    0.9707    0.9724
          0.9741    0.9759    0.9776    0.9793    0.9810
          0.9828    0.9845    0.9862    0.9879    0.9897
          0.9914    0.9931    0.9948    0.9966    0.9983
          1.0000
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GLOBAL OUTPUT:

	1.	0.1	YNNNN	YNNNNN

WinTR-20 Printed Page File End of Input Data List

Rock Creek Stream Restoration

Name of printed page file:
C:\Users\Meghan\Desktop\TR20\Rock Creek\EX_12_24hr_Rock_Creek_DUH_FINAL.out

Area or Reach Identifier	Drainage Area (sq mi)	Peak Flow by Storm p1-12 (cfs)	p2-12 (cfs)	p5-12 (cfs)	p10-12 (cfs)	p25-24 (cfs)
OverallDA	0.520	16.5	34.6	71.8	107.8	213.7
OUTLET	0.520	16.5	34.6	71.8	107.8	213.7

Area or Reach Identifier	Drainage Area (sq mi)	Peak Flow by Storm p50-24 (cfs)	p100-24 (cfs)	p200-24 (cfs)	p500-24 (cfs)	(cfs)
OverallDA	0.520	279.6	351.1	427.5	538.2	
OUTLET	0.520	279.6	351.1	427.5	538.2	

APPENDIX G

Geotechnical Investigations

BayLand Consultants & Designers, Inc.

Project: Rock Creek Stream Restoration	Date/Time	Started: 5/31/2023	Sampling Method: Auger Boring	Boring Number: B-1
Project Number: 5_20201		Completed: 5/31/2023		Total Depth of Boring: 3'
Client: Anne Arundel County		Backfilled: Y / N	Sample Type: Face of stream bank	Surface Elevation: 42'
City,State: Pasadena, MD				Groundwater Depth:
Weather/Site Conditions: 70s, sunny		Field Crew: ZT	Bit Type: Mud Auger	
		Logged By: ZT	Bit Diameter: 3.25"	

Depth (feet)	Elevation (feet)	**Soil Characteristics:** Munsell soil color, USCS description, presence of gravels and/or organics, other descriptors as needed	USCS Designation	Soil Density Description	Moisture Content
0'-0.5'		Brown silty sand with organics	SM	Coarse grained-loose	
0.5'-1'		Brown poorly-graded sand with silt	SP-SM	Coarse grained-loose	
1'-3'		Orange poorly-graded sand with silt	SP-SM	Coarse grained-very loose	
5					
10					

BayLand Consultants & Designers, Inc.

Project: Rock Creek Stream Restoration	Date/Time	Started: 5/31/2023	Sampling Method: Auger Boring	Boring Number: B-2
Project Number: 5_20201		Completed: 5/31/2023		Total Depth of Boring: 9'
Client: Anne Arundel County		Backfilled: Y / N	Sample Type: Face of stream bank	Surface Elevation: 38'
City,State: Pasadena, MD				Groundwater Depth: 8.5'
Weather/Site Conditions: 70s, sunny		Field Crew: ZT	Bit Type: Mud Auger	
		Logged By: ZT	Bit Diameter: 3.25"	

Depth (feet)	Elevation (feet)	Soil Characteristics: Munsell soil color, USCS description, presence of gravels and/or organics, other descriptors as needed	USCS Designation	Soil Density Description	Moisture Content
0'-1'		Brown silty sand with organics	SM	Coarse grained-loose	
1'-2'		Brown/tan poorly-graded sand with silt	SP-SM	Coarse grained-loose	
2'-7'		Orange poorly-graded sand with silt	SP-SM	Coarse grained-medium dense	M
7'-9'	▽	Tan poorly-graded sand	SP	Coarse grained-loose	W
10					

Bayland Consultants & Designers, Inc.

Project: Rock Creek Stream Restoration	Date/Time	Started: 5/31/2023	Sampling Method: Auger Boring	Boring Number: B-3
Project Number: 5_20201		Completed: 5/31/2023		Total Depth of Boring: 6.5'
Client: Anne Arundel County		Backfilled: Y / N	Sample Type: Face of stream bank	Surface Elevation: 33'
City,State: Pasadena, MD				Groundwater Depth: 6.5'
Weather/Site Conditions: 70s, sunny		Field Crew: ZT	Bit Type: Mud Auger	
		Logged By: ZT	Bit Diameter: 3.25"	

Depth (feet)	Elevation (feet)	**Soil Characteristics:** Munsell soil color, USCS description, presence of gravels and/or organics, other descriptors as needed	USCS Designation	Soil Density Description	Moisture Content
0'-1'		Brown silty sand with organics	SM	Coarse grained-loose	
1'-2'		Brown/tan poorly-graded sand with silt	SP-SM	Coarse grained-loose	
2'-5'		Orange poorly-graded sand	SP	Coarse grained-loose	M
5'-6.5'	▽	Tan poorly-graded sand with silt	SP-SM	Coarse grained-loose	W
10					

BayLand Consultants & Designers, Inc.

Project: Rock Creek Stream Restoration	Date/Time	Started: 5/31/2023	Sampling Method: Auger Boring	Boring Number: B-4
Project Number: 5_20201		Completed: 5/31/2023		Total Depth of Boring: 6'
Client: Anne Arundel County		Backfilled: Y / N	Sample Type: Face of stream bank	Surface Elevation: 21'
City,State: Pasadena, MD				Groundwater Depth: 5.5'
Weather/Site Conditions: 70s, sunny		Field Crew: ZT	Bit Type: Mud Auger	
		Logged By: ZT	Bit Diameter: 3.25"	

Depth (feet)	Elevation (feet)	Soil Characteristics: Munsell soil color, USCS description, presence of gravels and/or organics, other descriptors as needed	USCS Designation	Soil Density Description	Moisture Content
0'-1'		Dark brown poorly-graded sand with silt and organics	SP-SM	Coarse grained-loose	
1'-3'		Tan poorly-graded sand	SP	Coarse grained-medium dense	
3'-6'		White sandy silty clay	CL-ML	Fine grained-stiff	W
5	▽				
10					

BayLand Consultants & Designers, Inc.

Project: Rock Creek Stream Restoration	Date/Time	Started: 5/31/2023	Sampling Method: Auger Boring	Boring Number: B-5
Project Number: 5_20201		Completed: 5/31/2023		Total Depth of Boring: 2.5'
Client: Anne Arundel County		Backfilled: Y / N	Sample Type: Face of stream bank	Surface Elevation: 17'
City,State: Pasadena, MD				Groundwater Depth: 2'
Weather/Site Conditions: 70s, sunny		Field Crew: ZT	Bit Type: Mud Auger	
		Logged By: ZT	Bit Diameter: 3.25"	

Depth (feet)	Elevation (feet)	**Soil Characteristics:** Munsell soil color, USCS description, presence of gravels and/or organics, other descriptors as needed	USCS Designation	Soil Density Description	Moisture Content
0'-0.5'		Dark brown silty sand with organics	SM	Coarse grained-loose	
0.5'-1.5'		Brown poorly-graded sand with silt	SP-SM	Coarse grained-loose	M
1.5'-2.5'	▽	Tan poorly-graded sand	SP	Coarse grained-loose	W
5					
10					

BayLand Consultants & Designers, Inc.

Project: Rock Creek Stream Restoration	Date/Time	Started: 5/31/2023	Sampling Method: Auger Boring	Boring Number: B-6
Project Number: 5_20201		Completed: 5/31/2023		Total Depth of Boring: 2.5'
Client: Anne Arundel County		Backfilled: Y / N	Sample Type: Face of stream bank	Surface Elevation: 14'
City,State: Pasadena, MD				Groundwater Depth: 2.5'
Weather/Site Conditions: 70s, sunny		Field Crew: ZT	Bit Type: Mud Auger	
		Logged By: ZT	Bit Diameter: 3.25"	

Depth (feet)	Elevation (feet)	Soil Characteristics: Munsell soil color, USCS description, presence of gravels and/or organics, other descriptors as needed	USCS Designation	Soil Density Description	Moisture Content
0'-0.5'		Dark brown silty sand with organics	SM	Coarse grained-loose	
0.5'-1.5'		Brown poorly-graded sand with silt	SP-SM	Coarse grained-loose	
1.5'-2.5'	▽	Tan poorly-graded sand	SP	Coarse grained-loose	M
5					
10					

BayLand Consultants & Designers, Inc.

Project: Rock Creek Stream Restoration	Date/Time	Started: 5/31/2023	Sampling Method: Auger Boring	Boring Number: B-7
Project Number: 5_20201		Completed: 5/31/2023		Total Depth of Boring: 3'
Client: Anne Arundel County		Backfilled: Y / N	Sample Type: Face of stream bank	Surface Elevation: 13.5'
City,State: Pasadena, MD				Groundwater Depth: 2.5'
Weather/Site Conditions: 70s, sunny		Field Crew: ZT	Bit Type: Mud Auger	
		Logged By: ZT	Bit Diameter: 3.25"	

Depth (feet)	Elevation (feet)	**Soil Characteristics:** Munsell soil color, USCS description, presence of gravels and/or organics, other descriptors as needed	USCS Designation	Soil Density Description	Moisture Content
0'-0.5'		Dark brown silty sand with organics	SM	Coarse grained-loose	
0.5'-1.5'		Brown poorly-graded sand with silt	SP-SM	Coarse grained-loose	M
1.5'-3'	▽	Dark brown silty, clayey sand with organics	SC-SM	Coarse grained-medium dense	W
5					
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BayLand Consultants & Designers, Inc.

Project: Rock Creek Stream Restoration	Date/Time	Started: 5/31/2023	Sampling Method: Auger Boring	Boring Number: B-8
Project Number: 5_20201		Completed: 5/31/2023		Total Depth of Boring: 2.5'
Client: Anne Arundel County		Backfilled: Y / N	Sample Type: Face of stream bank	Surface Elevation: 39'
City,State: Pasadena, MD				Groundwater Depth:
Weather/Site Conditions: 70s, sunny		Field Crew: ZT	Bit Type: Mud Auger	
		Logged By: ZT	Bit Diameter: 3.25"	

Depth (feet)	Elevation (feet)	**Soil Characteristics:** Munsell soil color, USCS description, presence of gravels and/or organics, other descriptors as needed	USCS Designation	Soil Density Description	Moisture Content
0'-0.5'		Dark brown silty sand with organics	SM	Coarse grained-loose	
0.5'-1.5'		Brown/gray poorly-graded sand with clay	SP-SC	Coarse grained-dense	
1.5'-2.5'		Orange poorly-graded sand with silt	SP-SM	Coarse grained-loose	
5					
10					

BayLand Consultants & Designers, Inc.

Project: Rock Creek Stream Restoration	Date/Time	Started: 5/31/2023	Sampling Method: Auger Boring	Boring Number: B-9
Project Number: 5_20201		Completed: 5/31/2023		Total Depth of Boring: 8'
Client: Anne Arundel County		Backfilled: Y / N	Sample Type: Face of stream bank	Surface Elevation: 38'
City,State: Pasadena, MD				Groundwater Depth:
Weather/Site Conditions: 70s, sunny		Field Crew: ZT	Bit Type: Mud Auger	
		Logged By: ZT	Bit Diameter: 3.25"	

Depth (feet)	Elevation (feet)	**Soil Characteristics:** Munsell soil color, USCS description, presence of gravels and/or organics, other descriptors as needed	USCS Designation	Soil Density Description	Moisture Content
0'-1'		Dark brown silty sand with organics	SM	Coarse grained-loose	
1'-8'		Tan poorly-graded sand	SP	Coarse grained-loose	
5					
10					

LETTER OF TRANSMITTAL

DATE: June 1, 2023	JOB NO. 5_20201
TO: Findling, Inc.	
Attn: Mr. John Tallman; Project Manager	
3401 Carlins Park Drive	
Baltimore, MD 21215	
RE: Sediment Testing for Rock Creek	

BayLand Consultants & Designers, Inc.
"Integrating Engineering and Environment"
7455 New Ridge Road, Suite T Phone: (410) 694-9401
Hanover, Maryland 21076 Fax: (410) 694-9405
Website: www.baylandinc.com

The following items are: [X] Attached [ ] Sent under separate cover via _____

- [ ] Shop drawings
- [ ] Prints
- [ ] Plans
- [X] Samples
- [ ] Copy of letter
- [ ] Report
- [ ] Photos
- [ ] Specifications
- [ ] Other: _____
- [ ] COE Permit
- [ ] Wetland License

COPIES	DATE	NO. PAGES	DESCRIPTION
3		-	3 Rock Creek Sediment Samples for Atterberg Limits and
			Grain Size Analysis to #200 sieve

ITEMS ARE TRANSMITTED as checked below:

- [ ] For approval & signature
- [ ] Approved as submitted
- [ ] Returned after loan to us
- [X] For your use
- [ ] For review & comment
- [ ] Prints returned after loan to us
- [ ] Approved as noted
- [ ] Returned for corrections
- [ ] For bids due on _____
- [ ] As requested
- [ ] Per discussion
- [ ] Other: _____

Remarks: Please perform analysis on the three (3) enclosed samples and email the results followed by mailed results to ztate@baylandinc.com

COPY TO: Dipesh

SIGNED: Zach Tate

Summary of Laboratory Test Results

Bayland Consultants & Designers, Inc.

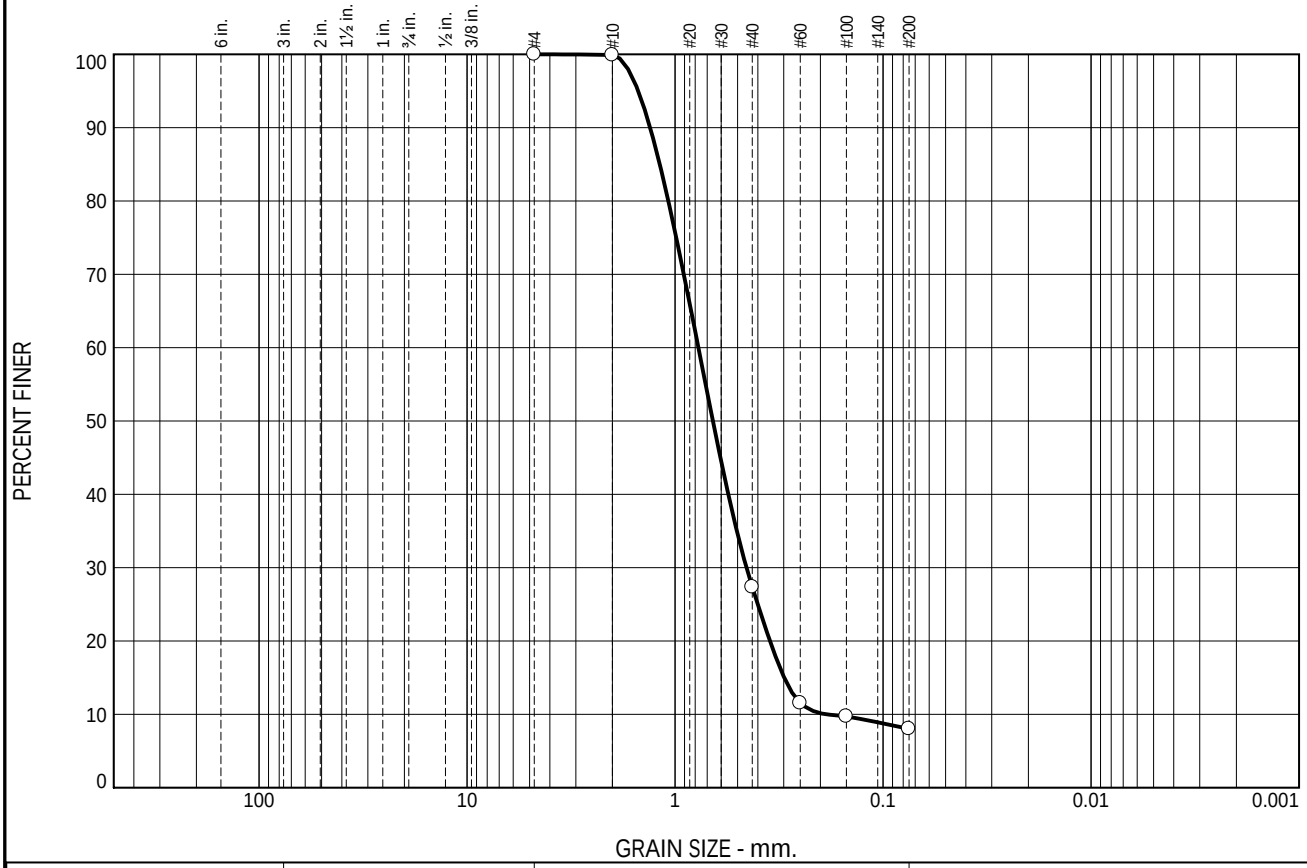
Rock Creek — Date: 6/7/2023

Findling Project No.: 12-1032-58 — Bayland Job No. 5_20201

Sample Date	Sample No.	Sample Depth	Natural Moisture Content, %	Atterberg Limits			Grain Size Distribution			Specific Gravity ASTM D-5057	USCS Classificatoin
				LL	PL	PI	GRAVEL (%)	SAND (%)	FINES (%)		
6/1/23	B-2	2.0 - 7.0		NV	NP	NP	0.0	92.0	8.0		SP-SM
6/1/23	B-4	3.0 - 6.0		25	18	7	0.0	31.9	68.1		CL-ML
6/1/23	B-7	0.5 - 1.5		NV	NP	NP	0.0	89.2	10.8		SP-SM

Note: NV = Non Viscous, NP = Non Plastic

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	72.5	19.4	8.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	27.4		
#60	11.5		
#100	9.7		
#200	8.0		

* (no specification provided)

Soil Description

Poorly graded SAND with Silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.3174 D_{85}= 1.1838 D_{60}= 0.7724
D_{50}= 0.6577 D_{30}= 0.4534 D_{15}= 0.2987
D_{10}= 0.1876 C_u= 4.12 C_c= 1.42

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Source of Sample: Rock Creek Depth: 2'-7'
Sample Number: B-2

Date: 6/7/23

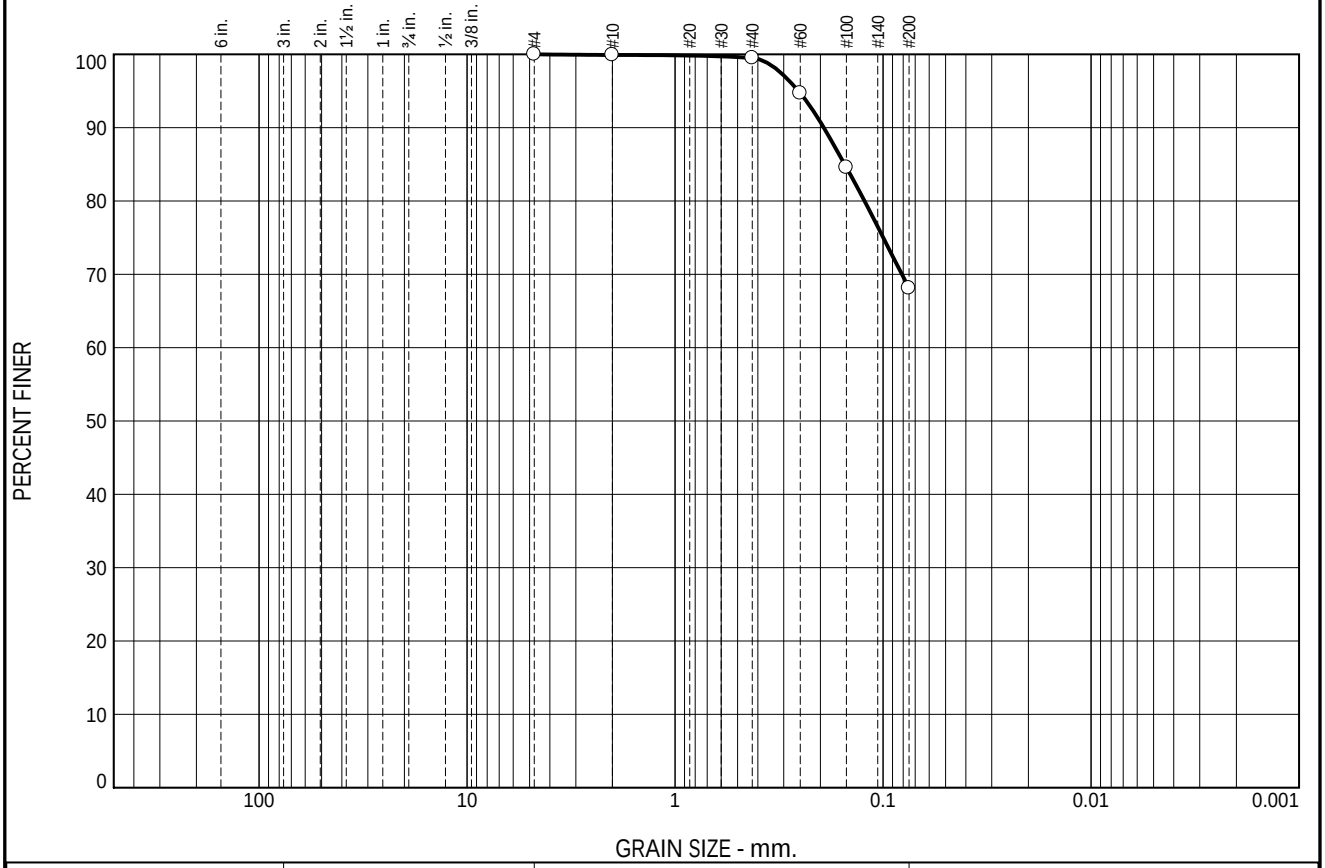
Findling, Inc.

Baltimore, Maryland

Client: Bayland Consultants & Designers, Inc.
Project: Rock Creek (5_20201)

Project No: 12-1032-58 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.4	31.4	68.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	99.5		
#60	94.7		
#100	84.6		
#200	68.1		

* (no specification provided)

Soil Description

Sandy Silty CLAY

Atterberg Limits

PL= 18 LL= 25 PI= 7

Coefficients

D_{90}= 0.1926 D_{85}= 0.1530 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(3)

Remarks

Source of Sample: Rock Creek Depth: 3'-6'
Sample Number: B-4

Date: 6/7/23

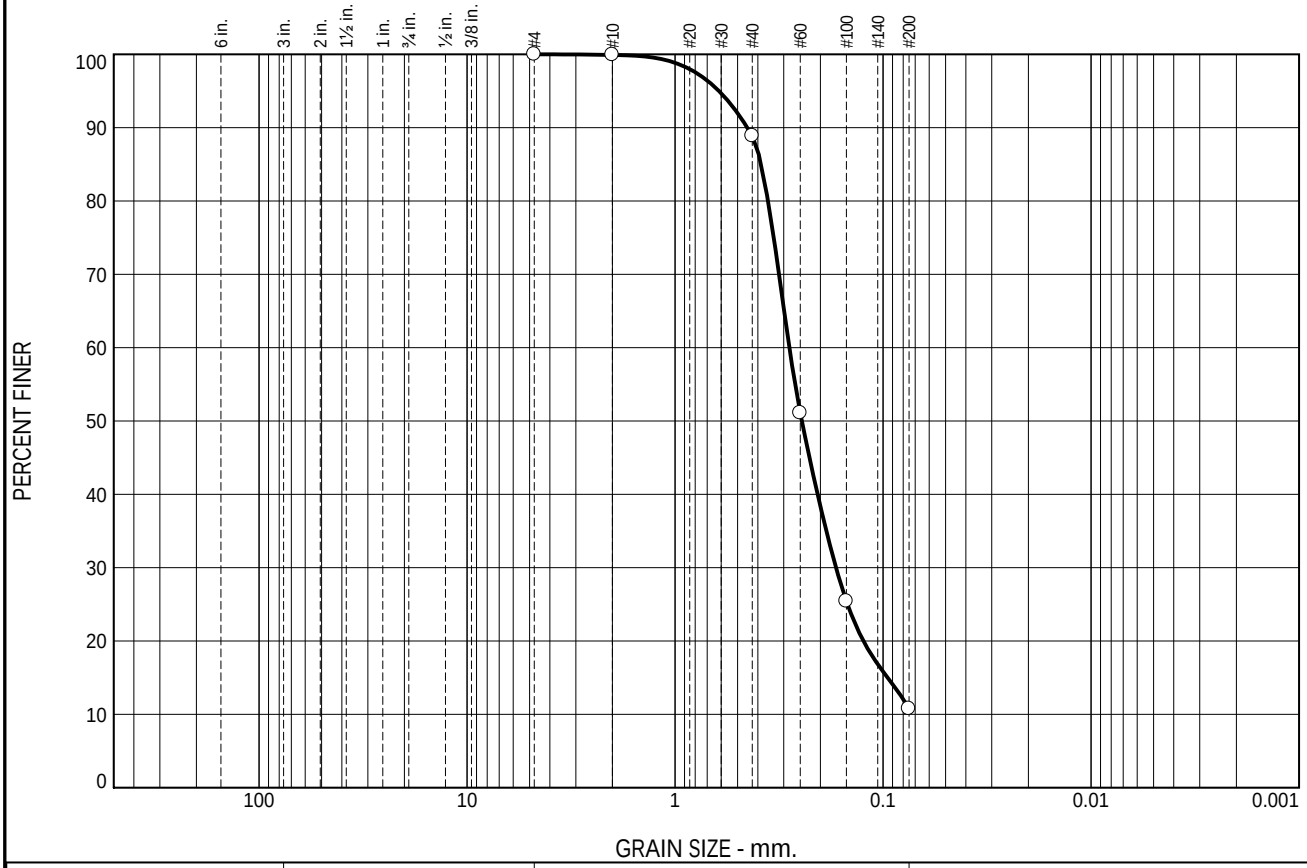
Findling, Inc.

Baltimore, Maryland

Client: Bayland Consultants & Designers, Inc.
Project: Rock Creek (5_20201)

Project No: 12-1032-58 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	11.0	78.1	10.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	88.9		
#60	51.1		
#100	25.4		
#200	10.8		

* (no specification provided)

Soil Description

Poorly graded SAND with Silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.4488 D_{85}= 0.3853 D_{60}= 0.2821
D_{50}= 0.2455 D_{30}= 0.1683 D_{15}= 0.0950
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-2-4(0)

Remarks

Source of Sample: Rock Creek Depth: .5'-1.5'
Sample Number: B-7

Date: 6/7/23

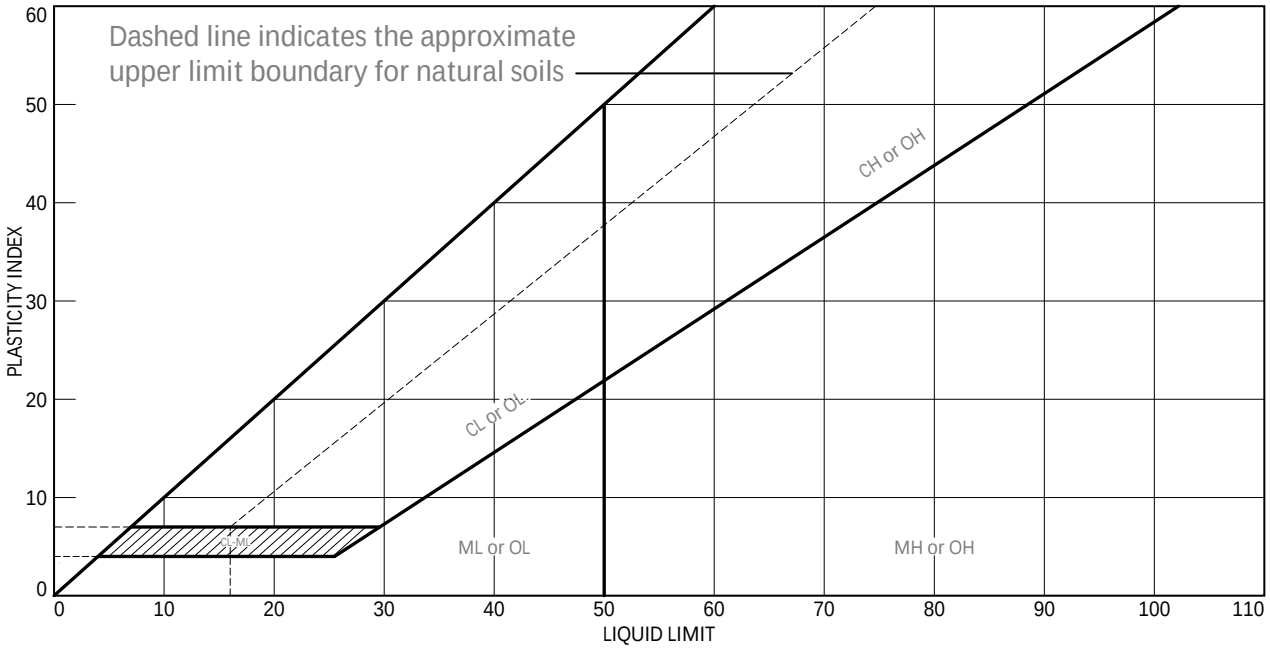
Findling, Inc.

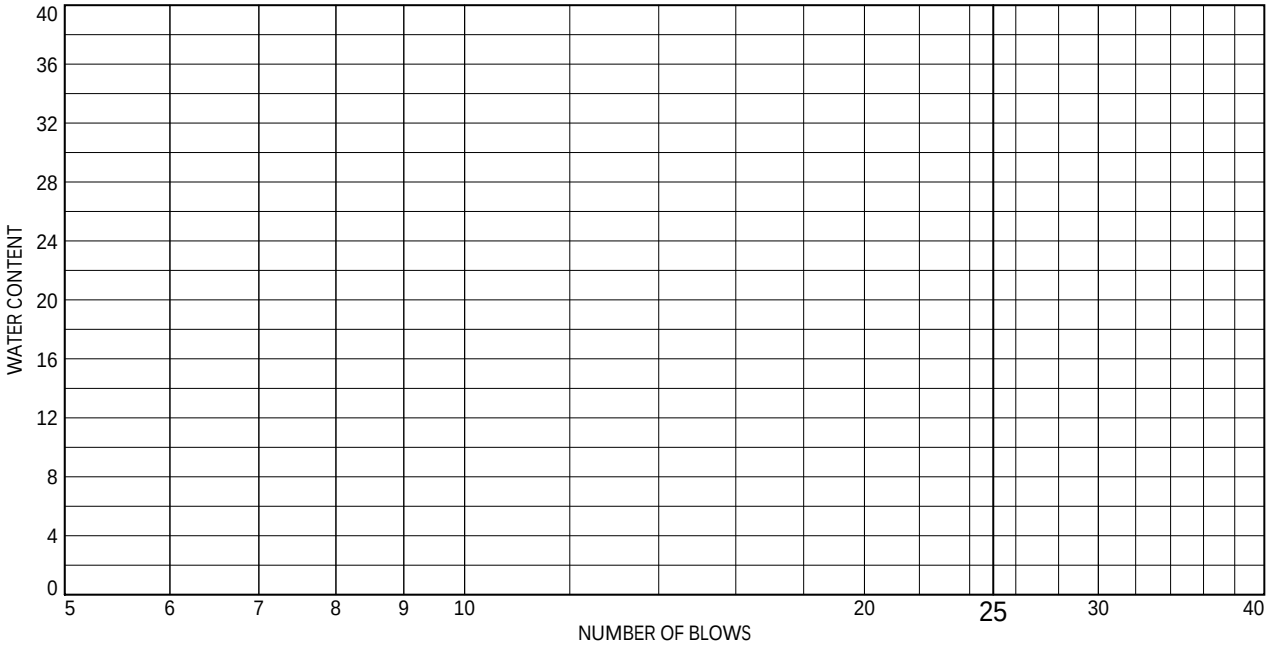
Baltimore, Maryland

Client: Bayland Consultants & Designers, Inc.
Project: Rock Creek (5_20201)

Project No: 12-1032-58 Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Poorly graded SAND with Silt	NV	NP	NP	27.4	8.0	SP-SM

Project No. 12-1032-58 Client: Bayland Consultants & Designers, Inc.

Project: Rock Creek (5_20201)

Source of Sample: Rock Creek Depth: 2'-7'
Sample Number: B-2

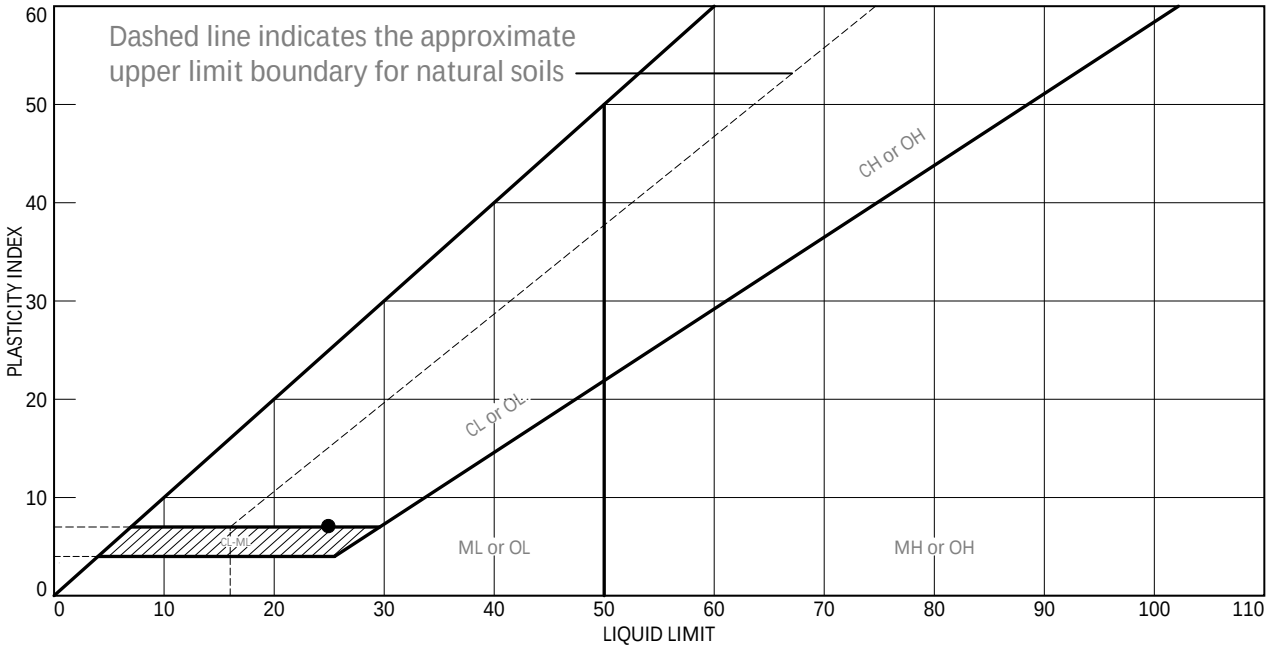
Findling, Inc.

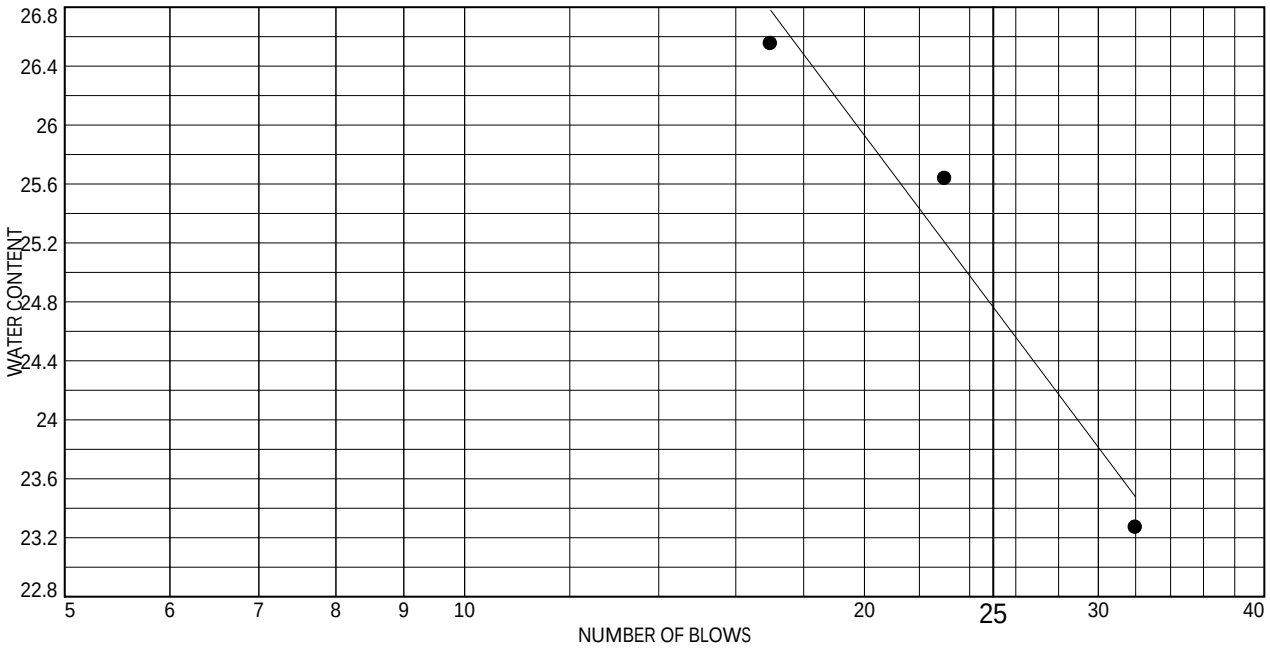
Baltimore, Maryland

Remarks:

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy Silty CLAY	25	18	7	99.5	68.1	CL-ML

Project No. 12-1032-58 Client: Bayland Consultants & Designers, Inc.

Project: Rock Creek (5_20201)

Source of Sample: Rock Creek Depth: 3'-6'
Sample Number: B-4

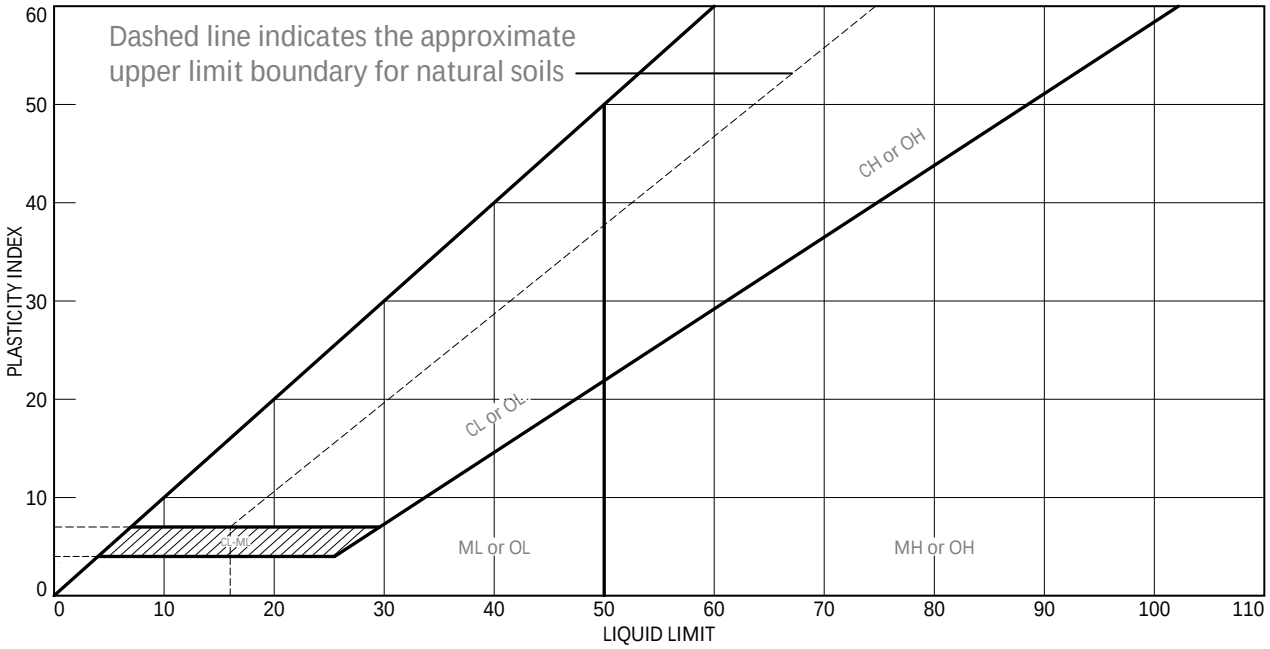
Findling, Inc.

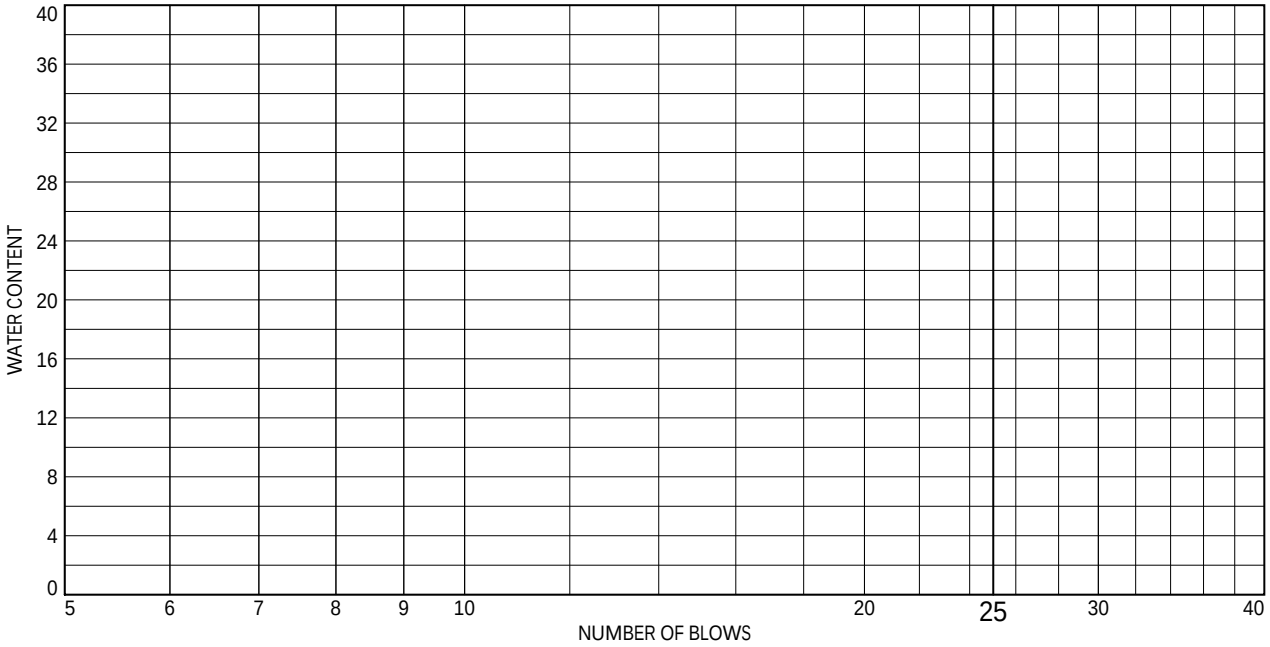
Baltimore, Maryland

Remarks:

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Poorly graded SAND with Silt	NV	NP	NP	88.9	10.8	SP-SM

Project No. 12-1032-58 Client: Bayland Consultants & Designers, Inc.

Project: Rock Creek (5_20201)

Source of Sample: Rock Creek Depth: .5'-1.5'
Sample Number: B-7

Findling, Inc.

Baltimore, Maryland

Remarks:

Figure

301 Fulling Mill Road | Middletown, PA 17057 | Phone: 717-944-5541 | Fax: 717-944-1430 | www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: PJLA 74618
State Certifications: FL E871113 , WA C999 , MD 128 , VA 460157 , WV DW 9961-C , WV 343

Analytical Results Report For **BayLands Consultants & Designers, Inc.**

Project Rock Creek Stream Restoration
Workorder 3306136
Report ID 252320 on 6/20/2023

Certificate of Analysis

Enclosed are the analytical results for samples received by the laboratory on Jun 02, 2023.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Elizabeth Parker (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Global.
ALS Middletown: 301 Fulling Mill Road, Middletown, PA 17057 : 717-944-5541.

Recipient(s):
Bill Heckert - BayLands Consultants & Designers, Inc.
Zachary Tate - BayLands Consultants & Designers, Inc.

Elizabeth Parker

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Elizabeth Parker *(ALS Digital Signature)*
Project Coordinator

Sample Summary

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collector	Collection Company
3306136001	Rock Creek B-1 Composite	Solid	05/31/2023 09:30	06/02/2023 17:10	CBC	Collected By Client
3306136002	Rock Creek B-2 Composite	Solid	05/31/2023 10:15	06/02/2023 17:10	CBC	Collected By Client
3306136003	Rock Creek B-3 Composite	Solid	05/31/2023 10:45	06/02/2023 17:10	CBC	Collected By Client
3306136004	Rock Creek B-4 Composite	Solid	05/31/2023 11:15	06/02/2023 17:10	CBC	Collected By Client
3306136005	Rock Creek B-5 Composite	Solid	05/31/2023 12:15	06/02/2023 17:10	CBC	Collected By Client
3306136006	Rock Creek B-6 Composite	Solid	05/31/2023 12:45	06/02/2023 17:10	CBC	Collected By Client
3306136007	Rock Creek B-7 Composite	Solid	05/31/2023 13:15	06/02/2023 17:10	CBC	Collected By Client
3306136008	Rock Creek B-8 Composite	Solid	05/31/2023 11:40	06/02/2023 17:10	CBC	Collected By Client
3306136009	Rock Creek B-9 Composite	Solid	05/31/2023 09:50	06/02/2023 17:10	CBC	Collected By Client

Reference

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- Except as qualified, Clean Water Act sample analyses are consistent with methodology requirements in 40 CFR Part 136.
- Except as qualified, Safe Drinking Water Act sample analyses are consistent with methodology requirements in 40 CFR Part 141.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.
- An Analysis-Prep Method Cross Reference Table is included after Analytical Results & Qualifiers section in this report.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND) above the MDL
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Practical Quantitation Limit for this Project
ND	Not Detected - indicates that the analyte was Not Detected
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits
#	Please reference the result in the Results Section for analyte-level flags.

Project Notations

Sample Notations

Lab ID	Sample ID

Result Notations

Notation Ref.	
1	The QC sample type LCS for method EPA 300.0 was outside the control limits for the analyte Nitrite-N. The % Recovery was reported as 81.7 and the control limits were 90 to 110.

Detected Results Summary

Client Sample ID	Rock Creek B-1 Composite	Collected	05/31/2023 09:30
Lab Sample ID	3306136001	Lab Receipt	06/02/2023 17:10

Compound	Result	Units	RDL	Method	Flag
WET CHEMISTRY					
Moisture	7.1	%	0.1	S2540G-11	#
Nitrate/Nitrite-N	6.1	mg/kg	5.5	SW846 9056A	#
Phosphorus, Total	220	mg/kg	110	EPA 365.1	#
Tot. Kjeldahl Nitrogen,(Moist)	513	mg/kg	50.0	S4500NH3G-11	#
Total Kjeldahl Nitrogen	552	mg/kg	53.8	S4500NH3G-11	#
Total Nitrogen	558	mg/kg	59.3	Calculation	#
Total Solids	92.9	%	0.1	S2540G-11	#

Detected Results Summary

Client Sample ID	Rock Creek B-2 Composite	Collected	05/31/2023 10:15
Lab Sample ID	3306136002	Lab Receipt	06/02/2023 17:10

Compound	Result	Units	RDL	Method	Flag
WET CHEMISTRY					
Moisture	11.7	%	0.1	S2540G-11	#
Phosphorus, Total	55.9	mg/kg	12.3	EPA 365.1	#
Tot. Kjeldahl Nitrogen,(Moist)	225	mg/kg	50.0	S4500NH3G-11	#
Total Kjeldahl Nitrogen	255	mg/kg	56.6	S4500NH3G-11	#
Total Nitrogen	255	mg/kg	62.5	Calculation	#
Total Solids	88.3	%	0.1	S2540G-11	#

Detected Results Summary

Client Sample ID	Rock Creek B-3 Composite	Collected	05/31/2023 10:45
Lab Sample ID	3306136003	Lab Receipt	06/02/2023 17:10

Compound	Result	Units	RDL	Method	Flag
WET CHEMISTRY					
Moisture	9.7	%	0.1	S2540G-11	#
Phosphorus, Total	112	mg/kg	103	EPA 365.1	#
Tot. Kjeldahl Nitrogen,(Moist)	295	mg/kg	50.0	S4500NH3G-11	#
Total Kjeldahl Nitrogen	326	mg/kg	55.4	S4500NH3G-11	#
Total Nitrogen	326	mg/kg	60.7	Calculation	#
Total Solids	90.3	%	0.1	S2540G-11	#

Detected Results Summary

Client Sample ID	Rock Creek B-4 Composite	Collected	05/31/2023 11:15
Lab Sample ID	3306136004	Lab Receipt	06/02/2023 17:10

Compound	Result	Units	RDL	Method	Flag
WET CHEMISTRY					
Moisture	10	%	0.1	S2540G-11	#
Phosphorus, Total	181	mg/kg	111	EPA 365.1	#
Tot. Kjeldahl Nitrogen,(Moist)	378	mg/kg	50.0	S4500NH3G-11	#
Total Kjeldahl Nitrogen	420	mg/kg	55.5	S4500NH3G-11	#
Total Nitrogen	420	mg/kg	60.9	Calculation	#
Total Solids	90.0	%	0.1	S2540G-11	#

Detected Results Summary

Client Sample ID	Rock Creek B-5 Composite	Collected	05/31/2023 12:15
Lab Sample ID	3306136005	Lab Receipt	06/02/2023 17:10

Compound	Result	Units	RDL	Method	Flag
WET CHEMISTRY					
Moisture	32.0	%	0.1	S2540G-11	#
Phosphorus, Total	245	mg/kg	150	EPA 365.1	#
Tot. Kjeldahl Nitrogen,(Moist)	556	mg/kg	49.5	S4500NH3G-11	#
Total Kjeldahl Nitrogen	817	mg/kg	72.8	S4500NH3G-11	#
Total Nitrogen	817	mg/kg	79.8	Calculation	#
Total Solids	68.0	%	0.1	S2540G-11	#

Detected Results Summary

Client Sample ID	Rock Creek B-6 Composite	Collected	05/31/2023 12:45
Lab Sample ID	3306136006	Lab Receipt	06/02/2023 17:10

Compound	Result	Units	RDL	Method	Flag
WET CHEMISTRY					
Moisture	25.1	%	0.1	S2540G-11	#
Phosphorus, Total	86.2	mg/kg	12.1	EPA 365.1	#
Tot. Kjeldahl Nitrogen,(Moist)	425	mg/kg	50.0	S4500NH3G-11	#
Total Kjeldahl Nitrogen	567	mg/kg	66.8	S4500NH3G-11	#
Total Nitrogen	567	mg/kg	73.7	Calculation	#
Total Solids	74.9	%	0.1	S2540G-11	#

Detected Results Summary

Client Sample ID	Rock Creek B-7 Composite	Collected	05/31/2023 13:15
Lab Sample ID	3306136007	Lab Receipt	06/02/2023 17:10

Compound	Result	Units	RDL	Method	Flag
WET CHEMISTRY					
Moisture	34.1	%	0.1	S2540G-11	#
Phosphorus, Total	74.8	mg/kg	15.2	EPA 365.1	#
Tot. Kjeldahl Nitrogen,(Moist)	434	mg/kg	50.8	S4500NH3G-11	#
Total Kjeldahl Nitrogen	659	mg/kg	77.0	S4500NH3G-11	#
Total Nitrogen	659	mg/kg	84.8	Calculation	#
Total Solids	65.9	%	0.1	S2540G-11	#

Detected Results Summary

Client Sample ID	Rock Creek B-8 Composite	Collected	05/31/2023 11:40
Lab Sample ID	3306136008	Lab Receipt	06/02/2023 17:10

Compound	Result	Units	RDL	Method	Flag
WET CHEMISTRY					
Moisture	9.8	%	0.1	S2540G-11	#
Phosphorus, Total	263	mg/kg	118	EPA 365.1	#
Tot. Kjeldahl Nitrogen,(Moist)	605	mg/kg	50.0	S4500NH3G-11	#
Total Kjeldahl Nitrogen	671	mg/kg	55.4	S4500NH3G-11	#
Total Nitrogen	671	mg/kg	61.2	Calculation	#
Total Solids	90.2	%	0.1	S2540G-11	#

Detected Results Summary

Client Sample ID	Rock Creek B-9 Composite	Collected	05/31/2023 09:50
Lab Sample ID	3306136009	Lab Receipt	06/02/2023 17:10

Compound	Result	Units	RDL	Method	Flag
WET CHEMISTRY					
Moisture	5.3	%	0.1	S2540G-11	#
Phosphorus, Total	88.9	mg/kg	10	EPA 365.1	#
Tot. Kjeldahl Nitrogen,(Moist)	271	mg/kg	50.3	S4500NH3G-11	#
Total Kjeldahl Nitrogen	286	mg/kg	53.1	S4500NH3G-11	#
Total Nitrogen	286	mg/kg	58.3	Calculation	#
Total Solids	94.7	%	0.1	S2540G-11	#

Results

Client Sample ID	Rock Creek B-1 Composite	Collected	05/31/2023 09:30
Lab Sample ID	3306136001	Lab Receipt	06/02/2023 17:10

WET CHEMISTRY

Compound	Result	Flag	Units	RDL	Method	Dilution	Analysis Date/Time	By	Cntr
Moisture	7.1		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	
Nitrate/Nitrite-N	6.1	1	mg/kg	5.5	SW846 9056A	5	06/05/2023 18:17	J1W	A
Phosphorus, Total	220		mg/kg	110	EPA 365.1	10	06/07/2023 15:52	SAM	A
Tot. Kjeldahl Nitrogen,(Moist)	513		mg/kg	50.0	S4500NH3G-11	1	06/20/2023 11:00	JXL	A
Total Kjeldahl Nitrogen	552		mg/kg	53.8	S4500NH3G-11	1	06/20/2023 11:08	EXC	A
Total Nitrogen	558		mg/kg	59.3	Calculation	1	06/20/2023 21:47	CW	A
Total Solids	92.9		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	

Results

Client Sample ID	Rock Creek B-2 Composite	Collected	05/31/2023 10:15
Lab Sample ID	3306136002	Lab Receipt	06/02/2023 17:10

WET CHEMISTRY

Compound	Result	Flag	Units	RDL	Method	Dilution	Analysis Date/Time	By	Cntr
Moisture	11.7		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	
Nitrate/Nitrite-N	ND	ND,1	mg/kg	5.9	SW846 9056A	5	06/05/2023 18:29	J1W	A
Phosphorus, Total	55.9		mg/kg	12.3	EPA 365.1	1	06/09/2023 20:54	SAM	A
Tot. Kjeldahl Nitrogen,(Moist)	225		mg/kg	50.0	S4500NH3G-11	1	06/20/2023 11:00	JXL	A
Total Kjeldahl Nitrogen	255		mg/kg	56.6	S4500NH3G-11	1	06/20/2023 11:11	EXC	A
Total Nitrogen	255		mg/kg	62.5	Calculation	1	06/20/2023 21:48	CW	A
Total Solids	88.3		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	

Results

Client Sample ID	Rock Creek B-3 Composite	Collected	05/31/2023 10:45
Lab Sample ID	3306136003	Lab Receipt	06/02/2023 17:10

WET CHEMISTRY

Compound	Result	Flag	Units	RDL	Method	Dilution	Analysis Date/Time	By	Cntr
Moisture	9.7		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	
Nitrate/Nitrite-N	ND	ND,1	mg/kg	5.3	SW846 9056A	5	06/05/2023 18:40	J1W	A
Phosphorus, Total	112		mg/kg	103	EPA 365.1	10	06/07/2023 15:56	SAM	A
Tot. Kjeldahl Nitrogen,(Moist)	295		mg/kg	50.0	S4500NH3G-11	1	06/20/2023 11:00	JXL	A
Total Kjeldahl Nitrogen	326		mg/kg	55.4	S4500NH3G-11	1	06/20/2023 11:13	EXC	A
Total Nitrogen	326		mg/kg	60.7	Calculation	1	06/20/2023 21:49	CW	A
Total Solids	90.3		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	

Results

Client Sample ID	Rock Creek B-4 Composite	Collected	05/31/2023 11:15
Lab Sample ID	3306136004	Lab Receipt	06/02/2023 17:10

WET CHEMISTRY

Compound	Result	Flag	Units	RDL	Method	Dilution	Analysis Date/Time	By	Cntr
Moisture	10		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	
Nitrate/Nitrite-N	ND	ND,1	mg/kg	5.4	SW846 9056A	5	06/05/2023 18:52	J1W	A
Phosphorus, Total	181		mg/kg	111	EPA 365.1	10	06/07/2023 15:58	SAM	A
Tot. Kjeldahl Nitrogen,(Moist)	378		mg/kg	50.0	S4500NH3G-11	1	06/20/2023 11:00	JXL	A
Total Kjeldahl Nitrogen	420		mg/kg	55.5	S4500NH3G-11	1	06/20/2023 11:16	EXC	A
Total Nitrogen	420		mg/kg	60.9	Calculation	1	06/20/2023 21:50	CW	A
Total Solids	90.0		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	

Results

Client Sample ID	Rock Creek B-5 Composite	Collected	05/31/2023 12:15
Lab Sample ID	3306136005	Lab Receipt	06/02/2023 17:10

WET CHEMISTRY

Compound	Result	Flag	Units	RDL	Method	Dilution	Analysis Date/Time	By	Cntr
Moisture	32.0		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	
Nitrate/Nitrite-N	ND	ND	mg/kg	7.0	SW846 9056A	5	06/05/2023 20:12	J1W	A
Phosphorus, Total	245		mg/kg	150	EPA 365.1	10	06/07/2023 16:00	SAM	A
Tot. Kjeldahl Nitrogen,(Moist)	556		mg/kg	49.5	S4500NH3G-11	1	06/20/2023 11:00	JXL	A
Total Kjeldahl Nitrogen	817		mg/kg	72.8	S4500NH3G-11	1	06/20/2023 11:18	EXC	A
Total Nitrogen	817		mg/kg	79.8	Calculation	1	06/20/2023 21:51	CW	A
Total Solids	68.0		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	

Results

Client Sample ID	Rock Creek B-6 Composite	Collected	05/31/2023 12:45
Lab Sample ID	3306136006	Lab Receipt	06/02/2023 17:10

WET CHEMISTRY

Compound	Result	Flag	Units	RDL	Method	Dilution	Analysis Date/Time	By	Cntr
Moisture	25.1		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	
Nitrate/Nitrite-N	ND	ND	mg/kg	6.9	SW846 9056A	5	06/05/2023 20:23	J1W	A
Phosphorus, Total	86.2		mg/kg	12.1	EPA 365.1	1	06/09/2023 20:56	SAM	A
Tot. Kjeldahl Nitrogen,(Moist)	425		mg/kg	50.0	S4500NH3G-11	1	06/20/2023 11:00	JXL	A
Total Kjeldahl Nitrogen	567		mg/kg	66.8	S4500NH3G-11	1	06/20/2023 11:26	EXC	A
Total Nitrogen	567		mg/kg	73.7	Calculation	1	06/20/2023 21:52	CW	A
Total Solids	74.9		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	

Results

Client Sample ID	Rock Creek B-7 Composite	Collected	05/31/2023 13:15
Lab Sample ID	3306136007	Lab Receipt	06/02/2023 17:10

WET CHEMISTRY

Compound	Result	Flag	Units	RDL	Method	Dilution	Analysis Date/Time	By	Cntr
Moisture	34.1		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	
Nitrate/Nitrite-N	ND	ND	mg/kg	7.7	SW846 9056A	5	06/05/2023 20:35	J1W	A
Phosphorus, Total	74.8		mg/kg	15.2	EPA 365.1	1	06/09/2023 20:58	SAM	A
Tot. Kjeldahl Nitrogen,(Moist)	434		mg/kg	50.8	S4500NH3G-11	1	06/20/2023 11:00	JXL	A
Total Kjeldahl Nitrogen	659		mg/kg	77.0	S4500NH3G-11	1	06/20/2023 11:29	EXC	A
Total Nitrogen	659		mg/kg	84.8	Calculation	1	06/20/2023 21:53	CW	A
Total Solids	65.9		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	

Results

Client Sample ID	Rock Creek B-8 Composite	Collected	05/31/2023 11:40
Lab Sample ID	3306136008	Lab Receipt	06/02/2023 17:10

WET CHEMISTRY

Compound	Result	Flag	Units	RDL	Method	Dilution	Analysis Date/Time	By	Cntr
Moisture	9.8		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	
Nitrate/Nitrite-N	ND	ND	mg/kg	5.8	SW846 9056A	5	06/05/2023 20:46	J1W	A
Phosphorus, Total	263		mg/kg	118	EPA 365.1	10	06/07/2023 16:06	SAM	A
Tot. Kjeldahl Nitrogen,(Moist)	605		mg/kg	50.0	S4500NH3G-11	1	06/20/2023 11:00	JXL	A
Total Kjeldahl Nitrogen	671		mg/kg	55.4	S4500NH3G-11	1	06/20/2023 11:31	EXC	A
Total Nitrogen	671		mg/kg	61.2	Calculation	1	06/20/2023 21:54	CW	A
Total Solids	90.2		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	

Results

Client Sample ID	Rock Creek B-9 Composite	Collected	05/31/2023 09:50
Lab Sample ID	3306136009	Lab Receipt	06/02/2023 17:10

WET CHEMISTRY

Compound	Result	Flag	Units	RDL	Method	Dilution	Analysis Date/Time	By	Cntr
Moisture	5.3		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	
Nitrate/Nitrite-N	ND	ND	mg/kg	5.3	SW846 9056A	5	06/05/2023 20:58	J1W	A
Phosphorus, Total	88.9		mg/kg	10	EPA 365.1	1	06/12/2023 23:33	SAM	A
Tot. Kjeldahl Nitrogen,(Moist)	271		mg/kg	50.3	S4500NH3G-11	1	06/20/2023 11:00	JXL	A
Total Kjeldahl Nitrogen	286		mg/kg	53.1	S4500NH3G-11	1	06/20/2023 11:34	EXC	A
Total Nitrogen	286		mg/kg	58.3	Calculation	1	06/20/2023 21:55	CW	A
Total Solids	94.7		%	0.1	S2540G-11	1	06/06/2023 09:38	SXS	

Sample - Method Cross Reference Table

Lab ID	Sample ID	Analysis Method	Preparation Method	Leachate Method
3306136001	Rock Creek B-1 Composite	Calculation	N/A	
		EPA 365.1	EPA 365.1	
		S2540G-11	N/A	
		S4500NH3G-11	S4500-NorgB-11	
		SW846 9056A	SW846 9056A	
3306136002	Rock Creek B-2 Composite	Calculation	N/A	
		EPA 365.1	EPA 365.1	
		S2540G-11	N/A	
		S4500NH3G-11	S4500-NorgB-11	
		SW846 9056A	SW846 9056A	
3306136003	Rock Creek B-3 Composite	Calculation	N/A	
		EPA 365.1	EPA 365.1	
		S2540G-11	N/A	
		S4500NH3G-11	S4500-NorgB-11	
		SW846 9056A	SW846 9056A	
3306136004	Rock Creek B-4 Composite	Calculation	N/A	
		EPA 365.1	EPA 365.1	
		S2540G-11	N/A	
		S4500NH3G-11	S4500-NorgB-11	
		SW846 9056A	SW846 9056A	
3306136005	Rock Creek B-5 Composite	Calculation	N/A	
		EPA 365.1	EPA 365.1	
		S2540G-11	N/A	
		S4500NH3G-11	S4500-NorgB-11	
		SW846 9056A	SW846 9056A	
3306136006	Rock Creek B-6 Composite	Calculation	N/A	
		EPA 365.1	EPA 365.1	
		S2540G-11	N/A	
		S4500NH3G-11	S4500-NorgB-11	
		SW846 9056A	SW846 9056A	
3306136007	Rock Creek B-7 Composite	Calculation	N/A	
		EPA 365.1	EPA 365.1	
		S2540G-11	N/A	
		S4500NH3G-11	S4500-NorgB-11	
		SW846 9056A	SW846 9056A	
3306136008	Rock Creek B-8 Composite	Calculation	N/A	
		EPA 365.1	EPA 365.1	
		S2540G-11	N/A	
		S4500NH3G-11	S4500-NorgB-11	
		SW846 9056A	SW846 9056A	
3306136009	Rock Creek B-9 Composite	Calculation	N/A	
		EPA 365.1	EPA 365.1	
		S2540G-11	N/A	
		S4500NH3G-11	S4500-NorgB-11	
		SW846 9056A	SW846 9056A	

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Lab ID	Sample ID	Preparation Method	Prep Batch	Prep Date/Time	By	Analysis Method	Anly Batch
3306136001	Rock Creek B-1 Composite	N/A	N/A	N/A		Calculation	
		EPA 365.1	1010831	06/05/2023 16:01	SAM	EPA 365.1	1011126
		N/A	N/A	N/A		S2540G-11	1010836
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017904
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017902
		SW846 9056A	1010625	06/05/2023 10:24	J1W	SW846 9056A	1010771
3306136002	Rock Creek B-2 Composite	N/A	N/A	N/A		Calculation	
		EPA 365.1	1010831	06/05/2023 16:01	SAM	EPA 365.1	1012131
		N/A	N/A	N/A		S2540G-11	1010836
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017904
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017902
		SW846 9056A	1010625	06/05/2023 10:24	J1W	SW846 9056A	1010771
3306136003	Rock Creek B-3 Composite	N/A	N/A	N/A		Calculation	
		EPA 365.1	1010831	06/05/2023 16:01	SAM	EPA 365.1	1011126
		N/A	N/A	N/A		S2540G-11	1010836
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017904
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017902
		SW846 9056A	1010625	06/05/2023 10:24	J1W	SW846 9056A	1010771
3306136004	Rock Creek B-4 Composite	N/A	N/A	N/A		Calculation	
		EPA 365.1	1010831	06/05/2023 16:01	SAM	EPA 365.1	1011126
		N/A	N/A	N/A		S2540G-11	1010836
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017904
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017902
		SW846 9056A	1010625	06/05/2023 10:24	J1W	SW846 9056A	1010771
3306136005	Rock Creek B-5 Composite	N/A	N/A	N/A		Calculation	
		EPA 365.1	1010831	06/05/2023 16:01	SAM	EPA 365.1	1011126
		N/A	N/A	N/A		S2540G-11	1010836
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017904
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017902
		SW846 9056A	1010626	06/05/2023 10:54	J1W	SW846 9056A	1010771
3306136006	Rock Creek B-6 Composite	N/A	N/A	N/A		Calculation	
		EPA 365.1	1010831	06/05/2023 16:01	SAM	EPA 365.1	1012131
		N/A	N/A	N/A		S2540G-11	1010836
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017904
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017902
		SW846 9056A	1010626	06/05/2023 10:54	J1W	SW846 9056A	1010771
3306136007	Rock Creek B-7 Composite	N/A	N/A	N/A		Calculation	
		EPA 365.1	1010831	06/05/2023 16:01	SAM	EPA 365.1	1012131
		N/A	N/A	N/A		S2540G-11	1010836
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017904
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017902
		SW846 9056A	1010626	06/05/2023 10:54	J1W	SW846 9056A	1010771
3306136008	Rock Creek B-8 Composite	N/A	N/A	N/A		Calculation	
		EPA 365.1	1010831	06/05/2023 16:01	SAM	EPA 365.1	1011126
		N/A	N/A	N/A		S2540G-11	1010836
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017904
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017902
		SW846 9056A	1010626	06/05/2023 10:54	J1W	SW846 9056A	1010771
3306136009	Rock Creek B-9 Composite	N/A	N/A	N/A		Calculation	
		EPA 365.1	1010831	06/05/2023 16:01	SAM	EPA 365.1	1012907
		N/A	N/A	N/A		S2540G-11	1010836
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017904
		S4500-NorgB-11	1013484	06/13/2023 18:54	EXC	S4500NH3G-11	1017902
		SW846 9056A	1010626	06/05/2023 10:54	J1W	SW846 9056A	1010771

301 Fulling Mill Road
Middletown, PA 17057
P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 3306136
Logged By: MJE
PM: EXP
ALS Qu

Client Name: BayLand Consultants & Designers, INC.
Address: 7455 New Ridge Road, Suite T
Hanover, MD 21076
Contact: Zach Tate
Phone#: 410-694-9401
Project Name/#: Rock Creek Stream Restoration
Bill To: Same

TAT [X] Normal-Standard TAT is 10-12 business days.
[ ] Rush-Subject to ALS approval and surcharges.
Date Required: Approved?
Email? [X] -Y ztate@baylandinc.com
Fax? [ ] -Y No.:

	Container Type	Container Size	Perservative
	Bag	Gallon	None

ANALYSES/METHOD REQUESTED

	Sample Description/Location (as it will appear on the lab report)	Date Collected mm/dd/yy	Time hh:mm	*G or C	**Matrix	Total Nitrogen	Total Phosphorous
				Enter Number of Containers Per Sample or Field Results Below.			
1	Rock Creek B-1 Composite	5/31/23	9:30	C	S	1	1
2	Rock Creek B-2 Composite	5/31/23	10:15	C	S	1	1
3	Rock Creek B-3 Composite	5/31/23	10:45	C	S	1	1
4	Rock Creek B-4 Composite	5/31/23	11:15	C	S	1	1
5	Rock Creek B-5 Composite	5/31/23	12:15	C	S	1	1
6	Rock Creek B-6 Composite	5/31/23	12:45	C	S	1	1
7	Rock Creek B-7 Composite	5/31/23	1:15	C	S	1	1
8	Rock Creek B-8 Composite	5/31/23	11:40	C	S	1	1
9	Rock Creek B-9 Composite	5/31/23	9:50	C	S	1	1
10							

Receipt Information (completed by Receiving Lab)
W.O. Temp: 3°C Therm ID: TH-570
Courier/Tracking #:
Purchase Order #:
Project Comments:

Temp By:	WO Temp (°C)	Therm ID
MJE	3	570

Receipt Info Completed By:	DAG
Cooler Custody Seal Intact	Y N NA
Sample Custody Seal Intact	Y N NA
Received on Ice	Y N NA
Cooler & Samples Intact	Y N
Correct Containers Provided	Y N
Sample Label/COC Agree	Y N
Adequate Sample Volumes	N
CR6 Samples Filtered	Y N NA
OP Samples Filtered	Y N NA
VOA Headspace Present	Y N NA
Voa Trip Blank	Y N NA
NJ≤ 4 Days?	Y N
Rad Screen (uCi)	
Courier/Tracking #:	
SDWA Compliance	Y N
PWSID	
WV Containers 0-6°C	Y N NA

SAMPLED BY (Please Print): Zach Tate

Sampler Comments:

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1 BayLand Con & Designers	6/02	2:00	2 ALS Evon P	6/2/23	1400
3 ALS Evon P	6.2.23	1710	4	6/2/23	1710
5			6		
7			8		
9			10		

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE/DOD [ ]
Special Processing: USACE [ ] Navy [ ]
State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] MD [ ] other
Reportable to PADEP? Yes [ ] No [ ] PWSID #
Sample Disposal: Lab [ ] Special [ ]
EDDS: Format Type-

* G=Grab; C=Composite
**Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

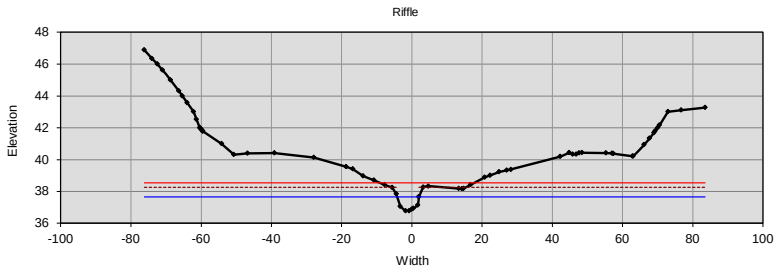
ALS SHIPPING ADDRESS: 301 Fulling Mill Road, Middletown, PA 17057

Rev 11/18

APPENDIX H

Geomorphic Data

Cross Section 1



Bankfull Dimensions		Flood Dimensions		Materials	
4.1	x-section area (ft.sq.)	26.7	W flood prone area (ft)	27	D50 Riffle (mm)
6.2	width (ft)	4.3	entrenchment ratio	50	D84 Riffle (mm)
0.7	mean depth (ft)	1.5	low bank height (ft)	24	threshold grain size (mm):
0.9	max depth (ft)	1.7	low bank height ratio		
6.7	wetted parimeter (ft)				
0.6	hyd radi (ft)				
9.2	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
4.7	velocity (ft/s)	0.026	Manning's roughness	1.29	channel slope (%)
19.3	discharge rate (cfs)	0.09	D'Arcy-Weisbach fric.	0.49	shear stress (lb/sq.ft.)
1.06	Froude number	6.5	resistance factor u/u*	0.50	shear velocity (ft/s)
		4.1	relative roughness	2.5	unit strm power (lb/ft/s)

Cross Section

reference ID: 1
instrument height: ---
longitudinal station: ---

Bankfull Stage

FS: -38.249 = 38.249 elev
elevation: 37.657 ---

Low Bank Height

FS: -38.249 = 38.249 elev
elevation:

Flood Prone Area

width fpa: 26.7

Channel Slope

percent slope: 1.29 ---

Flow Resistance

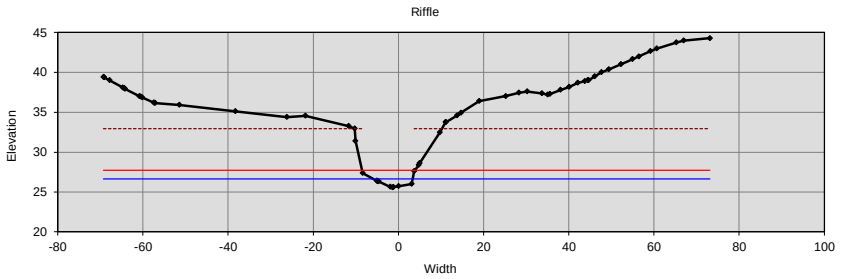
Manning's "n": 0.026 0.037
D'Arcy - Weisbach "f": 0.19

Note:

EX STA 06+31

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
-76.169		0	-46.878	46.878		
-73.995		0	-46.335	46.335		
-72.45		0	-46	46		
-71.012		0	-45.621	45.621		
-68.695		0	-45	45		
-66.382		0	-44.31	44.31		
-65.385		0	-44	44		
-63.999		0	-43.571	43.571		
-62.159		0	-43	43		
-61.333		0	-42.516	42.516		
-60.388		0	-42	42		
-60.266		0	-41.97	41.97		
-59.912		0	-41.881	41.881		
-59.676		0	-41.822	41.822		
-59.507		0	-41.78	41.78		
-59.507		0	-41.78	41.78		
-54.183		0	-40.995	40.995		
-50.655		0	-40.318	40.318		
-46.819		0	-40.392	40.392		
-39.141		0	-40.412	40.412		
-27.915		0	-40.134	40.134		
-18.673		0	-39.55	39.55		
-16.826		0	-39.404	39.404		
-13.848		0	-38.973	38.973		
-10.823		0	-38.713	38.713		
-7.792		0	-38.421	38.421		
-5.551		0	-38.249	38.249		
-4.42		0	-37.835	37.835		
-3.32		0	-37.066	37.066		
-1.8		0	-36.781	36.781		
-0.736		0	-36.778	36.778		
0		0	-36.875	36.875		
0.471		0	-36.937	36.937		
1.705		0	-37.137	37.137		
1.991		0	-37.664	37.664		
3.226		0	-38.274	38.274		
4.74		0	-38.334	38.334		
13.392		0	-38.181	38.181		
14.277		0	-38.168	38.168		
14.696		0	-38.185	38.185		
16.746		0	-38.431	38.431		
20.72		0	-38.883	38.883		
22.275		0	-39.006	39.006		
24.866		0	-39.223	39.223		
27.003		0	-39.337	39.337		
28.191		0	-39.379	39.379		
42.28		0	-40.202	40.202		
44.846		0	-40.443	40.443		
45.86		0	-40.337	40.337		
46.777		0	-40.337	40.337		
47.656		0	-40.408	40.408		
48.418		0	-40.434	40.434		
55.334		0	-40.405	40.405		
56.983		0	-40.391	40.391		
57.398		0	-40.382	40.382		
62.87		0	-40.222	40.222		
62.994		0	-40.214	40.214		
66.18		0	-40.942	40.942		
67.681		0	-41.334	41.334		
68.917		0	-41.677	41.677		
69.32		0	-41.793	41.793		
70.039		0	-42	42		
70.518		0	-42.162	42.162		
72.962		0	-43	43		
76.71		0	-43.101	43.101		
83.515		0	-43.274	43.274		

Cross Section 2



Bankfull Dimensions		Flood Dimensions		Materials	
6.5	x-section area (ft.sq.)	12.3	W flood prone area (ft)	27	D50 Riffle (mm)
9.2	width (ft)	1.3	entrenchment ratio	50	D84 Riffle (mm)
0.7	mean depth (ft)	7.4	low bank height (ft)	17	threshold grain size (mm):
1.1	max depth (ft)	6.9	low bank height ratio		
9.9	wetted parimeter (ft)				
0.7	hyd radi (ft)				
13.1	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
3.0	velocity (ft/s)	0.035	Manning's roughness	0.85	channel slope (%)
19.3	discharge rate (cfs)	0.16	D'Arcy-Weisbach fric.	0.35	shear stress (lb/sq.ft.)
0.65	Froude number	6.7	resistance factor u/u*	0.42	shear velocity (ft/s)
		4.3	relative roughness	1.11	unit strm power (lb/ft/s)

Cross Section

reference ID: 2
instrument height: ---
longitudinal station: ---

Bankfull Stage

FS: -32.951 = 32.951 elev
elevation: 26.653 ---

Low Bank Height

FS: -32.951 = 32.951 elev
elevation:

Flood Prone Area

width fpa: 12.3

Channel Slope

percent slope: 0.85 ---

Flow Resistance

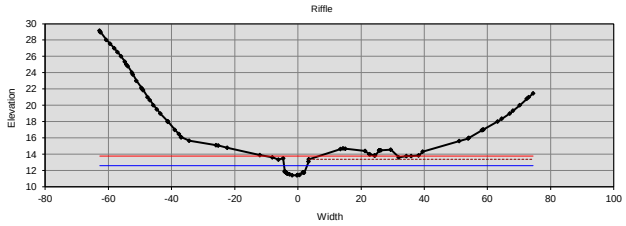
Manning's "n": 0.035 0.036
D'Arcy - Weisbach "f": 0.18

Note:

EX STA 11+19

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
-69.238		0	-39.427	**39.427**		
-69.067		0	-39.387	39.387		
-67.828		0	-39	39		
-64.763		0	-38.11	38.11		
-64.354		0	-38	38		
-64.169		0	-37.944	37.944		
-60.782		0	-37	37		
-60.495		0	-36.978	36.978		
-60.106		0	-36.857	36.857		
-57.409		0	-36.214	36.214		
-57.241		0	-36.168	36.168		
-57.154		0	-36.166	36.166		
-51.438		0	-35.913	35.913		
-38.252		0	-35.123	35.123		
-26.209		0	-34.407	34.407		
-21.849		0	-34.563	34.563		
-11.713		0	-33.262	33.262		
-10.296		0	-32.951	32.951		
-10.071		0	-31.403	31.403		
-8.379		0	-27.362	27.362		
-5.054		0	-26.414	26.414		
-4.908		0	-26.34	26.34		
-4.66		0	-26.318	26.318		
-1.908		0	-25.647	25.647		
-1.403		0	-25.589	25.589		
-1.195		0	-25.631	25.631		
0		0	-25.733	25.733		
3.13		0	-25.997	25.997		
3.687		0	-27.633	27.633		
4.733		0	-28.386	28.386		
4.965		0	-28.618	28.618		
9.753		0	-32.463	32.463		
11.053		0	-33.752	33.752		
11.153		0	-33.764	33.764		
13.759		0	-34.588	34.588		
14.649		0	-34.94	34.94		
18.987		0	-36.42	36.42		
25.19		0	-37.026	37.026		
28.288		0	-37.438	37.438		
30.245		0	-37.605	37.605		
33.723		0	-37.374	37.374		
35.076		0	-37.208	37.208		
35.593		0	-37.268	37.268		
38.086		0	-37.802	37.802		
40.08		0	-38.164	38.164		
42.119		0	-38.69	38.69		
43.742		0	-38.895	38.895		
44.45		0	-38.997	38.997		
44.648		0	-39	39		
46.076		0	-39.48	39.48		
47.66		0	-40	40		
49.392		0	-40.381	40.381		
52.25		0	-41	41		
54.988		0	-41.665	41.665		
56.475		0	-42	42		
59.182		0	-42.669	42.669		
60.634		0	-43	43		
65.259		0	-43.736	43.736		
66.936		0	-44	44		
73.122		0	-44.276	44.276		

Cross Section 5



Bankfull Dimensions		Flood Dimensions		Materials	
6.9	x-section area (ft.sq.)	22.3	W flood prone area (ft)	27	D50 Riffle (mm)
7.3	width (ft)	3.1	entrenchment ratio	50	D84 Riffle (mm)
0.9	mean depth (ft)	2.0	low bank height (ft)	17	threshold grain size (mm):
1.2	max depth (ft)	1.7	low bank height ratio		
8.3	wetted parimeter (ft)				
0.8	hyd radi (ft)				
7.7	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
2.8	velocity (ft/s)	0.039	Manning's roughness	0.68	channel slope (%)
19.3	discharge rate (cfs)	0.19	D'Arcy-Weisbach fric.	0.35	shear stress (lb/sq.ft.)
0.54	Froude number	7.2	resistance factor u/u*	0.43	shear velocity (ft/s)
		5.8	relative roughness	1.13	unit strm power (lb/ft/s)

Cross Section

reference ID: 5
instrument height: 0 ---
longitudinal station: ---

Bankfull Stage

FS: -13.386 = 13.386 elev
elevation: 12.6 ---

Low Bank Height

FS: -13.386 = 13.386 elev
elevation:

Flood Prone Area

width fpa: 22.3

Channel Slope

percent slope: 0.68 ---

Flow Resistance

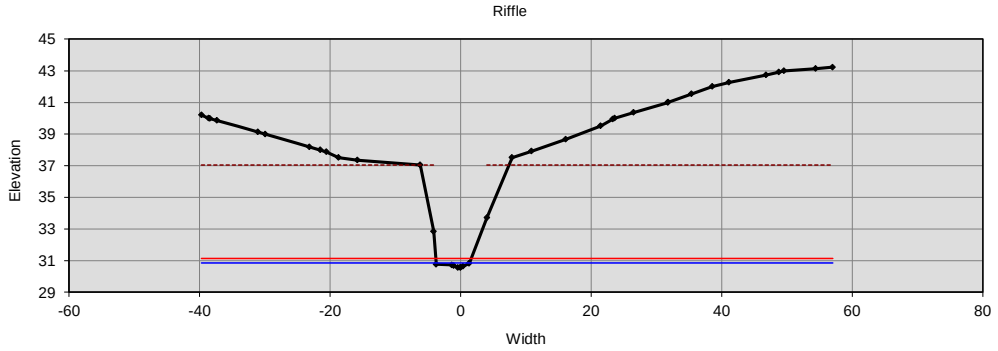
Manning's "n": 0.039 0.035
D'Arcy - Weisbach "f": 0.15

Note:

EX STA 24+81

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
-62.707		0	-29.133	29.133		
-62.494		0	-29	29		
-62.401		0	-28.948	28.948		
-60.599		0	-28	28		
-59.401		0	-27.521	27.521		
-58.122		0	-27	27		
-57.033		0	-26.499	26.499		
-55.991		0	-26	26		
-54.723		0	-25.325	25.325		
-54.21		0	-25	25		
-53.822		0	-24.775	24.775		
-52.508		0	-24	24		
-52.101		0	-23.782	23.782		
-51.077		0	-23	23		
-49.472		0	-22.124	22.124		
-49.246		0	-22	22		
-48.933		0	-21.835	21.835		
-47.548		0	-21	21		
-46.837		0	-20.629	20.629		
-45.669		0	-20	20		
-44.554		0	-19.483	19.483		
-43.525		0	-19	19		
-41.191		0	-18.034	18.034		
-41.121		0	-18	18		
-41.064		0	-17.973	17.973		
-38.954		0	-17	17		
-37.658		0	-16.455	16.455		
-36.882		0	-16.082	16.082		
-36.882		0	-16.082	16.082		
-34.351		0	-15.635	15.635		
-25.887		0	-15.102	15.102		
-25.174		0	-15.077	15.077		
-22.353		0	-14.796	14.796		
-11.963		0	-13.873	13.873		
-8.013		0	-13.596	13.596		
-6.141		0	-13.318	13.318		
-4.635		0	-13.486	13.486		
-4.117		0	-11.92	11.92		
-4.087		0	-11.84	11.84		
-3.718		0	-11.751	11.751		
-3.661		0	-11.706	11.706		
-3.386		0	-11.635	11.635		
-3.293		0	-11.619	11.619		
-2.575		0	-11.538	11.538		
-1.709		0	-11.42	11.42		
-0.229		0	-11.429	11.429		
0		0	-11.44	11.44		
0.606		0	-11.469	11.469		
1.558		0	-11.768	11.768		
1.871		0	-11.759	11.759		
1.967		0	-11.723	11.723		
3.462		0	-13.099	13.099		
3.486		0	-13.386	13.386		
13.528		0	-14.631	14.631		
14.34		0	-14.711	14.711		
15.091		0	-14.678	14.678		
21.292		0	-14.407	14.407		
22.624		0	-14.014	14.014		
22.879		0	-13.975	13.975		
24.259		0	-13.853	13.853		
24.457		0	-13.845	13.845		
25.776		0	-14.461	14.461		
25.824		0	-14.47	14.47		
25.905		0	-14.476	14.476		
26.258		0	-14.478	14.478		
29.493		0	-14.559	14.559		
31.952		0	-13.606	13.606		
34.448		0	-13.752	13.752		
35.914		0	-13.752	13.752		
38.245		0	-13.863	13.863		
39.602		0	-14.332	14.332		
51.106		0	-15.613	15.613		
53.939		0	-15.911	15.911		
54.191		0	-16	16		
58.335		0	-16.925	16.925		
58.547		0	-16.974	16.974		
58.659		0	-17	17		
58.792		0	-17.029	17.029		
63.242		0	-18	18		
64.579		0	-18.336	18.336		
67.101		0	-19	19		
68.169		0	-19.333	19.333		
70.264		0	-20	20		
72.472		0	-20.777	20.777		
73.125		0	-21	21		
74.515		0	-21.461	21.461		

Cross Section 6



Bankfull Dimensions		Flood Dimensions		Materials	
0.8	x-section area (ft.sq.)	5.4	W flood prone area (ft)	27	D50 Riffle (mm)
5.1	width (ft)	1.1	entrenchment ratio	50	D84 Riffle (mm)
0.1	mean depth (ft)	6.5	low bank height (ft)	9	threshold grain size (mm):
0.3	max depth (ft)	22.4	low bank height ratio		
5.2	wetted parimeter (ft)				
0.1	hyd radi (ft)				
34.3	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
1.6	velocity (ft/s)	0.035	Manning's roughness	1.93	channel slope (%)
1.2	discharge rate (cfs)	0.27	D'Arcy-Weisbach fric.	0.18	shear stress (lb/sq.ft.)
0.76	Froude number	3.1	resistance factor u/u*	0.30	shear velocity (ft/s)
		0.9	relative roughness	0.29	unit strm power (lb/ft/s)

Cross Section

reference ID: 6
instrument height: ---
longitudinal station: ---

Bankfull Stage

FS: -37.046 = 37.046 elev
elevation: 30.85 ---

Low Bank Height

FS: -37.046 = 37.046 elev
elevation:

Flood Prone Area

width fpa: 5.4

Channel Slope

percent slope: 1.93 ---

Flow Resistance

Manning's "n": 0.035 0.055
D'Arcy - Weisbach "f": 0.66

Note:

TRIB -- EX STA 02+31

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
-39.693		0	-40.197	40.197	☐	
-38.601		0	-40	40	☐	
-38.428		0	-39.979	39.979	☐	
-37.317		0	-39.854	39.854	☐	
-31.043		0	-39.139	39.139	☐	
-29.938		0	-39	39	☐	
-23.17		0	-38.18	38.18	☐	
-21.494		0	-38	38	☐	
-20.576		0	-37.875	37.875	☐	
-18.686		0	-37.515	37.515	☐	
-15.811		0	-37.345	37.345	☐	
-6.198		0	-37.046	37.046	☐	
-4.142		0	-32.852	32.852	☐	
-3.75		0	-30.768	30.768	☐	
-1.334		0	-30.726	30.726	☐	
-1.06		0	-30.683	30.683	☐	
-0.415		0	-30.561	30.561	☐	
-0.038		0	-30.561	30.561	☐	
0		0	-30.568	30.568	☐	
0.392		0	-30.645	30.645	☐	
1.314		0	-30.818	30.818	☐	
4.023		0	-33.711	33.711	☐	
7.886		0	-37.515	37.515	☐	
10.881		0	-37.925	37.925	☐	
16.091		0	-38.661	38.661	☐	
21.475		0	-39.519	39.519	☐	
23.299		0	-39.946	39.946	☐	
23.596		0	-40	40	☐	
26.502		0	-40.365	40.365	☐	
31.752		0	-41	41	☐	
31.812		0	-41.009	41.009	☐	
35.374		0	-41.534	41.534	☐	
38.544		0	-42	42	☐	
41.118		0	-42.261	42.261	☐	
46.785		0	-42.742	42.742	☐	
48.734		0	-42.918	42.918	☐	
49.536		0	-43	43	☐	
54.404		0	-43.143	43.143	☐	
56.996		0	-43.219	43.219	☐	
					☐	
					☐	
					☐	
					☐	

APPENDIX I

At-a-Station Computations

Rock Creek
At-a-Station Hydraulics

**Bankfull from USFWS Coastal Plain

RC-1

Cross-section ID	Storm	Discharge (cfs)	Reach Slope (%)	Cross-section Area (ft^2)	Width (ft)	Maximum Depth (ft)	Mean Depth (ft)	Width/ Depth	Entrenchment Ratio	Wetted Perimeter (ft)	Width of Floodprone Area (ft)	Low Bank Height Ratio	Velocity (ft/s)	Shear Velocity (ft/s)	Shear Stress (lb/sf)	Froude Number	Threshold Grain Size (mm)	Roughness	WSEL	Rosgen Classification
RC1 XS1	1-year	16.5	1.29	3.7	6.0	0.8	0.6	9.8	4.0	6.5	24.0	1.8	4.5	0.49	0.46	1.04	22	0.026		
RC1 XS1	2-year	34.6	1.29	6.3	7.5	1.2	0.8	8.8	5.3	8.2	39.9	1.2	5.5	0.57	0.62	1.10	31	0.026		
RC1 XS1	TOB	39	1.29	8.7	14.4	1.5	0.6	23.9	3.8	15.2	55.4	1.0	4.5	0.49	0.46	1.05	23	0.026		
RC1 XS1	Bankfull*	19.3	1.29	4.1	6.2	0.9	0.7	9.2	4.3	6.7	26.7	1.7	4.7	0.50	0.49	1.06	24	0.026		E5

RC-2

Cross-section ID	Storm	Discharge (cfs)	Reach Slope (%)	Cross-section Area (ft^2)	Width (ft)	Maximum Depth (ft)	Mean Depth (ft)	Width/ Depth	Entrenchment Ratio	Wetted Perimeter (ft)	Width of Floodprone Area (ft)	Low Bank Height Ratio	Velocity (ft/s)	Shear Velocity (ft/s)	Shear Stress (lb/sf)	Froude Number	Threshold Grain Size (mm)	Roughness	WSEL	Rosgen Classification
RC XS2	1-year	16.5	0.85	5.8	9.0	1.0	0.7	13.8	1.4	9.5	12.1	7.4	2.8	0.41	0.33	0.64	16	0.035		
RC XS2	2-year	34.6	0.85	9.8	10.5	1.4	0.9	11.3	1.3	11.4	13.5	5.3	3.5	0.48	0.45	0.67	22	0.035		
RC XS2	TOB	1004.9	0.85	105.5	20.5	7.4	5.1	4.0	5.9	27.9	121.8	1.0	9.5	1.02	2.01	0.86	99	0.035		
RC XS2	Bankfull*	19.3	0.85	6.5	9.2	1.1	0.7	13.1	1.3	9.9	12.3	6.9	3.0	0.42	0.35	0.65	17	0.035		F5

RC-3

Cross-section ID	Storm	Discharge (cfs)	Reach Slope (%)	Cross-section Area (ft^2)	Width (ft)	Maximum Depth (ft)	Mean Depth (ft)	Width/ Depth	Entrenchment Ratio	Wetted Perimeter (ft)	Width of Floodprone Area (ft)	Low Bank Height Ratio	Velocity (ft/s)	Shear Velocity (ft/s)	Shear Stress (lb/sf)	Froude Number	Threshold Grain Size (mm)	Roughness	WSEL	Rosgen Classification
RC3 XS5	1-year	16.5	0.68	6.2	7.1	1.1	0.9	8.2	1.8	8.0	13.1	1.8	2.7	0.41	0.33	0.53	16	0.039		
RC3 XS5	2-year	107.7	0.68	10.3	7.9	1.6	1.3	6.0	8.0	9.4	63.1	1.2	3.4	0.49	0.47	0.56	23	0.039		
RC3 XS5	TOB	45.5	0.68	13.0	9.2	2.0	1.4	6.4	8.6	11.2	78.6	1.0	3.5	0.51	0.49	0.57	24	0.039		
RC3 XS5	Bankfull*	19.3	0.68	6.9	7.3	1.2	0.9	7.7	3.1	8.3	22.3	1.7	2.8	0.43	0.35	0.54	17	0.039		E5

RC-4 (Trib)

Cross-section ID	Storm	Discharge (cfs)	Reach Slope (%)	Cross-section Area (ft^2)	Width (ft)	Maximum Depth (ft)	Mean Depth (ft)	Width/ Depth	Entrenchment Ratio	Wetted Perimeter (ft)	Width of Floodprone Area (ft)	Low Bank Height Ratio	Velocity (ft/s)	Shear Velocity (ft/s)	Shear Stress (lb/sf)	Froude Number	Threshold Grain Size (mm)	Roughness	WSEL	Rosgen Classification
RC XS6	1-year	2.25	1.93	1.1	5.2	0.4	0.2	24.5	1.1	5.4	5.6	18.3	2.1	0.36	0.25	0.80	12	0.035		
RC XS6	2-year	2.73	1.93	1.2	5.2	0.4	0.2	21.9	1.1	5.5	5.6	17	2.2	0.38	0.27	0.81	13	0.035		
RC XS6	TOB	665.7	1.93	57.1	13.6	6.5	4.2	3.2	8.8	20.6	119.8	1.0	11.7	1.31	3.34	1.23	164	0.035		
RC XS6	Bankfull*	1.2	1.93	0.8	5.1	0.3	0.1	34.3	1.1	5.2	5.4	6.5	1.6	0.30	0.18	0.76	9	0.035		F5

APPENDIX J

BANCS Analysis

BayLand Consultants & Designers

BEHI/NBS SUMMARY

By: MKS
Date: 12/4/2023

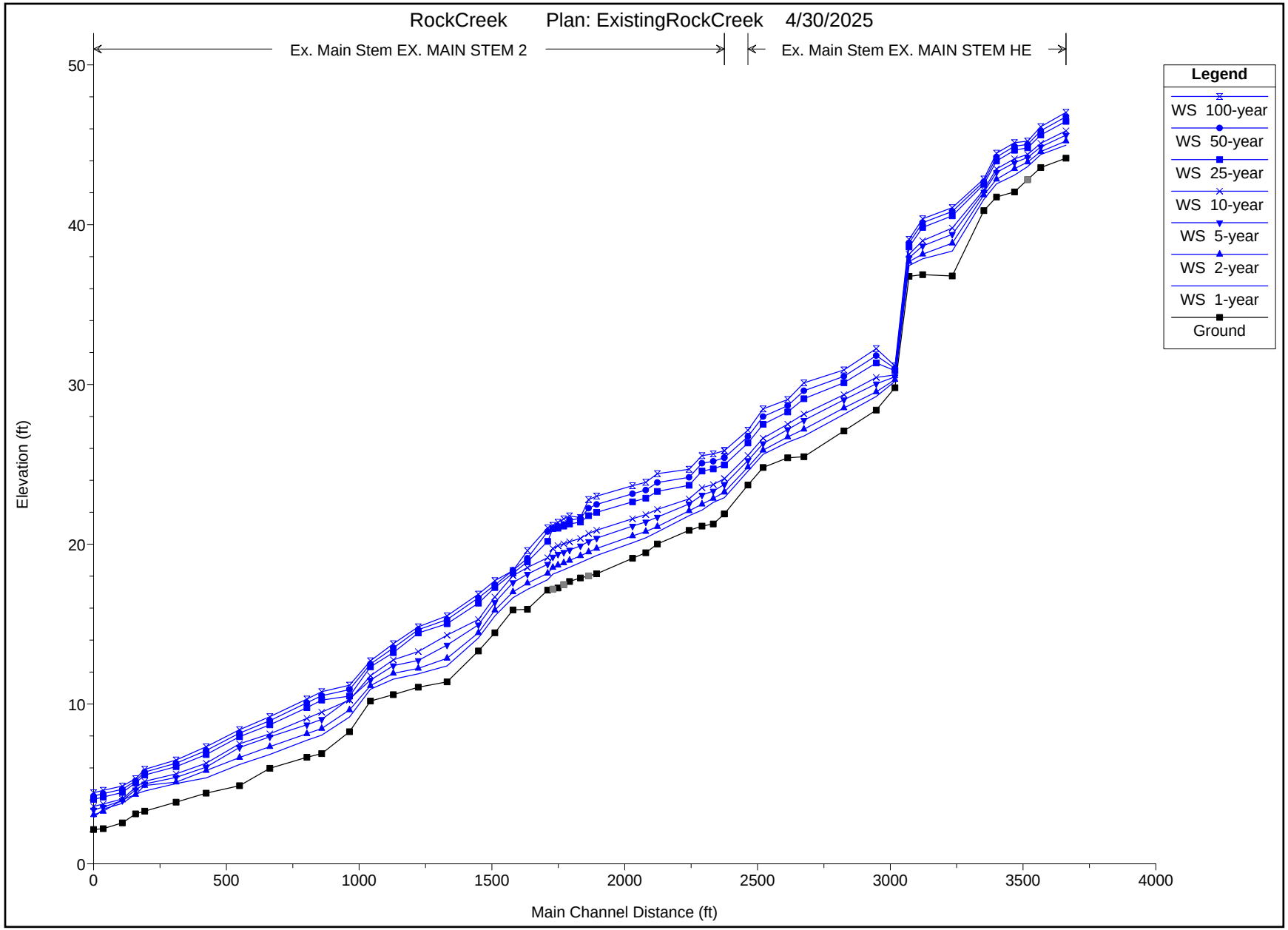
Project Name: Rock Creek Stream Restoration
County: Anne Arundel County
Reach: All

Project Number: 5_20201

Station	BEHI Total Score	Bank Length	Near Bank Stress	Modified NBS	Bank Area (sqft)	BEHI Rating	Modified BEHI	BEHI/NBS	Bank Erosion Rate (ft/yr)	Cu Feet of Sediment per year	Bulk Density Sediment	Sediment Loading
Main Stem												
LB-1	33.3	200	Moderate	3	600	High	4	HighModerate	0.640	384.0	90.52	17.38
RB-1	35.9	200	Low	2	500	High	4	HighLow	0.400	200.0	90.52	9.05
LB-2	38.5	80	Very High	5	800	High	4	HighVery High	1.750	1400.0	90.52	63.36
RB-2	42.0	350	High	4	2450	Very High	5	Very HighHigh	1.000	2450.0	90.52	110.89
LB-3	43.4	225	High	4	1575	Very High	5	Very HighHigh	1.000	1575.0	90.52	71.28
LB-4	40.0	250	High	4	1250	Very High	5	Very HighHigh	1.000	1250.0	90.52	56.58
LB-5	40.1	905	High	4	6335	Very High	5	Very HighHigh	1.000	6335.0	90.52	286.72
LB-6	37.5	290	Very High	5	1740	High	4	HighVery High	1.750	3045.0	112.99	172.03
RB-3	41.6	290	High	4	1740	Very High	5	Very HighHigh	1.000	1740.0	112.99	98.30
LB-7	33.1	140	High	4	560	High	4	HighHigh	1.000	560.0	112.99	31.64
RB-4	39.7	140	Moderate	3	630	Very High	5	Very HighModerate	0.640	403.2	112.99	22.78
LB-8	39.8	220	Moderate	3	660	Very High	5	Very HighModerate	0.640	422.4	112.99	23.86
RB-5	39.8	220	Moderate	3	660	Very High	5	Very HighModerate	0.640	422.4	112.99	23.86
LB-9	35.9	1065	Moderate	3	2130	High	4	HighModerate	0.640	1363.2	112.99	77.01
RB-6	38.0	115	Moderate	3	172.5	High	4	HighModerate	0.640	110.4	112.99	6.24
RB-7	33.2	950	Moderate	3	2375	High	4	HighModerate	0.640	1520.0	112.99	85.87
LB-10	31.0	425	Low	2	425	High	4	HighLow	0.400	170.0	87.40	7.43
RB-8	31.0	425	Low	2	425	High	4	HighLow	0.400	170.0	87.40	7.43
								Main Stem Total		**23,520.60**		**1171.72**
Trib 1 (No proposed work)												
LB-100	31.3	50	Low	2	37.5	High	4	HighLow	0.400	15.0	97.39	0.73
RB-100	34.5	50	Moderate	3	50	High	4	HighModerate	0.640	32.0	97.39	1.56
LB-101	31.8	200	Moderate	3	1000	High	4	HighModerate	0.640	640.0	97.39	31.16
RB-101	35.4	200	Moderate	3	900	High	4	HighModerate	0.640	576.0	97.39	28.05
								Trib 1 Total		**1,263.00**		**61.50**
Trib 2												
LB-200	42.5	585	High	4	3510	Very High	5	Very HighHigh	1.000	3510.0	92.39	162.14
RB-200	41.4	275	High	4	1650	Very High	5	Very HighHigh	1.000	1650.0	92.39	76.22
RB-201	41.4	45	Very High	5	405	Very High	5	Very HighVery High	1.750	708.8	92.39	32.74
RB-202	47.4	265	Extreme	6	3180	Extreme	6	ExtremeExtreme	4.500	14310.0	92.39	661.05
								Trib 2 Total		**20,178.75**		**932.16**
Trib 3 (No proposed work)												
LB-300	35.2	200	Moderate	3	1000	High	4	HighModerate	0.640	640.0	87.40	27.97
RB-300	35.2	200	Moderate	3	1000	High	4	HighModerate	0.640	640.0	87.40	27.97
								Trib 3 Total		**1,280.00**		**55.94**
								TOTAL PROPOSED WORK AREAS				**2103.87**

APPENDIX K

Hydraulic Analysis


RockCreek Plan: ExistingRockCreek 4/30/2025
Ex. Main Stem EX. MAIN STEM 2
Ex. Main Stem EX. MAIN STEM HE
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Elevation (ft)
Main Channel Distance (ft)
0
10
20
30
40
50
0
500
1000
1500
2000
2500
3000
3500
4000

HEC-RAS Plan: Existing

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
EX. MAIN STEM HE	3701.65	1-year	16.50	44.16	44.98	44.77	45.02	0.002678	1.77	9.31	19.83	0.46	0.08		
EX. MAIN STEM HE	3701.65	2-year	34.60	44.16	45.23	44.96	45.32	0.002884	2.37	14.60	21.21	0.50	0.12		
EX. MAIN STEM HE	3701.65	5-year	71.80	44.16	45.60	45.25	45.76	0.003176	3.15	22.82	23.18	0.56	0.19		
EX. MAIN STEM HE	3701.65	10-year	107.80	44.16	45.88	45.48	46.09	0.003387	3.68	29.32	24.69	0.59	0.25		
EX. MAIN STEM HE	3701.65	25-year	213.70	44.16	46.47	46.02	46.82	0.003835	4.76	44.92	28.08	0.66	0.37		
EX. MAIN STEM HE	3701.65	50-year	279.60	44.16	46.75	46.29	47.18	0.004033	5.25	53.23	29.72	0.69	0.44		
EX. MAIN STEM HE	3701.65	100-year	351.10	44.16	47.03	46.56	47.53	0.004215	5.71	61.49	31.27	0.72	0.50		
EX. MAIN STEM HE	3606.81	1-year	16.50	43.58	44.39	44.37	44.53	0.013251	3.00	5.49	17.66	0.95	0.26		
EX. MAIN STEM HE	3606.81	2-year	34.60	43.58	44.58	44.57	44.81	0.012591	3.81	9.09	19.68	0.99	0.36		
EX. MAIN STEM HE	3606.81	5-year	71.80	43.58	44.87	44.87	45.22	0.011709	4.76	15.09	22.10	1.02	0.49		
EX. MAIN STEM HE	3606.81	10-year	107.80	43.58	45.09	45.09	45.53	0.010842	5.31	20.30	23.76	1.01	0.57		
EX. MAIN STEM HE	3606.81	25-year	213.70	43.58	45.61	45.61	46.24	0.009637	6.36	33.58	27.32	1.01	0.73		
EX. MAIN STEM HE	3606.81	50-year	279.60	43.58	45.88	45.88	46.60	0.009206	6.81	41.06	29.13	1.01	0.80		
EX. MAIN STEM HE	3606.81	100-year	351.10	43.58	46.14	46.14	46.94	0.008866	7.20	48.76	30.88	1.01	0.86		
EX. MAIN STEM HE	3507.6	1-year	16.50	42.05	43.10	42.83	43.20	0.003664	2.52	6.55	10.26	0.56	0.14		
EX. MAIN STEM HE	3507.6	2-year	34.60	42.05	43.51	43.24	43.61	0.004295	2.59	13.34	22.85	0.60	0.15		
EX. MAIN STEM HE	3507.6	5-year	71.80	42.05	43.88	43.61	44.04	0.003840	3.15	22.76	26.65	0.60	0.20		
EX. MAIN STEM HE	3507.6	10-year	107.80	42.05	44.13	43.82	44.33	0.003999	3.65	29.49	28.52	0.63	0.25		
EX. MAIN STEM HE	3507.6	25-year	213.70	42.05	44.66	44.31	45.00	0.004355	4.67	45.77	32.59	0.69	0.37		
EX. MAIN STEM HE	3507.6	50-year	279.60	42.05	44.91	44.56	45.32	0.004484	5.15	54.31	35.65	0.72	0.44	0.01	
EX. MAIN STEM HE	3507.6	100-year	351.10	42.05	45.13	44.80	45.63	0.004572	5.68	62.80	40.82	0.74	0.51	0.04	0.04
EX. MAIN STEM HE	3440.06	1-year	16.50	41.73	42.55	42.55	42.76	0.013426	3.66	4.51	10.84	1.00	0.34		
EX. MAIN STEM HE	3440.06	2-year	34.60	41.73	42.84	42.84	43.14	0.011695	4.37	7.91	13.03	0.99	0.43		
EX. MAIN STEM HE	3440.06	5-year	71.80	41.73	43.27	43.27	43.60	0.011549	4.60	15.61	23.78	1.00	0.47		
EX. MAIN STEM HE	3440.06	10-year	107.80	41.73	43.49	43.49	43.90	0.010789	5.09	21.16	26.26	1.00	0.54		
EX. MAIN STEM HE	3440.06	25-year	213.70	41.73	43.99	43.99	44.55	0.009636	6.05	35.34	41.30	1.00	0.67		
EX. MAIN STEM HE	3440.06	50-year	279.60	41.73	44.23	44.23	44.88	0.009181	6.46	43.26	62.45	1.00	0.73		
EX. MAIN STEM HE	3440.06	100-year	351.10	41.73	44.47	44.47	45.19	0.008845	6.81	51.54	83.15	1.00	0.79		
EX. MAIN STEM HE	3392.25	1-year	16.50	40.88	41.58	41.67	41.94	0.021897	4.81	3.43	7.83	1.28	0.59		
EX. MAIN STEM HE	3392.25	2-year	34.60	40.88	41.86	41.98	42.24	0.033878	4.92	7.04	21.80	1.53	0.68		
EX. MAIN STEM HE	3392.25	5-year	71.80	40.88	42.04	42.24	42.68	0.035203	6.38	11.25	24.25	1.65	1.01		
EX. MAIN STEM HE	3392.25	10-year	107.80	40.88	42.19	42.44	43.01	0.035002	7.27	14.84	26.21	1.70	1.22		
EX. MAIN STEM HE	3392.25	25-year	213.70	40.88	42.52	42.89	43.72	0.032155	8.77	24.37	30.47	1.73	1.59		
EX. MAIN STEM HE	3392.25	50-year	279.60	40.88	42.69	43.12	44.07	0.030545	9.43	29.63	31.91	1.73	1.75		
EX. MAIN STEM HE	3392.25	100-year	351.10	40.88	42.86	43.35	44.41	0.028834	9.98	35.18	33.33	1.71	1.88		
EX. MAIN STEM HE	3273.37	1-year	16.50	36.79	38.35	37.75	38.40	0.001833	1.90	8.68	11.68	0.39	0.08		
EX. MAIN STEM HE	3273.37	2-year	34.60	36.79	38.84	38.14	38.92	0.001589	2.16	16.03	15.99	0.38	0.09		
EX. MAIN STEM HE	3273.37	5-year	71.80	36.79	39.40	38.68	39.52	0.001711	2.85	25.22	17.25	0.42	0.14		
EX. MAIN STEM HE	3273.37	10-year	107.80	36.79	39.79	38.95	39.96	0.001870	3.35	32.19	18.26	0.44	0.18		
EX. MAIN STEM HE	3273.37	25-year	213.70	36.79	40.56	39.61	40.88	0.002329	4.54	48.62	30.67	0.52	0.31	0.02	0.02
EX. MAIN STEM HE	3273.37	50-year	279.60	36.79	40.83	39.97	41.26	0.002731	5.29	58.60	41.20	0.57	0.40	0.05	0.04
EX. MAIN STEM HE	3273.37	100-year	351.10	36.79	41.06	40.30	41.62	0.003206	6.06	68.96	48.37	0.63	0.51	0.09	0.07
EX. MAIN STEM HE	3161.78	1-year	16.50	36.87	37.86	37.70	38.05	0.006327	3.42	4.83	6.92	0.72	0.26		
EX. MAIN STEM HE	3161.78	2-year	34.60	36.87	38.15	38.11	38.53	0.009460	4.94	7.55	20.34	0.92	0.50	0.02	0.03
EX. MAIN STEM HE	3161.78	5-year	71.80	36.87	38.67	38.67	39.14	0.007151	5.81	21.98	33.06	0.86	0.59	0.15	0.21
EX. MAIN STEM HE	3161.78	10-year	107.80	36.87	39.00	39.00	39.56	0.006990	6.59	33.84	39.96	0.88	0.71	0.21	0.31
EX. MAIN STEM HE	3161.78	25-year	213.70	36.87	39.83	39.83	40.46	0.005466	7.56	81.34	80.38	0.83	0.82	0.20	0.38
EX. MAIN STEM HE	3161.78	50-year	279.60	36.87	40.12	40.12	40.81	0.005579	8.20	106.02	87.40	0.85	0.93	0.30	0.43
EX. MAIN STEM HE	3161.78	100-year	351.10	36.87	40.37	40.37	41.12	0.005838	8.87	128.30	98.74	0.89	1.06	0.40	0.50
EX. MAIN STEM HE	3110.53	1-year	16.50	36.77	37.44	37.44	37.63	0.010770	3.62	6.31	18.80	0.91	0.32		0.13
EX. MAIN STEM HE	3110.53	2-year	34.60	36.77	37.69	37.69	37.99	0.011096	4.64	11.34	22.01	0.98	0.47	0.02	0.29
EX. MAIN STEM HE	3110.53	5-year	71.80	36.77	37.92	38.10	38.58	0.017272	7.01	17.54	30.67	1.28	0.97	0.16	0.56
EX. MAIN STEM HE	3110.53	10-year	107.80	36.77	38.15	38.40	39.00	0.017419	8.14	25.22	37.65	1.34	1.22	0.28	0.72
EX. MAIN STEM HE	3110.53	25-year	213.70	36.77	38.61	39.06	39.92	0.018772	10.57	47.14	59.55	1.47	1.84	0.50	1.10
EX. MAIN STEM HE	3110.53	50-year	279.60	36.77	38.86	39.31	40.28	0.017681	11.29	63.90	69.79	1.46	2.00	0.60	1.20
EX. MAIN STEM HE	3110.53	100-year	351.10	36.77	39.08	39.52	40.59	0.017083	11.97	79.76	72.55	1.46	2.16	0.80	1.30
EX. MAIN STEM HE	3057.41	1-year	16.50	29.80	30.20	30.55	35.12	3.216143	17.79	0.93	7.94	9.18	22.68		
EX. MAIN STEM HE	3057.41	2-year	34.60	29.80	30.31	30.75	35.47	1.848073	18.24	1.90	10.34	7.51	20.49		
EX. MAIN STEM HE	3057.41	5-year	71.80	29.80	30.48	31.05	35.31	0.974204	17.63	4.07	14.48	5.86	16.59		
EX. MAIN STEM HE	3057.41	10-year	107.80	29.80	30.60	31.28	35.76	0.801241	18.23	5.91	17.27	5.49	16.62		
EX. MAIN STEM HE	3057.41	25-year	213.70	29.80	30.86	31.83	36.71	0.482409	19.39	11.02	20.00	4.61	16.06		
EX. MAIN STEM HE	3057.41	50-year	279.60	29.80	31.01	32.11	37.27	0.393444	20.07	13.93	20.55	4.30	16.07		
EX. MAIN STEM HE	3057.41	100-year	351.10	29.80	31.16	32.39	37.72	0.326302	20.54	17.09	21.06	4.02	15.88		
EX. MAIN STEM HE	2987.08	1-year	16.50	28.40	29.25	29.11	29.38	0.010888	2.92	5.65	10.18	0.69	0.36		
EX. MAIN STEM HE	2987.08	2-year	34.60	28.40	29.54	29.41	29.78	0.012776	3.94	8.78	11.20	0.78	0.59		
EX. MAIN STEM HE	2987.08	5-year	71.80	28.40	30.04	29.84	30.42	0.011637	4.91	14.61	12.06	0.79	0.81		
EX. MAIN STEM HE	2987.08	10-year	107.80	28.40	30.44	30.18	30.91	0.010900	5.50	19.59	12.67	0.78	0.94		
EX. MAIN STEM HE	2987.08	25-year	213.70	28.40	31.35	30.98	32.06	0.010513	6.74	31.69	14.03	0.79	1.27		
EX. MAIN STEM HE	2987.08	50-year	279.60	28.40	31.80	31.39	32.63	0.010545	7.32	38.21	14.72	0.80	1.43		
EX. MAIN STEM HE	2987.08	100-year	351.10	28.40	32.24	31.80	33.19	0.010620	7.84	44.78	15.37	0.81	1.59		
EX. MAIN STEM HE	2865.6	1-year	16.50	27.09	28.13		28.23	0.008211	2.52	6.54	11.65	0.59	0.27		
EX. MAIN STEM HE	2865.6	2-year	34.60	27.09	28.53		28.67	0.006540	3.07	11.26	12.24	0.56	0.35		
EX. MAIN STEM HE	2865.6	5-year	71.80	27.09	29.04		29.29	0.007045	4.06	17.70	13.00	0.61	0.53		
EX. MAIN STEM HE	2865.6	10-year	107.80	27.09	29.36		29.74	0.008297	4.91	21.97	13.48	0.68	0.74		
EX. MAIN STEM HE	2865.6	25-year	213.70	27.09	30.11		30.78	0.010331	6.58	32.48	14.60	0.78	1.21		
EX. MAIN STEM HE	2865.6	50-year	279.60	27.09	30.51		31.33	0.010867	7.27	38.46	15.20	0.81	1.43		
EX. MAIN STEM HE	2865.6	100-year	351.10	27.09	30.91		31.87	0.011175	7.86	44.66	15.80	0.82	1.62		
EX. MAIN STEM HE	2714.78	1-year	16.50	25.48	26.77		26.92	0.009167	3.05	5.41	7.49	0.63	0.37		
EX. MAIN STEM HE	2714.78	2-year	34.60	25.48	27.20		27.41	0.011068	3.68	9.39	11.45	0.72	0.52		
EX. MAIN STEM HE	2714.78	5-year	71.80	25.48	27.76		28.03	0.010095	4.12	17.42	16.88	0.72	0.60		
EX. MAIN STEM HE	2714.78	10-year	107.80	25.48	28.15		28.46	0.008232	4.46	24.19	17.59	0.67	0.64		
EX. MAIN STEM HE	2714.78	25-year	213.70	25.48	29.10		29.52	0.006207	5.14	41.56	18.99	0.61	0.74		
EX. MAIN STEM HE	2714.78	50-year	279.60	25.48	29.61		30.07	0.005701	5.45	51.30	19.84	0.60	0.79		
EX. MAIN STEM HE	2714.78	100-year	351.10	25.48	30.10		30.61	0.005348	5.73	61.28	20.67	0.59	0.84		
EX. MAIN STEM HE	2653.5	1-year	16.50	25.41	26.38		26.47	0.005692	2.34	7.05	10.93	0.51	0.22		
EX. MAIN STEM HE	2653.5	2-year	34.60	25.41	26.72		26.87	0.006732	3.18	10.87	11.85	0.59	0.37		
EX. MAIN STEM HE	2653.5	5-year	71.80	25.41	27.18		27.47	0.008087	4.31	16.64	12.87	0.67	0.61		
EX. MAIN STEM HE	2653.5	10-year	107.80	25.41	27.52		27.93	0.009029	5.13	21.00	13.23	0.72	0.81		
EX. MAIN STEM HE	2653.5	25-year	213.70	25.41	28.28		28.99	0.010833	6.78	31.54	14.35	0.81	1.28		
EX. MAIN STEM HE	2653.5	50-year	279.60	25.41	28.67		29.54	0.011527	7.51	37.23	14.91	0.84	1.52		
EX. MAIN STEM HE	2653.5	100-year	351.10	25.41	29.05	28.75	30.09	0.012010	8.15	43.09	15.45	0.86	1.74		
EX. MAIN STEM HE	2560.79	1-year	16.50	24.80	25.63		25.74	0.011479	2.62	6.31	14.22	0.69	0.31		
EX. MAIN STEM HE	2560.79	2-year	34.60	24.80	25.88		26.07	0.011631	3.47	9.98	14.65	0.74	0.48		

HEC-RAS Plan: Existing (Continued)

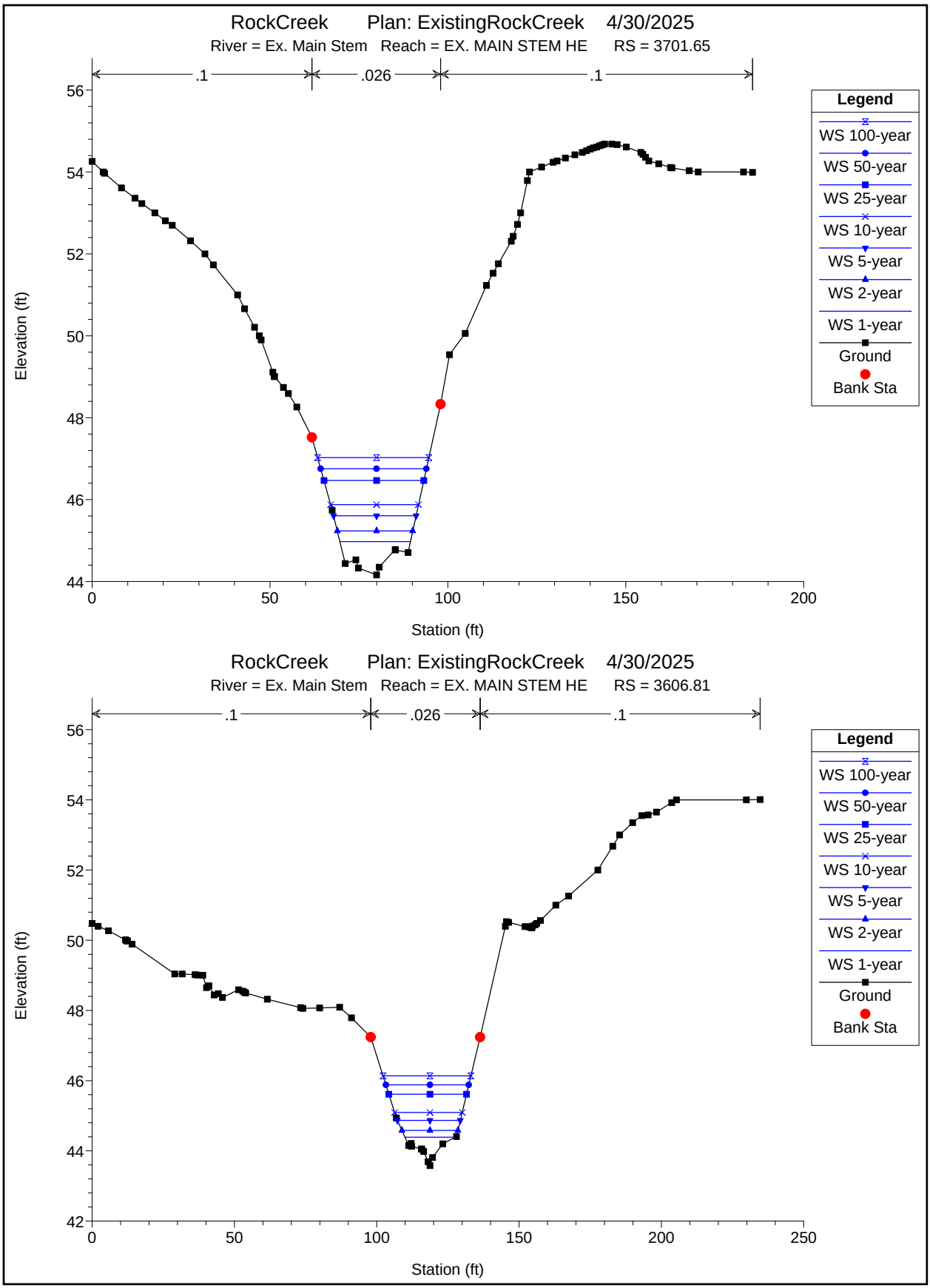
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
EX. MAIN STEM HE	2560.79	5-year	71.80	24.80	26.30		26.60	0.010947	4.43	16.19	15.35	0.76	0.68		
EX. MAIN STEM HE	2560.79	10-year	107.80	24.80	26.64		27.03	0.010262	5.01	21.54	15.96	0.76	0.80		
EX. MAIN STEM HE	2560.79	25-year	213.70	24.80	27.51		28.05	0.008582	5.91	36.16	17.71	0.73	0.99		
EX. MAIN STEM HE	2560.79	50-year	279.60	24.80	27.99		28.59	0.007789	6.22	44.94	18.69	0.71	1.04		
EX. MAIN STEM HE	2560.79	100-year	351.10	24.80	28.47		29.13	0.007150	6.48	54.22	19.66	0.69	1.08		
EX. MAIN STEM HE	2504.06	1-year	16.50	23.71	24.58	24.58	24.78	0.026424	3.67	4.50	11.31	1.02	0.64		
EX. MAIN STEM HE	2504.06	2-year	34.60	23.71	24.84	24.84	25.16	0.022975	4.58	7.55	11.97	1.02	0.86		
EX. MAIN STEM HE	2504.06	5-year	71.80	23.71	25.24	25.24	25.75	0.020425	5.75	12.48	12.43	1.01	1.18		
EX. MAIN STEM HE	2504.06	10-year	107.80	23.71	25.56	25.56	26.22	0.019354	6.52	16.54	12.79	1.01	1.40		
EX. MAIN STEM HE	2504.06	25-year	213.70	23.71	26.33	26.33	27.33	0.017933	7.99	26.76	13.67	1.01	1.86		
EX. MAIN STEM HE	2504.06	50-year	279.60	23.71	26.73	26.73	27.90	0.017646	8.65	32.31	14.12	1.01	2.09		
EX. MAIN STEM HE	2504.06	100-year	351.10	23.71	27.13	27.13	28.46	0.017313	9.22	38.06	14.57	1.01	2.29		
EX. MAIN STEM 2	2415.02	1-year	16.50	21.90	22.92	22.49	22.96	0.002473	1.73	9.55	12.31	0.35	0.11		
EX. MAIN STEM 2	2415.02	2-year	34.60	21.90	23.26	22.75	23.36	0.003462	2.48	13.97	13.34	0.43	0.21		
EX. MAIN STEM 2	2415.02	5-year	71.80	21.90	23.74	23.17	23.93	0.004680	3.47	20.71	14.77	0.52	0.38		
EX. MAIN STEM 2	2415.02	10-year	107.80	21.90	24.10	23.49	24.37	0.005308	4.10	26.28	15.84	0.56	0.51		
EX. MAIN STEM 2	2415.02	25-year	213.70	21.90	24.97	24.23	25.39	0.005871	5.21	41.00	18.22	0.61	0.74		
EX. MAIN STEM 2	2415.02	50-year	279.60	21.90	25.42	24.61	25.92	0.005933	5.65	49.47	19.45	0.62	0.84		
EX. MAIN STEM 2	2415.02	100-year	351.10	21.90	25.86	24.97	26.42	0.005896	6.03	58.18	20.44	0.63	0.93		
EX. MAIN STEM 2	2373.13	1-year	16.50	21.27	22.62	22.55	22.75	0.015412	2.82	5.85	13.96	0.77	0.38		
EX. MAIN STEM 2	2373.13	2-year	34.60	21.27	22.87		23.08	0.014871	3.67	9.44	14.69	0.81	0.55		
EX. MAIN STEM 2	2373.13	5-year	71.80	21.27	23.33		23.63	0.011392	4.35	16.49	16.02	0.76	0.67		
EX. MAIN STEM 2	2373.13	10-year	107.80	21.27	23.74		24.07	0.009091	4.63	23.27	17.20	0.70	0.69		
EX. MAIN STEM 2	2373.13	25-year	213.70	21.27	24.71		25.13	0.006583	5.16	41.40	20.02	0.63	0.75		
EX. MAIN STEM 2	2373.13	50-year	279.60	21.27	25.19		25.65	0.006068	5.45	51.27	21.29	0.62	0.80		
EX. MAIN STEM 2	2373.13	100-year	351.10	21.27	25.65		26.16	0.005710	5.72	61.35	22.40	0.61	0.85		
EX. MAIN STEM 2	2330.83	1-year	16.50	21.14	22.14		22.24	0.009424	2.54	6.50	12.93	0.63	0.28		
EX. MAIN STEM 2	2330.83	2-year	34.60	21.14	22.51		22.64	0.006991	2.96	11.69	14.50	0.58	0.33		
EX. MAIN STEM 2	2330.83	5-year	71.80	21.14	23.08		23.27	0.005495	3.50	20.52	16.24	0.55	0.40		
EX. MAIN STEM 2	2330.83	10-year	107.80	21.14	23.54		23.77	0.004798	3.80	28.38	17.78	0.53	0.44		
EX. MAIN STEM 2	2330.83	25-year	213.70	21.14	24.58		24.88	0.004076	4.39	48.65	21.43	0.51	0.52		
EX. MAIN STEM 2	2330.83	50-year	279.60	21.14	25.07		25.41	0.003944	4.69	59.67	23.17	0.51	0.57		
EX. MAIN STEM 2	2330.83	100-year	351.10	21.14	25.55		25.92	0.003896	4.94	71.10	25.26	0.52	0.62		
EX. MAIN STEM 2	2282.49	1-year	16.50	20.87	21.79		21.88	0.005905	2.40	6.88	10.24	0.52	0.23		
EX. MAIN STEM 2	2282.49	2-year	34.60	20.87	22.09		22.27	0.008052	3.45	10.02	10.60	0.63	0.43		
EX. MAIN STEM 2	2282.49	5-year	71.80	20.87	22.52		22.89	0.010856	4.89	14.67	11.08	0.75	0.79		
EX. MAIN STEM 2	2282.49	10-year	107.80	20.87	22.84		23.38	0.012918	5.87	18.37	11.83	0.83	1.08		
EX. MAIN STEM 2	2282.49	25-year	213.70	20.87	23.70	23.52	24.49	0.014132	7.17	29.81	15.03	0.90	1.49		
EX. MAIN STEM 2	2282.49	50-year	279.60	20.87	24.19	23.95	25.04	0.013077	7.43	37.62	16.87	0.88	1.55		
EX. MAIN STEM 2	2282.49	100-year	351.10	20.87	24.69		25.57	0.011584	7.54	46.58	18.55	0.84	1.53		
EX. MAIN STEM 2	2162.99	1-year	16.50	20.02	20.77		20.88	0.012399	2.74	6.01	13.37	0.72	0.34		
EX. MAIN STEM 2	2162.99	2-year	34.60	20.02	21.11		21.27	0.008775	3.20	10.80	14.52	0.65	0.40		
EX. MAIN STEM 2	2162.99	5-year	71.80	20.02	21.70		21.90	0.005927	3.60	19.93	16.48	0.58	0.43		
EX. MAIN STEM 2	2162.99	10-year	107.80	20.02	22.18		22.41	0.004752	3.82	28.18	17.79	0.54	0.44		
EX. MAIN STEM 2	2162.99	25-year	213.70	20.02	23.30		23.59	0.003516	4.30	49.65	20.22	0.48	0.49		
EX. MAIN STEM 2	2162.99	50-year	279.60	20.02	23.87		24.19	0.003263	4.56	61.29	21.29	0.47	0.53		
EX. MAIN STEM 2	2162.99	100-year	351.10	20.02	24.42		24.77	0.003075	4.79	73.34	22.34	0.47	0.56		
EX. MAIN STEM 2	2119.15	1-year	16.50	19.47	20.40		20.50	0.006419	2.43	6.78	10.66	0.54	0.24		
EX. MAIN STEM 2	2119.15	2-year	34.60	19.47	20.80		20.95	0.006112	3.10	11.16	11.41	0.55	0.34		
EX. MAIN STEM 2	2119.15	5-year	71.80	19.47	21.40		21.64	0.005946	3.93	18.25	12.29	0.57	0.49		
EX. MAIN STEM 2	2119.15	10-year	107.80	19.47	21.85		22.16	0.005977	4.49	24.01	12.97	0.58	0.60		
EX. MAIN STEM 2	2119.15	25-year	213.70	19.47	22.89		23.37	0.006155	5.59	38.25	14.51	0.61	0.83		
EX. MAIN STEM 2	2119.15	50-year	279.60	19.47	23.39		23.97	0.006398	6.13	45.65	15.23	0.62	0.97		
EX. MAIN STEM 2	2119.15	100-year	351.10	19.47	23.88		24.55	0.006541	6.59	53.31	15.94	0.63	1.08		
EX. MAIN STEM 2	2069.5	1-year	16.50	19.12	20.09		20.18	0.006157	2.42	6.82	10.68	0.53	0.24		
EX. MAIN STEM 2	2069.5	2-year	34.60	19.12	20.52		20.66	0.005364	2.99	11.59	11.61	0.53	0.32		
EX. MAIN STEM 2	2069.5	5-year	71.80	19.12	21.13		21.35	0.005246	3.76	19.11	12.94	0.55	0.44		
EX. MAIN STEM 2	2069.5	10-year	107.80	19.12	21.60		21.88	0.005228	4.26	25.32	13.89	0.56	0.53		
EX. MAIN STEM 2	2069.5	25-year	213.70	19.12	22.65		23.07	0.005198	5.20	41.11	15.99	0.57	0.72		
EX. MAIN STEM 2	2069.5	50-year	279.60	19.12	23.16		23.65	0.005337	5.66	49.39	16.99	0.59	0.82		
EX. MAIN STEM 2	2069.5	100-year	351.10	19.12	23.66		24.23	0.005343	6.03	58.23	17.99	0.59	0.90		
EX. MAIN STEM 2	1934.24	1-year	16.50	18.15	19.30		19.40	0.005387	2.46	6.70	8.81	0.50	0.24		
EX. MAIN STEM 2	1934.24	2-year	34.60	18.15	19.74		19.89	0.006081	3.15	10.99	10.83	0.55	0.35		
EX. MAIN STEM 2	1934.24	5-year	71.80	18.15	20.38		20.61	0.005783	3.84	18.70	12.93	0.56	0.47		
EX. MAIN STEM 2	1934.24	10-year	107.80	18.15	20.88		21.16	0.005410	4.23	25.48	14.30	0.56	0.53		
EX. MAIN STEM 2	1934.24	25-year	213.70	18.15	22.00		22.38	0.004873	4.95	43.16	17.28	0.55	0.66		
EX. MAIN STEM 2	1934.24	50-year	279.60	18.15	22.49		22.94	0.004996	5.38	51.96	18.55	0.57	0.75		
EX. MAIN STEM 2	1934.24	100-year	351.10	18.15	23.01		23.51	0.004965	5.65	62.14	20.48	0.57	0.80		
EX. MAIN STEM 2	1873.32	1-year	16.50	17.89	18.85	18.61	18.97	0.006988	2.73	6.04	8.43	0.57	0.29		
EX. MAIN STEM 2	1873.32	2-year	34.60	17.89	19.28	18.95	19.47	0.007306	3.54	9.78	9.30	0.61	0.44		
EX. MAIN STEM 2	1873.32	5-year	71.80	17.89	19.90	19.47	20.21	0.007667	4.51	15.94	10.58	0.65	0.64		
EX. MAIN STEM 2	1873.32	10-year	107.80	17.89	20.37	19.87	20.77	0.007740	5.09	21.17	11.55	0.66	0.77		
EX. MAIN STEM 2	1873.32	25-year	213.70	17.89	21.39	20.77	22.00	0.008176	6.29	34.00	21.43	0.70	1.07		
EX. MAIN STEM 2	1873.32	50-year	279.60	17.89	21.63	21.23	22.50	0.010738	7.47	37.45	29.37	0.81	1.48		
EX. MAIN STEM 2	1873.32	100-year	351.10	17.89	21.67	21.67	23.00	0.016337	9.25	37.94	30.64	1.00	2.27		
EX. MAIN STEM 2	1832.11	1-year	16.50	17.67	18.56	18.33	18.68	0.007328	2.73	6.05	8.87	0.58	0.30		
EX. MAIN STEM 2	1832.11	2-year	34.60	17.67	18.98	18.67	19.17	0.007249	3.43	10.08	10.21	0.61	0.42		
EX. MAIN STEM 2	1832.11	5-year	71.80	17.67	19.64	19.17	19.90	0.006584	4.11	17.46	12.30	0.61	0.54		
EX. MAIN STEM 2	1832.11	10-year	107.80	17.67	20.16	19.54	20.46	0.005967	4.45	24.23	13.96	0.60	0.59		
EX. MAIN STEM 2	1832.11	25-year	213.70	17.67	21.27	20.39	21.68	0.005106	5.13	42.14	65.70	0.58	0.70	0.04	
EX. MAIN STEM 2	1832.11	50-year	279.60	17.67	21.49	20.80	22.07	0.006662	6.14	47.25	90.09	0.67	0.98	0.10	
EX. MAIN STEM 2	1832.11	100-year	351.10	17.67	21.78	21.19	22.33	0.006097	6.29	94.14	96.74	0.65	1.00	0.21	0.06
EX. MAIN STEM 2	1788.49	1-year	16.50	17.26	18.26	18.02	18.36	0.006728	2.62	6.31	9.08	0.55	0.27		
EX. MAIN STEM 2	1788.49	2-year	34.60	17.26	18.69	18.33	18.86	0.006497	3.31	10.47	10.08	0.57	0.39		
EX. MAIN STEM 2	1788.49	5-year	71.80	17.26	19.38	18.82	19.63	0.005892	4.00	17.93	11.68	0.57	0.50		
EX. MAIN STEM 2	1788.49	10-year	107.80	17.26	19.91	19.21	20.21	0.005498	4.40	24.49	12.91	0.56	0.57		
EX. MAIN STEM 2	1788.49	25-year	213.70	17.26	21.00	20.07	21.45	0.005373	5.34	41.36	74.03	0.58	0.75	0.06	
EX. MAIN STEM 2	1788.49	50-year	279.60	17.26	21.11	20.51	21.71	0.007370	6.38	65.56	91.28	0.68	1.07	0.14	
EX. MAIN STEM 2	1788.49	100-year	351.10	17.26	21.37	20.96	22.02	0.007690	6.85	89.15	92.02	0.71	1.20	0.27	0.02
EX. MAIN STEM 2	1749.95	1-year	16.50	17.13	17.78	17.75	18.02	0.021028	3.93	4.20	7.71	0.94	0.67		
EX. MAIN STEM 2	1749.95	2-year	34.60	17.13	18.18	18.09	18.52	0.016239	4.68	7.40	8.20	0.87	0.82		
EX. MAIN STEM 2	1749.95	5-year	71.80	17.13	18.75	18.63	19.28	0.015531	5.85	12.26	8.90	0.88	1.13		
EX. MAIN STEM 2	1749.95	10-year	107.80	17.13	19.15	19.04	19.86	0.016271	6.75	15.97	9.39	0.91	1.41		

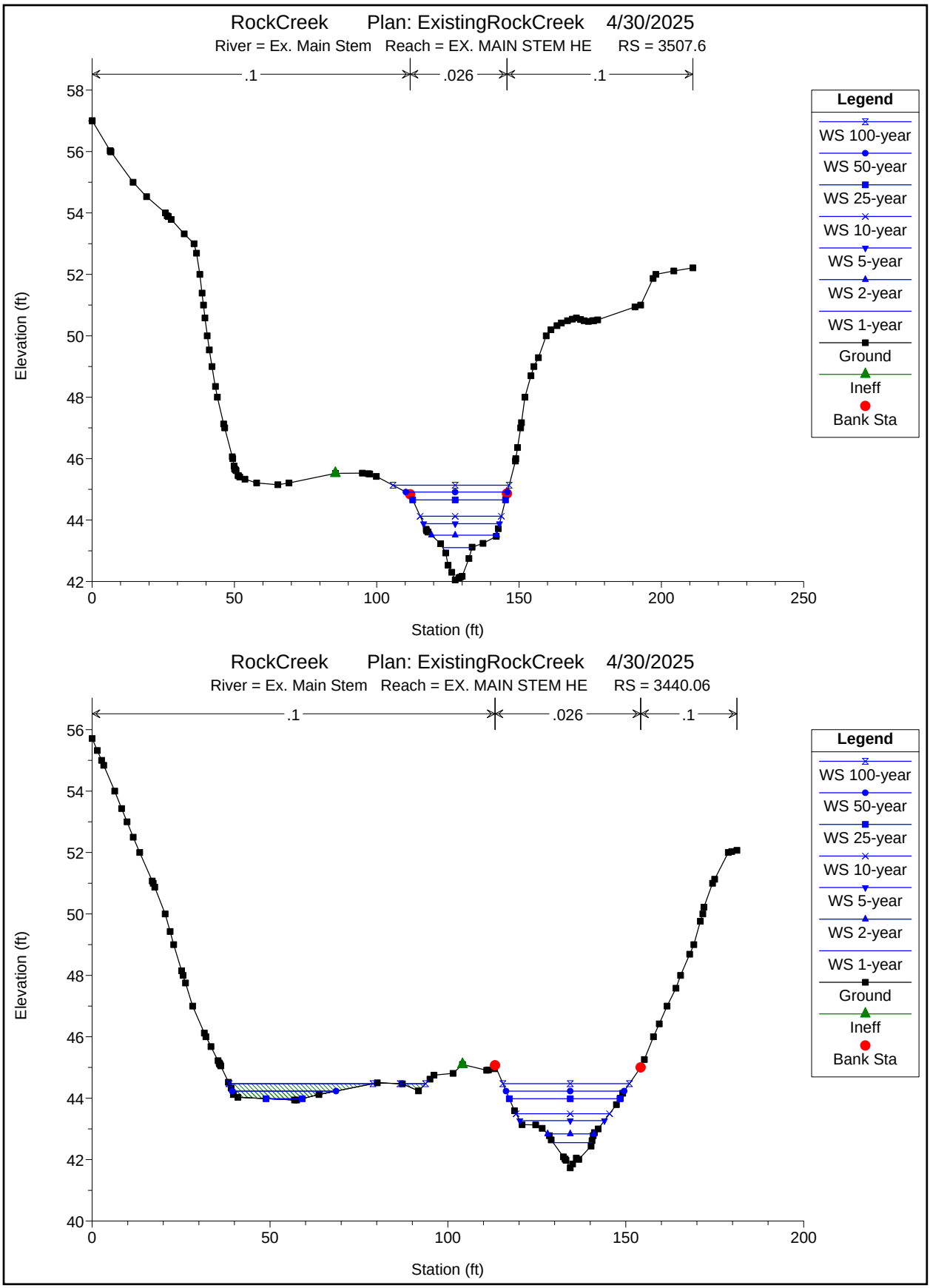
HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
EX. MAIN STEM 2	1749.95	25-year	213.70	17.13	20.18	20.11	21.12	0.016211	7.77	27.93	40.81	0.95	1.74	0.08	
EX. MAIN STEM 2	1749.95	50-year	279.60	17.13	20.79	20.79	21.40	0.008737	6.72	76.49	82.28	0.72	1.20	0.33	0.10
EX. MAIN STEM 2	1749.95	100-year	351.10	17.13	21.03	21.03	21.68	0.009082	7.25	96.09	85.37	0.75	1.36	0.47	0.16
EX. MAIN STEM 2	1673.69	1-year	16.50	15.93	17.17	16.82	17.25	0.005375	2.26	7.30	9.46	0.45	0.24		
EX. MAIN STEM 2	1673.69	2-year	34.60	15.93	17.57	17.14	17.71	0.006558	3.06	11.31	10.64	0.52	0.40		
EX. MAIN STEM 2	1673.69	5-year	71.80	15.93	18.13	17.63	18.38	0.007786	4.04	17.76	12.30	0.59	0.64		
EX. MAIN STEM 2	1673.69	10-year	107.80	15.93	18.55	18.01	18.88	0.008403	4.66	23.14	13.62	0.63	0.81		
EX. MAIN STEM 2	1673.69	25-year	213.70	15.93	18.90	18.85	19.80	0.018272	7.62	28.51	22.84	0.95	2.05	0.09	0.09
EX. MAIN STEM 2	1673.69	50-year	279.60	15.93	19.12	19.35	20.34	0.021500	8.88	33.90	30.57	1.05	2.69	0.27	0.28
EX. MAIN STEM 2	1673.69	100-year	351.10	15.93	19.60	19.79	20.73	0.016100	8.76	54.99	52.53	0.94	2.45	0.43	0.46
EX. MAIN STEM 2	1619.34	1-year	16.50	15.89	16.65	16.55	16.79	0.015308	2.99	5.53	15.76	0.72	0.48		
EX. MAIN STEM 2	1619.34	2-year	34.60	15.89	17.02	16.83	17.23	0.012476	3.63	9.53	17.17	0.70	0.61		
EX. MAIN STEM 2	1619.34	5-year	71.80	15.89	17.60	17.27	17.90	0.010183	4.36	16.50	20.54	0.67	0.77		0.03
EX. MAIN STEM 2	1619.34	10-year	107.80	15.89	18.03	17.61	18.40	0.009242	4.89	23.61	46.51	0.66	0.89		0.14
EX. MAIN STEM 2	1619.34	25-year	213.70	15.89	18.19	18.13	18.77	0.016229	6.81	48.44	52.64	0.88	1.69	1.10	0.41
EX. MAIN STEM 2	1619.34	50-year	279.60	15.89	18.37	18.47	19.10	0.019207	7.81	58.34	57.25	0.97	2.16	1.12	0.69
EX. MAIN STEM 2	1619.34	100-year	351.10	15.89	18.35	18.74	19.54	0.031488	9.94	57.23	56.74	1.23	3.50	1.86	1.09
EX. MAIN STEM 2	1550.93	1-year	16.50	14.46	15.51	15.40	15.70	0.016562	3.51	4.70	12.44	0.77	0.63		
EX. MAIN STEM 2	1550.93	2-year	34.60	14.46	15.88	15.78	16.20	0.018298	4.54	7.62	15.13	0.85	0.95		
EX. MAIN STEM 2	1550.93	5-year	71.80	14.46	16.36	16.31	16.90	0.021206	5.92	12.13	21.71	0.95	1.46		
EX. MAIN STEM 2	1550.93	10-year	107.80	14.46	16.70	16.70	17.43	0.022481	6.84	15.77	25.53	1.00	1.84		
EX. MAIN STEM 2	1550.93	25-year	213.70	14.46	17.29	17.29	17.77	0.013758	6.61	58.22	76.99	0.82	1.54	0.29	1.08
EX. MAIN STEM 2	1550.93	50-year	279.60	14.46	17.46	17.51	18.05	0.016003	7.51	71.14	77.88	0.90	1.94	0.50	1.36
EX. MAIN STEM 2	1550.93	100-year	351.10	14.46	17.72	17.72	18.30	0.014494	7.71	91.71	79.26	0.87	1.97	0.68	1.38
EX. MAIN STEM 2	1489.01	1-year	16.50	13.32	14.14	14.14	14.38	0.028087	4.00	4.13	8.09	0.99	0.87		
EX. MAIN STEM 2	1489.01	2-year	34.60	13.32	14.47	14.47	14.84	0.026097	4.93	7.02	9.38	1.00	1.17		
EX. MAIN STEM 2	1489.01	5-year	71.80	13.32	14.96	14.96	15.51	0.023497	5.99	11.99	10.74	1.00	1.52		
EX. MAIN STEM 2	1489.01	10-year	107.80	13.32	15.29	15.33	16.03	0.022887	6.88	16.01	13.40	1.02	1.86		0.21
EX. MAIN STEM 2	1489.01	25-year	213.70	13.32	16.31	16.40	16.99	0.011943	7.03	48.27	64.11	0.80	1.64	0.25	0.50
EX. MAIN STEM 2	1489.01	50-year	279.60	13.32	16.65	16.72	17.30	0.010549	7.21	73.32	78.69	0.77	1.65	0.37	0.55
EX. MAIN STEM 2	1489.01	100-year	351.10	13.32	16.88	16.95	17.57	0.010873	7.72	91.54	80.88	0.79	1.84	0.53	0.66
EX. MAIN STEM 2	1370.67	1-year	16.50	11.39	12.39	11.97	12.40	0.001100	0.89	18.48	30.45	0.20	0.04		
EX. MAIN STEM 2	1370.67	2-year	34.60	11.39	12.86	12.12	12.88	0.000733	1.04	33.24	31.74	0.18	0.05		
EX. MAIN STEM 2	1370.67	5-year	71.80	11.39	13.69	12.33	13.71	0.000483	1.19	60.27	34.83	0.16	0.05	0.00	
EX. MAIN STEM 2	1370.67	10-year	107.80	11.39	14.32	12.51	14.34	0.000395	1.31	88.83	53.42	0.15	0.06	0.01	0.00
EX. MAIN STEM 2	1370.67	25-year	213.70	11.39	15.02	12.93	15.08	0.000616	1.94	133.17	69.86	0.19	0.11	0.03	0.02
EX. MAIN STEM 2	1370.67	50-year	279.60	11.39	15.28	13.16	15.36	0.000787	2.31	152.61	80.41	0.22	0.16	0.04	0.04
EX. MAIN STEM 2	1370.67	100-year	351.10	11.39	15.52	13.39	15.62	0.000962	2.68	172.08	83.06	0.25	0.20	0.06	0.06
EX. MAIN STEM 2	1262.41	1-year	16.50	11.05	11.89	11.76	12.08	0.016677	3.55	4.65	6.56	0.74	0.64		
EX. MAIN STEM 2	1262.41	2-year	34.60	11.05	12.23	12.13	12.62	0.021807	4.99	6.93	6.76	0.87	1.14		
EX. MAIN STEM 2	1262.41	5-year	71.80	11.05	12.73	12.73	13.47	0.028569	6.91	10.39	7.03	1.00	1.98		
EX. MAIN STEM 2	1262.41	10-year	107.80	11.05	13.29	13.29	14.13	0.026432	7.35	14.90	11.70	0.98	2.13		0.12
EX. MAIN STEM 2	1262.41	25-year	213.70	11.05	14.45	14.45	14.88	0.009606	6.18	66.38	79.28	0.64	1.28	0.29	0.38
EX. MAIN STEM 2	1262.41	50-year	279.60	11.05	14.65	14.65	15.12	0.010472	6.75	82.99	82.36	0.68	1.49	0.40	0.54
EX. MAIN STEM 2	1262.41	100-year	351.10	11.05	14.83	14.83	15.35	0.011425	7.32	97.92	84.51	0.71	1.72	0.52	0.71
EX. MAIN STEM 2	1168.75	1-year	16.50	10.59	11.56	11.12	11.59	0.002193	1.40	11.76	22.83	0.29	0.10		
EX. MAIN STEM 2	1168.75	2-year	34.60	10.59	11.92	11.34	11.98	0.002614	1.93	17.97	32.65	0.34	0.16		
EX. MAIN STEM 2	1168.75	5-year	71.80	10.59	12.40	11.69	12.48	0.002687	2.40	41.16	45.92	0.36	0.22		0.09
EX. MAIN STEM 2	1168.75	10-year	107.80	10.59	12.77	11.96	12.86	0.002695	2.70	61.19	63.89	0.37	0.27		0.10
EX. MAIN STEM 2	1168.75	25-year	213.70	10.59	13.22	12.53	13.40	0.004172	3.87	93.32	79.67	0.47	0.51	0.02	0.24
EX. MAIN STEM 2	1168.75	50-year	279.60	10.59	13.51	12.82	13.72	0.004121	4.20	117.91	87.49	0.48	0.58	0.07	0.31
EX. MAIN STEM 2	1168.75	100-year	351.10	10.59	13.77	13.05	14.01	0.004175	4.54	141.59	92.10	0.49	0.65	0.11	0.37
EX. MAIN STEM 2	1082.61	1-year	16.50	10.19	10.93	10.93	11.10	0.032513	3.33	4.96	14.46	1.00	0.68		
EX. MAIN STEM 2	1082.61	2-year	34.60	10.19	11.15	11.15	11.42	0.028523	4.19	8.26	19.36	1.01	0.93		
EX. MAIN STEM 2	1082.61	5-year	71.80	10.19	11.50	11.50	11.92	0.024981	5.24	13.70	32.73	1.01	1.27		
EX. MAIN STEM 2	1082.61	10-year	107.80	10.19	11.77	11.77	12.31	0.022090	5.89	18.80	50.36	0.99	1.46	0.08	0.19
EX. MAIN STEM 2	1082.61	25-year	213.70	10.19	12.33	12.33	12.79	0.013742	6.10	62.19	67.48	0.83	1.37	0.58	0.49
EX. MAIN STEM 2	1082.61	50-year	279.60	10.19	12.50	12.50	13.07	0.015525	6.92	74.19	70.65	0.90	1.71	0.78	0.68
EX. MAIN STEM 2	1082.61	100-year	351.10	10.19	12.70	12.70	13.35	0.015896	7.51	88.75	74.37	0.93	1.94	0.93	0.85
EX. MAIN STEM 2	1003.65	1-year	16.50	8.27	9.18	9.03	9.33	0.013041	3.11	5.31	13.04	0.69	0.49		
EX. MAIN STEM 2	1003.65	2-year	34.60	8.27	9.63	9.36	9.85	0.010916	3.75	9.22	16.09	0.66	0.62		
EX. MAIN STEM 2	1003.65	5-year	71.80	8.27	10.32	9.88	10.43	0.003885	2.89	26.61	20.62	0.41	0.33	0.23	
EX. MAIN STEM 2	1003.65	10-year	107.80	8.27	10.25	10.25	10.54	0.010182	4.57	25.26	19.92	0.67	0.82	0.61	
EX. MAIN STEM 2	1003.65	25-year	213.70	8.27	10.49	10.58	11.28	0.023675	7.57	30.45	22.62	1.04	2.17	1.43	
EX. MAIN STEM 2	1003.65	50-year	279.60	8.27	10.90	10.97	11.66	0.017961	7.59	43.89	45.70	0.93	2.03	1.26	0.18
EX. MAIN STEM 2	1003.65	100-year	351.10	8.27	11.18	11.31	11.97	0.016655	7.95	58.15	56.62	0.92	2.14	1.09	0.40
EX. MAIN STEM 2	898.69	1-year	16.50	6.90	8.05	7.79	8.18	0.009400	2.89	5.70	17.57	0.58	0.41		
EX. MAIN STEM 2	898.69	2-year	34.60	6.90	8.47	8.17	8.70	0.011041	3.84	9.02	19.97	0.66	0.65		
EX. MAIN STEM 2	898.69	5-year	71.80	6.90	9.04	8.74	9.43	0.012666	5.02	14.30	27.49	0.73	1.00		
EX. MAIN STEM 2	898.69	10-year	107.80	6.90	9.49	9.14	9.57	0.001794	2.30	53.79	48.93	0.29	0.19		0.04
EX. MAIN STEM 2	898.69	25-year	213.70	6.90	10.25	9.26	10.37	0.002000	2.99	101.97	85.03	0.32	0.29	0.04	0.13
EX. MAIN STEM 2	898.69	50-year	279.60	6.90	10.52	9.26	10.68	0.002276	3.41	127.83	98.07	0.35	0.37	0.07	0.19
EX. MAIN STEM 2	898.69	100-year	351.10	6.90	10.77	9.55	10.96	0.002528	3.79	152.36	100.94	0.38	0.44	0.12	0.24
EX. MAIN STEM 2	843.07	1-year	16.50	6.67	7.73	7.40	7.80	0.004832	2.06	8.02	11.10	0.43	0.21		
EX. MAIN STEM 2	843.07	2-year	34.60	6.67	8.14	7.68	8.26	0.005186	2.71	12.77	12.09	0.47	0.32		
EX. MAIN STEM 2	843.07	5-year	71.80	6.67	8.70	8.12	8.90	0.006079	3.59	19.98	18.44	0.53	0.50		
EX. MAIN STEM 2	843.07	10-year	107.80	6.67	9.10	8.46	9.38	0.006703	4.18	25.76	26.26	0.56	0.65		
EX. MAIN STEM 2	843.07	25-year	213.70	6.67	9.77	9.26	10.16	0.007126	5.29	69.05	94.72	0.61	0.94	0.19	0.17
EX. MAIN STEM 2	843.07	50-year	279.60	6.67	10.09	9.88	10.46	0.006409	5.47	99.61	97.27	0.59	0.96	0.29	0.25
EX. MAIN STEM 2	843.07	100-year	351.10	6.67	10.31	10.09	10.72	0.006668	5.89	121.90	98.84	0.61	1.08	0.39	0.34
EX. MAIN STEM 2	703.67	1-year	16.50	5.98	6.85	6.59	6.94	0.007912	2.47	6.69	10.05	0.53	0.31		
EX. MAIN STEM 2	703.67	2-year	34.60	5.98	7.34	6.90	7.47	0.006192	2.88	12.01	11.75	0.50	0.36		
EX. MAIN STEM 2	703.67	5-year	71.80	5.98	7.95	7.37	8.13	0.005046	3.49	27.93	45.57	0.49	0.46	0.06	0.09
EX. MAIN STEM 2	703.67	10-year	107.80	5.98	8.14	7.83	8.42	0.007104	4.46	37.40	52.42	0.59	0.73	0.12	0.20
EX. MAIN STEM 2	703.67	25-year	213.70	5.98	8.70	8.37	9.11	0.008262	5.78	73.24	74.78	0.67	1.11	0.35	0.38
EX. MAIN STEM 2	703.67	50-year	279.60	5.98	8.96	8.81	9.43	0.008880	6.42	95.51	94.61	0.70	1.33	0.46	0.42
EX. MAIN STEM 2	703.67	100-year	351.10	5.98	9.21	9.11	9.69	0.008717	6.76	119.34	98.51	0.71	1.43	0.53	0.53
EX. MAIN STEM 2	589.35	1-year	16.50	4.89	6.21	5.73	6.29	0.004290	2.18	7.59	8.54	0.41	0.22		
EX. MAIN STEM 2	589.35	2-year	34.60	4.89	6.65	6.11	6.79	0.005640	2.96	11.72	13.65	0.48	0.37	0.01	
EX. MAIN STEM 2	589.35	5-year	71.80	4.89	7.28	6.67	7.50	0.005847	3.80	21.64	72.25	0.52	0.54	0.12	0.03
EX. MAIN STEM 2	589.35	10-year	107.80	4.89	7.51	7.07	7.69	0.005087	3.87	59.84	86.60	0.50	0.54	0.12	0.18
EX. MAIN STEM 2	589.35	25-year	213.70	4.89	7.96	7.71	8.21	0.006505	5.04	100.03	93.32	0.58	0.85	0.29	0.39
EX. MAIN STEM 2	589.35	50-year	279.60	4.89	8.18	7.90	8.46	0.006946	5.53	121.00	94.89	0.61	1.00	0.40	0.51

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
EX. MAIN STEM 2	589.35	100-year	351.10	4.89	8.39	8.08	8.70	0.007334	5.99	141.28	96.36	0.63	1.14	0.51	0.62
EX. MAIN STEM 2	463.67	1-year	16.50	4.42	5.38	5.14	5.51	0.009522	2.88	5.73	11.48	0.60	0.41		
EX. MAIN STEM 2	463.67	2-year	34.60	4.42	5.84	5.51	5.99	0.007506	3.26	13.69	33.83	0.56	0.46		0.09
EX. MAIN STEM 2	463.67	5-year	71.80	4.42	6.05	6.05	6.39	0.015327	5.09	21.49	46.48	0.81	1.07		0.31
EX. MAIN STEM 2	463.67	10-year	107.80	4.42	6.29	6.29	6.68	0.016059	5.74	31.17	50.21	0.85	1.30		0.55
EX. MAIN STEM 2	463.67	25-year	213.70	4.42	6.84	6.74	7.20	0.012207	6.20	70.16	85.57	0.78	1.36	0.29	0.80
EX. MAIN STEM 2	463.67	50-year	279.60	4.42	7.09	6.95	7.45	0.011354	6.48	92.96	92.41	0.77	1.43	0.40	0.91
EX. MAIN STEM 2	463.67	100-year	351.10	4.42	7.33	7.14	7.70	0.010758	6.75	115.69	97.72	0.76	1.50	0.50	1.00
EX. MAIN STEM 2	350.48	1-year	16.50	3.86	5.02	4.49	5.05	0.001993	1.38	11.97	26.22	0.28	0.09		
EX. MAIN STEM 2	350.48	2-year	34.60	3.86	5.11	4.79	5.22	0.006141	2.58	13.39	26.49	0.50	0.31		
EX. MAIN STEM 2	350.48	5-year	71.80	3.86	5.41	5.13	5.50	0.003941	2.43	29.78	40.21	0.41	0.25	0.01	0.01
EX. MAIN STEM 2	350.48	10-year	107.80	3.86	5.63	5.38	5.77	0.004530	2.95	41.90	62.56	0.46	0.35	0.05	0.05
EX. MAIN STEM 2	350.48	25-year	213.70	3.86	6.08	5.63	6.32	0.005679	4.04	73.85	78.31	0.54	0.59	0.18	0.18
EX. MAIN STEM 2	350.48	50-year	279.60	3.86	6.30	5.88	6.58	0.006176	4.55	91.25	84.90	0.57	0.72	0.25	0.26
EX. MAIN STEM 2	350.48	100-year	351.10	3.86	6.49	6.10	6.84	0.006650	5.04	108.56	90.78	0.61	0.86	0.31	0.35
EX. MAIN STEM 2	232.34	1-year	16.50	3.30	4.56	4.16	4.66	0.006377	2.59	6.37	32.97	0.49	0.31		
EX. MAIN STEM 2	232.34	2-year	34.60	3.30	4.91	4.58	4.92	0.001132	1.26	33.38	78.21	0.22	0.07	0.03	0.00
EX. MAIN STEM 2	232.34	5-year	71.80	3.30	5.00	4.84	5.06	0.003219	2.23	43.34	88.31	0.37	0.21	0.10	0.04
EX. MAIN STEM 2	232.34	10-year	107.80	3.30	5.16	4.84	5.23	0.003963	2.70	57.75	93.51	0.42	0.29	0.15	0.08
EX. MAIN STEM 2	232.34	25-year	213.70	3.30	5.55	5.11	5.66	0.004684	3.49	97.13	106.60	0.47	0.45	0.27	0.17
EX. MAIN STEM 2	232.34	50-year	279.60	3.30	5.74	5.25	5.86	0.004975	3.86	117.44	108.59	0.50	0.54	0.34	0.24
EX. MAIN STEM 2	232.34	100-year	351.10	3.30	5.91	5.37	6.06	0.005362	4.25	136.16	111.54	0.52	0.63	0.41	0.31
EX. MAIN STEM 2	197.96	1-year	16.50	3.13	4.36	3.94	4.45	0.005386	2.47	6.69	55.86	0.46	0.28		
EX. MAIN STEM 2	197.96	2-year	34.60	3.13	4.34	4.34	4.77	0.025410	5.30	6.53	53.79	0.99	1.29		
EX. MAIN STEM 2	197.96	5-year	71.80	3.13	4.63	4.63	4.84	0.015591	4.71	34.56	86.24	0.80	0.96	0.50	
EX. MAIN STEM 2	197.96	10-year	107.80	3.13	4.79	4.69	4.98	0.015449	4.95	58.40	101.48	0.80	1.03	0.54	0.42
EX. MAIN STEM 2	197.96	25-year	213.70	3.13	5.06	4.69	5.34	0.021998	6.47	88.90	117.98	0.98	1.68	0.99	0.88
EX. MAIN STEM 2	197.96	50-year	279.60	3.13	5.19	5.17	5.52	0.024359	7.22	104.04	121.39	1.04	2.03	1.24	1.16
EX. MAIN STEM 2	197.96	100-year	351.10	3.13	5.32	5.29	5.69	0.025337	7.80	120.31	123.77	1.08	2.31	1.46	1.40
EX. MAIN STEM 2	148.31	1-year	16.50	2.56	3.79	3.63	4.01	0.016284	3.76	4.39	68.34	0.74	0.69		
EX. MAIN STEM 2	148.31	2-year	34.60	2.56	4.01	3.96	4.02	0.002135	1.51	43.43	95.83	0.27	0.11	0.06	
EX. MAIN STEM 2	148.31	5-year	71.80	2.56	3.96	3.96	4.04	0.012097	3.51	39.01	93.69	0.65	0.58	0.30	
EX. MAIN STEM 2	148.31	10-year	107.80	2.56	4.06	3.96	4.17	0.015725	4.17	48.30	99.36	0.75	0.80	0.47	
EX. MAIN STEM 2	148.31	25-year	213.70	2.56	4.46	4.18	4.55	0.010286	3.92	99.69	136.06	0.62	0.66	0.48	0.27
EX. MAIN STEM 2	148.31	50-year	279.60	2.56	4.67	4.30	4.76	0.008762	3.99	128.41	142.53	0.59	0.65	0.50	0.33
EX. MAIN STEM 2	148.31	100-year	351.10	2.56	4.87	4.39	4.96	0.007713	4.08	156.98	144.40	0.56	0.65	0.53	0.37
EX. MAIN STEM 2	75.84	1-year	16.50	2.20	3.43	2.95	3.48	0.003538	1.91	8.62	92.45	0.37	0.17		
EX. MAIN STEM 2	75.84	2-year	34.60	2.20	3.28	3.28	3.65	0.026517	4.84	7.14	67.72	1.01	1.14		
EX. MAIN STEM 2	75.84	5-year	71.80	2.20	3.55	3.55	3.58	0.002785	1.80	55.96	111.21	0.34	0.15	0.08	
EX. MAIN STEM 2	75.84	10-year	107.80	2.20	3.74	3.55	3.78	0.003093	2.08	77.75	129.94	0.36	0.19	0.12	0.01
EX. MAIN STEM 2	75.84	25-year	213.70	2.20	4.18	3.55	4.22	0.003071	2.63	137.76	132.81	0.38	0.27	0.20	0.11
EX. MAIN STEM 2	75.84	50-year	279.60	2.20	4.39	3.65	4.45	0.003145	2.91	166.22	133.98	0.40	0.31	0.25	0.15
EX. MAIN STEM 2	75.84	100-year	351.10	2.20	4.60	3.75	4.66	0.003204	3.17	194.06	135.11	0.41	0.36	0.29	0.19
EX. MAIN STEM 2	39.91	1-year	16.50	2.15	2.90	2.90	3.18	0.028420	4.26	3.87	49.34	0.99	0.96		
EX. MAIN STEM 2	39.91	2-year	34.60	2.15	3.07	3.07	3.10	0.004020	1.81	26.02	54.51	0.38	0.16	0.11	
EX. MAIN STEM 2	39.91	5-year	71.80	2.15	3.37	3.07	3.41	0.005000	2.34	47.16	90.12	0.44	0.25	0.17	0.04
EX. MAIN STEM 2	39.91	10-year	107.80	2.15	3.60	3.09	3.64	0.005002	2.70	70.75	119.78	0.46	0.31	0.18	0.11
EX. MAIN STEM 2	39.91	25-year	213.70	2.15	4.03	3.42	4.09	0.005001	3.38	125.09	129.19	0.48	0.44	0.30	0.23
EX. MAIN STEM 2	39.91	50-year	279.60	2.15	4.24	3.58	4.31	0.005003	3.68	152.50	130.68	0.49	0.50	0.36	0.29
EX. MAIN STEM 2	39.91	100-year	351.10	2.15	4.44	3.72	4.53	0.005004	3.97	179.41	132.14	0.50	0.56	0.42	0.34


RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM HE RS = 3701.65
.1
.026
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM HE RS = 3606.81
.1
.026
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta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River = Ex. Main Stem Reach = EX. MAIN STEM HE RS = 3507.6
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Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM HE RS = 3440.06
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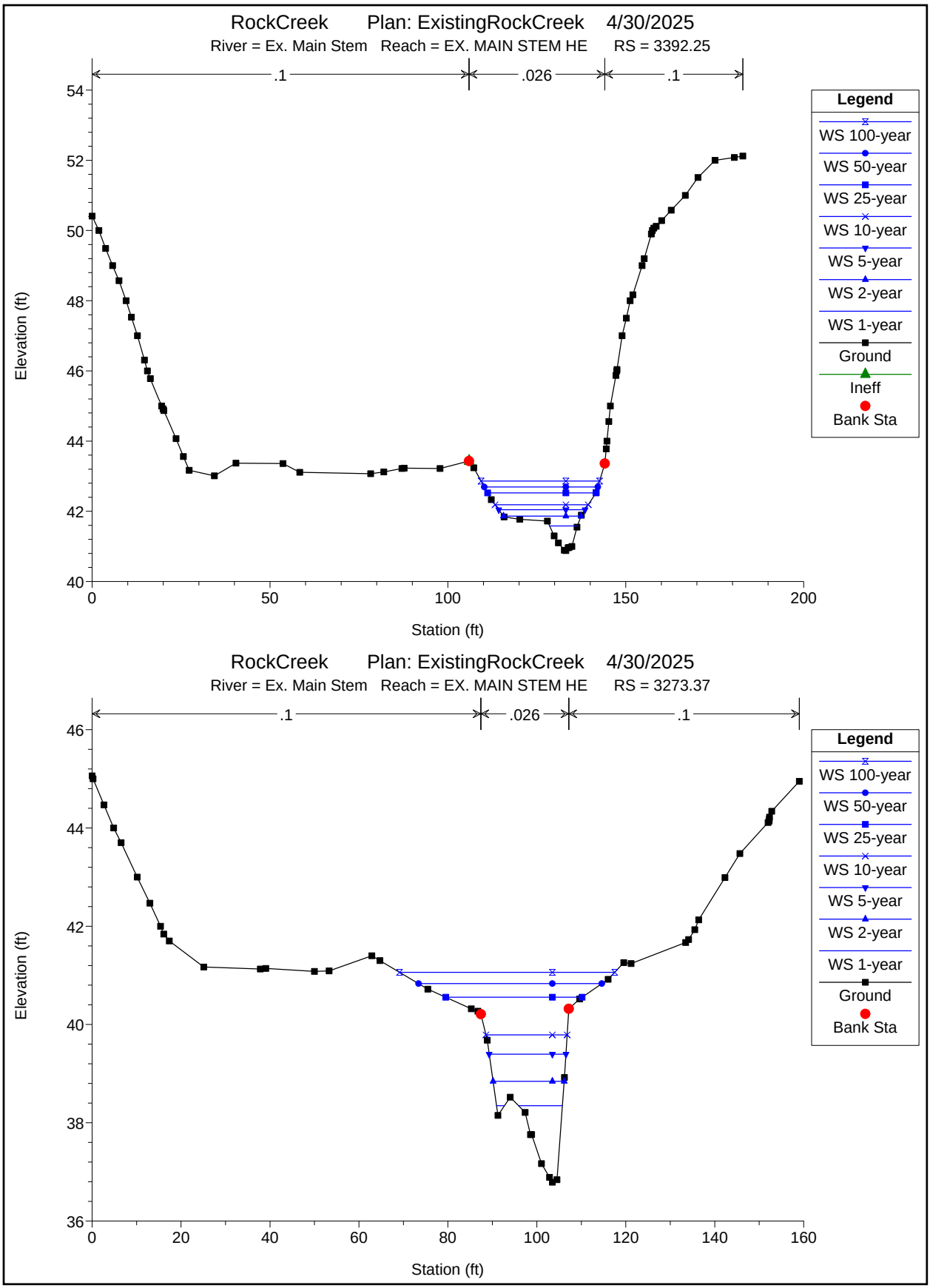
.026
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta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Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM HE RS = 3273.37
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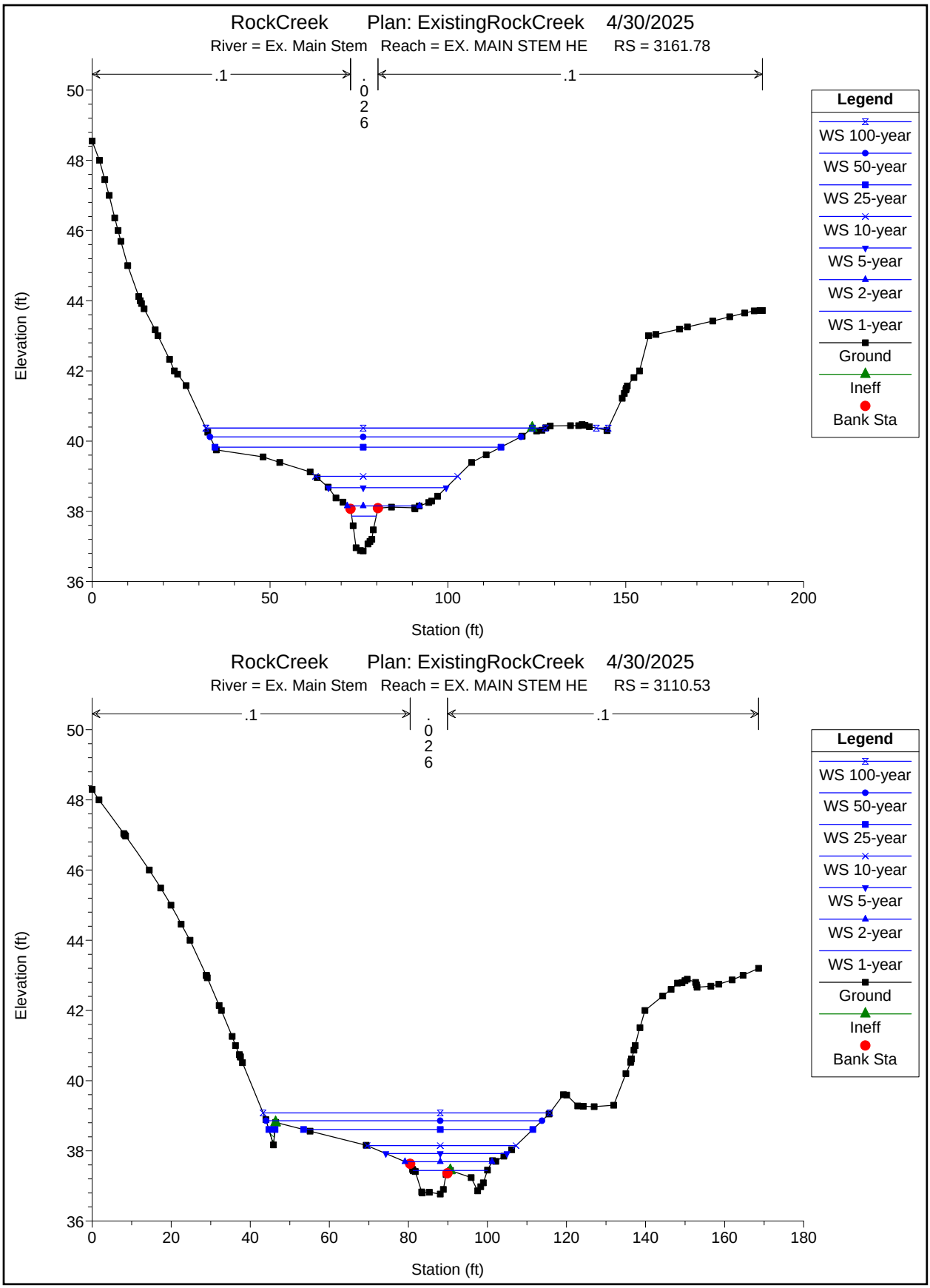
.026
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta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Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM HE RS = 3110.53
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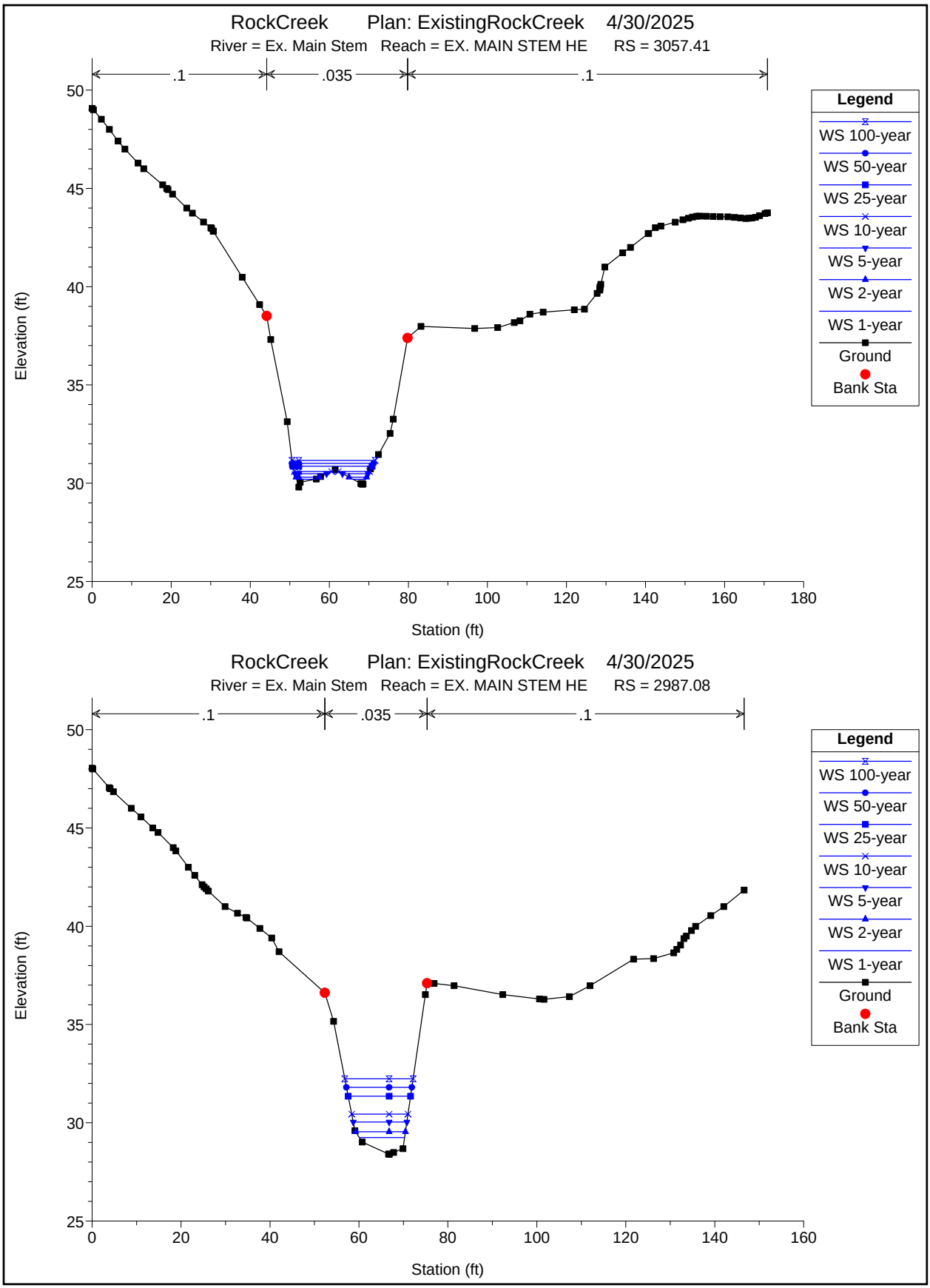
.026
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta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Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM HE RS = 2987.08
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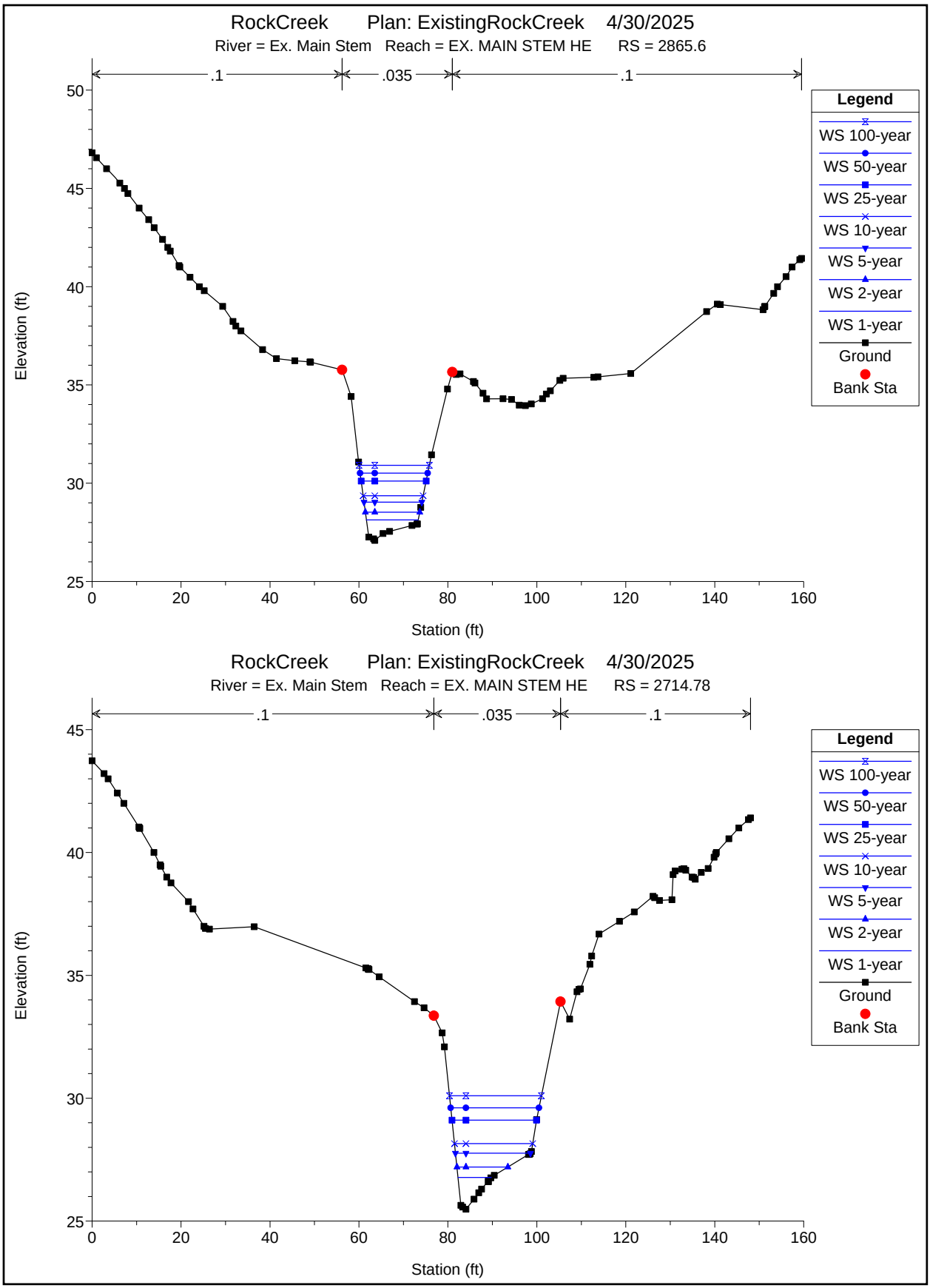
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta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River = Ex. Main Stem Reach = EX. MAIN STEM HE RS = 2865.6
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Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
Elevation (ft)
Station (ft)
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM HE RS = 2714.78
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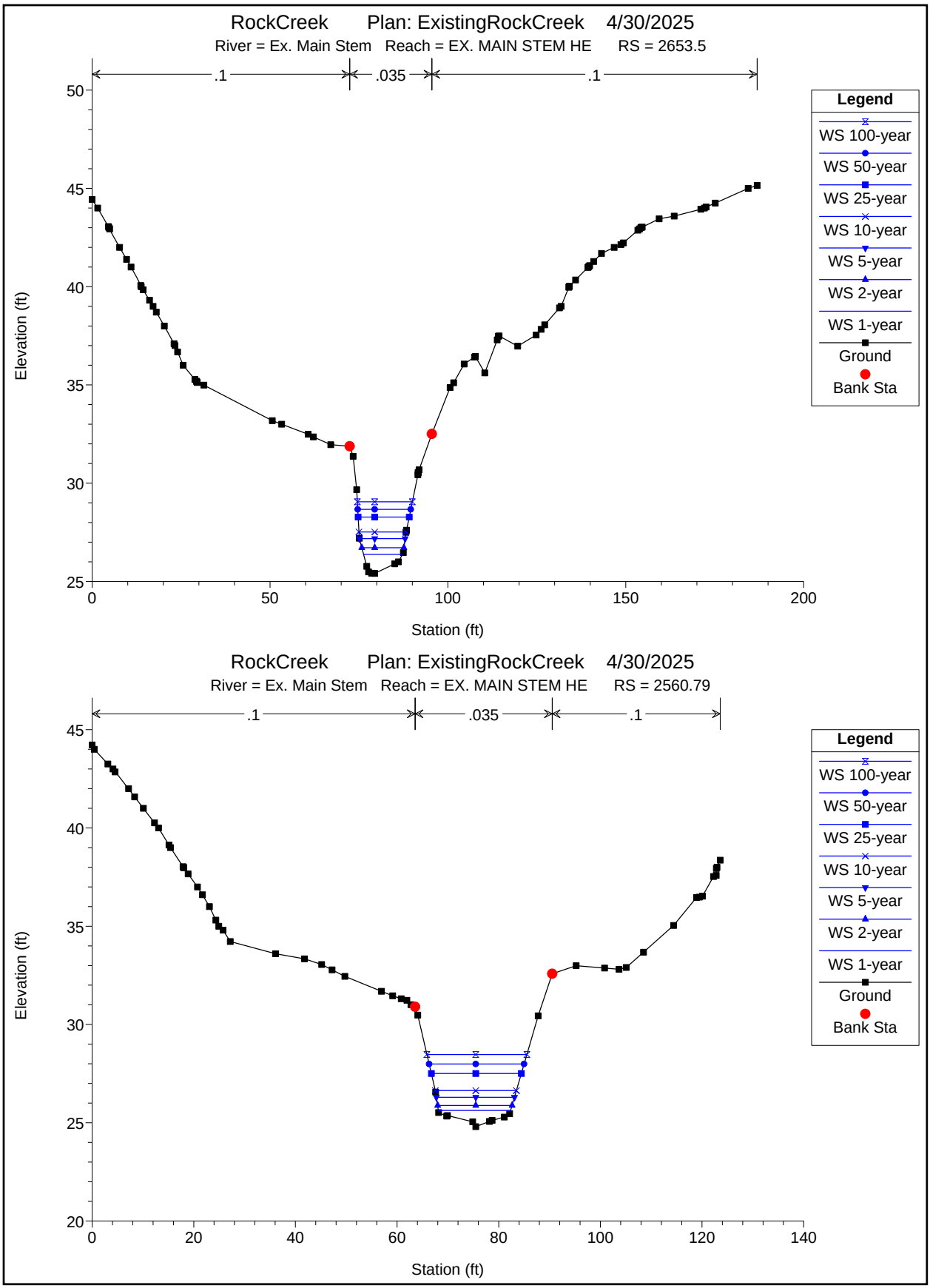
.035
.1
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
Elevation (ft)
Station (ft)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Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
Elevation (ft)
Station (ft)
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM HE RS = 2560.79
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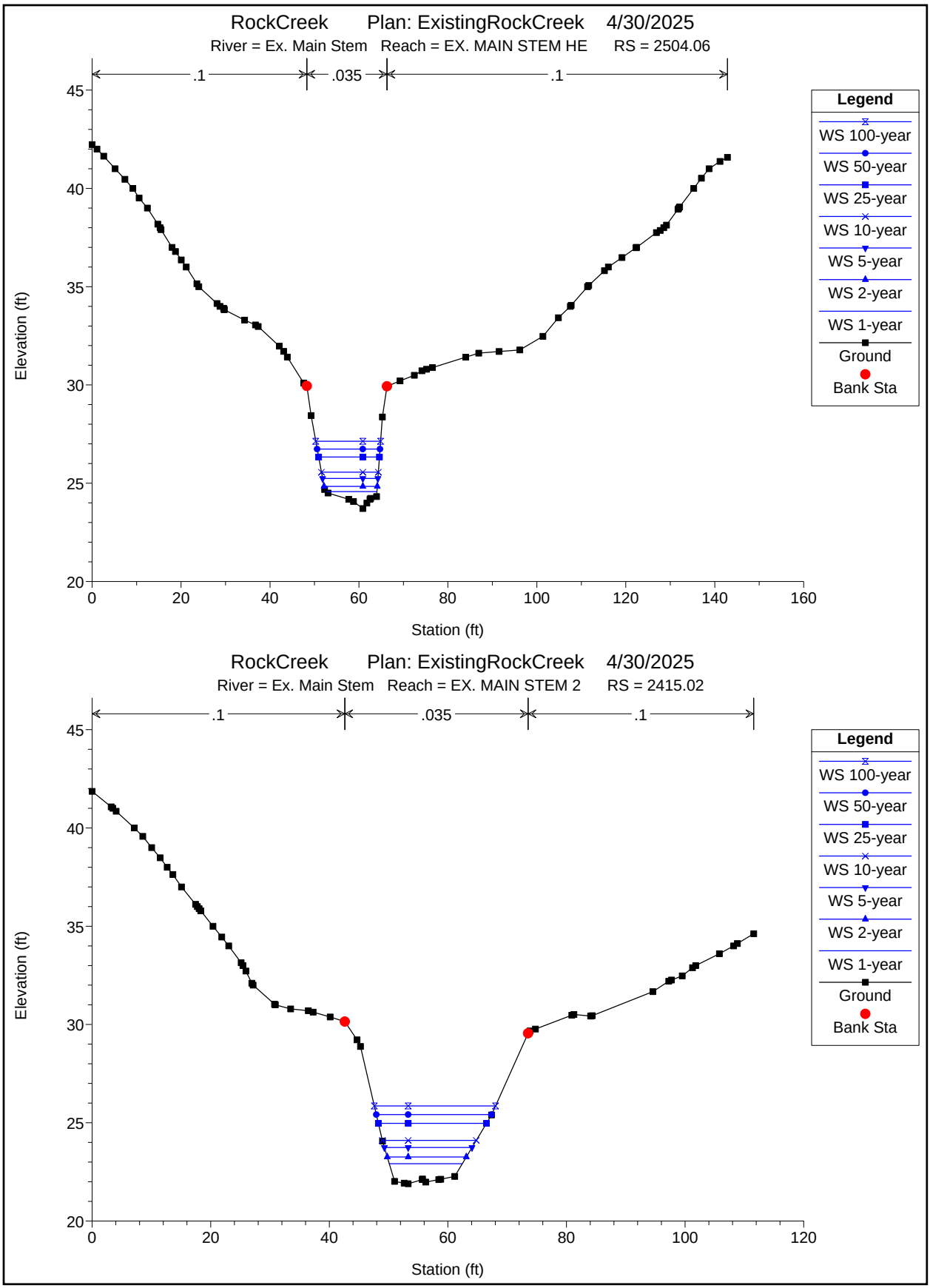
.035
.1
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
Elevation (ft)
Station (ft)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Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 2415.02
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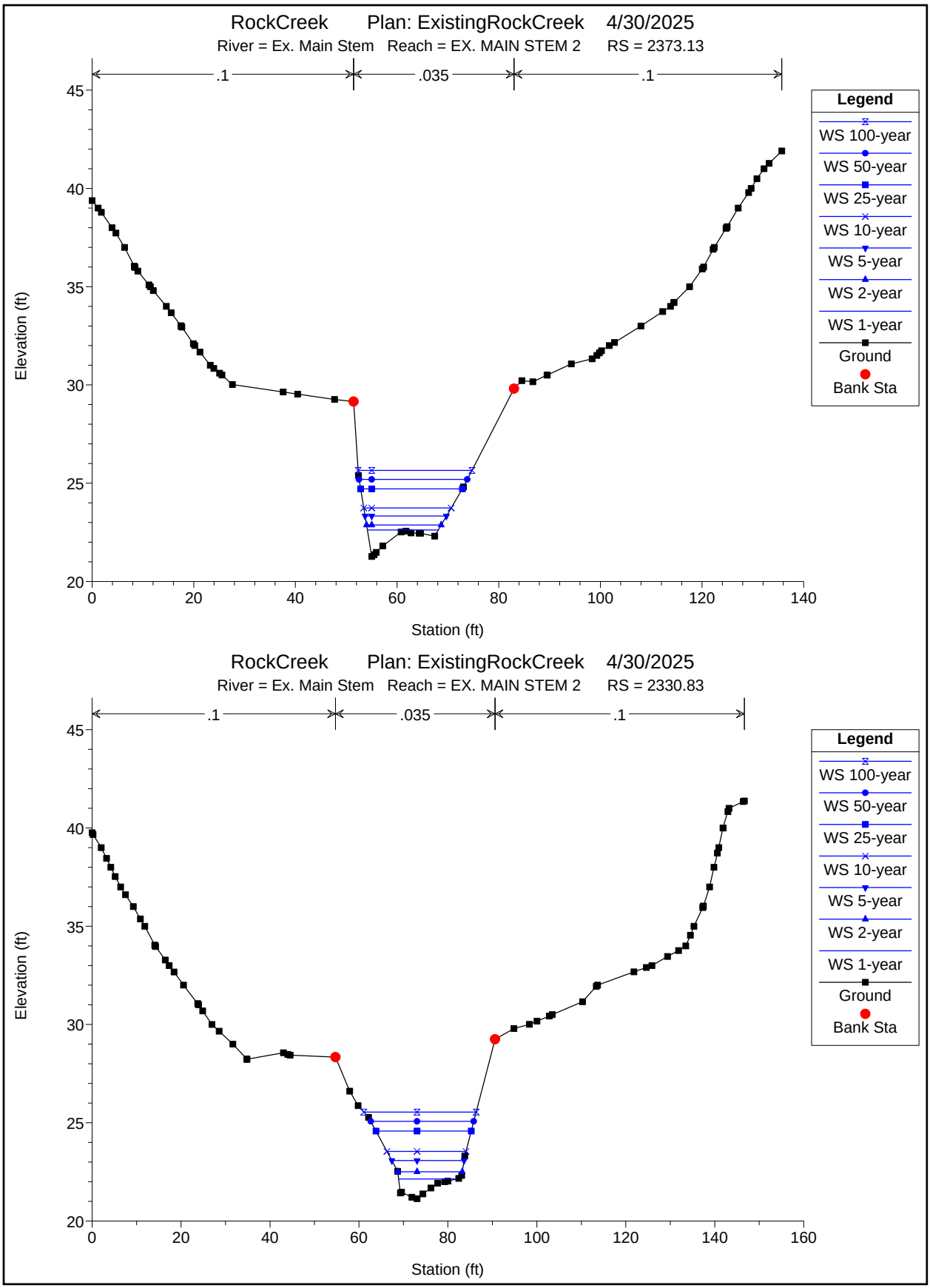
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta


RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 2373.13
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Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 2330.83
.1
.035
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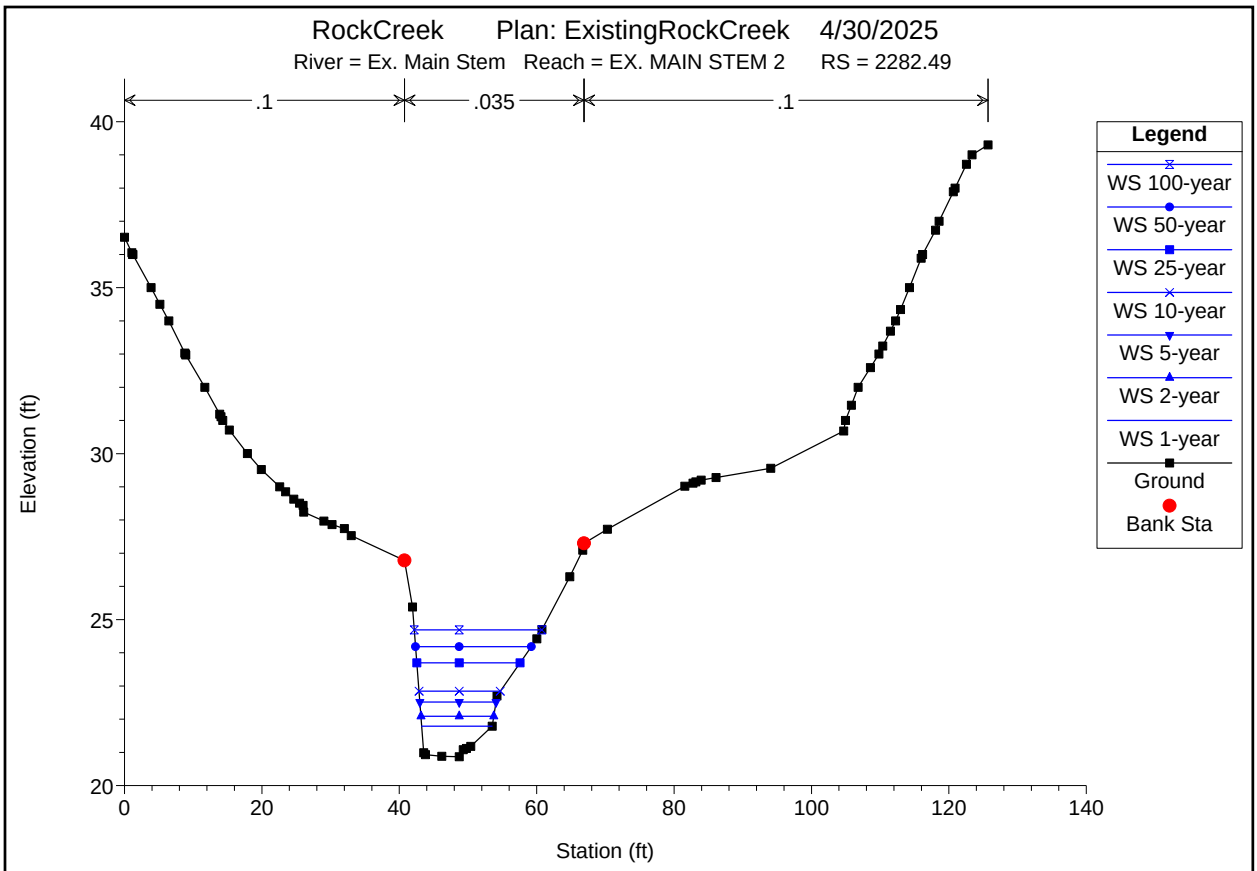
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta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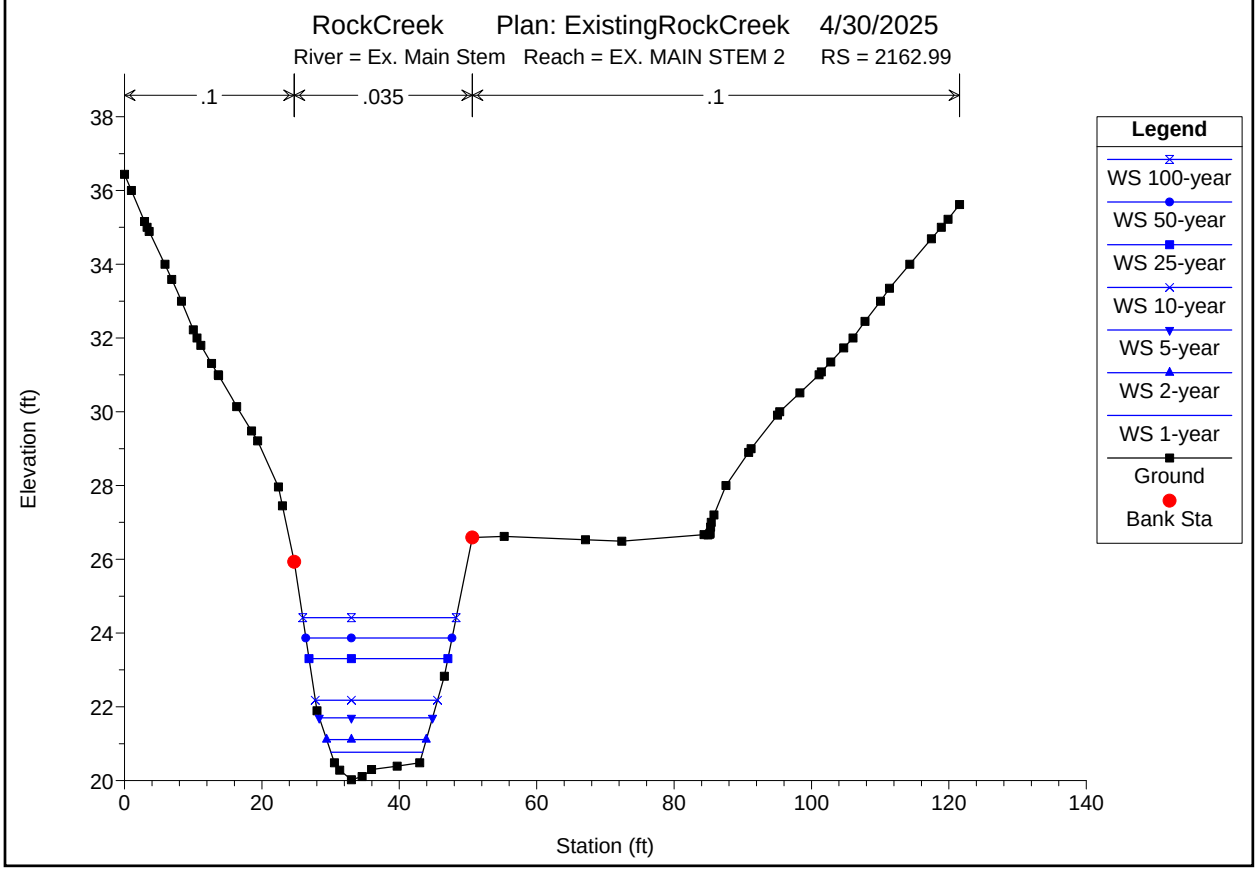
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta


RockCreek Plan: ExistingRockCreek 4/30/2025
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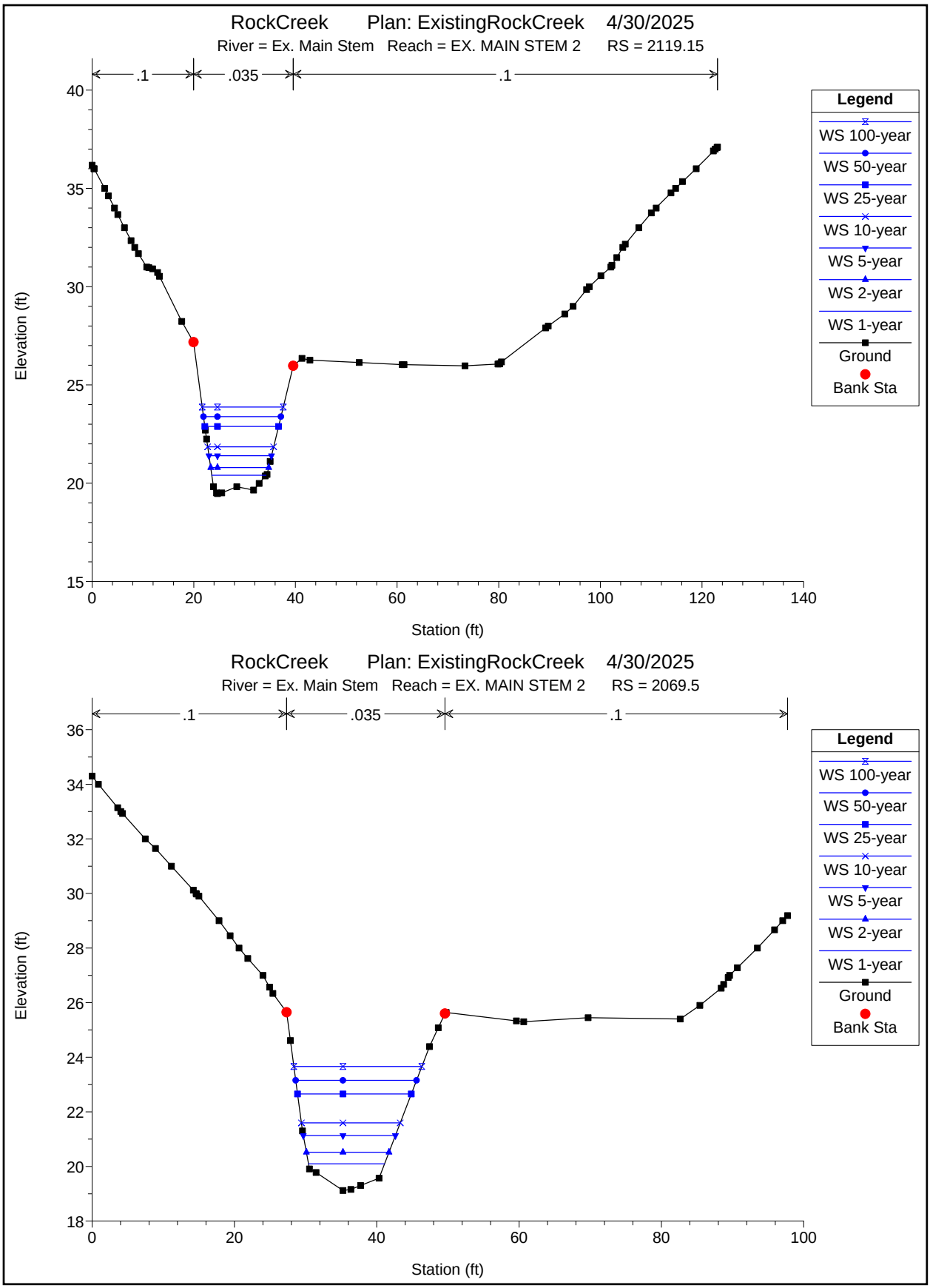
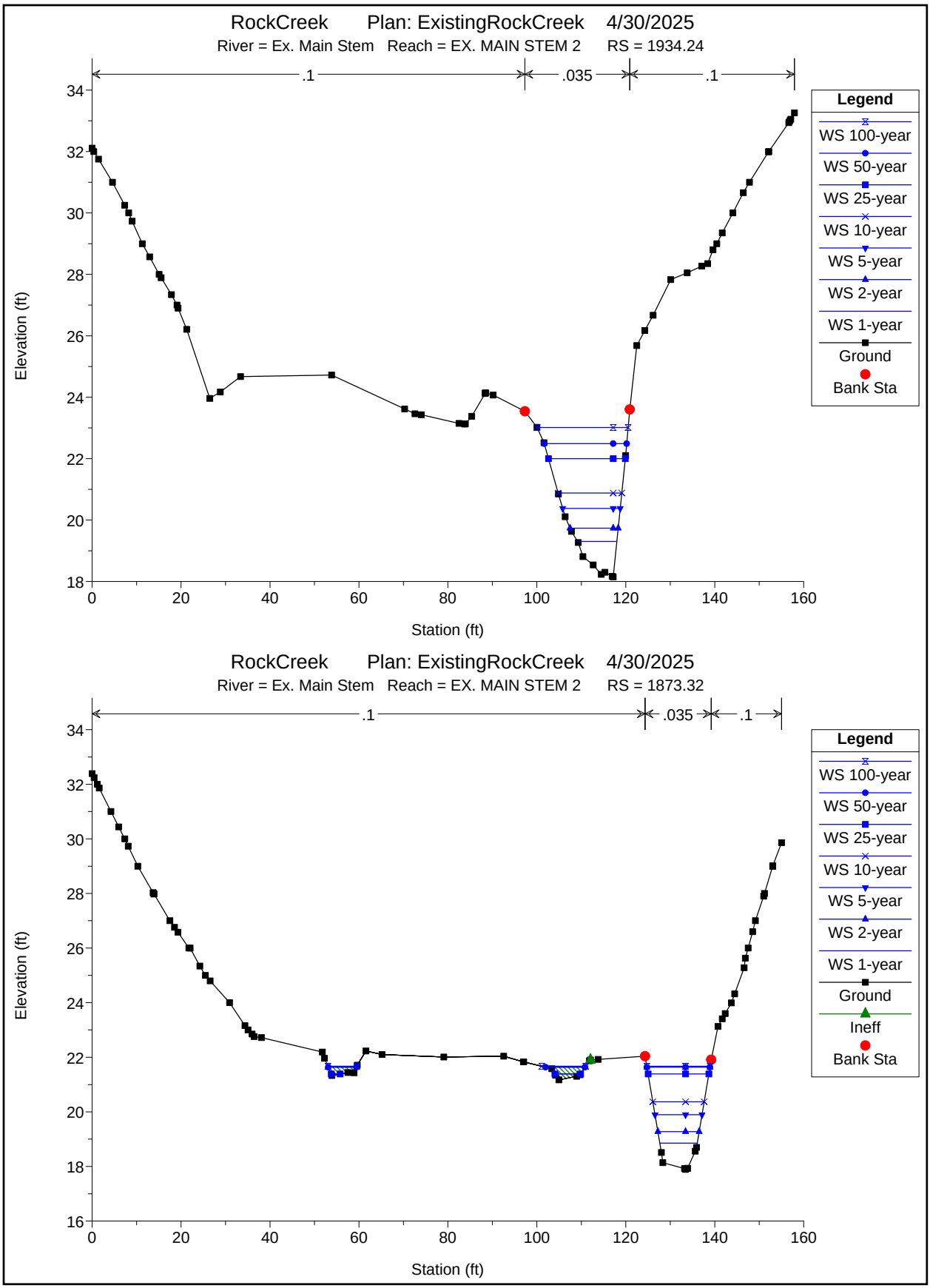
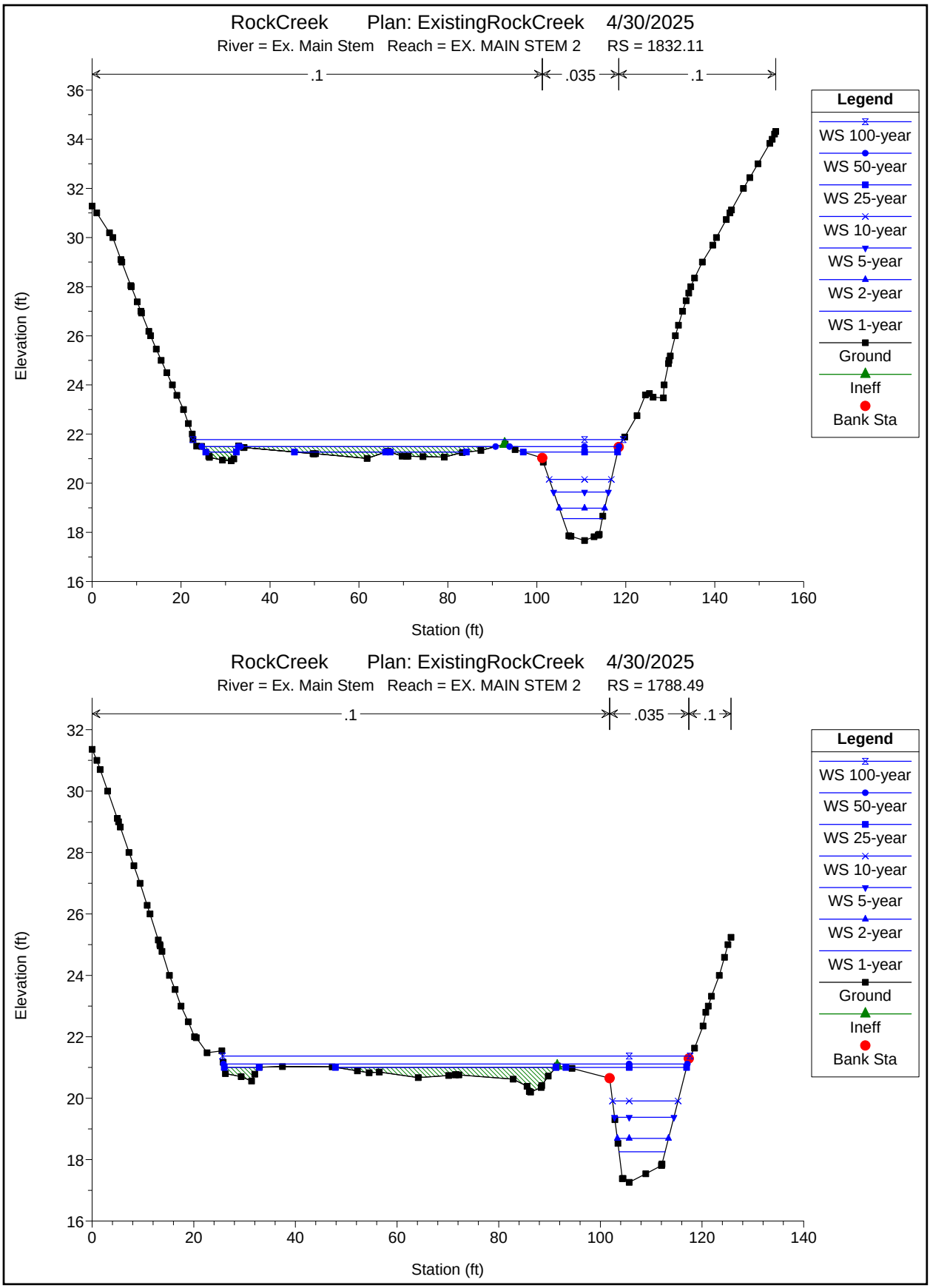
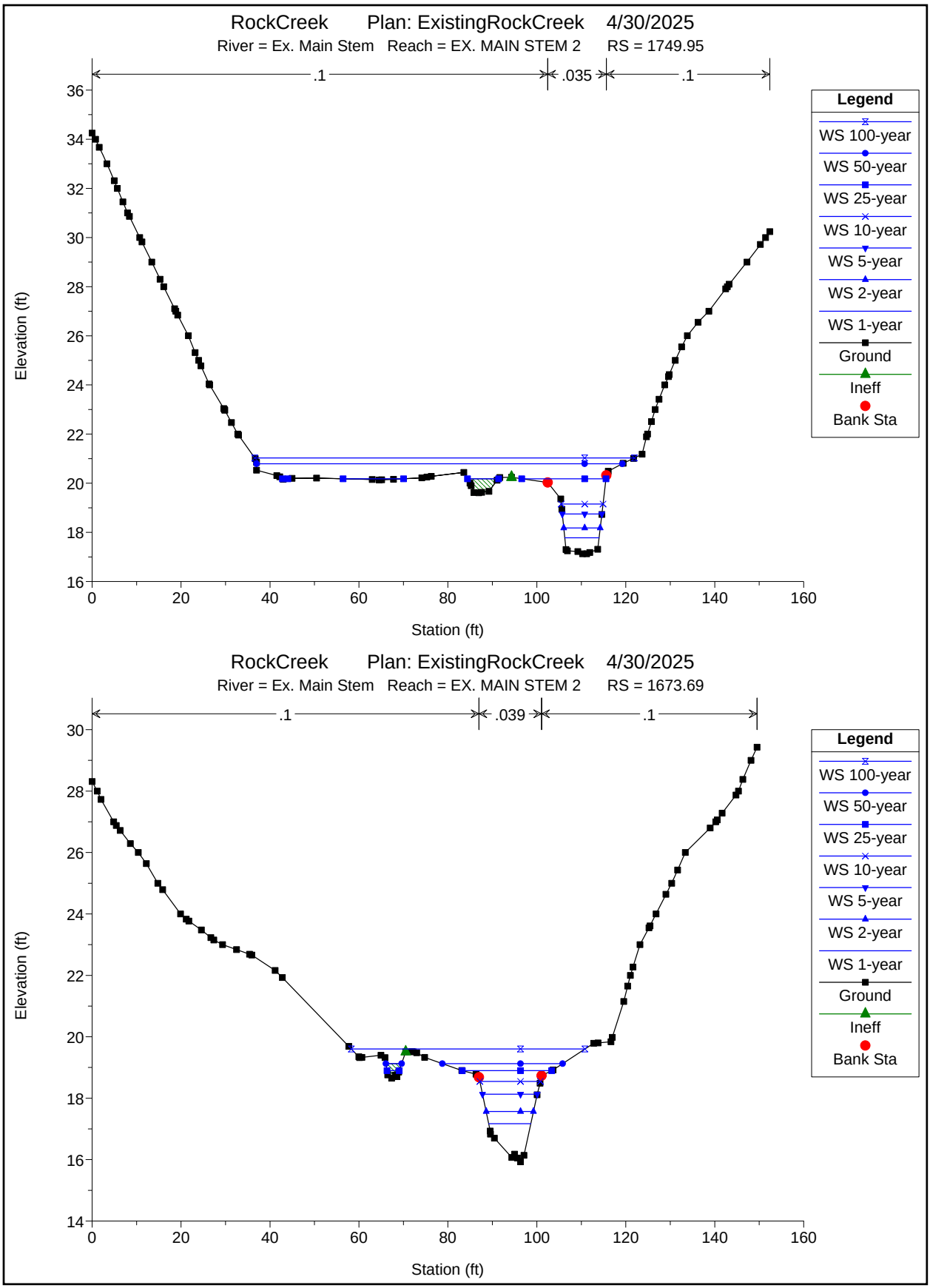
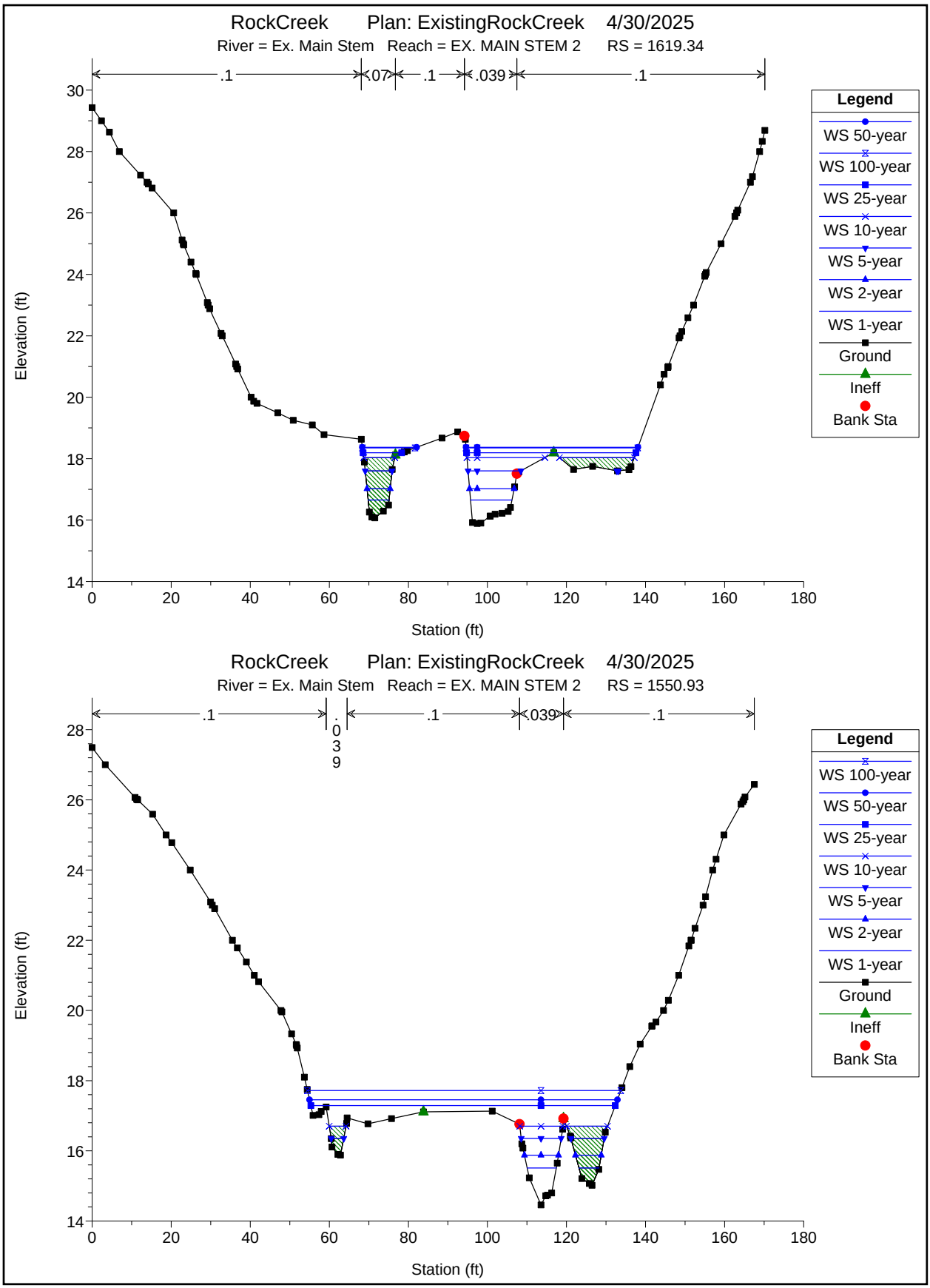
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta

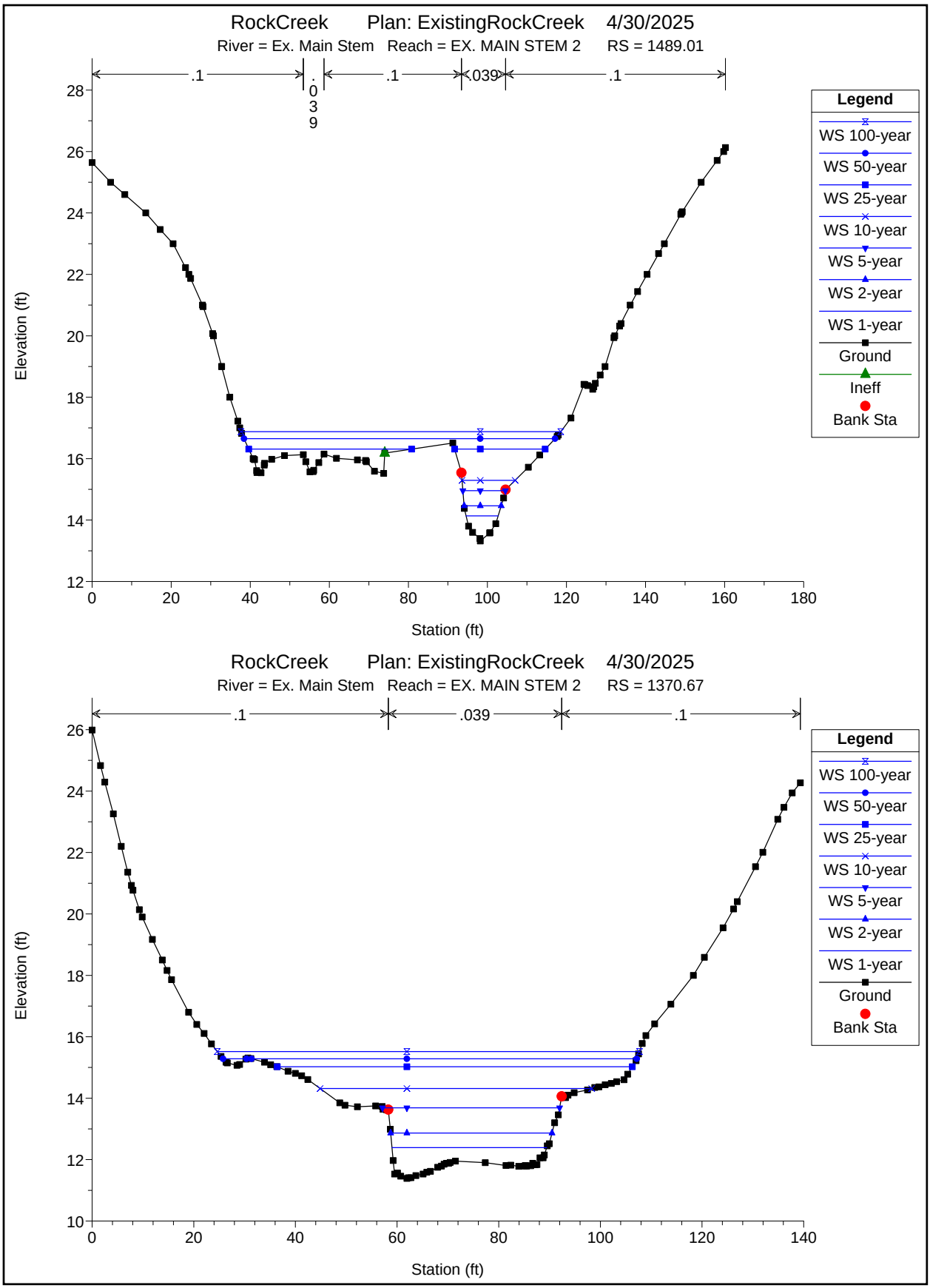

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 2119.15
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 2069.5
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta

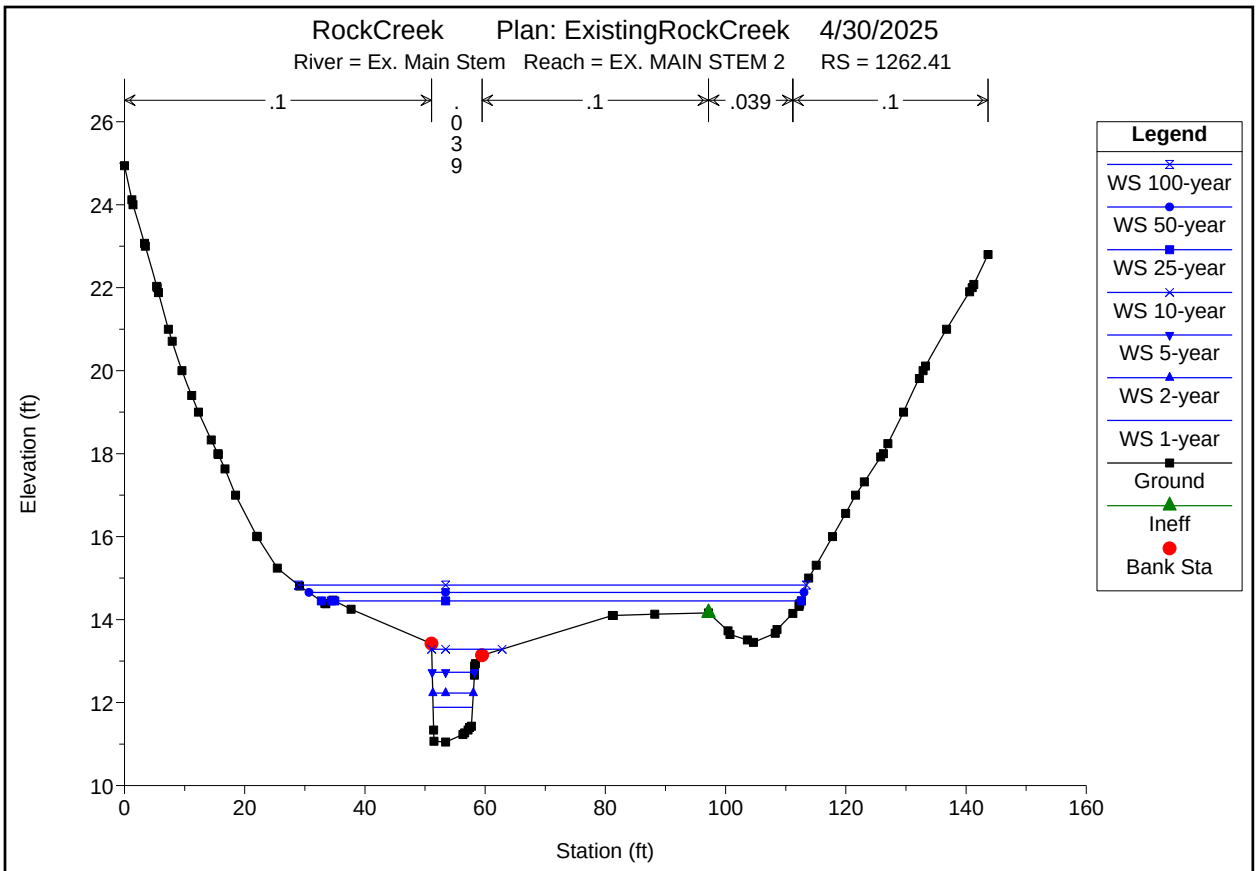

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1934.24
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1873.32
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta

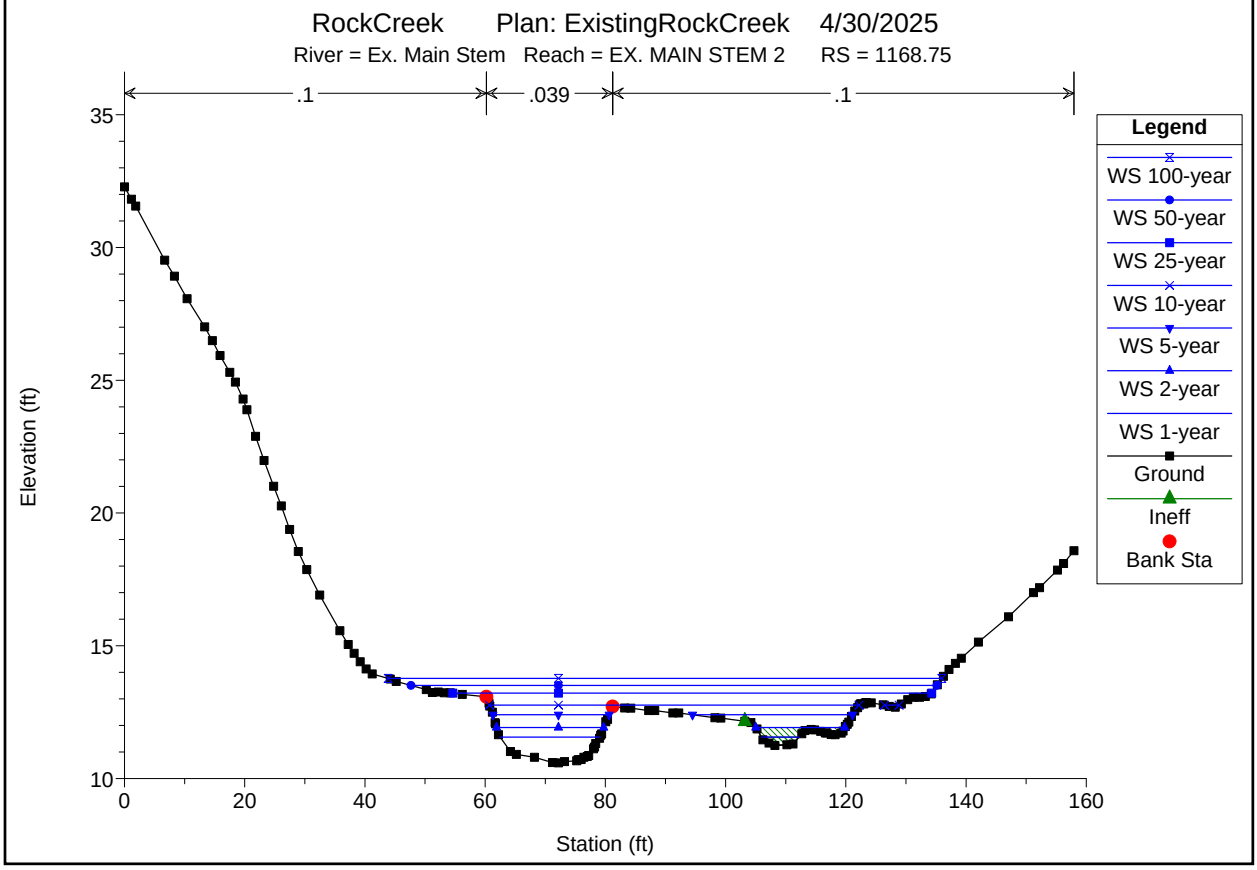

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1832.11
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1788.49
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta

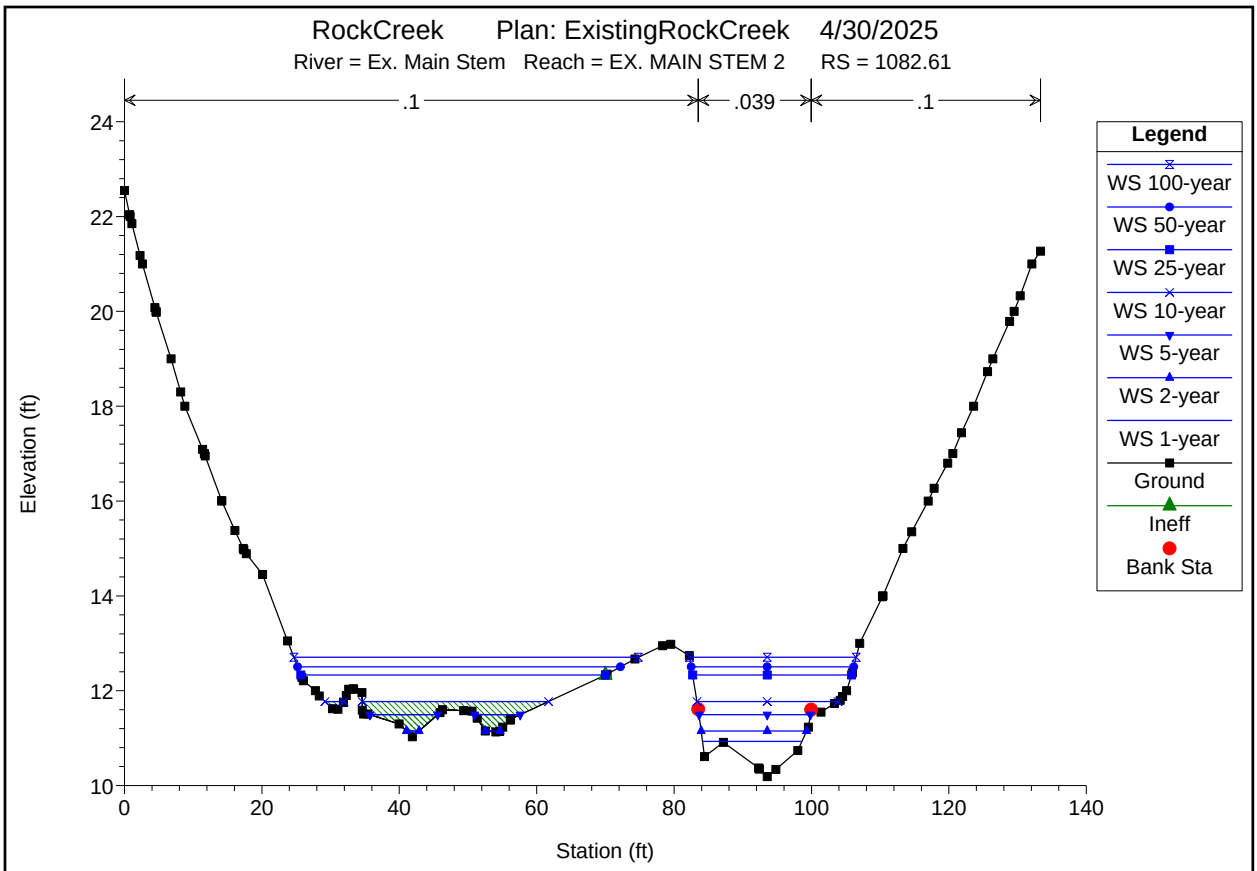

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1749.95
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1673.69
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta

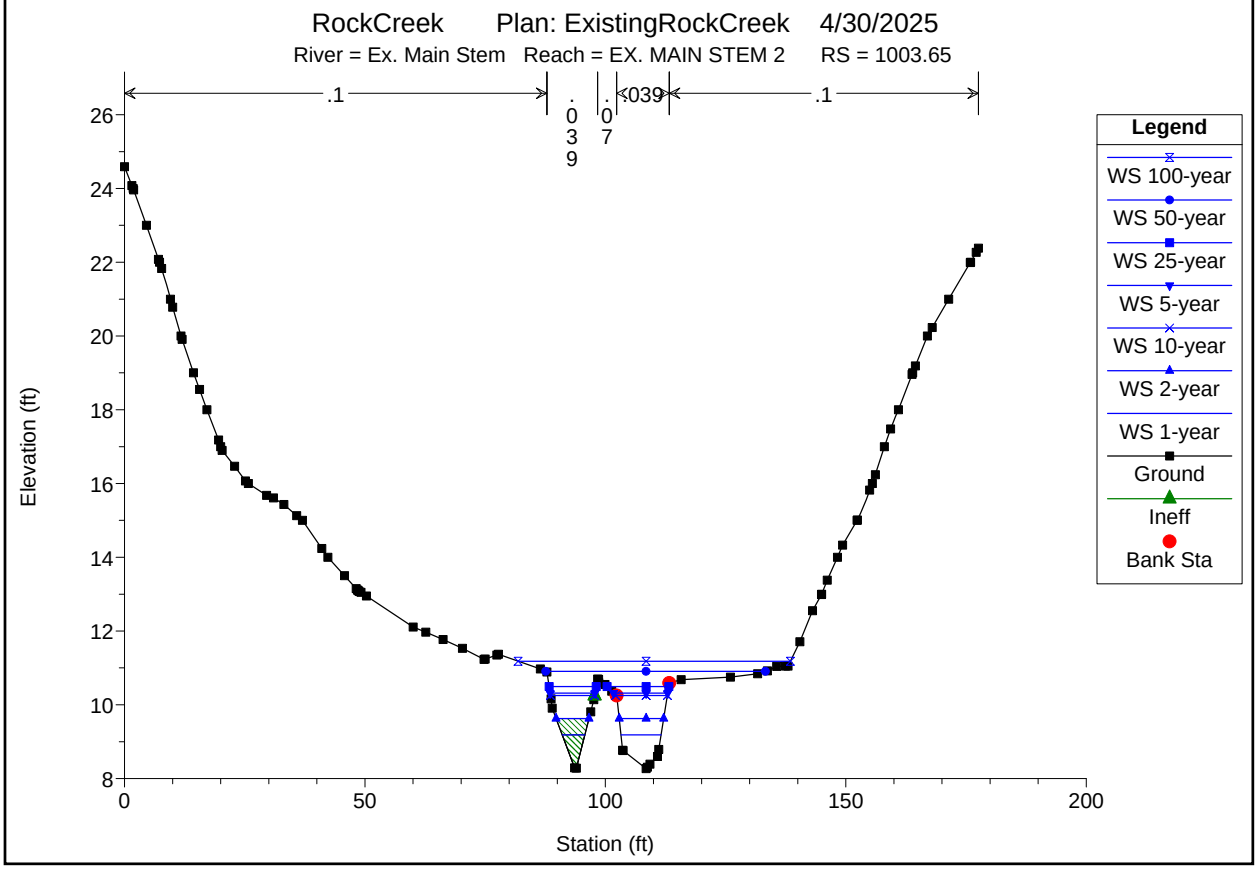

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1619.34
.1
.07
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 50-year
WS 100-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1550.93
.1
.039
.1
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta

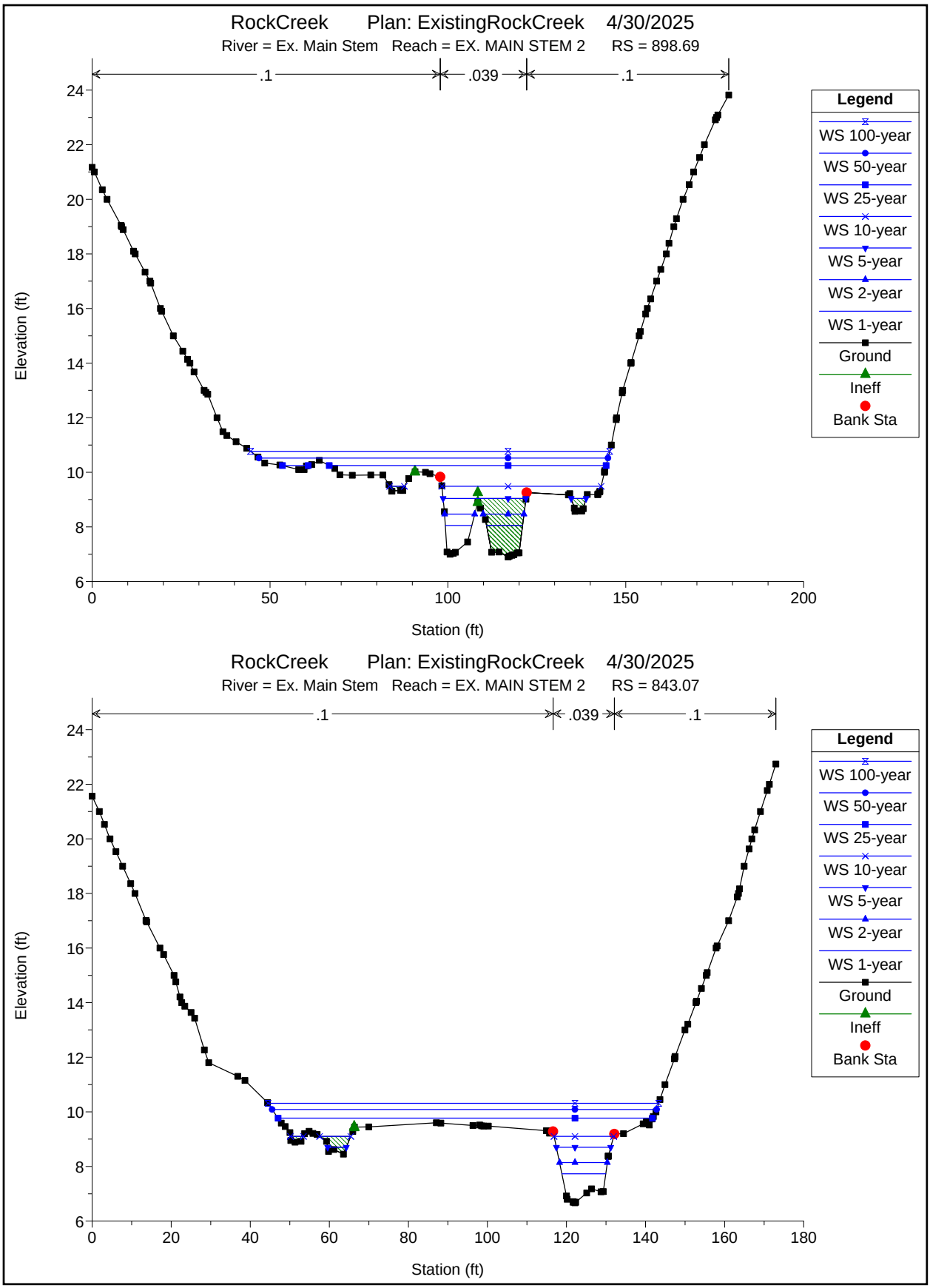

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1489.01
.1
.039
.1
.1
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1370.67
.1
.039
.1
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
Elevation (ft)
Station (ft)

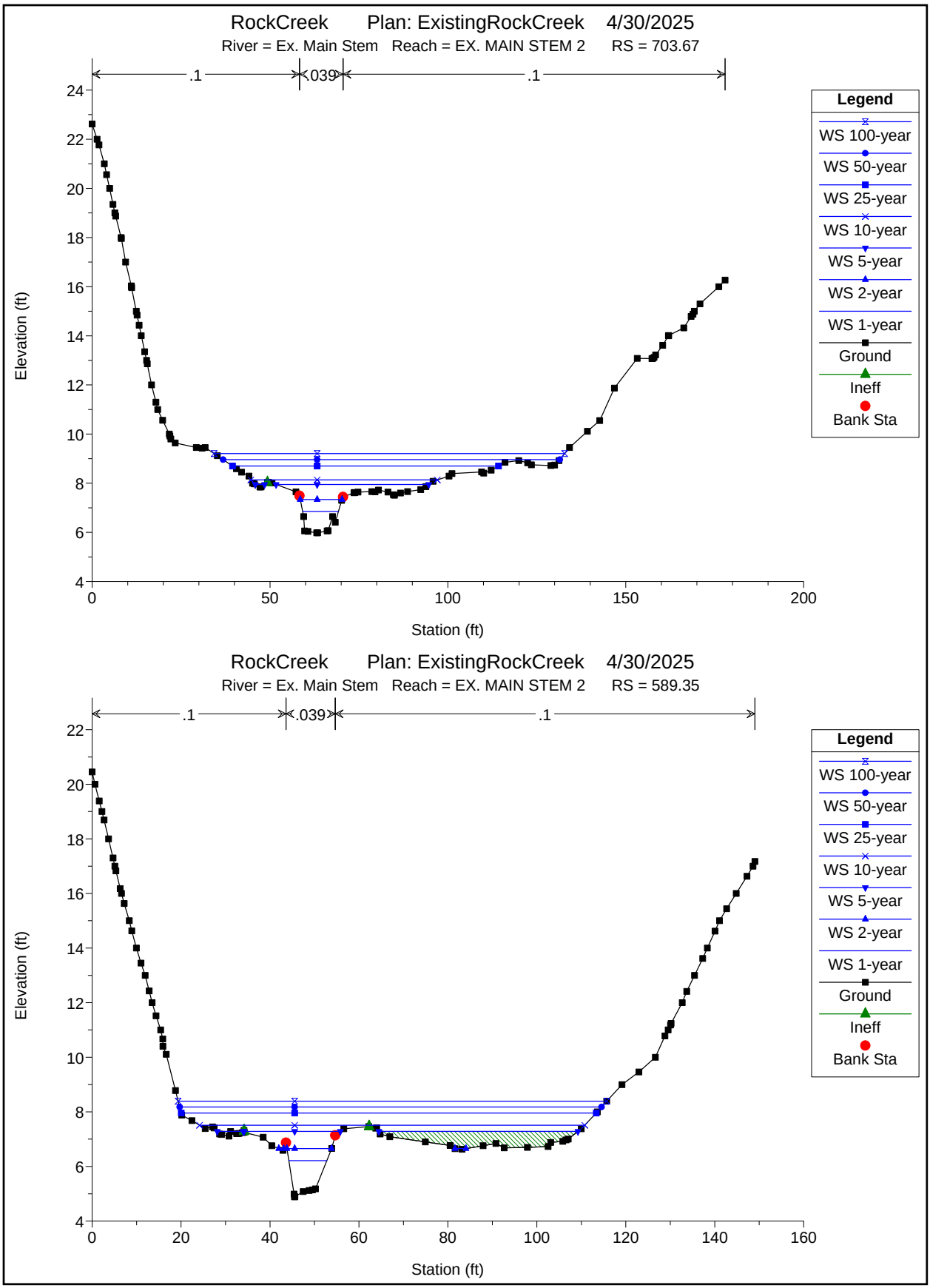

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1262.41
.1
.039
.1
.1
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

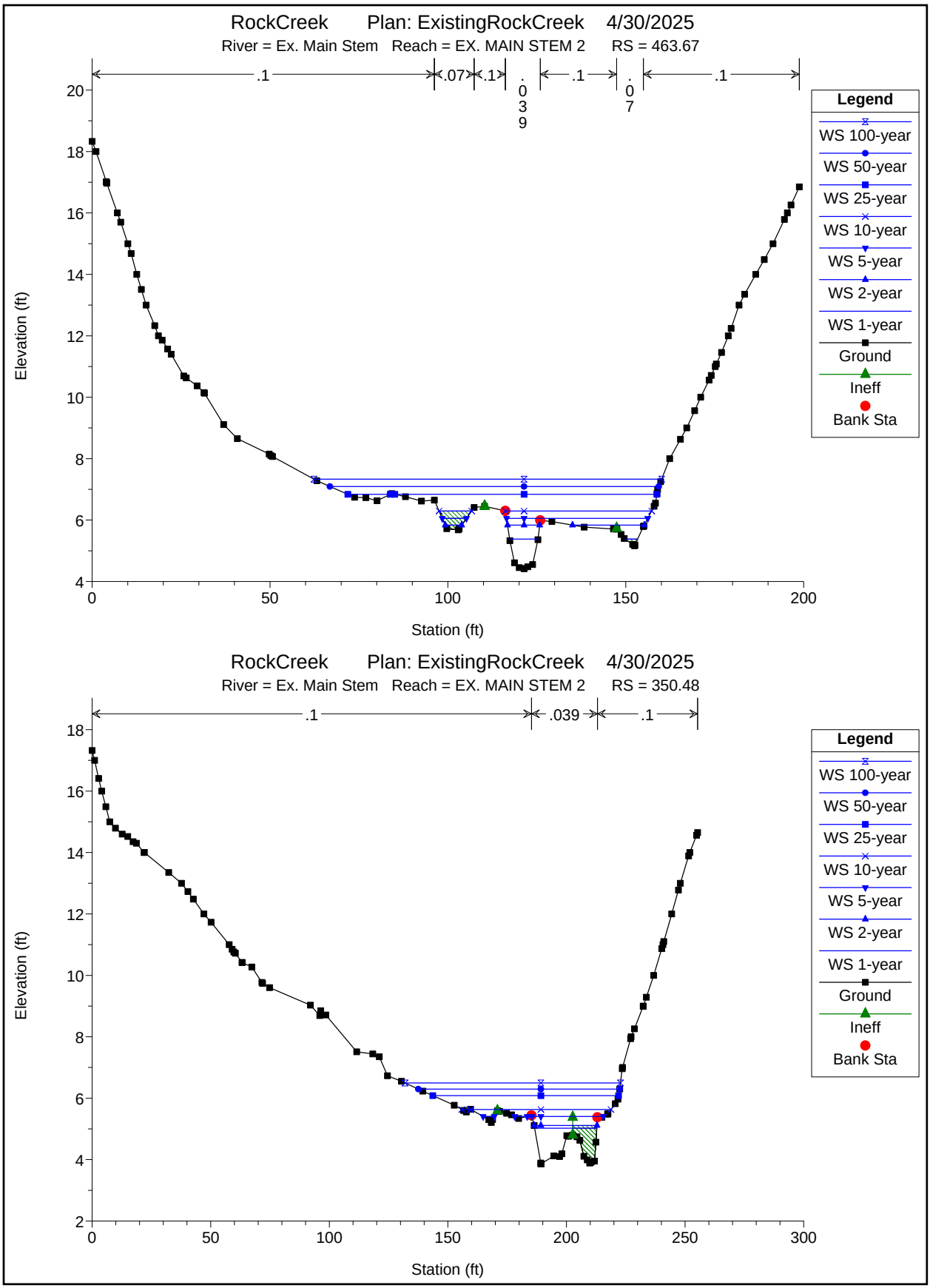

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1168.75
.1
.039
.1
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

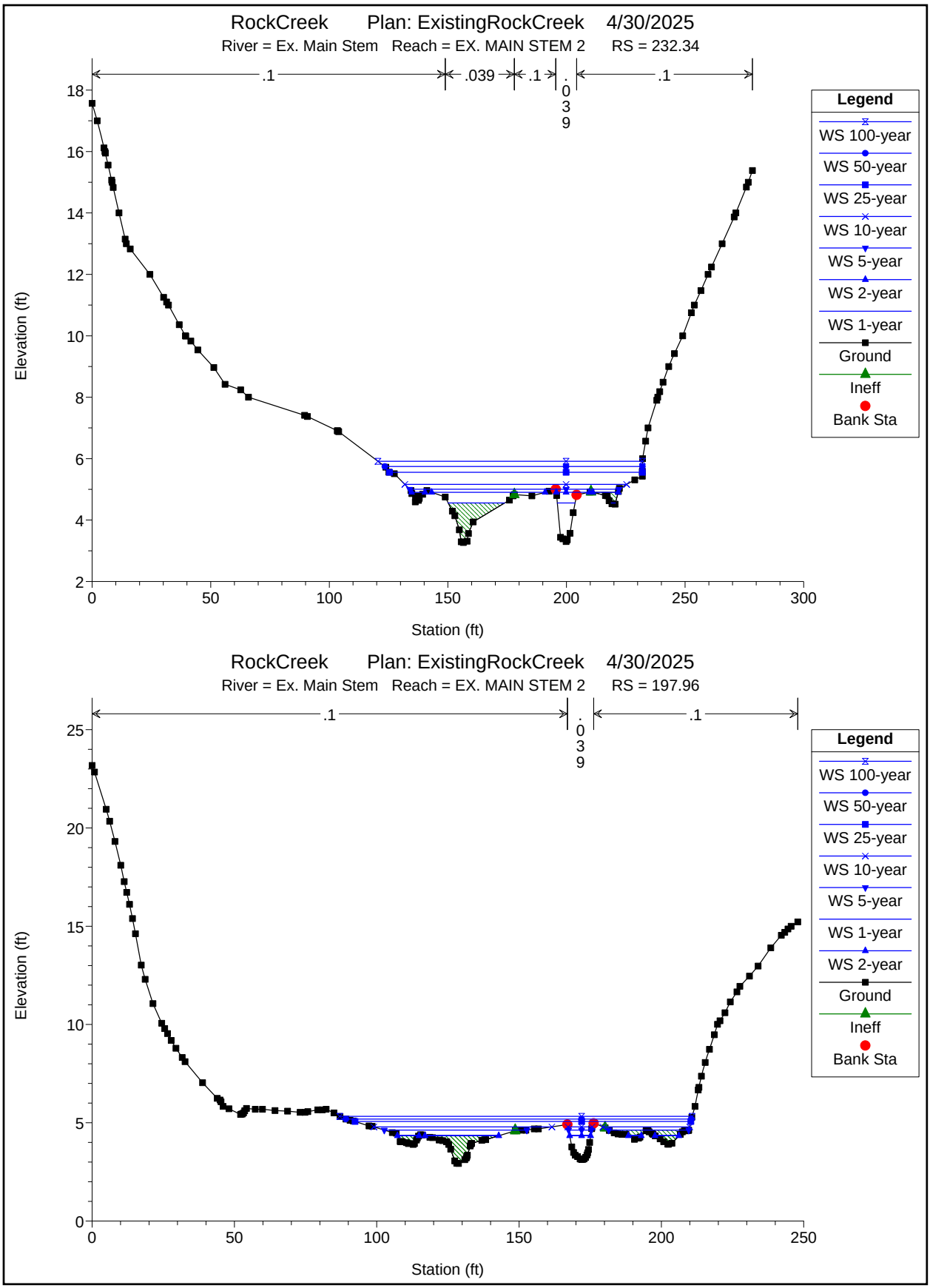

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1082.61
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta

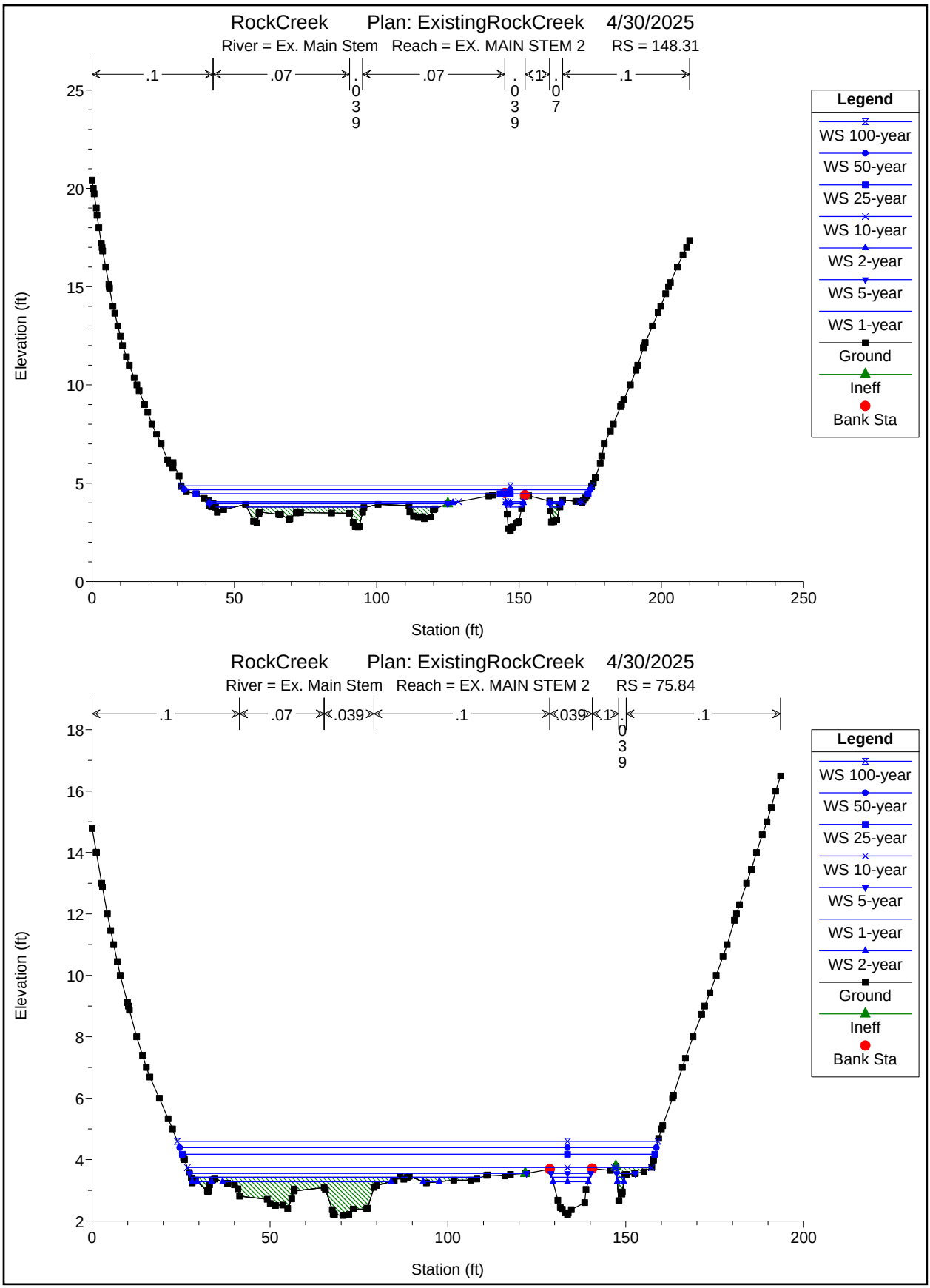

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 1003.65
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 5-year
WS 10-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta

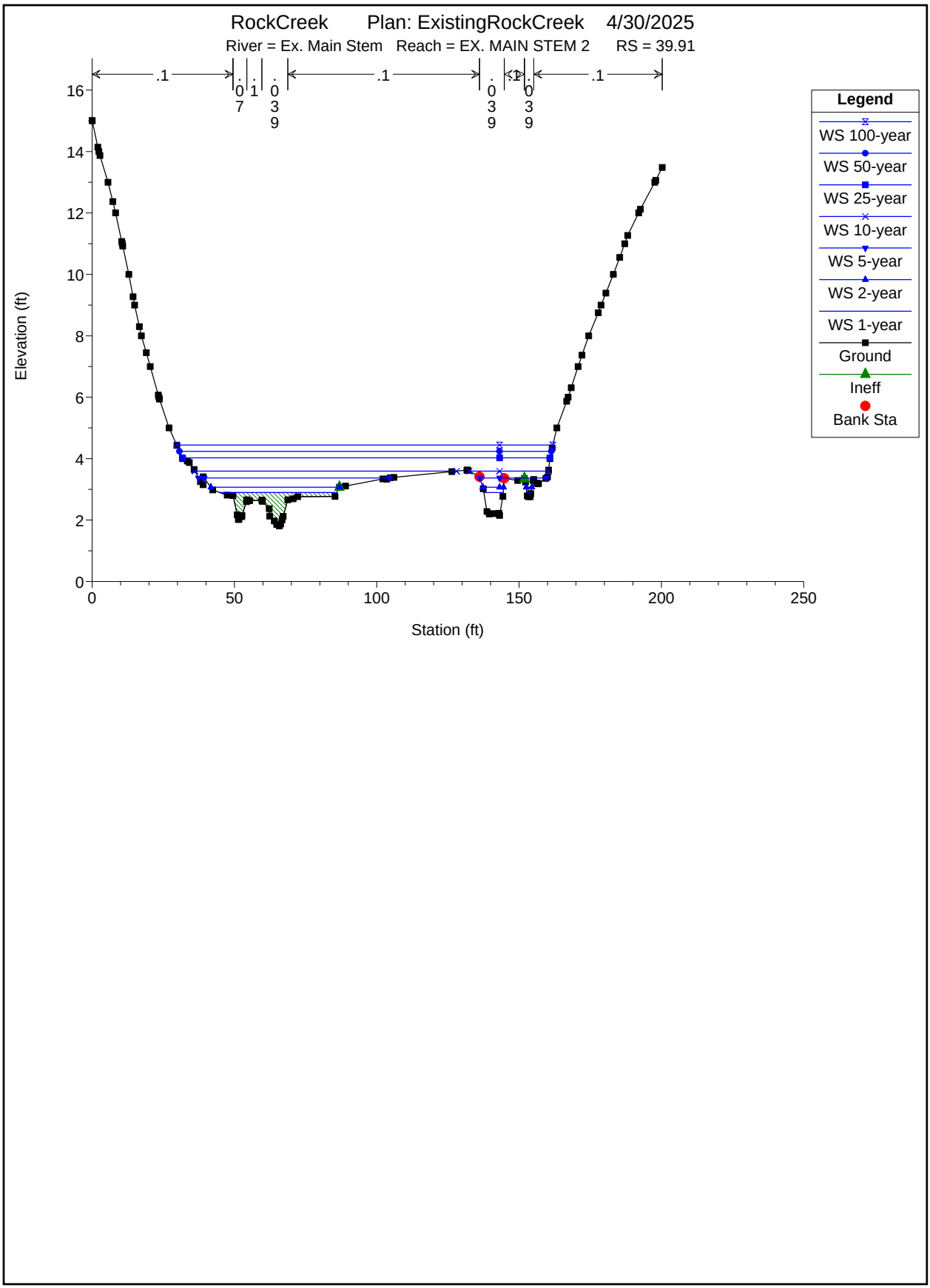

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 898.69
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 843.07
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta

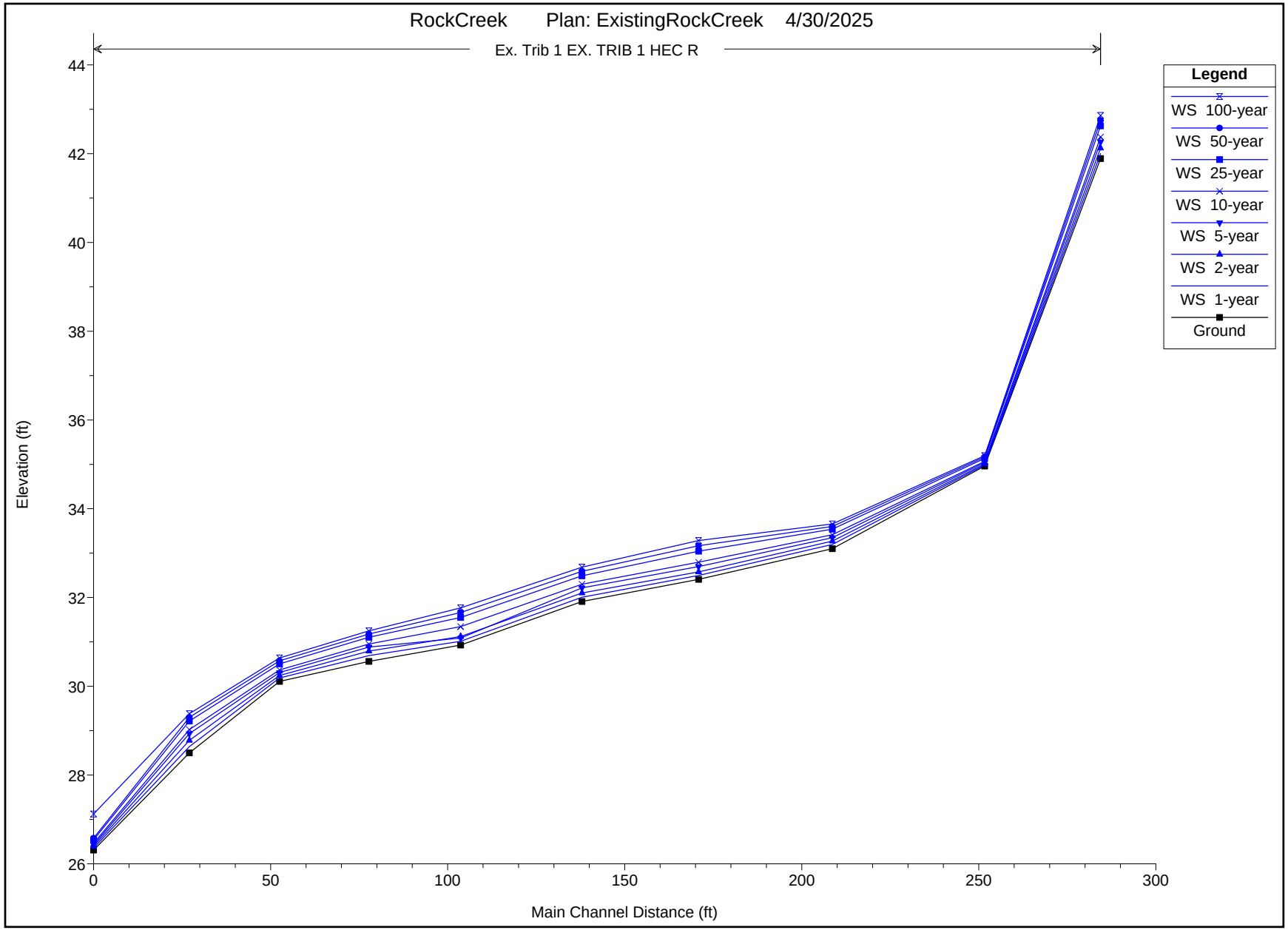

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 703.67
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 589.35
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta


RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 463.67
.1
.07
.1
.039
.1
.07
.1
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 350.48
.1
.039
.1
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 232.34
.1
.039
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 197.96
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 1-year
WS 2-year
Ground
Ineff
Bank Sta

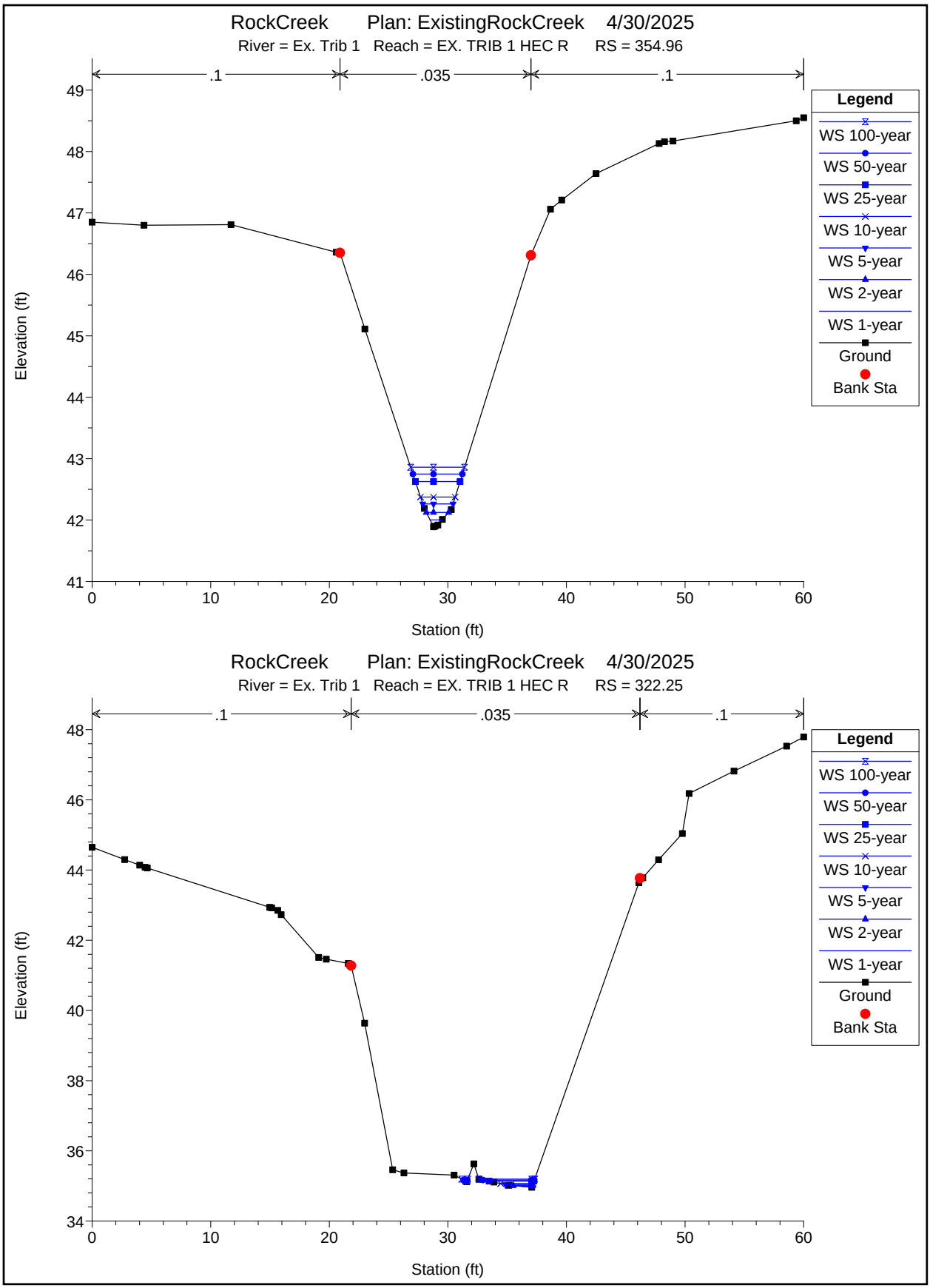

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 148.31
.1
.07
.039
.07
.039
.1
.07
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 2-year
WS 5-year
WS 1-year
Ground
Ineff
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 75.84
.1
.07
.039
.1
.039
.1
.1
.039
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 1-year
WS 2-year
Ground
Ineff
Bank Sta

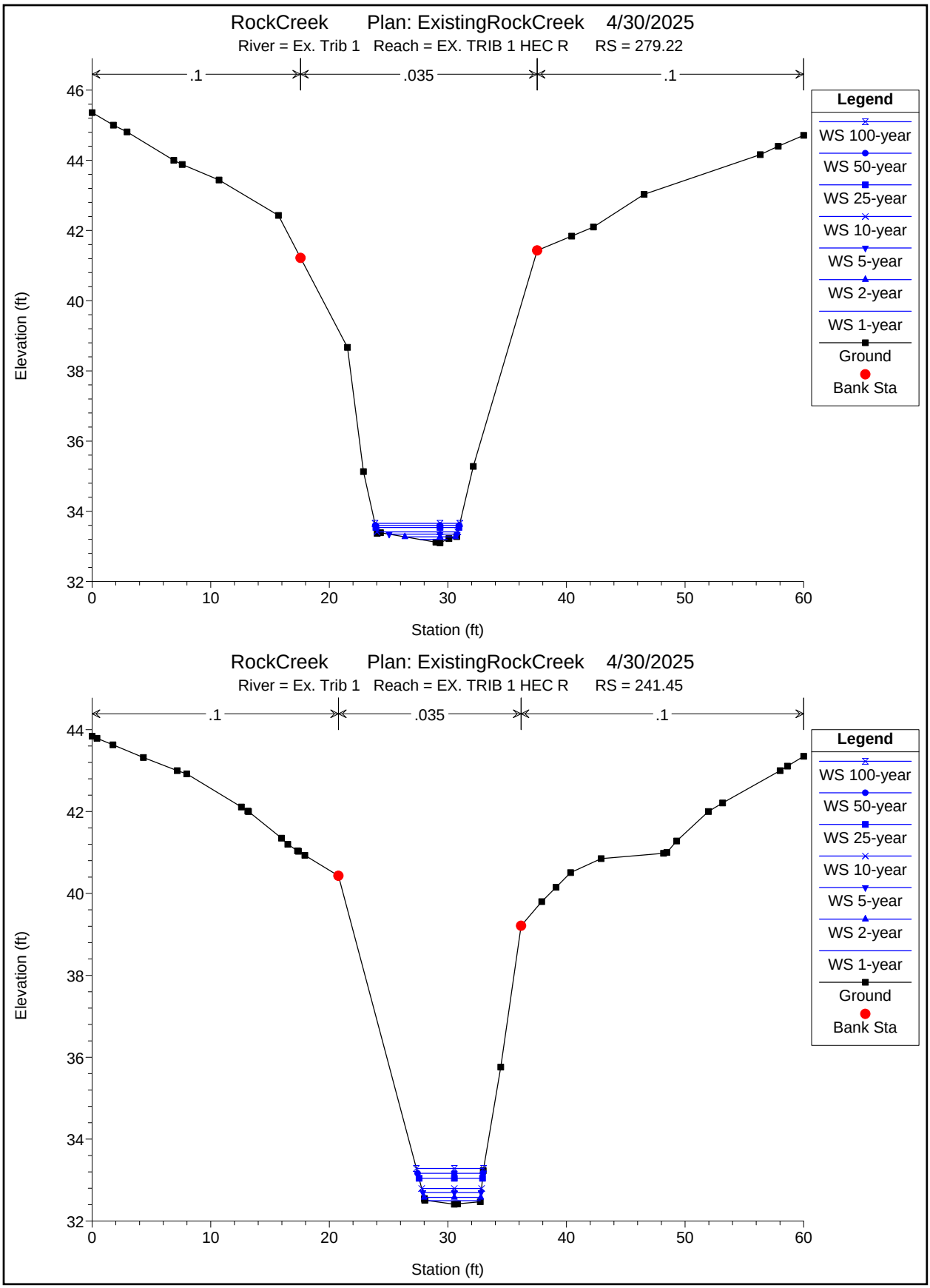

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Main Stem Reach = EX. MAIN STEM 2 RS = 39.91
.1
.1
.1
.07
.1
.039
.039
.039
Elevation (ft)
Station (ft)
0
2
4
6
8
10
12
14
16
0
50
100
150
200
250
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Ineff
Bank Sta

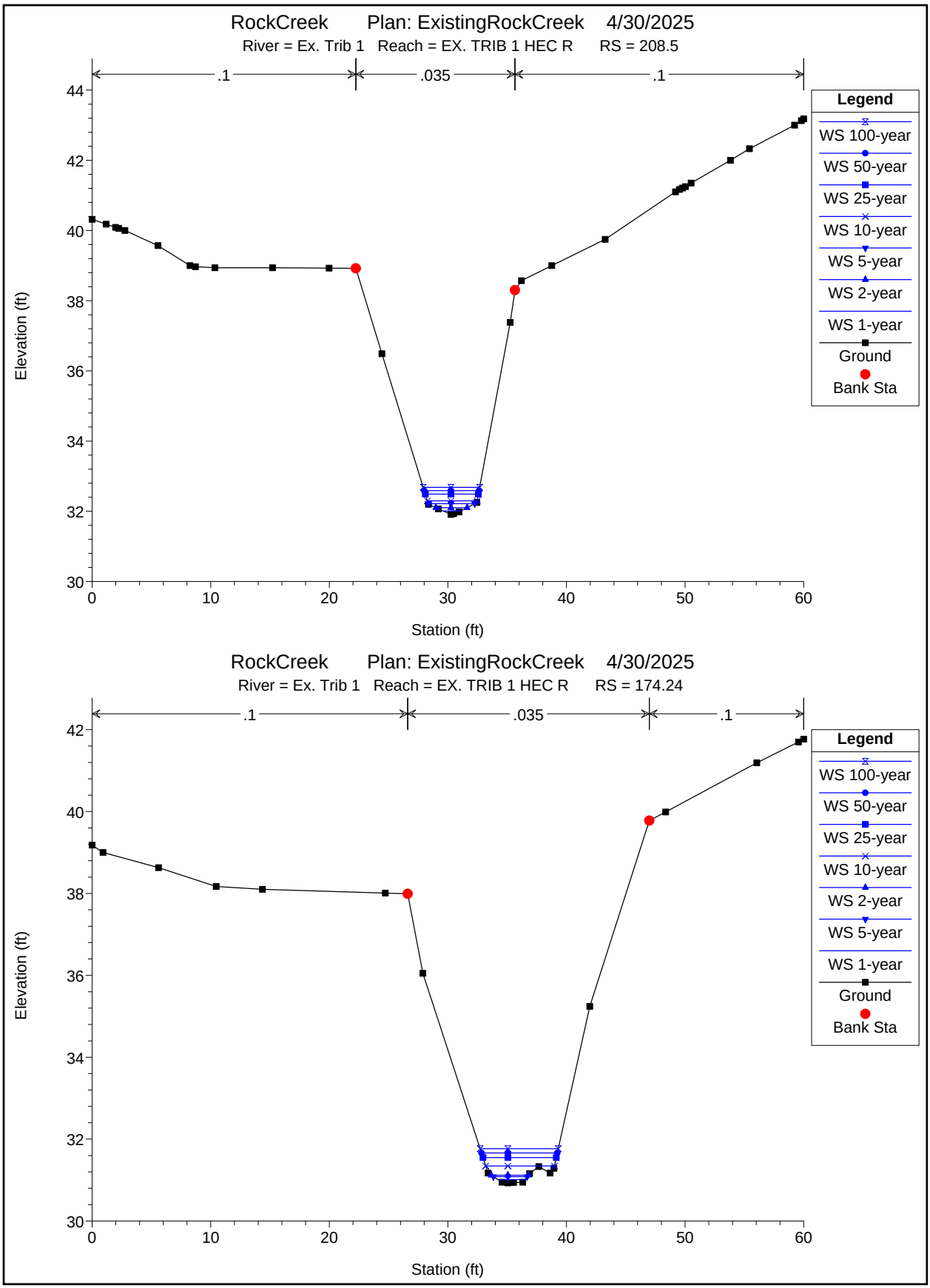

RockCreek Plan: ExistingRockCreek 4/30/2025
Ex. Trib 1 EX. TRIB 1 HEC R
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Elevation (ft)
Main Channel Distance (ft)
26
28
30
32
34
36
38
40
42
44
0
50
100
150
200
250
300

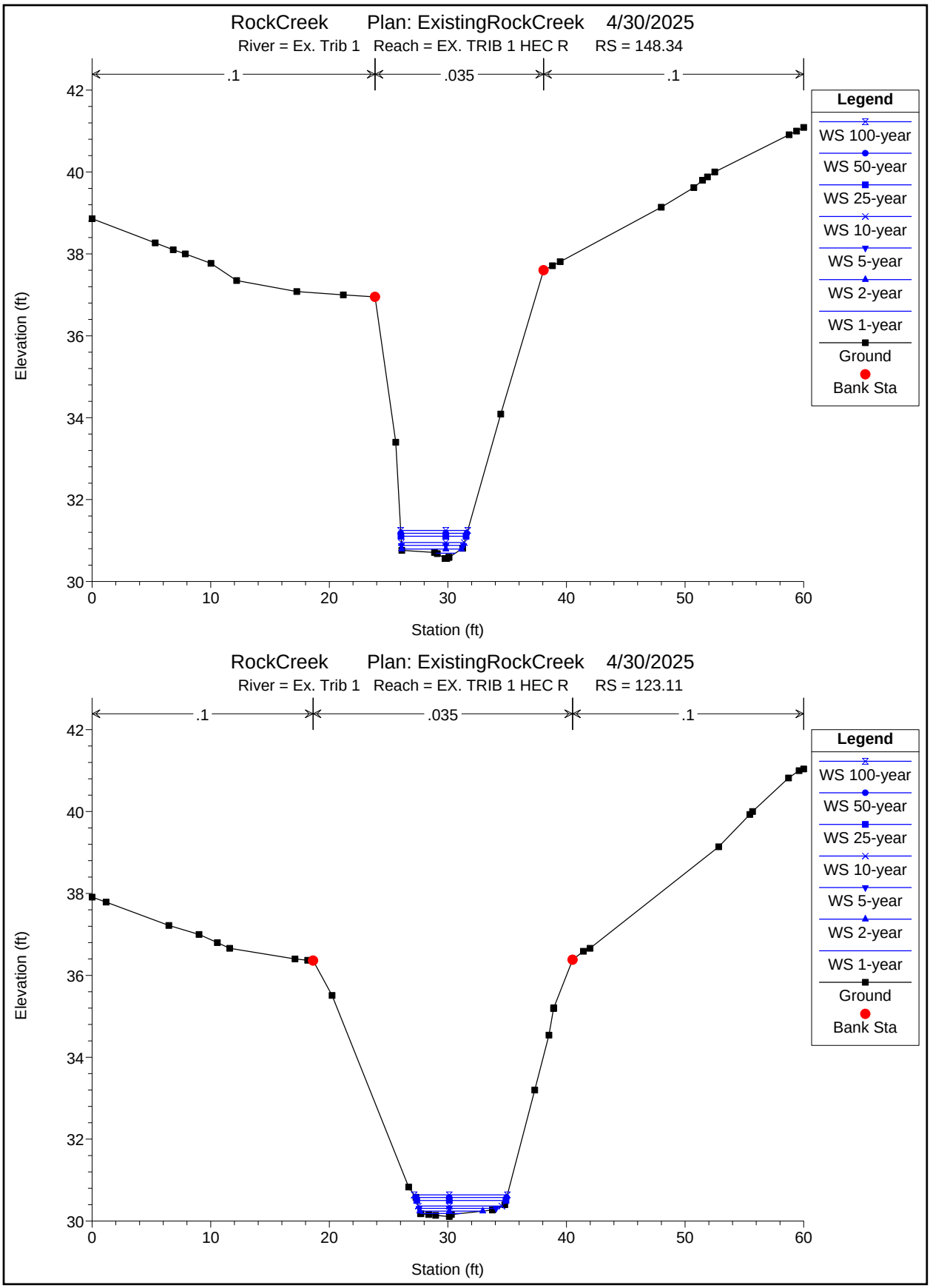
HEC-RAS Plan: Existing River: Ex. Trib 1 Reach: EX. TRIB 1 HEC R

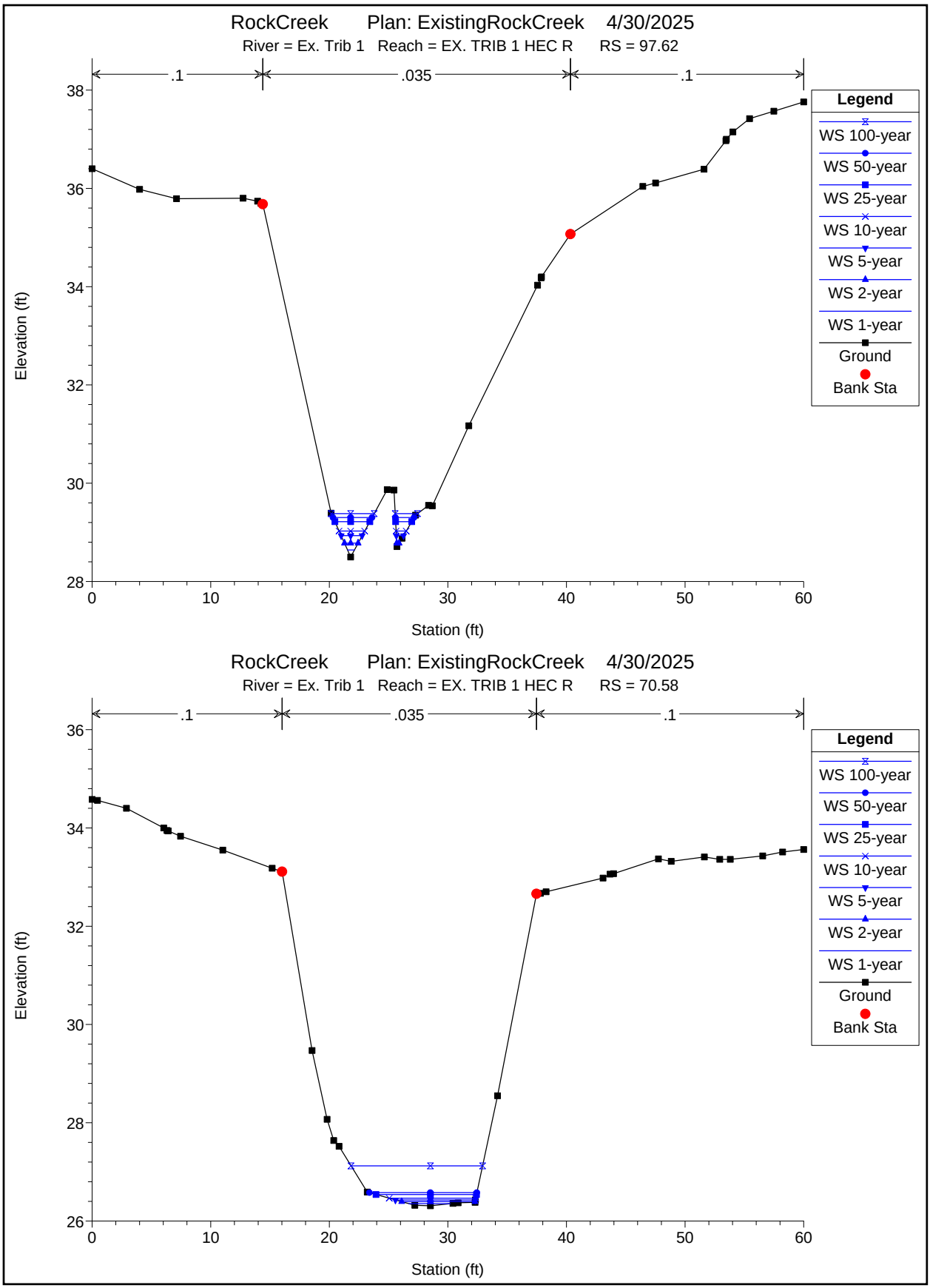
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
EX. TRIB 1 HEC R	354.96	1-year	0.10	41.89	42.00	42.00	42.04	0.046791	1.48	0.07	1.02	1.01	0.19		
EX. TRIB 1 HEC R	354.96	2-year	0.50	41.89	42.12	42.12	42.19	0.037549	2.05	0.24	1.89	1.01	0.29		
EX. TRIB 1 HEC R	354.96	5-year	1.50	41.89	42.26	42.26	42.37	0.031935	2.67	0.56	2.55	1.01	0.42		
EX. TRIB 1 HEC R	354.96	10-year	2.70	41.89	42.37	42.37	42.53	0.029760	3.12	0.87	2.92	1.01	0.52		
EX. TRIB 1 HEC R	354.96	25-year	6.60	41.89	42.63	42.63	42.86	0.026528	3.86	1.71	3.76	1.01	0.69		
EX. TRIB 1 HEC R	354.96	50-year	9.10	41.89	42.75	42.75	43.02	0.025478	4.15	2.19	4.17	1.01	0.76		
EX. TRIB 1 HEC R	354.96	100-year	11.70	41.89	42.86	42.86	43.16	0.024391	4.37	2.68	4.54	1.00	0.81		
EX. TRIB 1 HEC R	322.25	1-year	0.10	34.96	34.99	35.04	36.37	17.107480	9.45	0.01	0.84	14.82	13.34		
EX. TRIB 1 HEC R	322.25	2-year	0.50	34.96	35.01	35.11	37.52	12.869000	12.71	0.04	1.61	14.34	19.36		
EX. TRIB 1 HEC R	322.25	5-year	1.50	34.96	35.04	35.21	38.37	7.617295	14.64	0.10	2.29	12.19	20.99		
EX. TRIB 1 HEC R	322.25	10-year	2.70	34.96	35.07	35.27	38.80	5.316670	15.49	0.17	2.72	10.79	20.90		
EX. TRIB 1 HEC R	322.25	25-year	6.60	34.96	35.14	35.43	39.55	3.452815	16.85	0.39	3.89	9.36	21.27		
EX. TRIB 1 HEC R	322.25	50-year	9.10	34.96	35.17	35.49	39.81	3.112496	17.29	0.53	4.64	9.05	21.55		
EX. TRIB 1 HEC R	322.25	100-year	11.70	34.96	35.19	35.53	40.03	2.798244	17.65	0.66	5.22	8.73	21.64		
EX. TRIB 1 HEC R	279.22	1-year	0.10	33.10	33.20	33.20	33.21	0.026750	0.92	0.11	2.26	0.74	0.08		
EX. TRIB 1 HEC R	279.22	2-year	0.50	33.10	33.27	33.27	33.30	0.031662	1.42	0.35	4.27	0.88	0.16		
EX. TRIB 1 HEC R	279.22	5-year	1.50	33.10	33.35	33.35	33.41	0.035632	2.03	0.74	5.74	1.00	0.28		
EX. TRIB 1 HEC R	279.22	10-year	2.70	33.10	33.41	33.41	33.50	0.032540	2.33	1.16	6.82	0.99	0.34		
EX. TRIB 1 HEC R	279.22	25-year	6.60	33.10	33.54	33.55	33.70	0.031906	3.25	2.03	6.99	1.06	0.56		
EX. TRIB 1 HEC R	279.22	50-year	9.10	33.10	33.60	33.62	33.81	0.032983	3.70	2.46	7.08	1.11	0.69		
EX. TRIB 1 HEC R	279.22	100-year	11.70	33.10	33.66	33.69	33.92	0.033951	4.10	2.85	7.15	1.14	0.80		
EX. TRIB 1 HEC R	241.45	1-year	0.10	32.41	32.50	32.47	32.50	0.006738	0.47	0.21	4.35	0.37	0.02		
EX. TRIB 1 HEC R	241.45	2-year	0.50	32.41	32.58	32.52	32.59	0.006601	0.84	0.59	4.77	0.42	0.05		
EX. TRIB 1 HEC R	241.45	5-year	1.50	32.41	32.70	32.60	32.72	0.006629	1.28	1.17	4.92	0.46	0.09		
EX. TRIB 1 HEC R	241.45	10-year	2.70	32.41	32.80	32.67	32.84	0.006976	1.62	1.67	5.04	0.50	0.13		
EX. TRIB 1 HEC R	241.45	25-year	6.60	32.41	33.04	32.84	33.12	0.007109	2.23	2.96	5.35	0.53	0.22		
EX. TRIB 1 HEC R	241.45	50-year	9.10	32.41	33.17	32.93	33.26	0.007339	2.51	3.62	5.51	0.55	0.26		
EX. TRIB 1 HEC R	241.45	100-year	11.70	32.41	33.28	33.02	33.40	0.007402	2.74	4.28	5.67	0.56	0.30		
EX. TRIB 1 HEC R	208.5	1-year	0.10	31.91	32.01	32.01	32.03	0.048917	1.30	0.08	1.47	1.01	0.16		
EX. TRIB 1 HEC R	208.5	2-year	0.50	31.91	32.10	32.10	32.16	0.038697	1.83	0.27	2.63	1.00	0.25		
EX. TRIB 1 HEC R	208.5	5-year	1.50	31.91	32.22	32.22	32.30	0.032681	2.30	0.65	3.91	0.99	0.34		
EX. TRIB 1 HEC R	208.5	10-year	2.70	31.91	32.30	32.30	32.42	0.029817	2.74	0.99	4.20	1.00	0.42		
EX. TRIB 1 HEC R	208.5	25-year	6.60	31.91	32.49	32.49	32.70	0.026829	3.64	1.81	4.48	1.01	0.63		
EX. TRIB 1 HEC R	208.5	50-year	9.10	31.91	32.59	32.59	32.84	0.025907	4.01	2.27	4.62	1.01	0.73		
EX. TRIB 1 HEC R	208.5	100-year	11.70	31.91	32.68	32.68	32.97	0.025167	4.32	2.71	4.76	1.01	0.81		
EX. TRIB 1 HEC R	174.24	1-year	0.10	30.93	31.01	30.99	31.02	0.011110	0.70	0.14	2.25	0.50	0.04		
EX. TRIB 1 HEC R	174.24	2-year	0.50	30.93	31.12	31.06	31.14	0.010841	1.17	0.43	3.12	0.55	0.09		
EX. TRIB 1 HEC R	174.24	5-year	1.50	30.93	31.09	31.18	31.41	0.212530	4.59	0.33	2.84	2.39	1.51		
EX. TRIB 1 HEC R	174.24	10-year	2.70	30.93	31.34	31.28	31.40	0.013411	1.89	1.43	5.79	0.67	0.20		
EX. TRIB 1 HEC R	174.24	25-year	6.60	30.93	31.55	31.44	31.65	0.011387	2.48	2.66	6.18	0.67	0.29		
EX. TRIB 1 HEC R	174.24	50-year	9.10	30.93	31.66	31.52	31.78	0.010513	2.70	3.37	6.39	0.66	0.32		
EX. TRIB 1 HEC R	174.24	100-year	11.70	30.93	31.77	31.60	31.90	0.009987	2.90	4.04	6.59	0.65	0.35		
EX. TRIB 1 HEC R	148.34	1-year	0.10	30.56	30.69	30.66	30.70	0.014165	0.86	0.12	1.62	0.57	0.06		
EX. TRIB 1 HEC R	148.34	2-year	0.50	30.56	30.79	30.77	30.81	0.014702	1.06	0.47	5.04	0.61	0.09		
EX. TRIB 1 HEC R	148.34	5-year	1.50	30.56	30.88	30.83	30.92	0.014511	1.60	0.94	5.22	0.66	0.16		
EX. TRIB 1 HEC R	148.34	10-year	2.70	30.56	30.95	30.91	31.02	0.016399	2.07	1.31	5.31	0.74	0.24		
EX. TRIB 1 HEC R	148.34	25-year	6.60	30.56	31.10	31.07	31.25	0.020950	3.10	2.13	5.49	0.88	0.47		
EX. TRIB 1 HEC R	148.34	50-year	9.10	30.56	31.18	31.16	31.38	0.023344	3.60	2.53	5.57	0.94	0.60		
EX. TRIB 1 HEC R	148.34	100-year	11.70	30.56	31.25	31.24	31.50	0.024539	4.00	2.93	5.65	0.98	0.71		
EX. TRIB 1 HEC R	123.11	1-year	0.10	30.11	30.19	30.19	30.20	0.031533	0.82	0.12	3.44	0.76	0.07		
EX. TRIB 1 HEC R	123.11	2-year	0.50	30.11	30.24	30.24	30.27	0.033959	1.33	0.38	5.31	0.88	0.15		
EX. TRIB 1 HEC R	123.11	5-year	1.50	30.11	30.31	30.31	30.37	0.036457	1.94	0.77	6.50	1.00	0.27		
EX. TRIB 1 HEC R	123.11	10-year	2.70	30.11	30.37	30.37	30.45	0.032768	2.30	1.17	7.04	1.00	0.34		
EX. TRIB 1 HEC R	123.11	25-year	6.60	30.11	30.50	30.50	30.65	0.027754	3.04	2.17	7.52	1.00	0.49		
EX. TRIB 1 HEC R	123.11	50-year	9.10	30.11	30.57	30.57	30.75	0.026204	3.36	2.71	7.65	1.00	0.56		
EX. TRIB 1 HEC R	123.11	100-year	11.70	30.11	30.64	30.64	30.85	0.025731	3.65	3.20	7.86	1.01	0.63		
EX. TRIB 1 HEC R	97.62	1-year	0.10	28.50	28.64	28.67	28.73	0.131728	2.45	0.04	0.58	1.63	0.52		
EX. TRIB 1 HEC R	97.62	2-year	0.50	28.50	28.78	28.82	28.92	0.092536	2.95	0.17	1.35	1.47	0.63		
EX. TRIB 1 HEC R	97.62	5-year	1.50	28.50	28.93	28.98	29.10	0.069652	3.32	0.45	2.38	1.34	0.70		
EX. TRIB 1 HEC R	97.62	10-year	2.70	28.50	29.03	29.09	29.26	0.071597	3.84	0.70	3.01	1.40	0.88		
EX. TRIB 1 HEC R	97.62	25-year	6.60	28.50	29.22	29.32	29.56	0.069477	4.71	1.40	4.30	1.45	1.18		
EX. TRIB 1 HEC R	97.62	50-year	9.10	28.50	29.30	29.43	29.70	0.069257	5.08	1.79	4.87	1.48	1.33		
EX. TRIB 1 HEC R	97.62	100-year	11.70	28.50	29.38	29.52	29.82	0.067435	5.31	2.20	5.51	1.48	1.41		
EX. TRIB 1 HEC R	70.58	1-year	0.10	26.31	26.35	26.35	26.37	0.072589	1.04	0.10	3.48	1.11	0.12		
EX. TRIB 1 HEC R	70.58	2-year	0.50	26.31	26.39	26.41	26.44	0.088847	1.67	0.30	6.19	1.34	0.27		
EX. TRIB 1 HEC R	70.58	5-year	1.50	26.31	26.43	26.46	26.55	0.132929	2.83	0.53	6.74	1.78	0.65		
EX. TRIB 1 HEC R	70.58	10-year	2.70	26.31	26.47	26.52	26.65	0.134442	3.48	0.78	7.29	1.88	0.89		
EX. TRIB 1 HEC R	70.58	25-year	6.60	26.31	26.54	26.65	26.90	0.148366	4.82	1.37	8.47	2.11	1.48		
EX. TRIB 1 HEC R	70.58	50-year	9.10	26.31	26.58	26.71	27.03	0.152274	5.37	1.69	9.05	2.19	1.76		
EX. TRIB 1 HEC R	70.58	100-year	11.70	26.31	27.12	26.76	27.16	0.002701	1.62	7.24	11.09	0.35	0.11		

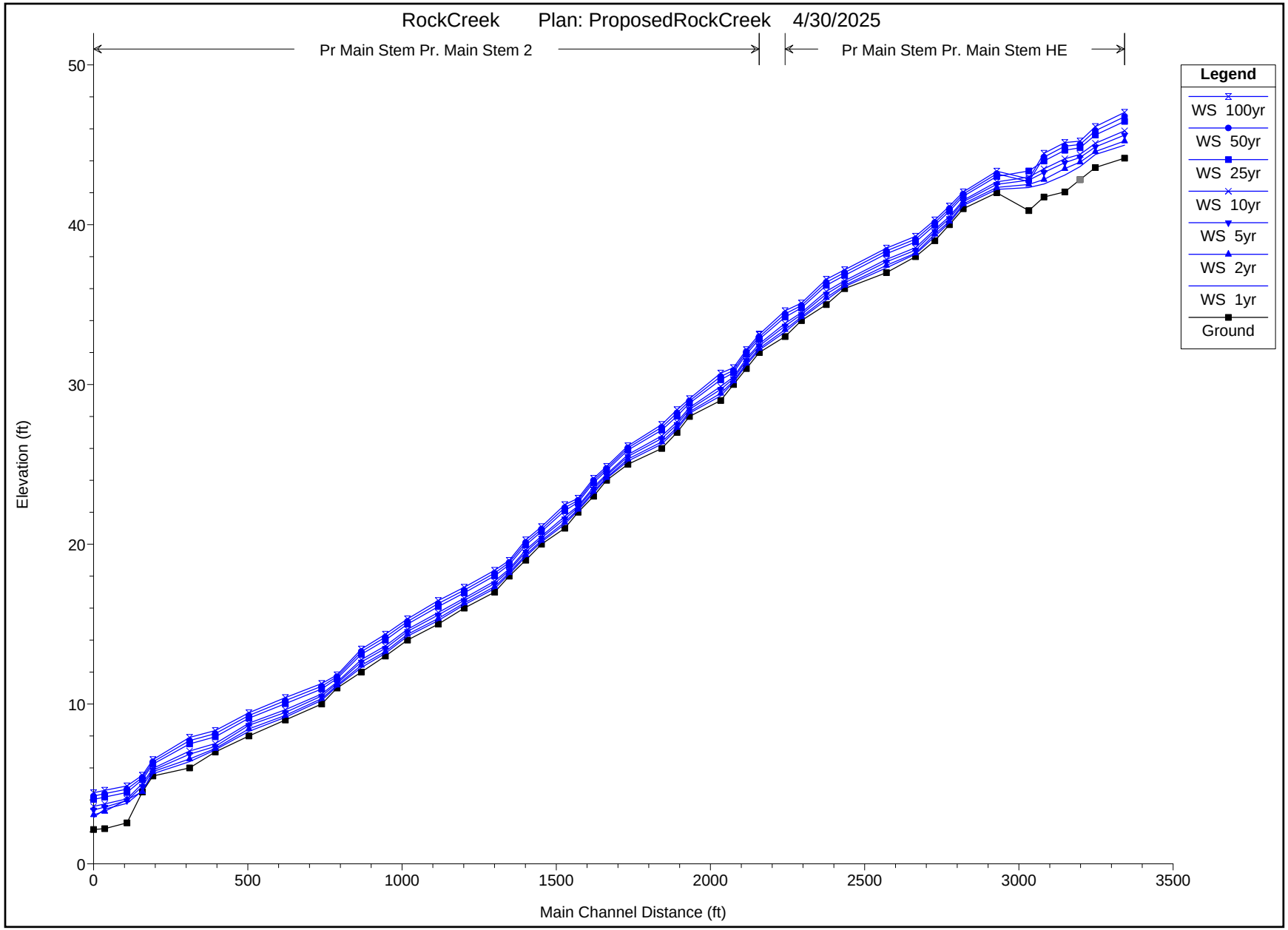

RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Trib 1 Reach = EX. TRIB 1 HEC R RS = 354.96
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Trib 1 Reach = EX. TRIB 1 HEC R RS = 322.25
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta


RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Trib 1 Reach = EX. TRIB 1 HEC R RS = 279.22
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Trib 1 Reach = EX. TRIB 1 HEC R RS = 241.45
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta


RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Trib 1 Reach = EX. TRIB 1 HEC R RS = 208.5
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Trib 1 Reach = EX. TRIB 1 HEC R RS = 174.24
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 2-year
WS 5-year
WS 1-year
Ground
Bank Sta


RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Trib 1 Reach = EX. TRIB 1 HEC R RS = 148.34
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Trib 1 Reach = EX. TRIB 1 HEC R RS = 123.11
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta


RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Trib 1 Reach = EX. TRIB 1 HEC R RS = 97.62
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta
RockCreek Plan: ExistingRockCreek 4/30/2025
River = Ex. Trib 1 Reach = EX. TRIB 1 HEC R RS = 70.58
.1
.035
.1
Elevation (ft)
Station (ft)
Legend
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
WS 1-year
Ground
Bank Sta


RockCreek Plan: ProposedRockCreek 4/30/2025
Pr Main Stem Pr. Main Stem 2
Pr Main Stem Pr. Main Stem HE
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Elevation (ft)
Main Channel Distance (ft)
0
10
20
30
40
50
0
500
1000
1500
2000
2500
3000
3500

HEC-RAS Plan: Proposed

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
Pr. Main Stem HE	-99.79	1yr	16.50	44.16	44.98	44.77	45.02	0.002684	1.77	9.30	19.83	0.46	0.08		
Pr. Main Stem HE	-99.79	2yr	34.60	44.16	45.23	44.96	45.32	0.002881	2.37	14.61	21.21	0.50	0.12		
Pr. Main Stem HE	-99.79	5yr	71.80	44.16	45.60	45.25	45.76	0.003174	3.15	22.82	23.18	0.56	0.19		
Pr. Main Stem HE	-99.79	10yr	107.80	44.16	45.88	45.48	46.09	0.003381	3.67	29.34	24.69	0.59	0.25		
Pr. Main Stem HE	-99.79	25yr	213.70	44.16	46.47	46.02	46.82	0.003819	4.75	44.99	28.09	0.66	0.37		
Pr. Main Stem HE	-99.79	50yr	279.60	44.16	46.76	46.29	47.19	0.004009	5.24	53.34	29.74	0.69	0.44		
Pr. Main Stem HE	-99.79	100yr	351.10	44.16	47.03	46.56	47.53	0.004183	5.69	61.66	31.31	0.72	0.50		
Pr. Main Stem HE	-194.63	1yr	16.50	43.58	44.39	44.37	44.53	0.013157	3.00	5.51	17.69	0.95	0.25		
Pr. Main Stem HE	-194.63	2yr	34.60	43.58	44.58	44.57	44.81	0.012615	3.81	9.08	19.66	0.99	0.36		
Pr. Main Stem HE	-194.63	5yr	71.80	43.58	44.87	44.87	45.22	0.011706	4.76	15.08	22.05	1.02	0.49		
Pr. Main Stem HE	-194.63	10yr	107.80	43.58	45.09	45.09	45.53	0.010841	5.32	20.28	23.70	1.01	0.57		
Pr. Main Stem HE	-194.63	25yr	213.70	43.58	45.62	45.62	46.25	0.009632	6.37	33.53	27.21	1.01	0.73		
Pr. Main Stem HE	-194.63	50yr	279.60	43.58	45.88	45.88	46.60	0.009200	6.82	41.00	29.00	1.01	0.80		
Pr. Main Stem HE	-194.63	100yr	351.10	43.58	46.14	46.14	46.95	0.008860	7.21	48.68	30.73	1.01	0.86		
Pr. Main Stem HE	-244.23*	1yr	16.50	42.82	43.64	43.64	43.85	0.014025	3.69	4.47	10.95	1.02	0.35		
Pr. Main Stem HE	-244.23*	2yr	34.60	42.82	43.92	43.92	44.17	0.013326	4.01	8.62	18.01	1.02	0.39		
Pr. Main Stem HE	-244.23*	5yr	71.80	42.82	44.20	44.24	44.60	0.013546	5.03	14.28	21.52	1.09	0.56		
Pr. Main Stem HE	-244.23*	10yr	107.80	42.82	44.40	44.47	44.92	0.014155	5.77	18.68	23.65	1.14	0.69		
Pr. Main Stem HE	-244.23*	25yr	213.70	42.82	44.81	44.98	45.64	0.015100	7.28	29.33	27.41	1.24	1.00		
Pr. Main Stem HE	-244.23*	50yr	279.60	42.82	45.02	45.24	46.00	0.015186	7.96	35.15	28.86	1.27	1.14		
Pr. Main Stem HE	-244.23*	100yr	351.10	42.82	45.23	45.50	46.35	0.014857	8.48	41.40	30.35	1.28	1.25		
Pr. Main Stem HE	-293.83	1yr	16.50	42.05	43.10	42.83	43.20	0.003653	2.52	6.56	10.27	0.56	0.14		
Pr. Main Stem HE	-293.83	2yr	34.60	42.05	43.51	43.24	43.61	0.004210	2.57	13.44	22.91	0.59	0.15		
Pr. Main Stem HE	-293.83	5yr	71.80	42.05	43.88	43.61	44.04	0.003823	3.15	22.80	26.67	0.60	0.20		
Pr. Main Stem HE	-293.83	10yr	107.80	42.05	44.13	43.82	44.33	0.004001	3.65	29.50	28.53	0.63	0.25		
Pr. Main Stem HE	-293.83	25yr	213.70	42.05	44.66	44.31	45.00	0.004359	4.67	45.76	32.59	0.69	0.37		
Pr. Main Stem HE	-293.83	50yr	279.60	42.05	44.91	44.56	45.32	0.004485	5.15	54.31	35.64	0.72	0.44	0.01	
Pr. Main Stem HE	-293.83	100yr	351.10	42.05	45.14	44.80	45.64	0.004547	5.67	62.92	40.88	0.74	0.51	0.04	0.04
Pr. Main Stem HE	-361.38	1yr	16.50	41.73	42.55	42.55	42.76	0.013712	3.68	4.48	10.81	1.01	0.35		
Pr. Main Stem HE	-361.38	2yr	34.60	41.73	42.83	42.83	43.14	0.012154	4.44	7.79	12.92	1.01	0.45		
Pr. Main Stem HE	-361.38	5yr	71.80	41.73	43.27	43.27	43.60	0.011523	4.60	15.62	23.78	1.00	0.47		
Pr. Main Stem HE	-361.38	10yr	107.80	41.73	43.49	43.49	43.90	0.010780	5.09	21.17	26.26	1.00	0.54		
Pr. Main Stem HE	-361.38	25yr	213.70	41.73	43.99	43.99	44.55	0.009609	6.04	35.37	41.49	1.00	0.67		
Pr. Main Stem HE	-361.38	50yr	279.60	41.73	44.23	44.23	44.88	0.009177	6.46	43.26	62.45	1.00	0.73		
Pr. Main Stem HE	-361.38	100yr	351.10	41.73	44.47	44.47	45.19	0.008942	6.84	51.34	82.08	1.00	0.79		
Pr. Main Stem HE	-410.38	1yr	16.50	40.88	42.33	41.66	42.34	0.000423	0.89	18.61	28.12	0.19	0.02		
Pr. Main Stem HE	-410.38	2yr	34.60	40.88	42.52	41.98	42.55	0.000848	1.42	24.32	30.45	0.28	0.04		
Pr. Main Stem HE	-410.38	5yr	71.80	40.88	42.79	42.23	42.86	0.001493	2.19	32.75	32.71	0.39	0.09		
Pr. Main Stem HE	-410.38	10yr	107.80	40.88	42.97	42.43	43.09	0.002002	2.76	39.01	34.27	0.46	0.14		
Pr. Main Stem HE	-410.38	25yr	213.70	40.88	43.36	42.88	43.62	0.003229	4.04	52.96	104.41	0.60	0.28		
Pr. Main Stem HE	-410.38	50yr	279.60	40.88	42.70	43.11	44.06	0.029859	9.36	29.86	31.96	1.71	1.72		
Pr. Main Stem HE	-410.38	100yr	351.10	40.88	42.87	43.32	44.39	0.028177	9.90	35.46	33.39	1.69	1.84		
Pr. Main Stem HE	-514.37	1yr	16.50	42.00	42.21	42.11	42.22	0.007681	0.97	17.08	82.96	0.38	0.10		
Pr. Main Stem HE	-514.37	2yr	34.60	42.00	42.33	42.18	42.35	0.007260	1.27	27.23	83.94	0.39	0.15		
Pr. Main Stem HE	-514.37	5yr	71.80	42.00	42.53		42.57	0.006526	1.64	43.89	85.51	0.40	0.21		
Pr. Main Stem HE	-514.37	10yr	107.80	42.00	42.68		42.73	0.006317	1.89	56.89	86.72	0.41	0.26		
Pr. Main Stem HE	-514.37	25yr	213.70	42.00	43.02		43.11	0.006281	2.46	87.61	122.30	0.44	0.38		0.01
Pr. Main Stem HE	-514.37	50yr	279.60	42.00	43.18	42.71	43.30	0.006312	2.72	108.05	124.09	0.45	0.44		0.07
Pr. Main Stem HE	-514.37	100yr	351.10	42.00	43.35	42.82	43.48	0.006292	2.96	128.25	125.84	0.46	0.50		0.13
Pr. Main Stem HE	-622.92	1yr	16.50	41.00	41.20		41.22	0.011125	1.13	14.56	73.48	0.45	0.14		
Pr. Main Stem HE	-622.92	2yr	34.60	41.00	41.30		41.34	0.012320	1.56	22.13	74.30	0.51	0.23		
Pr. Main Stem HE	-622.92	5yr	71.80	41.00	41.44		41.51	0.015666	2.24	32.09	75.37	0.60	0.42		
Pr. Main Stem HE	-622.92	10yr	107.80	41.00	41.54		41.65	0.017719	2.72	39.64	76.16	0.66	0.57		
Pr. Main Stem HE	-622.92	25yr	213.70	41.00	41.78		41.99	0.019858	3.66	58.35	78.10	0.75	0.92		
Pr. Main Stem HE	-622.92	50yr	279.60	41.00	41.92		42.17	0.019454	4.03	69.39	79.23	0.76	1.06		
Pr. Main Stem HE	-622.92	100yr	351.10	41.00	42.05		42.35	0.019461	4.39	79.98	80.29	0.78	1.21		
Pr. Main Stem HE	-667.72	1yr	16.50	40.00	40.13	40.13	40.20	0.068563	2.09	7.90	62.23	1.03	0.54		
Pr. Main Stem HE	-667.72	2yr	34.60	40.00	40.21	40.21	40.32	0.053913	2.60	13.29	62.92	1.00	0.71		
Pr. Main Stem HE	-667.72	5yr	71.80	40.00	40.38	40.35	40.52	0.033098	2.98	24.06	64.28	0.86	0.77		
Pr. Main Stem HE	-667.72	10yr	107.80	40.00	40.52		40.69	0.026770	3.27	32.95	65.37	0.81	0.84		
Pr. Main Stem HE	-667.72	25yr	213.70	40.00	40.85		41.08	0.020501	3.91	54.69	67.98	0.77	1.03		
Pr. Main Stem HE	-667.72	50yr	279.60	40.00	41.00		41.29	0.019971	4.29	65.25	69.21	0.78	1.17		
Pr. Main Stem HE	-667.72	100yr	351.10	40.00	41.16		41.49	0.018875	4.58	76.66	70.52	0.77	1.28		
Pr. Main Stem HE	-715.15	1yr	16.50	39.00	39.26	39.14	39.28	0.008780	1.18	13.95	55.22	0.41	0.14		
Pr. Main Stem HE	-715.15	2yr	34.60	39.00	39.40	39.23	39.44	0.008622	1.57	22.06	56.38	0.44	0.21		
Pr. Main Stem HE	-715.15	5yr	71.80	39.00	39.57		39.65	0.011337	2.26	31.80	57.75	0.54	0.39		
Pr. Main Stem HE	-715.15	10yr	107.80	39.00	39.70		39.82	0.013051	2.75	39.18	58.76	0.59	0.54		
Pr. Main Stem HE	-715.15	25yr	213.70	39.00	39.98		40.21	0.016481	3.82	55.93	61.00	0.70	0.94		
Pr. Main Stem HE	-715.15	50yr	279.60	39.00	40.14		40.42	0.016954	4.25	65.72	62.27	0.73	1.11		
Pr. Main Stem HE	-715.15	100yr	351.10	39.00	40.29		40.63	0.017421	4.66	75.33	63.49	0.75	1.28		
Pr. Main Stem HE	-777.65	1yr	16.50	38.00	38.15	38.15	38.21	0.045650	1.90	8.69	58.32	0.87	0.42		
Pr. Main Stem HE	-777.65	2yr	34.60	38.00	38.22	38.22	38.33	0.053671	2.67	12.97	58.91	1.00	0.74		
Pr. Main Stem HE	-777.65	5yr	71.80	38.00	38.41		38.55	0.030618	2.99	24.02	60.39	0.84	0.76		
Pr. Main Stem HE	-777.65	10yr	107.80	38.00	38.56		38.72	0.024155	3.25	33.18	61.59	0.78	0.81		
Pr. Main Stem HE	-777.65	25yr	213.70	38.00	38.92		39.15	0.017806	3.83	55.86	64.47	0.72	0.96		
Pr. Main Stem HE	-777.65	50yr	279.60	38.00	39.10		39.36	0.016729	4.14	67.48	65.90	0.72	1.07		
Pr. Main Stem HE	-777.65	100yr	351.10	38.00	39.27		39.58	0.015955	4.44	79.15	67.30	0.72	1.17		
Pr. Main Stem HE	-872.18	1yr	16.50	37.00	37.30	37.12	37.31	0.003044	0.77	21.30	71.91	0.25	0.06		
Pr. Main Stem HE	-872.18	2yr	34.60	37.00	37.46	37.20	37.47	0.003360	1.07	32.48	73.14	0.28	0.09		
Pr. Main Stem HE	-872.18	5yr	71.80	37.00	37.67		37.70	0.003989	1.49	48.26	74.85	0.33	0.16		
Pr. Main Stem HE	-872.18	10yr	107.80	37.00	37.83		37.88	0.004339	1.78	60.47	76.14	0.35	0.21		
Pr. Main Stem HE	-872.18	25yr	213.70	37.00	38.18		38.27	0.005204	2.44	87.62	78.94	0.41	0.36		
Pr. Main Stem HE	-872.18	50yr	279.60	37.00	38.36		38.48	0.005487	2.74	102.10	80.40	0.43	0.43		
Pr. Main Stem HE	-872.18	100yr	351.10	37.00	38.53		38.67	0.005806	3.03	115.87	81.76	0.45	0.51		
Pr. Main Stem HE	-1007.55	1yr	16.50	36.00	36.12	36.12	36.19	0.068844	2.03	8.12	66.88	1.03	0.52		
Pr. Main Stem HE	-1007.55	2yr	34.60	36.00	36.20	36.20	36.30	0.054727	2.54	13.61	67.53	1.00	0.69		
Pr. Main Stem HE	-1007.55	5yr	71.80	36.00	36.36	36.33	36.50	0.034357	2.94	24.45	68.80	0.87	0.76		
Pr. Main Stem HE	-1007.55	10yr	107.80	36.00	36.49	36.43	36.65	0.027987	3.23	33.38	69.83	0.82	0.83		
Pr. Main Stem HE	-1007.55	25yr	213.70	36.00	36.83		37.04	0.019336	3.74	57.10	72.50	0.74	0.95		
Pr. Main Stem HE	-1007.55	50yr	279.60	36.00	37.00		37.25	0.017166	3.99	70.09	73.92	0.72	1.01		
Pr. Main Stem HE	-1007.55	100yr	351.10	36.00	37.18		37.46	0.015676	4.22	83.22	75.33	0.71	1.08		
Pr. Main Stem HE	-1066.83	1yr	16.50	35.00	35.29	35.14	35.30	0.005592	1.02	16.24	57.60	0.34	0.10		

HEC-RAS Plan: Proposed (Continued)

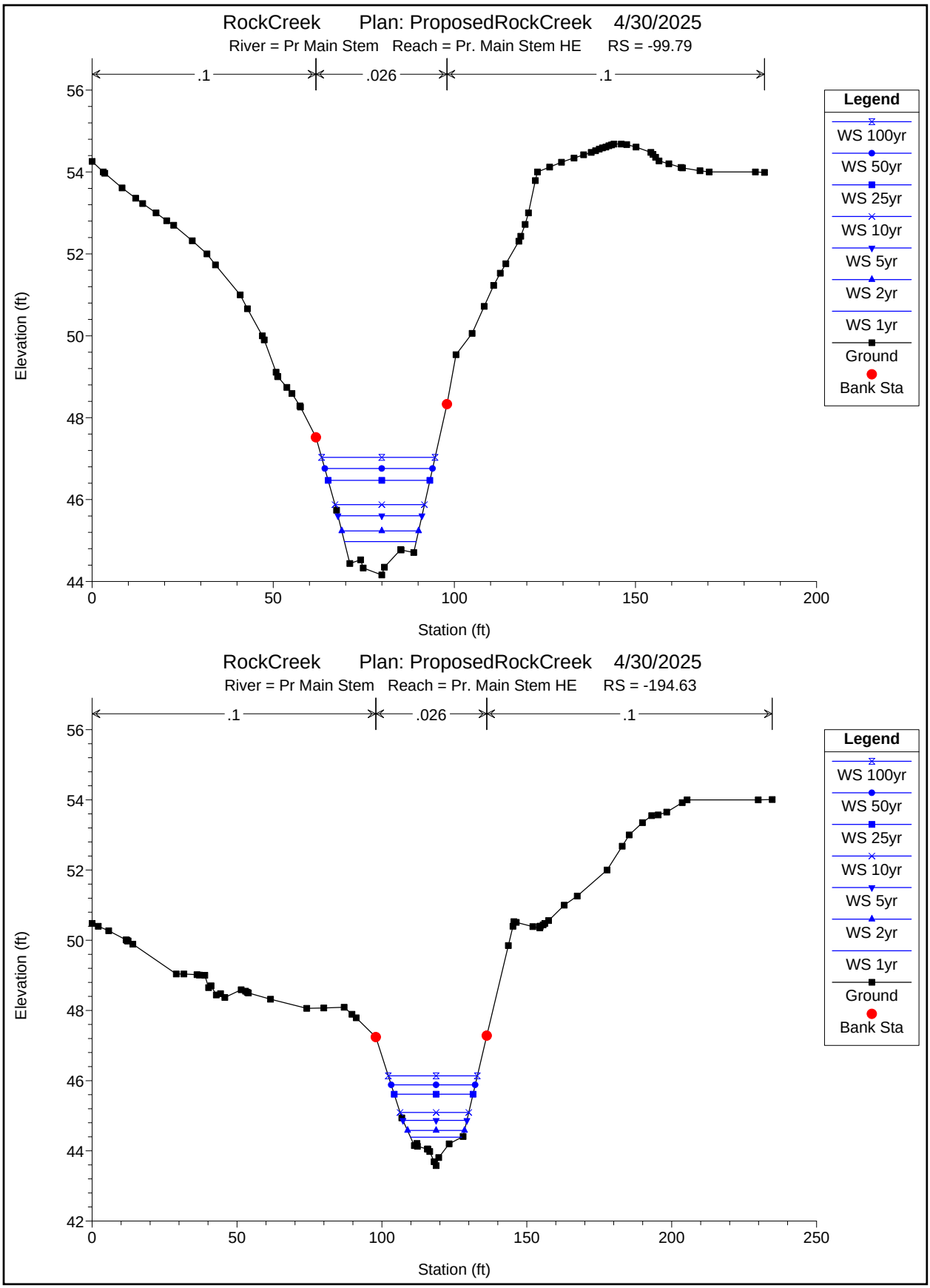
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
Pr. Main Stem HE	-1066.83	2yr	34.60	35.00	35.44	35.23	35.47	0.006074	1.39	24.92	58.79	0.38	0.16		
Pr. Main Stem HE	-1066.83	5yr	71.80	35.00	35.66		35.71	0.006610	1.88	38.11	60.56	0.42	0.26		
Pr. Main Stem HE	-1066.83	10yr	107.80	35.00	35.83		35.90	0.006929	2.23	48.38	61.91	0.44	0.34		
Pr. Main Stem HE	-1066.83	25yr	213.70	35.00	36.21		36.34	0.007547	2.95	72.52	64.95	0.49	0.52		
Pr. Main Stem HE	-1066.83	50yr	279.60	35.00	36.40		36.57	0.007802	3.28	85.18	66.49	0.51	0.62		
Pr. Main Stem HE	-1066.83	100yr	351.10	35.00	36.59		36.79	0.008023	3.59	97.72	67.98	0.53	0.72		
Pr. Main Stem HE	-1147.74	1yr	16.50	34.00	34.14	34.14	34.22	0.062765	2.17	7.61	53.06	1.01	0.56		
Pr. Main Stem HE	-1147.74	2yr	34.60	34.00	34.24	34.24	34.36	0.052439	2.75	12.59	53.81	1.00	0.77		
Pr. Main Stem HE	-1147.74	5yr	71.80	34.00	34.39	34.39	34.57	0.044711	3.48	20.66	54.99	1.00	1.05		
Pr. Main Stem HE	-1147.74	10yr	107.80	34.00	34.50	34.50	34.75	0.041514	3.97	27.14	55.93	1.01	1.25		
Pr. Main Stem HE	-1147.74	25yr	213.70	34.00	34.79	34.79	35.17	0.036057	4.92	43.39	58.21	1.01	1.67		
Pr. Main Stem HE	-1147.74	50yr	279.60	34.00	34.94	34.94	35.38	0.033951	5.34	52.36	59.43	1.00	1.86		
Pr. Main Stem HE	-1147.74	100yr	351.10	34.00	35.09	35.09	35.60	0.032208	5.71	61.49	60.64	1.00	2.03		
Pr. Main Stem HE	-1200.69	1yr	16.50	33.00	33.28	33.14	33.30	0.005530	1.00	16.44	58.88	0.33	0.10		
Pr. Main Stem HE	-1200.69	2yr	34.60	33.00	33.43	33.23	33.46	0.006060	1.38	25.15	60.05	0.37	0.16		
Pr. Main Stem HE	-1200.69	5yr	71.80	33.00	33.65	33.37	33.71	0.006434	1.85	38.74	61.83	0.41	0.25		
Pr. Main Stem HE	-1200.69	10yr	107.80	33.00	33.83	33.48	33.90	0.006594	2.18	49.52	63.21	0.43	0.32		
Pr. Main Stem HE	-1200.69	25yr	213.70	33.00	34.22	33.75	34.34	0.006991	2.86	74.83	66.34	0.47	0.49		
Pr. Main Stem HE	-1200.69	50yr	279.60	33.00	34.42	33.89	34.58	0.007047	3.16	88.60	67.98	0.49	0.57		
Pr. Main Stem HE	-1200.69	100yr	351.10	33.00	34.61		34.80	0.007202	3.45	101.84	69.52	0.50	0.65		
Pr. Main Stem 2	-1284.68	1yr	16.50	32.00	32.16	32.15	32.23	0.055351	2.13	7.73	50.25	0.96	0.53		
Pr. Main Stem 2	-1284.68	2yr	34.60	32.00	32.26	32.25	32.37	0.045359	2.69	12.88	51.06	0.94	0.71		
Pr. Main Stem 2	-1284.68	5yr	71.80	32.00	32.41	32.40	32.60	0.039828	3.43	20.96	52.31	0.95	0.99		
Pr. Main Stem 2	-1284.68	10yr	107.80	32.00	32.54	32.52	32.78	0.037877	3.94	27.36	53.28	0.97	1.21		
Pr. Main Stem 2	-1284.68	25yr	213.70	32.00	32.83	32.82	33.21	0.034385	4.94	43.22	55.61	0.99	1.66		
Pr. Main Stem 2	-1284.68	50yr	279.60	32.00	32.97	32.97	33.43	0.033824	5.43	51.48	56.79	1.01	1.91		
Pr. Main Stem 2	-1284.68	100yr	351.10	32.00	33.13	33.13	33.65	0.032254	5.81	60.40	58.03	1.00	2.09		
Pr. Main Stem 2	-1326.24	1yr	16.50	31.00	31.22	31.14	31.25	0.012839	1.29	12.79	59.16	0.49	0.17		
Pr. Main Stem 2	-1326.24	2yr	34.60	31.00	31.33	31.22	31.38	0.014393	1.78	19.39	60.04	0.55	0.29		
Pr. Main Stem 2	-1326.24	5yr	71.80	31.00	31.50	31.36	31.59	0.015607	2.43	29.60	61.39	0.62	0.47		
Pr. Main Stem 2	-1326.24	10yr	107.80	31.00	31.62	31.47	31.75	0.016504	2.88	37.40	62.39	0.66	0.62		
Pr. Main Stem 2	-1326.24	25yr	213.70	31.00	31.91	31.74	32.14	0.018197	3.85	55.57	64.68	0.73	0.97		
Pr. Main Stem 2	-1326.24	50yr	279.60	31.00	32.06	31.88	32.34	0.018683	4.28	65.27	65.87	0.76	1.15		
Pr. Main Stem 2	-1326.24	100yr	351.10	31.00	32.18	32.02	32.54	0.020654	4.81	73.03	66.81	0.81	1.40		
Pr. Main Stem 2	-1367.8	1yr	16.50	30.00	30.13	30.13	30.20	0.066192	2.11	7.81	58.97	1.02	0.55		
Pr. Main Stem 2	-1367.8	2yr	34.60	30.00	30.22	30.22	30.33	0.053423	2.65	13.05	59.68	1.00	0.73		
Pr. Main Stem 2	-1367.8	5yr	71.80	30.00	30.36	30.36	30.54	0.046734	3.39	21.21	60.76	1.01	1.02		
Pr. Main Stem 2	-1367.8	10yr	107.80	30.00	30.47	30.47	30.70	0.042412	3.85	28.03	61.65	1.01	1.20		
Pr. Main Stem 2	-1367.8	25yr	213.70	30.00	30.74	30.74	31.09	0.036270	4.76	44.93	63.81	1.00	1.59		
Pr. Main Stem 2	-1367.8	50yr	279.60	30.00	30.88	30.88	31.30	0.034796	5.19	53.83	64.91	1.01	1.80		
Pr. Main Stem 2	-1367.8	100yr	351.10	30.00	31.05	31.02	31.50	0.030062	5.40	65.03	66.28	0.96	1.83		
Pr. Main Stem 2	-1409.38	1yr	16.50	29.00	29.29	29.14	29.31	0.006263	1.07	15.37	54.60	0.36	0.11		
Pr. Main Stem 2	-1409.38	2yr	34.60	29.00	29.45	29.24	29.48	0.006062	1.42	24.44	55.91	0.38	0.17		
Pr. Main Stem 2	-1409.38	5yr	71.80	29.00	29.69	29.38	29.75	0.006185	1.88	38.17	57.85	0.41	0.25		
Pr. Main Stem 2	-1409.38	10yr	107.80	29.00	29.88	29.50	29.95	0.006264	2.20	49.04	59.33	0.43	0.32		
Pr. Main Stem 2	-1409.38	25yr	213.70	29.00	30.29	29.78	30.42	0.006625	2.87	74.34	62.65	0.47	0.49		
Pr. Main Stem 2	-1409.38	50yr	279.60	29.00	30.50	29.94	30.66	0.006825	3.20	87.51	64.31	0.48	0.58		
Pr. Main Stem 2	-1409.38	100yr	351.10	29.00	30.71		30.89	0.006935	3.48	100.88	65.95	0.50	0.66		
Pr. Main Stem 2	-1510.82	1yr	16.50	28.00	28.20		28.24	0.021755	1.56	10.55	54.28	0.63	0.26		
Pr. Main Stem 2	-1510.82	2yr	34.60	28.00	28.29		28.37	0.025924	2.20	15.70	55.03	0.73	0.46		
Pr. Main Stem 2	-1510.82	5yr	71.80	28.00	28.44		28.58	0.027713	2.98	24.06	56.23	0.80	0.74		
Pr. Main Stem 2	-1510.82	10yr	107.80	28.00	28.56		28.75	0.028867	3.53	30.53	57.15	0.85	0.96		
Pr. Main Stem 2	-1510.82	25yr	213.70	28.00	28.83	28.78	29.16	0.029556	4.60	46.41	59.33	0.92	1.44		
Pr. Main Stem 2	-1510.82	50yr	279.60	28.00	28.97	28.93	29.37	0.029923	5.11	54.75	60.44	0.95	1.69		
Pr. Main Stem 2	-1510.82	100yr	351.10	28.00	29.11	29.08	29.59	0.029747	5.54	63.36	61.57	0.96	1.90		
Pr. Main Stem 2	-1551.14	1yr	16.50	27.00	27.19		27.23	0.028575	1.74	9.51	51.32	0.71	0.33		
Pr. Main Stem 2	-1551.14	2yr	34.60	27.00	27.31		27.39	0.022776	2.16	16.00	52.33	0.69	0.43		
Pr. Main Stem 2	-1551.14	5yr	71.80	27.00	27.50		27.62	0.020738	2.78	25.79	53.80	0.71	0.62		
Pr. Main Stem 2	-1551.14	10yr	107.80	27.00	27.65		27.81	0.018674	3.14	34.28	55.05	0.70	0.72		
Pr. Main Stem 2	-1551.14	25yr	213.70	27.00	28.02		28.25	0.016370	3.89	54.92	57.97	0.70	0.96		
Pr. Main Stem 2	-1551.14	50yr	279.60	27.00	28.22		28.49	0.015197	4.19	66.74	59.58	0.70	1.06		
Pr. Main Stem 2	-1551.14	100yr	351.10	27.00	28.42		28.73	0.014376	4.47	78.63	61.16	0.69	1.15		
Pr. Main Stem 2	-1600.58	1yr	16.50	26.00	26.27		26.31	0.013308	1.50	11.01	41.70	0.51	0.22		
Pr. Main Stem 2	-1600.58	2yr	34.60	26.00	26.40		26.47	0.015414	2.09	16.59	42.76	0.59	0.37		
Pr. Main Stem 2	-1600.58	5yr	71.80	26.00	26.62		26.74	0.015500	2.75	26.10	44.50	0.63	0.57		
Pr. Main Stem 2	-1600.58	10yr	107.80	26.00	26.78		26.94	0.016071	3.23	33.33	45.78	0.67	0.73		
Pr. Main Stem 2	-1600.58	25yr	213.70	26.00	27.15		27.42	0.017139	4.23	50.55	48.70	0.73	1.10		
Pr. Main Stem 2	-1600.58	50yr	279.60	26.00	27.32		27.67	0.018114	4.73	59.10	50.08	0.77	1.33		
Pr. Main Stem 2	-1600.58	100yr	351.10	26.00	27.49		27.91	0.018618	5.17	67.95	51.47	0.79	1.52		
Pr. Main Stem 2	-1710.19	1yr	16.50	25.00	25.21		25.22	0.007541	0.95	17.33	84.85	0.37	0.10		
Pr. Main Stem 2	-1710.19	2yr	34.60	25.00	25.33		25.35	0.007117	1.25	27.63	85.82	0.39	0.14		
Pr. Main Stem 2	-1710.19	5yr	71.80	25.00	25.49		25.54	0.007949	1.72	41.68	87.12	0.44	0.24		
Pr. Main Stem 2	-1710.19	10yr	107.80	25.00	25.61		25.68	0.008417	2.05	52.53	88.11	0.47	0.31		
Pr. Main Stem 2	-1710.19	25yr	213.70	25.00	25.89		26.01	0.009489	2.77	77.18	90.32	0.53	0.51		
Pr. Main Stem 2	-1710.19	50yr	279.60	25.00	26.03		26.18	0.009871	3.10	90.08	91.45	0.55	0.61		
Pr. Main Stem 2	-1710.19	100yr	351.10	25.00	26.16		26.35	0.010423	3.44	102.07	92.50	0.58	0.72		
Pr. Main Stem 2	-1779.12	1yr	16.50	24.00	24.12	24.12	24.16	0.046368	1.66	9.93	82.37	0.84	0.35		
Pr. Main Stem 2	-1779.12	2yr	34.60	24.00	24.18	24.18	24.27	0.057269	2.37	14.57	82.82	1.00	0.63		
Pr. Main Stem 2	-1779.12	5yr	71.80	24.00	24.29	24.29	24.43	0.046716	2.98	24.11	83.74	0.98	0.84		
Pr. Main Stem 2	-1779.12	10yr	107.80	24.00	24.38	24.38	24.56	0.042267	3.39	31.82	84.47	0.97	0.99		
Pr. Main Stem 2	-1779.12	25yr	213.70	24.00	24.62	24.59	24.88	0.032877	4.09	52.21	86.38	0.93	1.24		
Pr. Main Stem 2	-1779.12	50yr	279.60	24.00	24.75	24.71	25.05	0.030620	4.44	62.96	87.37	0.92	1.37		
Pr. Main Stem 2	-1779.12	100yr	351.10	24.00	24.87	24.82	25.22	0.028385	4.73	74.20	88.39	0.91	1.48		
Pr. Main Stem 2	-1821.4	1yr	16.50	23.00	23.20	23.11	23.22	0.009773	1.07	15.40	76.72	0.42	0.12		
Pr. Main Stem 2	-1821.4	2yr	34.60	23.00	23.31	23.19	23.34	0.010749	1.48	23.45	77.56	0.47	0.20		
Pr. Main Stem 2	-1821.4	5yr	71.80	23.00	23.46	23.30	23.53	0.011672	2.01	35.68	78.81	0.53	0.33		
Pr. Main Stem 2	-1821.4	10yr	107.80	23.00	23.58	23.40	23.67	0.012172	2.39	45.19	79.77	0.56	0.43		
Pr. Main Stem 2	-1821.4	25yr	213.70	23.00	23.85	23.62	24.01	0.013319	3.19	67.05	81.93	0.62	0.68		
Pr. Main Stem 2	-1821.4	50yr	279.60	23.00	24.00	23.74	24.19	0.013595	3.55	78.75	83.07	0.64	0.80		
Pr. Main Stem 2	-1821.4	100yr	351.10	23.00	24.12	23.86	24.36	0.014280	3.93	89.41	84.09	0.67	0.94		
Pr. Main Stem 2	-1871.75	1yr	16.50	22.00	22.11	22.11	22.17	0.068307	1.93	8.53	75.31	1.01	0.48		
Pr. Main Stem 2	-1871.75	2yr	34.60	22.00	22.19	22.19	22.28	0.056236	2.45	14.15	75.91	1.00	0.65		

HEC-RAS Plan: Proposed (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
Pr. Main Stem 2	-1871.75	5yr	71.80	22.00	22.30	22.30	22.46	0.048329	3.11	23.06	76.84	1.00	0.90		
Pr. Main Stem 2	-1871.75	10yr	107.80	22.00	22.40	22.40	22.60	0.044547	3.56	30.28	77.59	1.00	1.08		
Pr. Main Stem 2	-1871.75	25yr	213.70	22.00	22.63	22.63	22.93	0.038551	4.44	48.13	79.41	1.01	1.46		
Pr. Main Stem 2	-1871.75	50yr	279.60	22.00	22.75	22.75	23.11	0.036436	4.84	57.81	80.38	1.01	1.63		
Pr. Main Stem 2	-1871.75	100yr	351.10	22.00	22.88	22.87	23.29	0.033664	5.15	68.22	81.41	0.99	1.76		
Pr. Main Stem 2	-1914.74	1yr	16.50	21.00	21.25	21.12	21.27	0.005851	0.96	17.22	69.03	0.34	0.09		
Pr. Main Stem 2	-1914.74	2yr	34.60	21.00	21.38	21.20	21.41	0.006370	1.31	26.35	70.08	0.38	0.15		
Pr. Main Stem 2	-1914.74	5yr	71.80	21.00	21.59	21.33	21.63	0.006657	1.77	40.67	71.69	0.41	0.24		
Pr. Main Stem 2	-1914.74	10yr	107.80	21.00	21.74	21.43	21.81	0.006842	2.08	51.84	72.93	0.43	0.30		
Pr. Main Stem 2	-1914.74	25yr	213.70	21.00	22.10	21.67	22.22	0.007047	2.71	78.72	75.82	0.47	0.46		
Pr. Main Stem 2	-1914.74	50yr	279.60	21.00	22.29	21.80	22.43	0.007034	3.00	93.31	77.34	0.48	0.53		
Pr. Main Stem 2	-1914.74	100yr	351.10	21.00	22.48		22.64	0.007089	3.26	107.54	78.80	0.49	0.60		
Pr. Main Stem 2	-1990.31	1yr	16.50	20.00	20.14	20.14	20.22	0.064948	2.20	7.50	52.46	1.03	0.58		
Pr. Main Stem 2	-1990.31	2yr	34.60	20.00	20.24	20.24	20.36	0.050355	2.73	12.69	53.24	0.98	0.75		
Pr. Main Stem 2	-1990.31	5yr	71.80	20.00	20.39	20.39	20.58	0.043005	3.45	20.82	54.45	0.98	1.02		
Pr. Main Stem 2	-1990.31	10yr	107.80	20.00	20.51	20.51	20.75	0.040923	3.97	27.15	55.37	1.00	1.25		
Pr. Main Stem 2	-1990.31	25yr	213.70	20.00	20.79	20.79	21.17	0.035927	4.94	43.28	57.65	1.00	1.68		
Pr. Main Stem 2	-1990.31	50yr	279.60	20.00	20.95	20.95	21.39	0.034083	5.37	52.10	58.87	1.01	1.88		
Pr. Main Stem 2	-1990.31	100yr	351.10	20.00	21.10	21.10	21.61	0.032573	5.75	61.05	60.07	1.01	2.06		
Pr. Main Stem 2	-2041.37	1yr	16.50	19.00	19.22		19.24	0.008859	1.09	15.15	68.33	0.41	0.12		
Pr. Main Stem 2	-2041.37	2yr	34.60	19.00	19.34		19.37	0.009797	1.50	23.04	69.25	0.46	0.20		
Pr. Main Stem 2	-2041.37	5yr	71.80	19.00	19.51		19.58	0.010573	2.04	35.19	70.63	0.51	0.33		
Pr. Main Stem 2	-2041.37	10yr	107.80	19.00	19.65		19.74	0.010947	2.41	44.72	71.71	0.54	0.43		
Pr. Main Stem 2	-2041.37	25yr	213.70	19.00	19.95	19.68	20.11	0.011817	3.20	66.79	74.13	0.59	0.66		
Pr. Main Stem 2	-2041.37	50yr	279.60	19.00	20.11	19.80	20.31	0.011890	3.54	78.90	75.42	0.61	0.77		
Pr. Main Stem 2	-2041.37	100yr	351.10	19.00	20.27	19.93	20.50	0.012051	3.87	90.69	76.66	0.63	0.89		
Pr. Main Stem 2	-2095.29	1yr	16.50	18.00	18.13	18.13	18.20	0.069160	2.10	7.85	61.80	1.04	0.55		
Pr. Main Stem 2	-2095.29	2yr	34.60	18.00	18.21	18.21	18.32	0.054609	2.62	13.21	62.48	1.00	0.72		
Pr. Main Stem 2	-2095.29	5yr	71.80	18.00	18.35	18.35	18.52	0.046337	3.32	21.65	63.56	1.00	0.98		
Pr. Main Stem 2	-2095.29	10yr	107.80	18.00	18.45	18.45	18.68	0.042780	3.79	28.45	64.41	1.00	1.18		
Pr. Main Stem 2	-2095.29	25yr	213.70	18.00	18.72	18.72	19.06	0.036594	4.69	45.55	66.50	1.00	1.56		
Pr. Main Stem 2	-2095.29	50yr	279.60	18.00	18.85	18.85	19.26	0.034675	5.11	54.76	67.60	1.00	1.75		
Pr. Main Stem 2	-2095.29	100yr	351.10	18.00	18.99	18.99	19.46	0.033501	5.50	63.84	68.66	1.01	1.94		
Pr. Main Stem 2	-2142.27	1yr	16.50	17.00	17.22	17.14	17.24	0.008843	1.08	15.21	68.99	0.41	0.12		
Pr. Main Stem 2	-2142.27	2yr	34.60	17.00	17.35	17.20	17.38	0.008515	1.43	24.14	70.01	0.43	0.18		
Pr. Main Stem 2	-2142.27	5yr	71.80	17.00	17.54	17.33	17.60	0.008499	1.90	37.77	71.55	0.46	0.28		
Pr. Main Stem 2	-2142.27	10yr	107.80	17.00	17.69	17.43	17.77	0.008635	2.23	48.29	72.72	0.48	0.36		
Pr. Main Stem 2	-2142.27	25yr	213.70	17.00	18.02	17.67	18.16	0.009021	2.93	72.92	75.38	0.53	0.54		
Pr. Main Stem 2	-2142.27	50yr	279.60	17.00	18.19	17.80	18.36	0.009143	3.25	85.97	76.76	0.54	0.64		
Pr. Main Stem 2	-2142.27	100yr	351.10	17.00	18.36	17.93	18.56	0.009237	3.55	98.96	78.10	0.56	0.73		
Pr. Main Stem 2	-2241	1yr	16.50	16.00	16.21		16.23	0.011902	1.21	13.69	66.18	0.47	0.15		
Pr. Main Stem 2	-2241	2yr	34.60	16.00	16.32		16.36	0.012906	1.65	20.94	67.05	0.52	0.25		
Pr. Main Stem 2	-2241	5yr	71.80	16.00	16.49		16.56	0.013348	2.22	32.39	68.40	0.57	0.39		
Pr. Main Stem 2	-2241	10yr	107.80	16.00	16.63		16.73	0.013060	2.57	41.88	69.50	0.58	0.49		
Pr. Main Stem 2	-2241	25yr	213.70	16.00	16.96		17.12	0.012318	3.27	65.26	72.14	0.61	0.69		
Pr. Main Stem 2	-2241	50yr	279.60	16.00	17.13		17.33	0.011956	3.59	77.98	73.54	0.61	0.79		
Pr. Main Stem 2	-2241	100yr	351.10	16.00	17.30		17.54	0.011629	3.87	90.83	74.92	0.62	0.88		
Pr. Main Stem 2	-2324.97	1yr	16.50	15.00	15.22		15.25	0.011429	1.23	13.44	61.38	0.46	0.16		
Pr. Main Stem 2	-2324.97	2yr	34.60	15.00	15.36		15.40	0.010255	1.59	21.81	62.46	0.47	0.22		
Pr. Main Stem 2	-2324.97	5yr	71.80	15.00	15.57		15.64	0.009033	2.02	35.51	64.19	0.48	0.31		
Pr. Main Stem 2	-2324.97	10yr	107.80	15.00	15.73		15.82	0.008993	2.36	45.74	65.45	0.50	0.39		
Pr. Main Stem 2	-2324.97	25yr	213.70	15.00	16.10		16.24	0.008873	3.03	70.51	68.41	0.53	0.57		
Pr. Main Stem 2	-2324.97	50yr	279.60	15.00	16.29		16.47	0.008858	3.34	83.65	69.93	0.54	0.66		
Pr. Main Stem 2	-2324.97	100yr	351.10	15.00	16.48		16.68	0.008834	3.63	96.80	71.42	0.55	0.74		
Pr. Main Stem 2	-2425	1yr	16.50	14.00	14.25		14.27	0.008357	1.13	14.65	60.18	0.40	0.13		
Pr. Main Stem 2	-2425	2yr	34.60	14.00	14.37		14.41	0.009746	1.58	21.96	61.14	0.46	0.22		
Pr. Main Stem 2	-2425	5yr	71.80	14.00	14.54		14.62	0.011533	2.20	32.65	62.53	0.54	0.38		
Pr. Main Stem 2	-2425	10yr	107.80	14.00	14.68		14.78	0.012253	2.62	41.21	63.61	0.57	0.49		
Pr. Main Stem 2	-2425	25yr	213.70	14.00	15.00		15.18	0.012949	3.44	62.12	66.19	0.63	0.76		
Pr. Main Stem 2	-2425	50yr	279.60	14.00	15.16		15.39	0.013277	3.83	73.03	67.50	0.65	0.89		
Pr. Main Stem 2	-2425	100yr	351.10	14.00	15.33		15.60	0.013283	4.16	84.38	68.83	0.66	1.01		
Pr. Main Stem 2	-2496.87	1yr	16.50	13.00	13.17		13.22	0.031436	1.71	9.63	56.87	0.73	0.33		
Pr. Main Stem 2	-2496.87	2yr	34.60	13.00	13.29		13.36	0.023919	2.11	16.40	57.82	0.70	0.42		
Pr. Main Stem 2	-2496.87	5yr	71.80	13.00	13.48		13.59	0.018493	2.59	27.76	59.37	0.67	0.54		
Pr. Main Stem 2	-2496.87	10yr	107.80	13.00	13.64		13.77	0.016430	2.91	37.02	60.60	0.66	0.62		
Pr. Main Stem 2	-2496.87	25yr	213.70	13.00	14.00		14.20	0.014138	3.59	59.51	63.50	0.65	0.82		
Pr. Main Stem 2	-2496.87	50yr	279.60	13.00	14.19		14.42	0.013573	3.91	71.47	64.99	0.66	0.93		
Pr. Main Stem 2	-2496.87	100yr	351.10	13.00	14.36		14.64	0.013315	4.22	83.14	66.41	0.67	1.04		
Pr. Main Stem 2	-2574.84	1yr	16.50	12.00	12.28	12.14	12.30	0.006031	1.04	15.87	57.49	0.35	0.10		
Pr. Main Stem 2	-2574.84	2yr	34.60	12.00	12.42	12.23	12.46	0.006677	1.43	24.19	58.64	0.39	0.17		
Pr. Main Stem 2	-2574.84	5yr	71.80	12.00	12.63	12.37	12.69	0.007703	1.98	36.33	60.27	0.45	0.29		
Pr. Main Stem 2	-2574.84	10yr	107.80	12.00	12.78	12.49	12.87	0.008430	2.37	45.49	61.48	0.49	0.39		
Pr. Main Stem 2	-2574.84	25yr	213.70	12.00	13.12	12.76	13.28	0.009867	3.21	66.58	64.16	0.56	0.64		
Pr. Main Stem 2	-2574.84	50yr	279.60	12.00	13.28	12.91	13.48	0.010569	3.62	77.28	65.48	0.59	0.77		
Pr. Main Stem 2	-2574.84	100yr	351.10	12.00	13.44	13.05	13.69	0.011235	4.01	87.66	66.74	0.62	0.92		
Pr. Main Stem 2	-2653.46	1yr	16.50	11.00	11.11	11.11	11.16	0.068512	1.88	8.78	81.19	1.01	0.46		
Pr. Main Stem 2	-2653.46	2yr	34.60	11.00	11.18	11.18	11.27	0.059600	2.42	14.32	81.73	1.02	0.65		
Pr. Main Stem 2	-2653.46	5yr	71.80	11.00	11.29	11.29	11.43	0.048667	3.03	23.69	82.65	1.00	0.87		
Pr. Main Stem 2	-2653.46	10yr	107.80	11.00	11.38	11.38	11.57	0.044589	3.46	31.15	83.36	1.00	1.04		
Pr. Main Stem 2	-2653.46	25yr	213.70	11.00	11.60	11.60	11.89	0.038961	4.33	49.32	85.09	1.00	1.41		
Pr. Main Stem 2	-2653.46	50yr	279.60	11.00	11.71	11.71	12.06	0.036901	4.73	59.16	86.01	1.00	1.58		
Pr. Main Stem 2	-2653.46	100yr	351.10	11.00	11.83	11.83	12.23	0.035250	5.08	69.06	86.93	1.01	1.74		
Pr. Main Stem 2	-2703.16	1yr	16.50	10.00	10.23	10.10	10.24	0.004849	0.81	20.25	89.92	0.30	0.07		
Pr. Main Stem 2	-2703.16	2yr	34.60	10.00	10.34	10.17	10.36	0.005635	1.14	30.32	90.81	0.35	0.12		
Pr. Main Stem 2	-2703.16	5yr	71.80	10.00	10.51	10.27	10.55	0.006322	1.57	45.66	92.15	0.39	0.20		
Pr. Main Stem 2	-2703.16	10yr	107.80	10.00	10.63	10.36	10.69	0.006824	1.88	57.20	93.15	0.42	0.26		
Pr. Main Stem 2	-2703.16	25yr	213.70	10.00	10.94	10.56	11.04	0.006977	2.47	86.60	95.64	0.46	0.39		
Pr. Main Stem 2	-2703.16	50yr	279.60	10.00	11.11	10.67	11.23	0.006822	2.71	103.04	97.01	0.46	0.45		
Pr. Main Stem 2	-2703.16	100yr	351.10	10.00	11.28	10.78	11.42	0.006638	2.93	119.79	98.38	0.47	0.50		
Pr. Main Stem 2	-2821.09	1yr	16.50	9.00	9.17		9.20	0.020092	1.37	12.05	71.36	0.59	0.21		
Pr. Main Stem 2	-2821.09	2yr	34.60	9.00	9.29		9.33	0.014938	1.67	20.66	72.32	0.55	0.27		
Pr. Main Stem 2	-2821.09	5yr	71.80	9.00	9.48		9.55	0.012084	2.09	34.41	73.83	0.54	0.35		

HEC-RAS Plan: Proposed (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
Pr. Main Stem 2	-2821.09	10yr	107.80	9.00	9.65		9.73	0.009826	2.29	47.07	75.19	0.51	0.38		
Pr. Main Stem 2	-2821.09	25yr	213.70	9.00	10.03		10.15	0.008259	2.81	75.98	78.20	0.50	0.50		
Pr. Main Stem 2	-2821.09	50yr	279.60	9.00	10.22		10.36	0.007900	3.07	91.21	79.75	0.51	0.56		
Pr. Main Stem 2	-2821.09	100yr	351.10	9.00	10.40		10.57	0.007751	3.31	105.95	81.21	0.51	0.63		
Pr. Main Stem 2	-2939.46	1yr	16.50	8.00	8.29	8.12	8.30	0.003903	0.86	19.23	67.13	0.28	0.07		
Pr. Main Stem 2	-2939.46	2yr	34.60	8.00	8.44	8.21	8.46	0.004257	1.18	29.44	68.34	0.32	0.11		
Pr. Main Stem 2	-2939.46	5yr	71.80	8.00	8.67	8.33	8.71	0.004604	1.59	45.04	70.14	0.35	0.18		
Pr. Main Stem 2	-2939.46	10yr	107.80	8.00	8.80		8.86	0.005684	1.99	54.29	71.19	0.40	0.27		
Pr. Main Stem 2	-2939.46	25yr	213.70	8.00	9.11		9.23	0.007285	2.77	77.06	73.70	0.48	0.47		
Pr. Main Stem 2	-2939.46	50yr	279.60	8.00	9.28		9.43	0.007737	3.12	89.59	75.05	0.50	0.57		
Pr. Main Stem 2	-2939.46	100yr	351.10	8.00	9.46		9.64	0.007896	3.41	102.87	76.45	0.52	0.66		
Pr. Main Stem 2	-3048.45	1yr	16.50	7.00	7.13	7.13	7.20	0.063921	2.06	8.03	61.55	1.00	0.52		
Pr. Main Stem 2	-3048.45	2yr	34.60	7.00	7.22	7.22	7.32	0.054093	2.62	13.22	62.22	1.00	0.72		
Pr. Main Stem 2	-3048.45	5yr	71.80	7.00	7.35	7.34	7.52	0.047850	3.35	21.40	63.27	1.02	1.01		
Pr. Main Stem 2	-3048.45	10yr	107.80	7.00	7.53		7.69	0.026149	3.26	33.05	64.72	0.80	0.83		
Pr. Main Stem 2	-3048.45	25yr	213.70	7.00	7.95		8.14	0.014073	3.49	61.28	68.12	0.65	0.79		
Pr. Main Stem 2	-3048.45	50yr	279.60	7.00	8.15		8.37	0.012677	3.73	75.01	69.72	0.63	0.85		
Pr. Main Stem 2	-3048.45	100yr	351.10	7.00	8.34		8.59	0.012005	3.98	88.17	71.21	0.63	0.92		
Pr. Main Stem 2	-3131.47	1yr	16.50	6.00	6.39	6.14	6.40	0.002041	0.75	22.10	58.43	0.21	0.05		
Pr. Main Stem 2	-3131.47	2yr	34.60	6.00	6.56	6.23	6.58	0.002676	1.08	32.15	60.09	0.26	0.09		
Pr. Main Stem 2	-3131.47	5yr	71.80	6.00	6.86		6.89	0.002711	1.42	50.60	63.03	0.28	0.14		
Pr. Main Stem 2	-3131.47	10yr	107.80	6.00	7.06		7.11	0.002984	1.70	63.53	65.01	0.30	0.18		
Pr. Main Stem 2	-3131.47	25yr	213.70	6.00	7.51		7.59	0.003527	2.29	93.85	113.77	0.35	0.30	0.00	0.00
Pr. Main Stem 2	-3131.47	50yr	279.60	6.00	7.72		7.82	0.003666	2.56	117.77	116.88	0.36	0.35	0.05	0.05
Pr. Main Stem 2	-3131.47	100yr	351.10	6.00	7.91		8.03	0.003750	2.81	141.27	119.77	0.37	0.41	0.09	0.09
Pr. Main Stem 2	-3250.38	1yr	16.50	5.50	5.64	5.64	5.70	0.062895	2.08	7.94	59.08	1.00	0.53		
Pr. Main Stem 2	-3250.38	2yr	34.60	5.50	5.77		5.84	0.026861	2.15	16.10	60.18	0.73	0.45		
Pr. Main Stem 2	-3250.38	5yr	71.80	5.50	5.86	5.86	6.03	0.045875	3.36	21.34	60.87	1.00	1.00		
Pr. Main Stem 2	-3250.38	10yr	107.80	5.50	5.97	5.97	6.20	0.042329	3.84	28.07	61.75	1.00	1.20		
Pr. Main Stem 2	-3250.38	25yr	213.70	5.50	6.24	6.24	6.59	0.036430	4.76	44.89	63.89	1.00	1.59		
Pr. Main Stem 2	-3250.38	50yr	279.60	5.50	6.38	6.38	6.79	0.034485	5.18	54.01	65.02	1.00	1.78		
Pr. Main Stem 2	-3250.38	100yr	351.10	5.50	6.52	6.52	7.00	0.033188	5.57	63.07	66.13	1.00	1.97		
Pr. Main Stem 2	-3284.76	1yr	16.50	4.50	4.57	4.34	4.59	0.006680	0.45	16.94	76.15	0.29	0.03	0.14	0.03
Pr. Main Stem 2	-3284.76	2yr	34.60	4.50	4.52	4.52	4.64	0.048673	0.45	12.79	71.00	0.62	0.05	0.88	0.07
Pr. Main Stem 2	-3284.76	5yr	71.80	4.50	4.84	4.69	4.90	0.017677	1.92	41.95	106.12	0.60	0.34	0.49	0.34
Pr. Main Stem 2	-3284.76	10yr	107.80	4.50	5.02	4.78	5.08	0.014730	2.30	61.95	116.98	0.59	0.43	0.53	0.40
Pr. Main Stem 2	-3284.76	25yr	213.70	4.50	5.27	4.98	5.37	0.019174	3.47	91.80	122.81	0.72	0.84	0.93	0.81
Pr. Main Stem 2	-3284.76	50yr	279.60	4.50	5.40	5.08	5.52	0.020374	4.00	108.04	124.85	0.76	1.06	1.13	1.02
Pr. Main Stem 2	-3284.76	100yr	351.10	4.50	5.54	5.18	5.68	0.020661	4.45	125.57	132.29	0.79	1.25	1.22	1.20
Pr. Main Stem 2	-3334.41	1yr	16.50	2.56	3.79	3.63	4.01	0.016284	3.76	4.39	68.34	0.74	0.69		
Pr. Main Stem 2	-3334.41	2yr	34.60	2.56	4.01	3.96	4.02	0.002129	1.50	43.49	95.85	0.27	0.11	0.06	
Pr. Main Stem 2	-3334.41	5yr	71.80	2.56	3.96	3.96	4.04	0.012097	3.51	39.01	93.69	0.65	0.58	0.30	
Pr. Main Stem 2	-3334.41	10yr	107.80	2.56	4.06	3.96	4.17	0.015522	4.15	48.54	99.82	0.74	0.79	0.46	
Pr. Main Stem 2	-3334.41	25yr	213.70	2.56	4.47	4.18	4.56	0.010136	3.90	100.26	136.41	0.62	0.65	0.48	0.27
Pr. Main Stem 2	-3334.41	50yr	279.60	2.56	4.67	4.30	4.76	0.008630	3.97	129.09	142.58	0.58	0.64	0.50	0.32
Pr. Main Stem 2	-3334.41	100yr	351.10	2.56	4.87	4.39	4.97	0.007602	4.06	157.76	144.42	0.56	0.64	0.53	0.37
Pr. Main Stem 2	-3406.88	1yr	16.50	2.20	3.43	2.95	3.48	0.003538	1.91	8.62	92.45	0.37	0.17		
Pr. Main Stem 2	-3406.88	2yr	34.60	2.20	3.28	3.28	3.65	0.026517	4.84	7.14	67.72	1.01	1.14		
Pr. Main Stem 2	-3406.88	5yr	71.80	2.20	3.55	3.55	3.58	0.002784	1.80	55.96	110.68	0.34	0.15	0.08	
Pr. Main Stem 2	-3406.88	10yr	107.80	2.20	3.75	3.55	3.78	0.003038	2.07	78.34	130.09	0.36	0.19	0.12	0.01
Pr. Main Stem 2	-3406.88	25yr	213.70	2.20	4.18	3.55	4.23	0.003027	2.61	138.37	132.83	0.38	0.26	0.20	0.11
Pr. Main Stem 2	-3406.88	50yr	279.60	2.20	4.40	3.65	4.45	0.003103	2.90	166.88	134.01	0.39	0.31	0.24	0.15
Pr. Main Stem 2	-3406.88	100yr	351.10	2.20	4.60	3.75	4.67	0.003164	3.16	194.76	135.14	0.41	0.35	0.29	0.19
Pr. Main Stem 2	-3442.81	1yr	16.50	2.15	2.90	2.90	3.18	0.028420	4.26	3.87	49.34	0.99	0.96		
Pr. Main Stem 2	-3442.81	2yr	34.60	2.15	3.07	3.07	3.10	0.004020	1.81	26.02	54.51	0.38	0.16	0.11	
Pr. Main Stem 2	-3442.81	5yr	71.80	2.15	3.37	3.07	3.41	0.004999	2.34	47.16	90.12	0.44	0.25	0.17	0.04
Pr. Main Stem 2	-3442.81	10yr	107.80	2.15	3.60	3.09	3.64	0.005002	2.70	70.76	119.89	0.46	0.31	0.18	0.11
Pr. Main Stem 2	-3442.81	25yr	213.70	2.15	4.03	3.42	4.09	0.005001	3.38	125.09	129.19	0.48	0.44	0.30	0.23
Pr. Main Stem 2	-3442.81	50yr	279.60	2.15	4.24	3.58	4.31	0.005003	3.68	152.50	130.68	0.49	0.50	0.36	0.29
Pr. Main Stem 2	-3442.81	100yr	351.10	2.15	4.44	3.72	4.53	0.005004	3.97	179.42	132.14	0.50	0.56	0.42	0.34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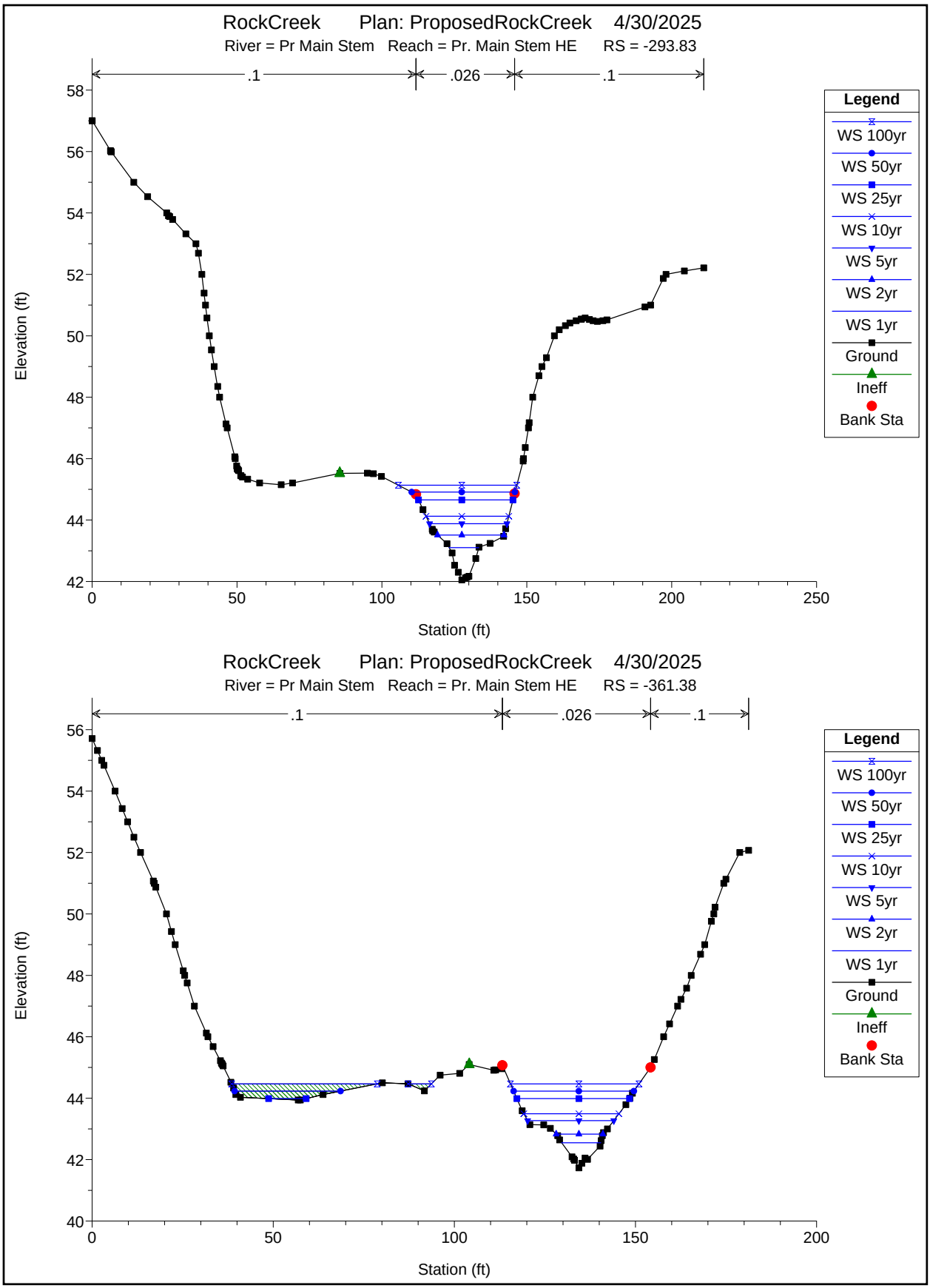
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -99.79
.1
.026
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -194.63
.1
.026
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta


RockCreek Plan: ProposedRockCreek 4/30/2025
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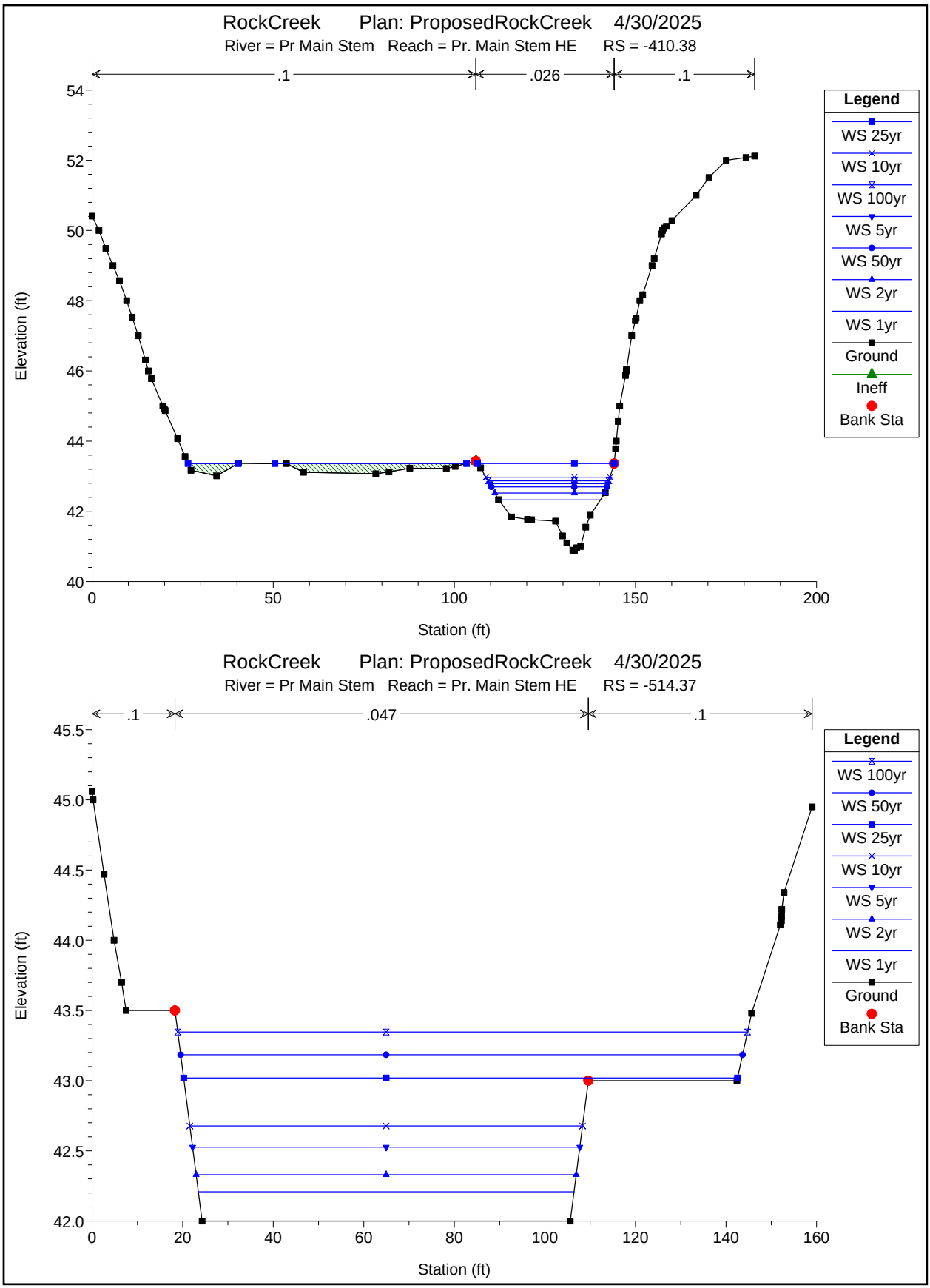
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Ineff
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -361.38
.1
.026
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Ineff
Bank Sta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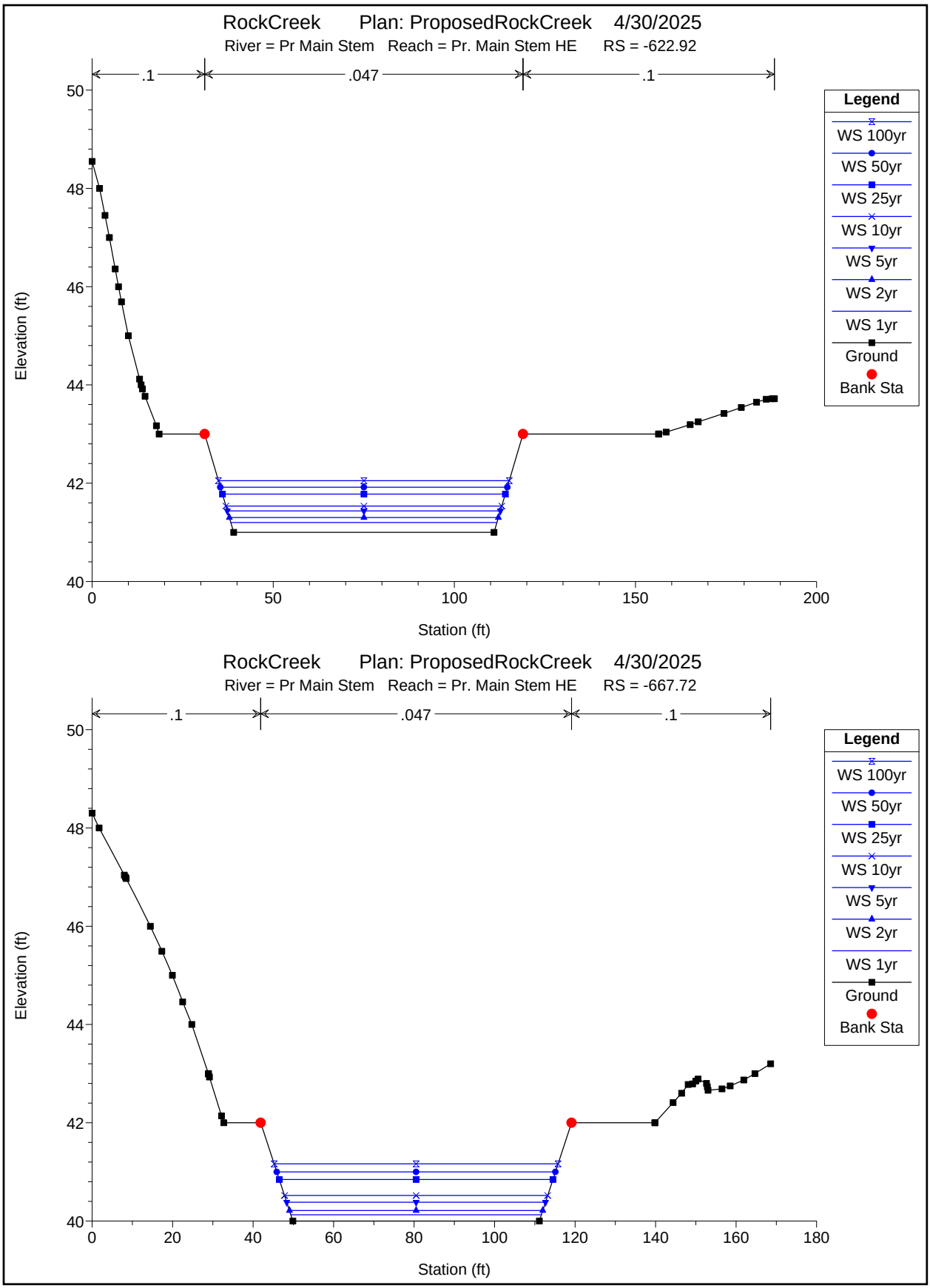
Legend
WS 25yr
WS 10yr
WS 100yr
WS 5yr
WS 50yr
WS 2yr
WS 1yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -514.37
.1
.047
.1
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -622.92
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.047
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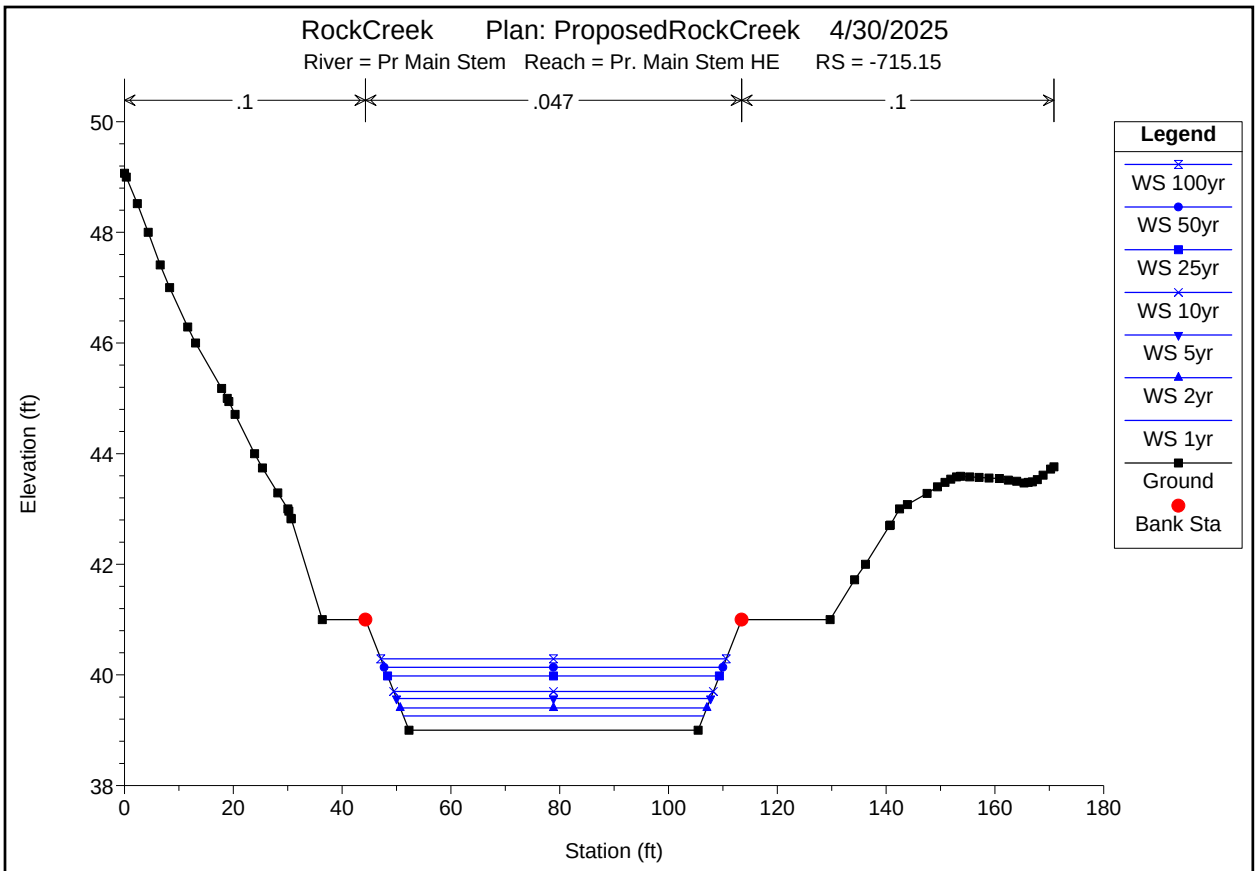
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -667.72
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta


RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -715.15
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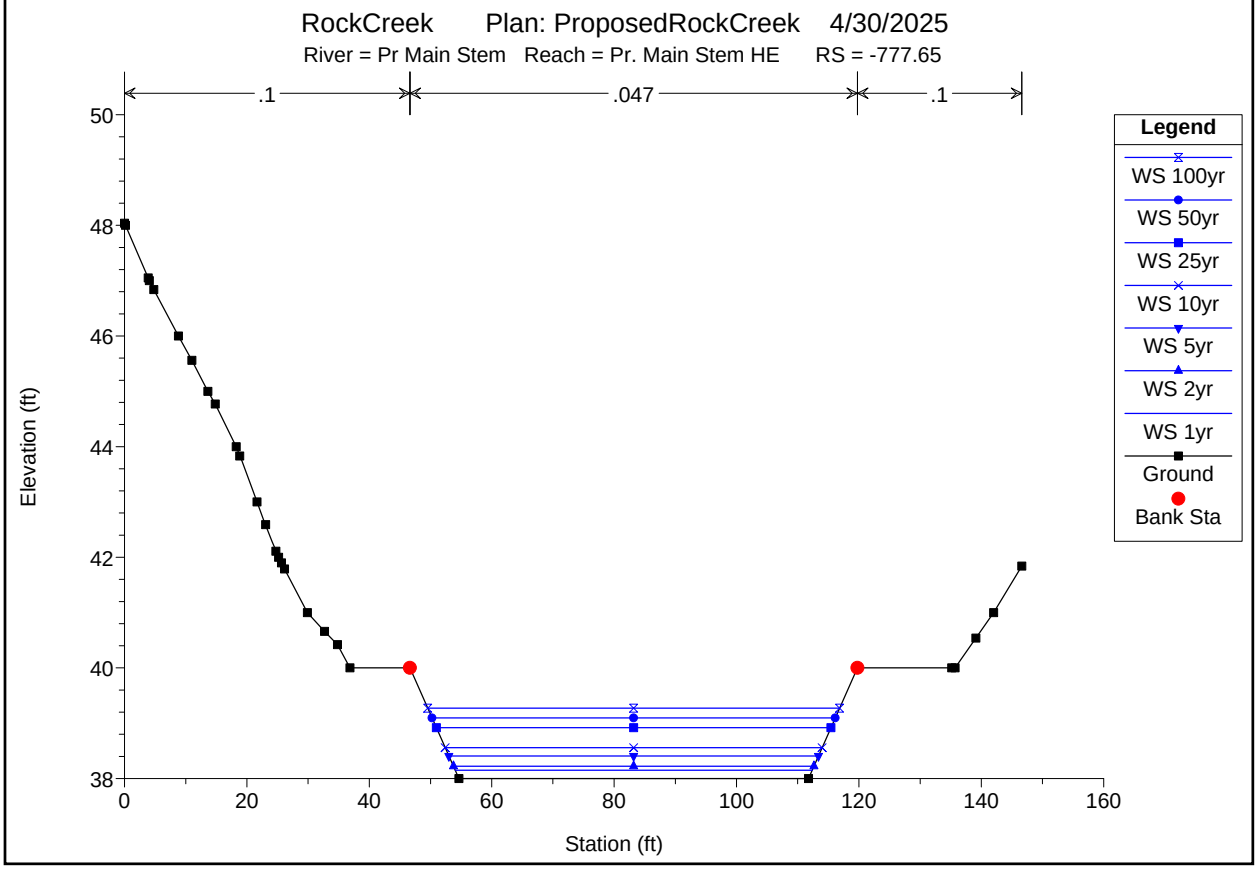
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta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River = Pr Main Stem Reach = Pr. Main Stem HE RS = -777.65
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.047
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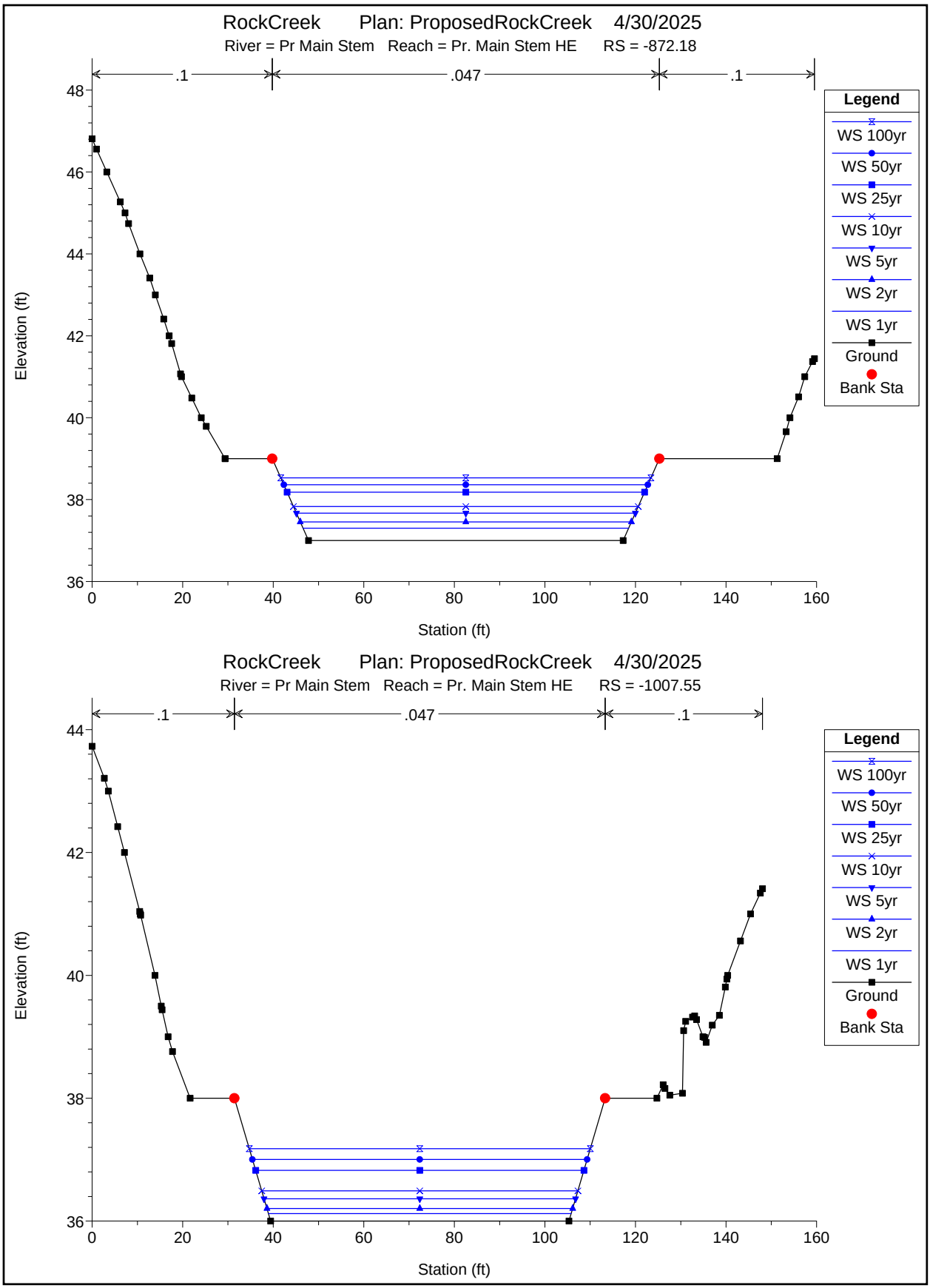
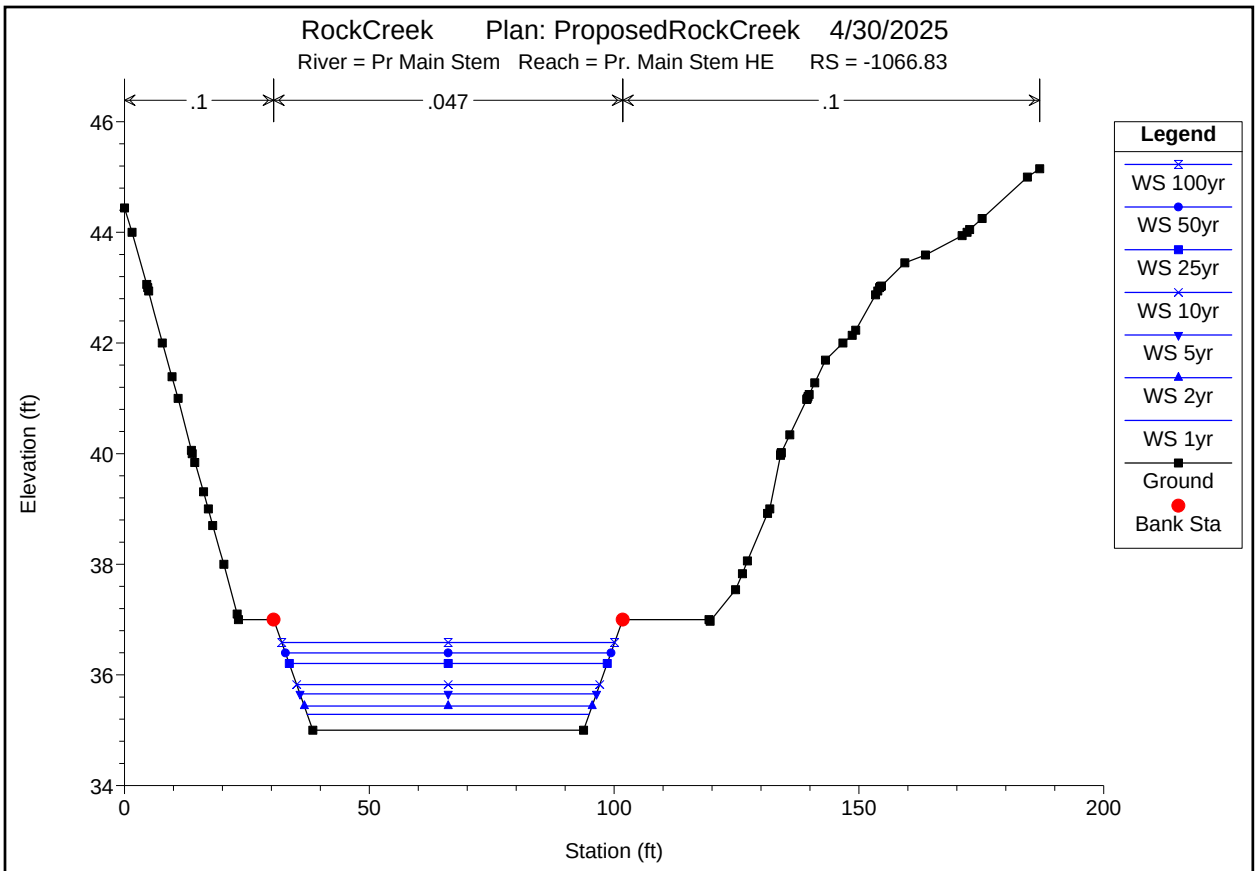
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta


RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -872.18
.1
.047
.1
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -1007.55
.1
.047
.1
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -1066.83
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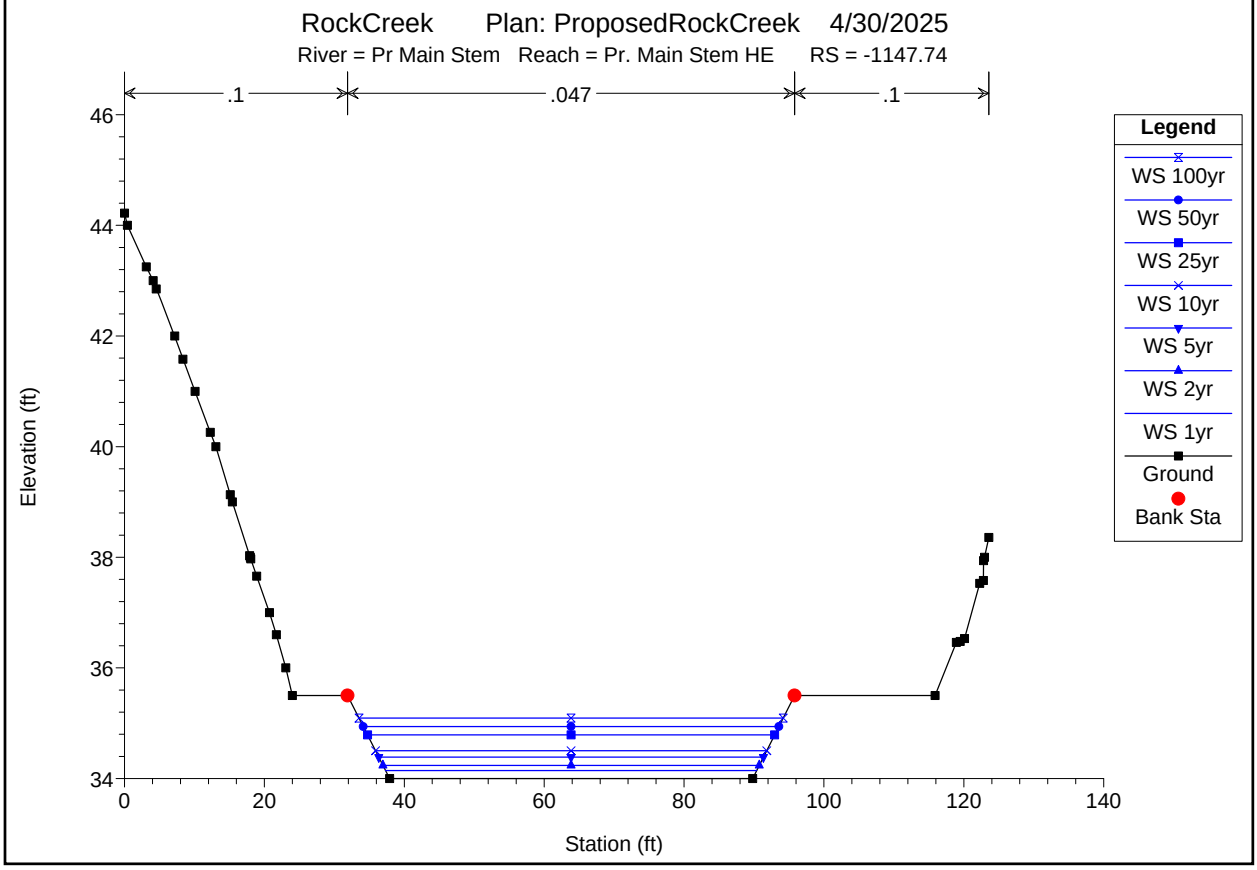
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta


RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem HE RS = -1147.74
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.047
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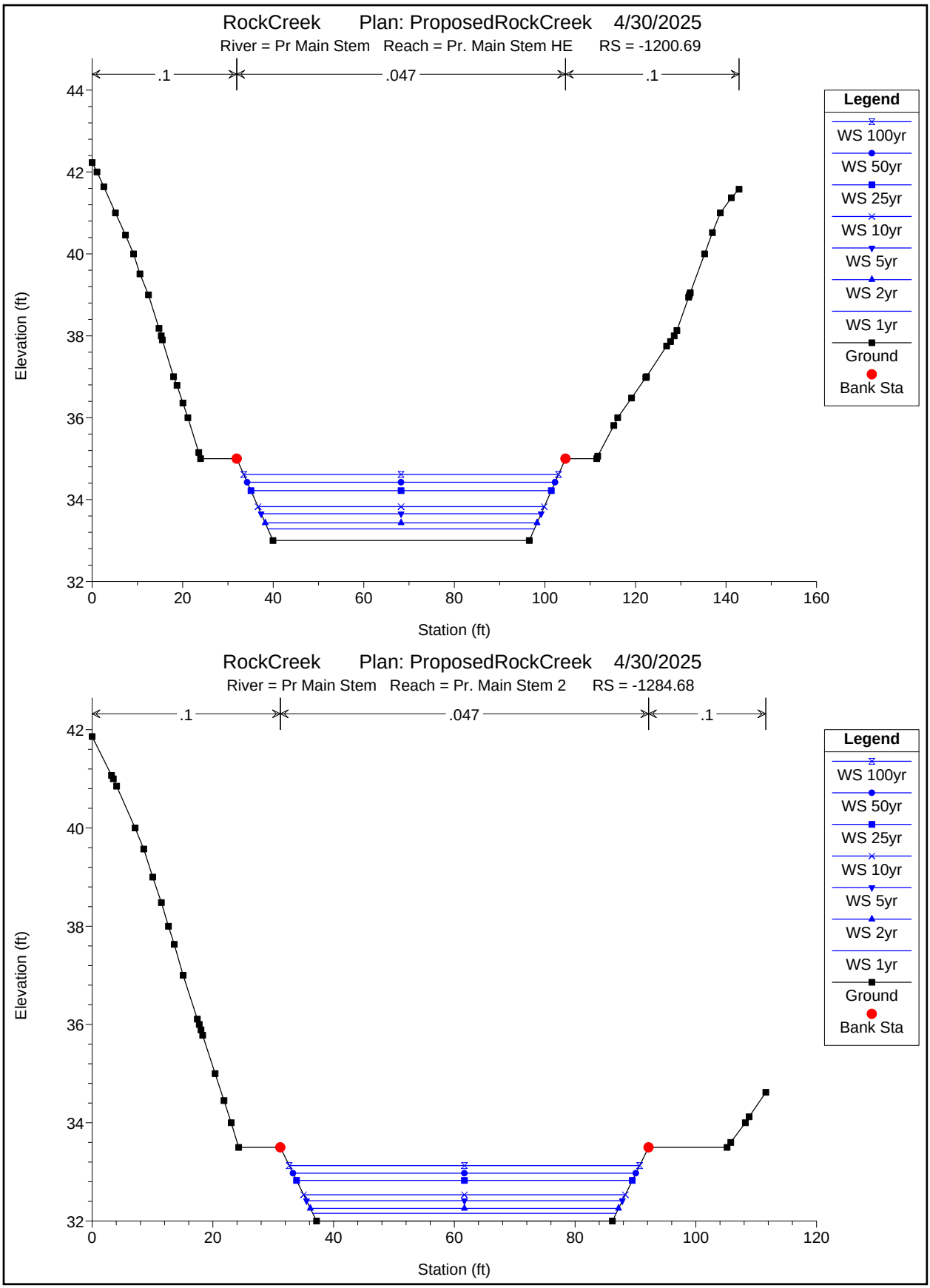
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta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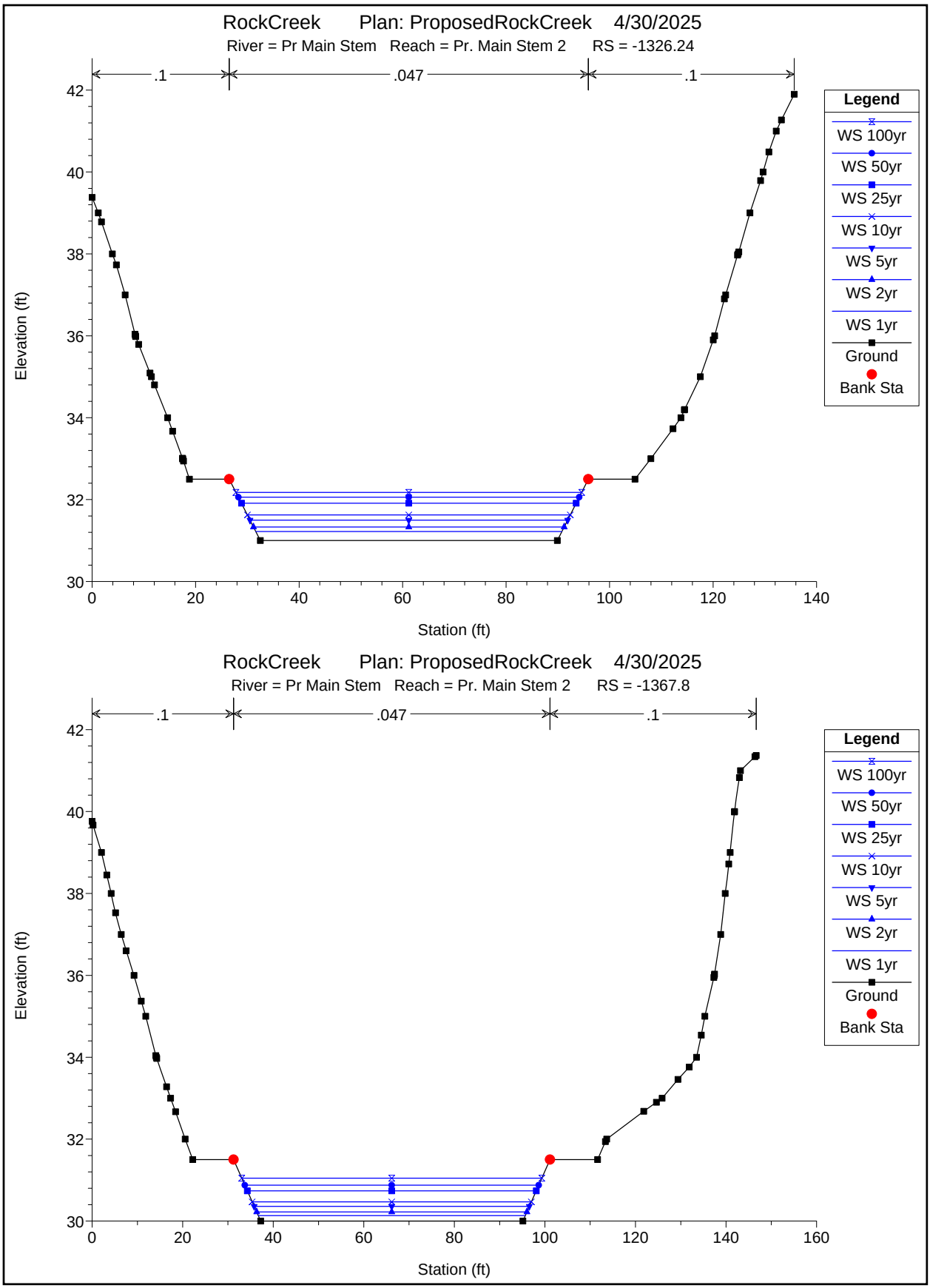
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -1284.68
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta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River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -1326.24
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.047
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Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -1367.8
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.047
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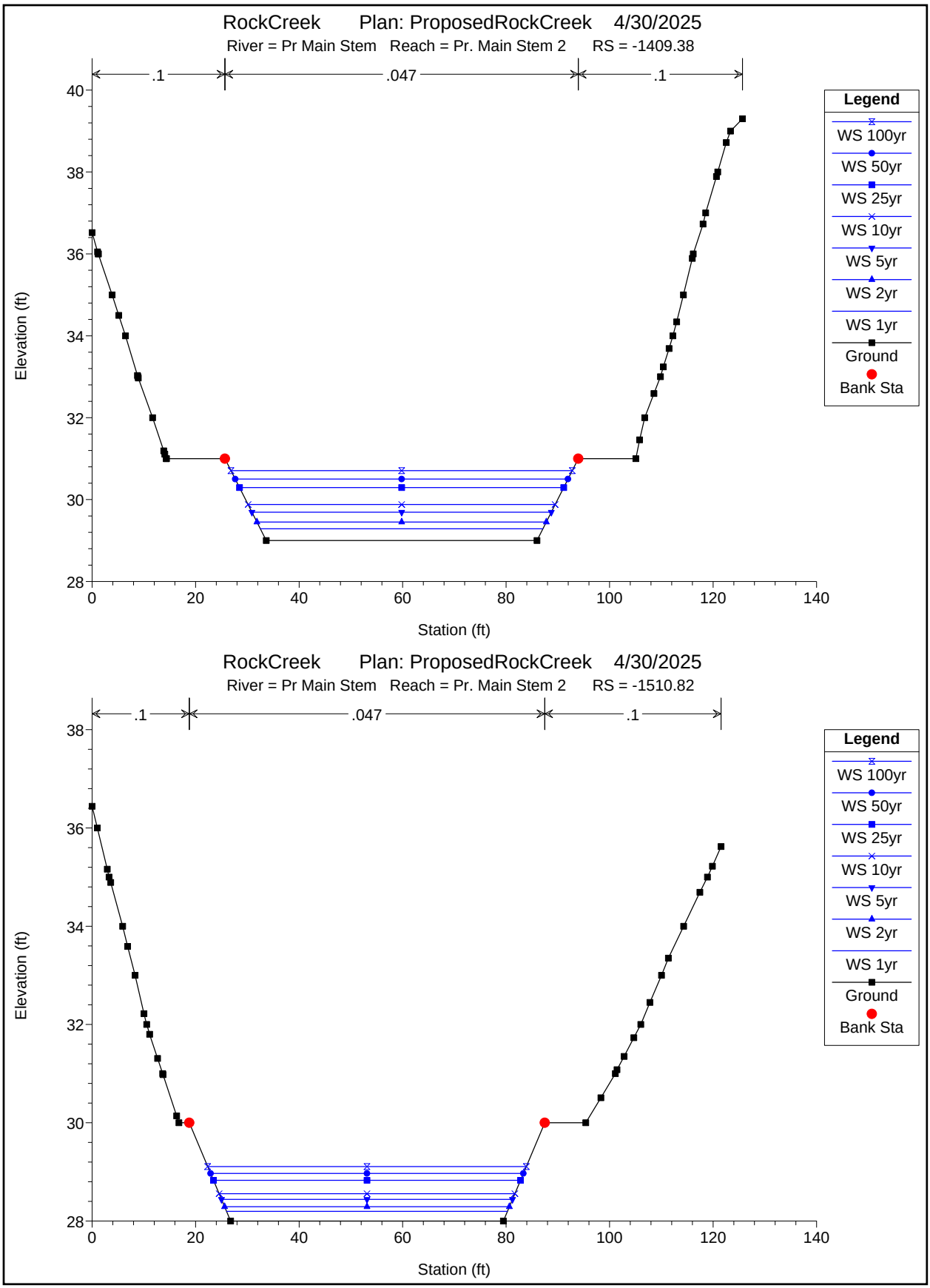
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta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River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -1409.38
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.047
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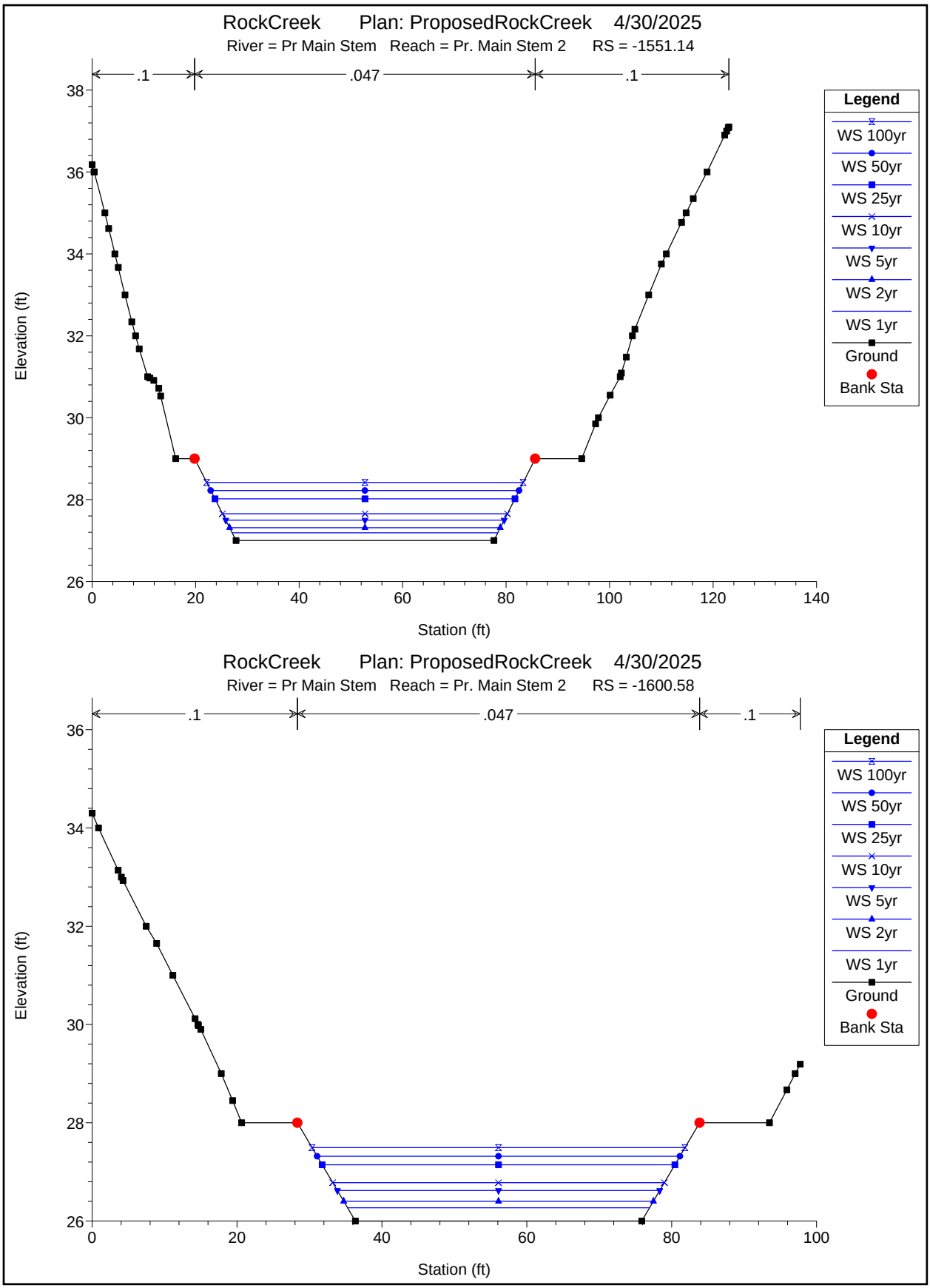
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -1510.82
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta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.047
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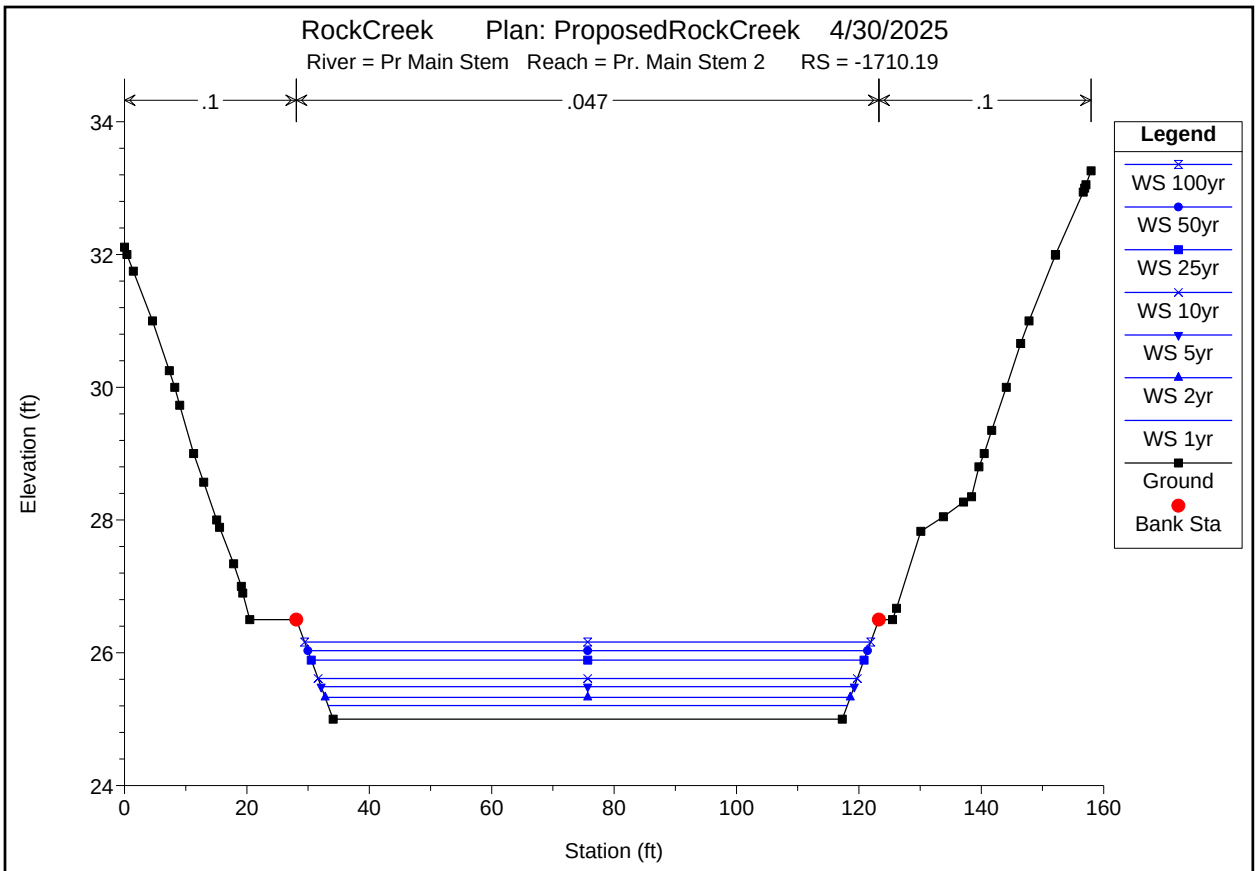
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -1600.58
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta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River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -1710.19
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.047
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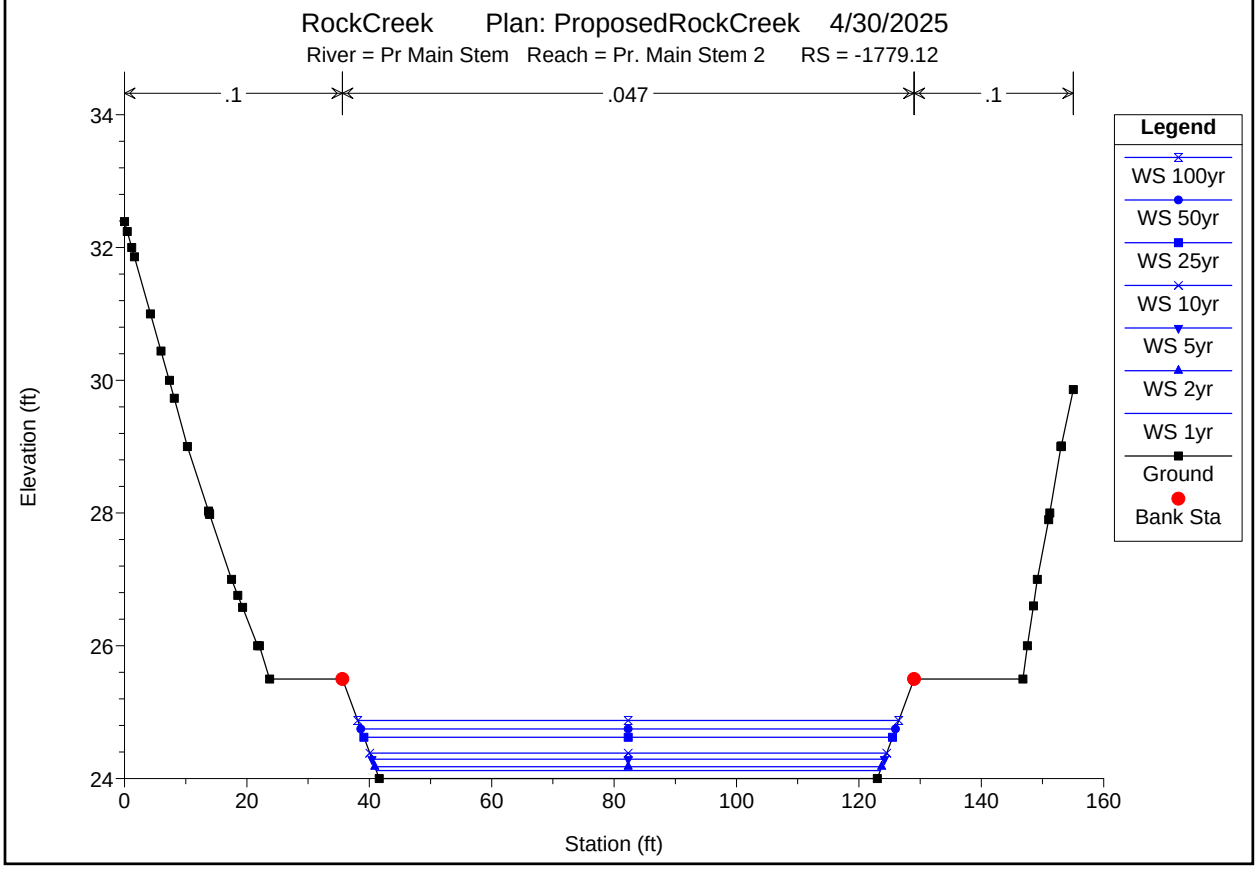
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta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.047
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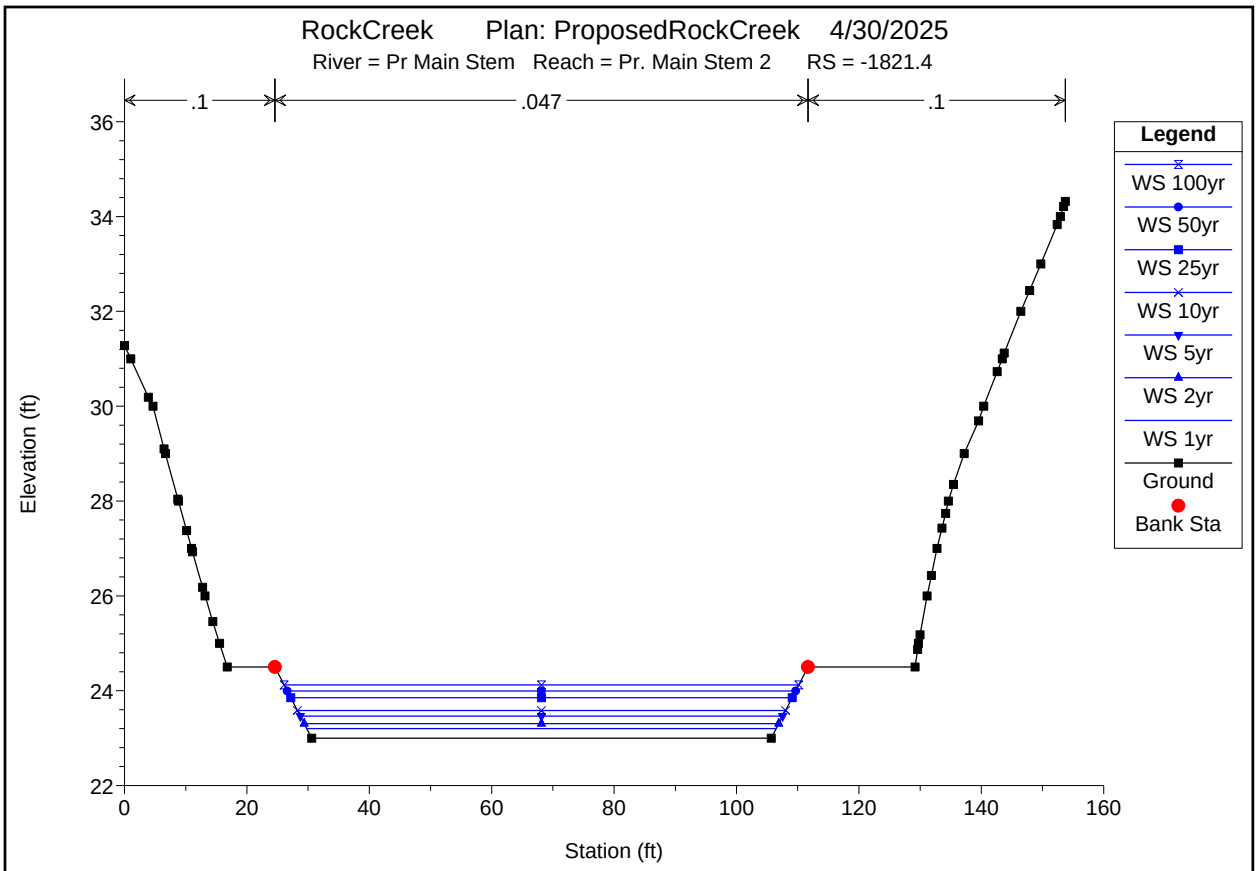
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta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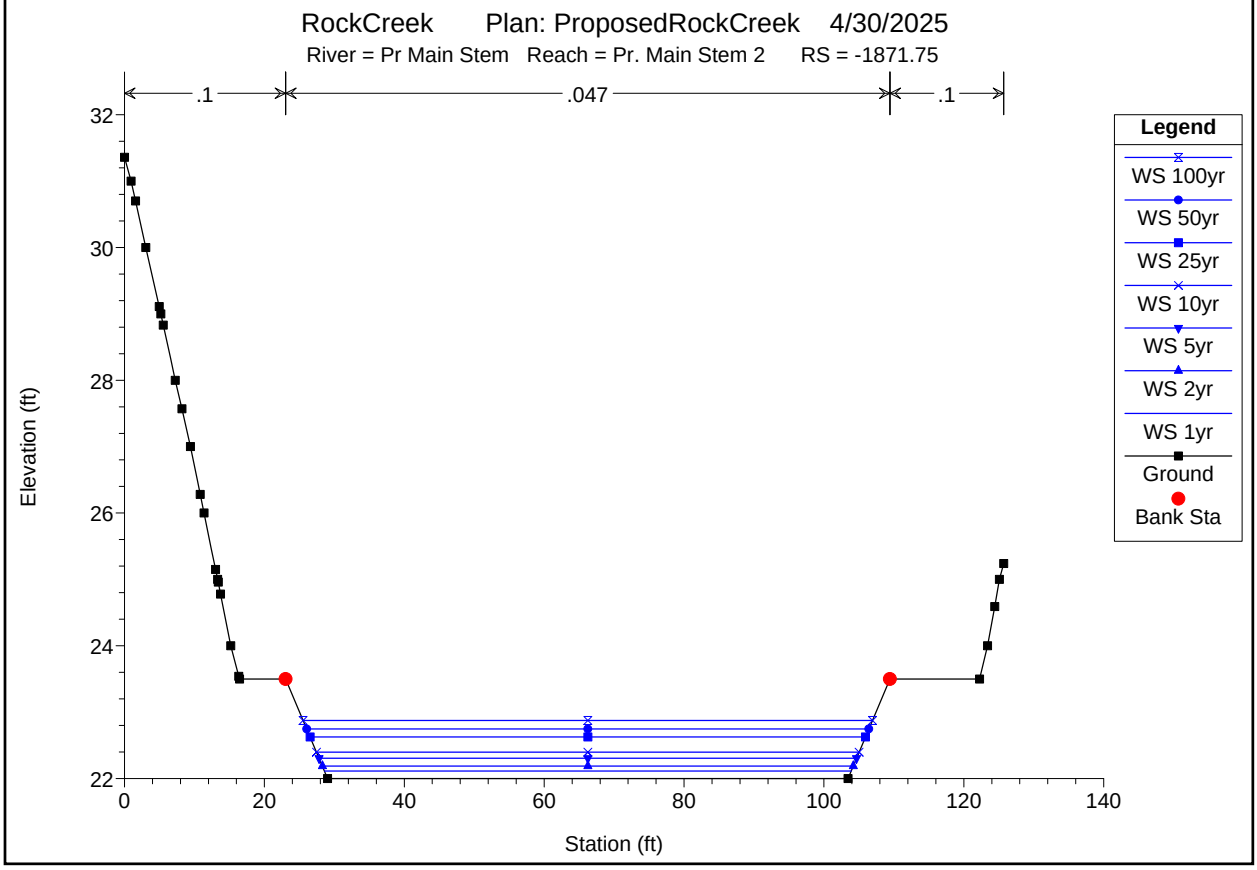
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta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.047
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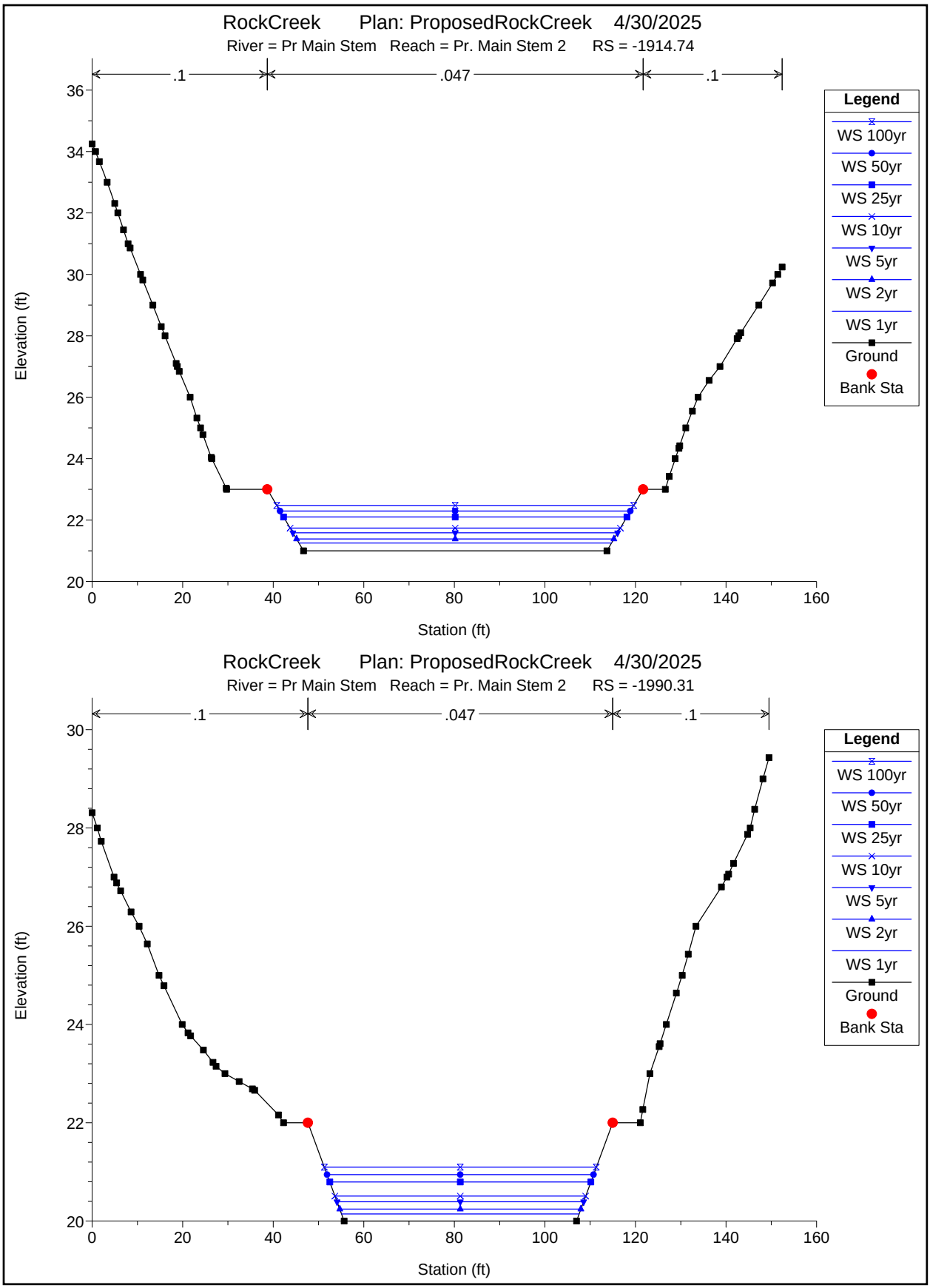
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta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River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -1914.74
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.047
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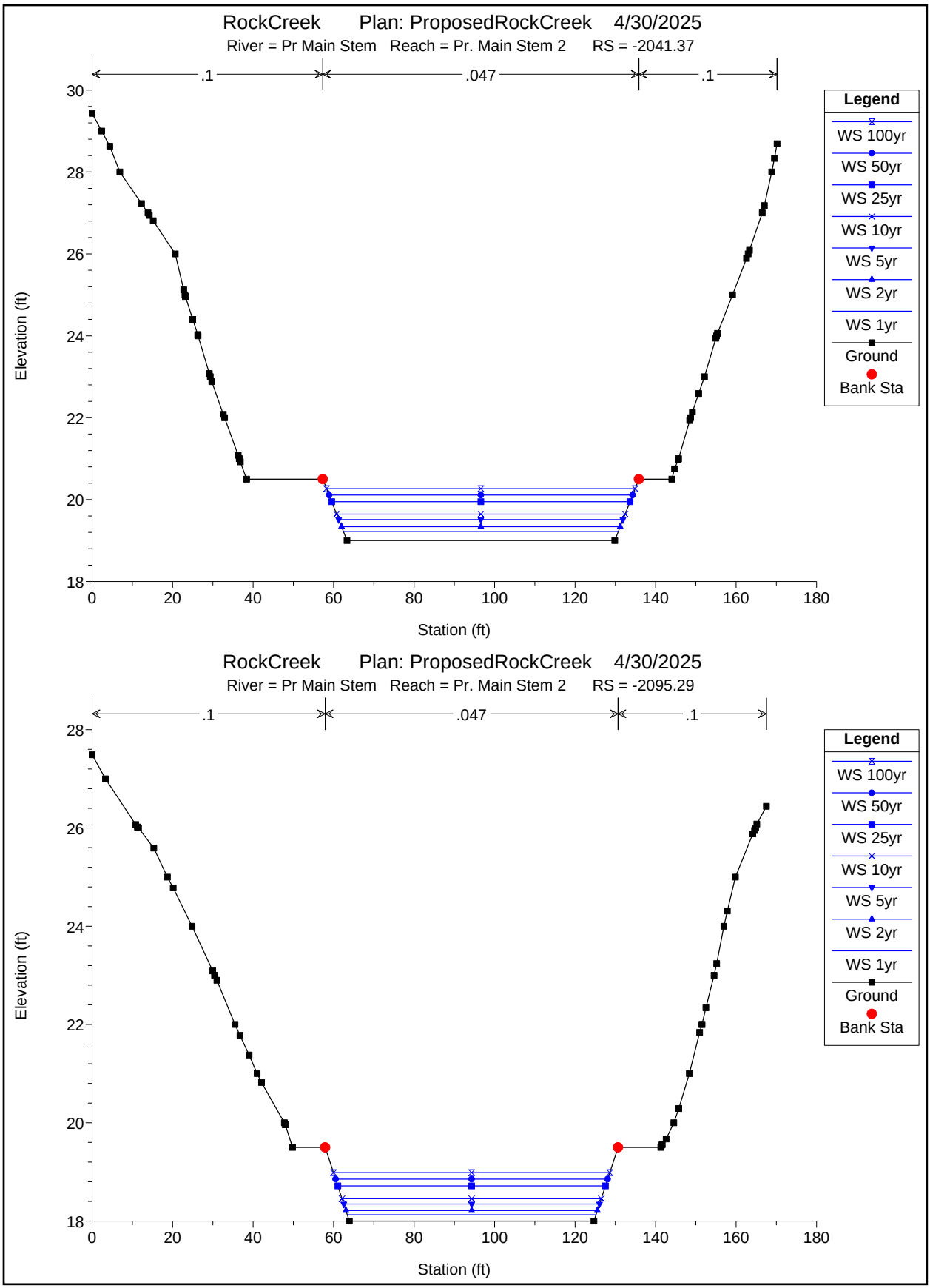
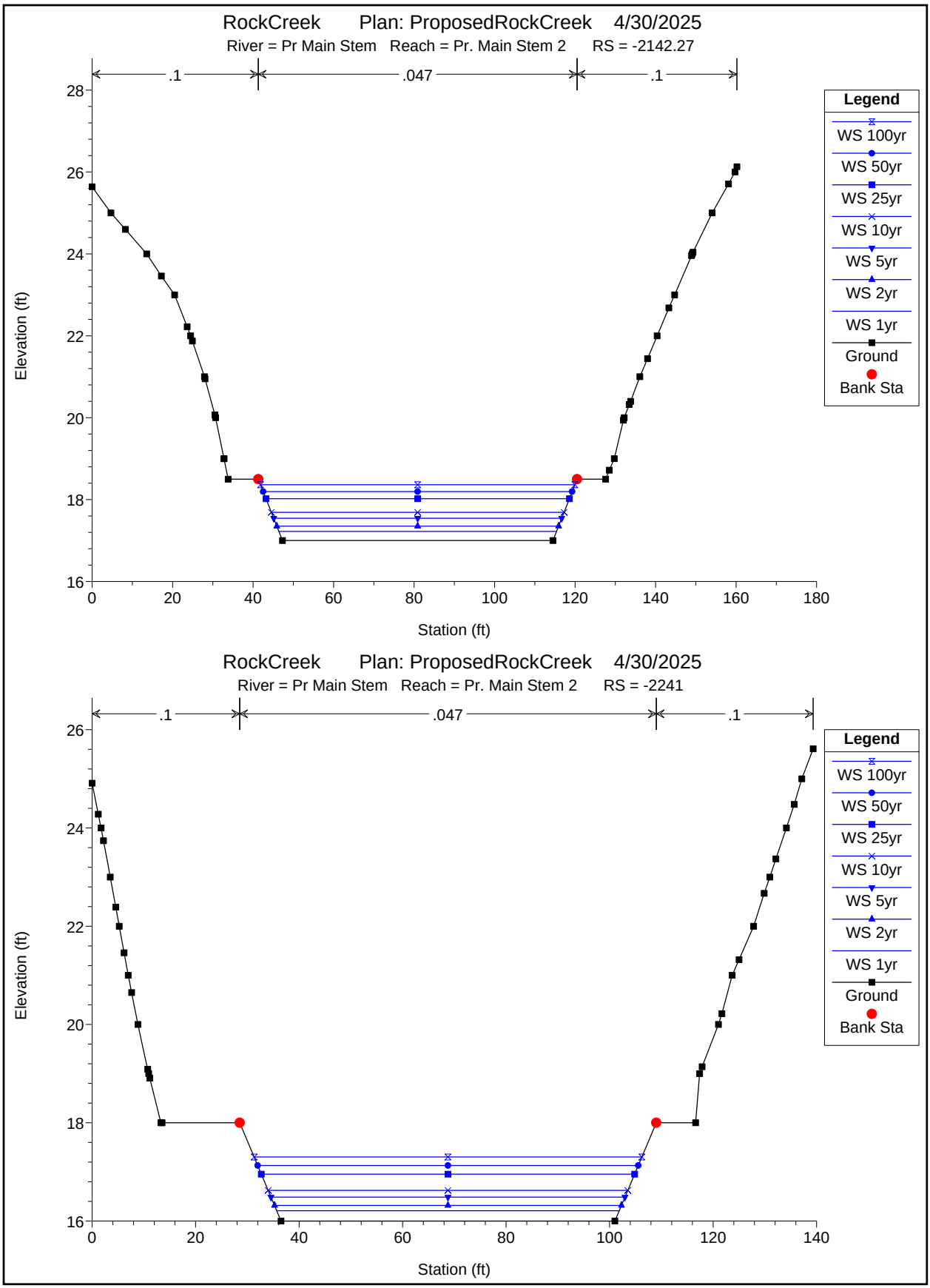
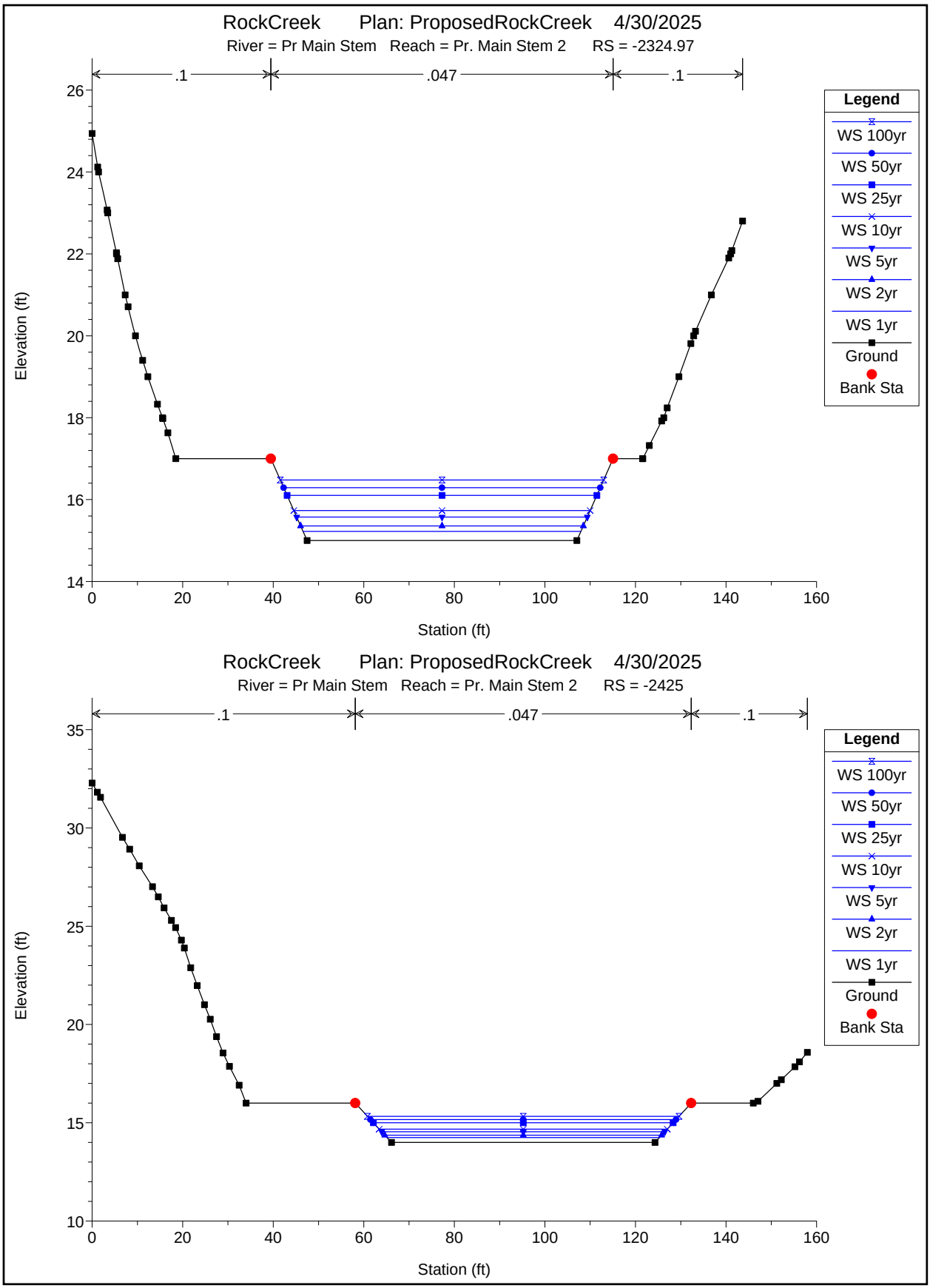
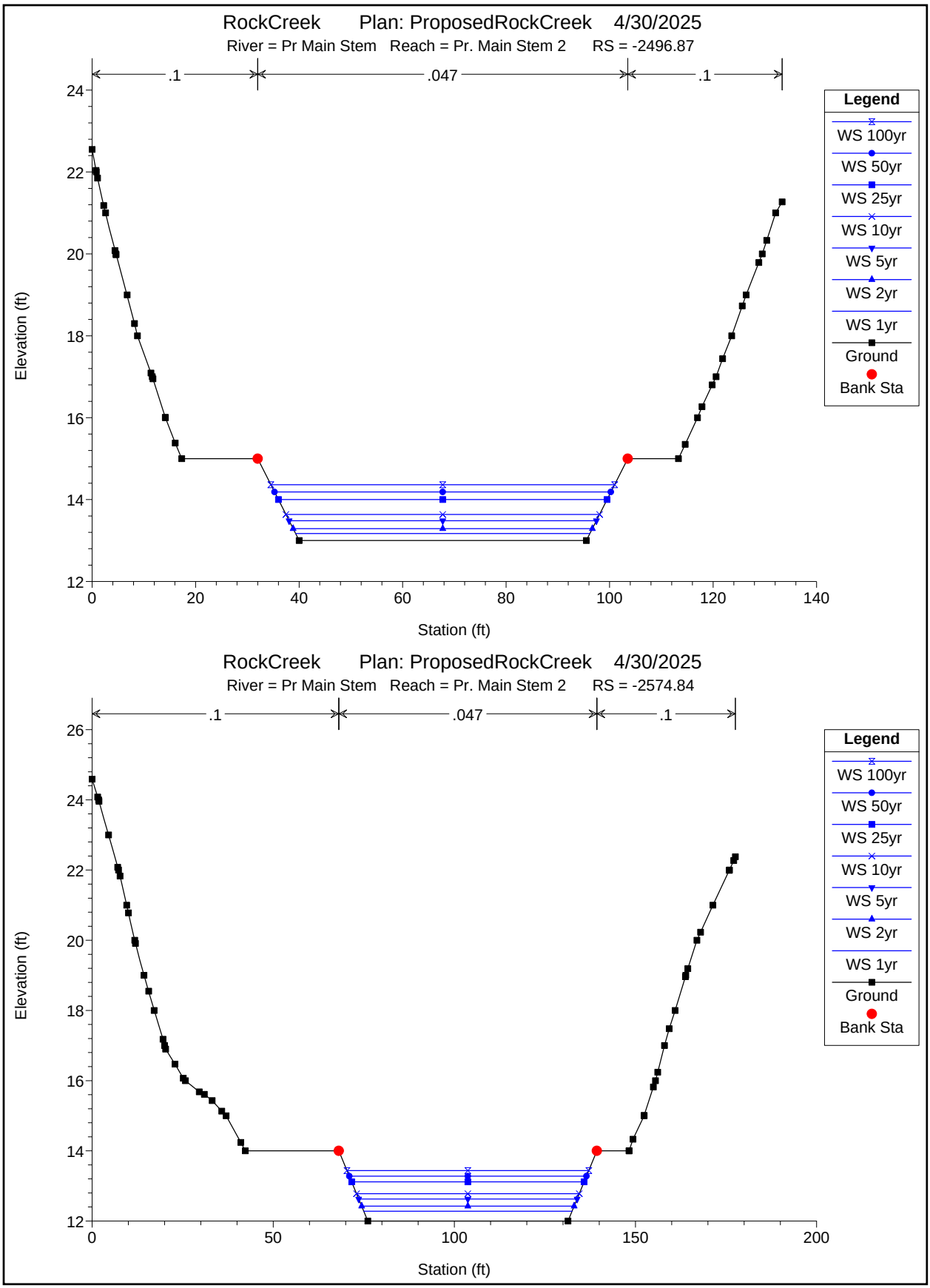
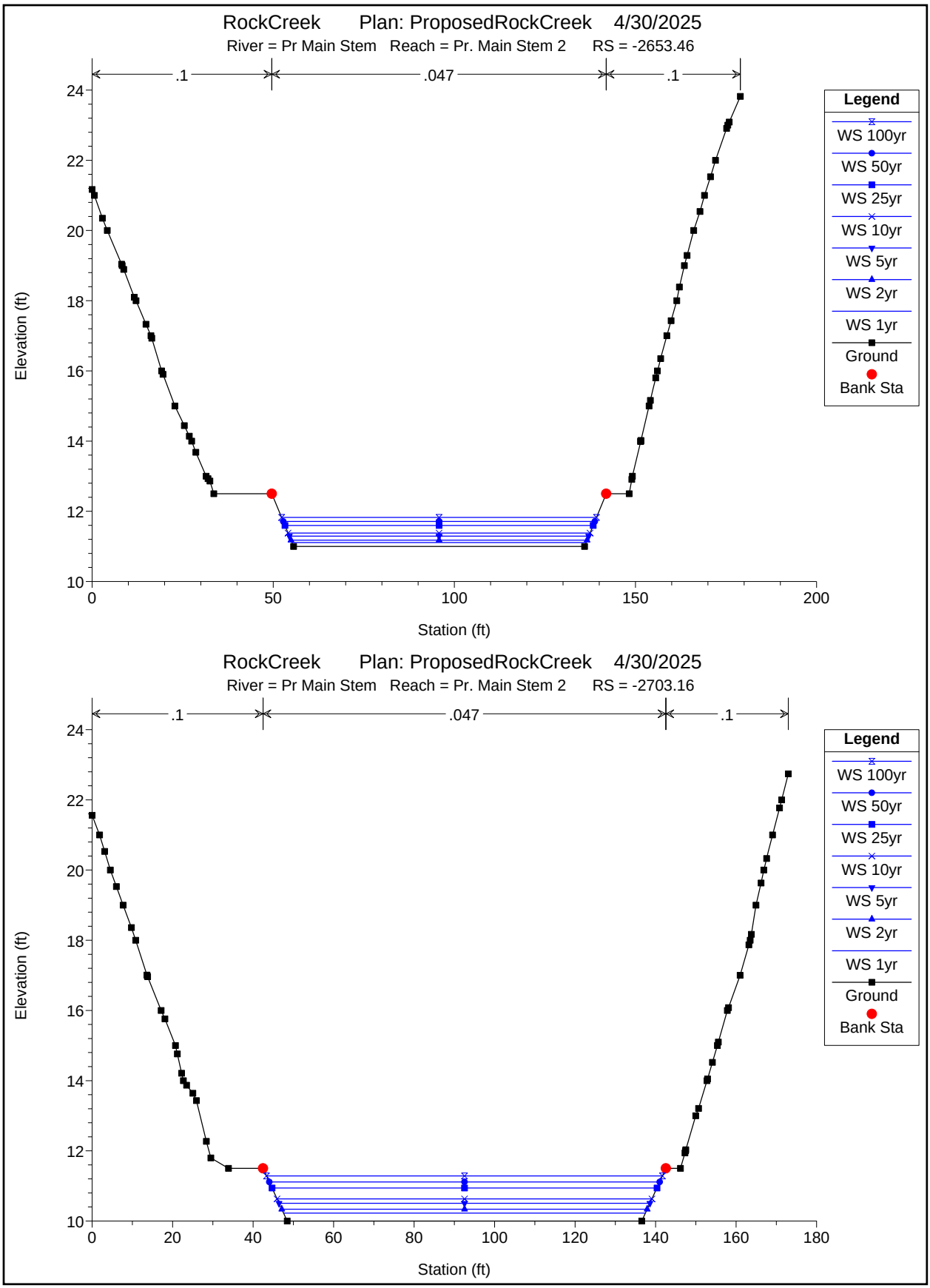
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -1990.31
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta

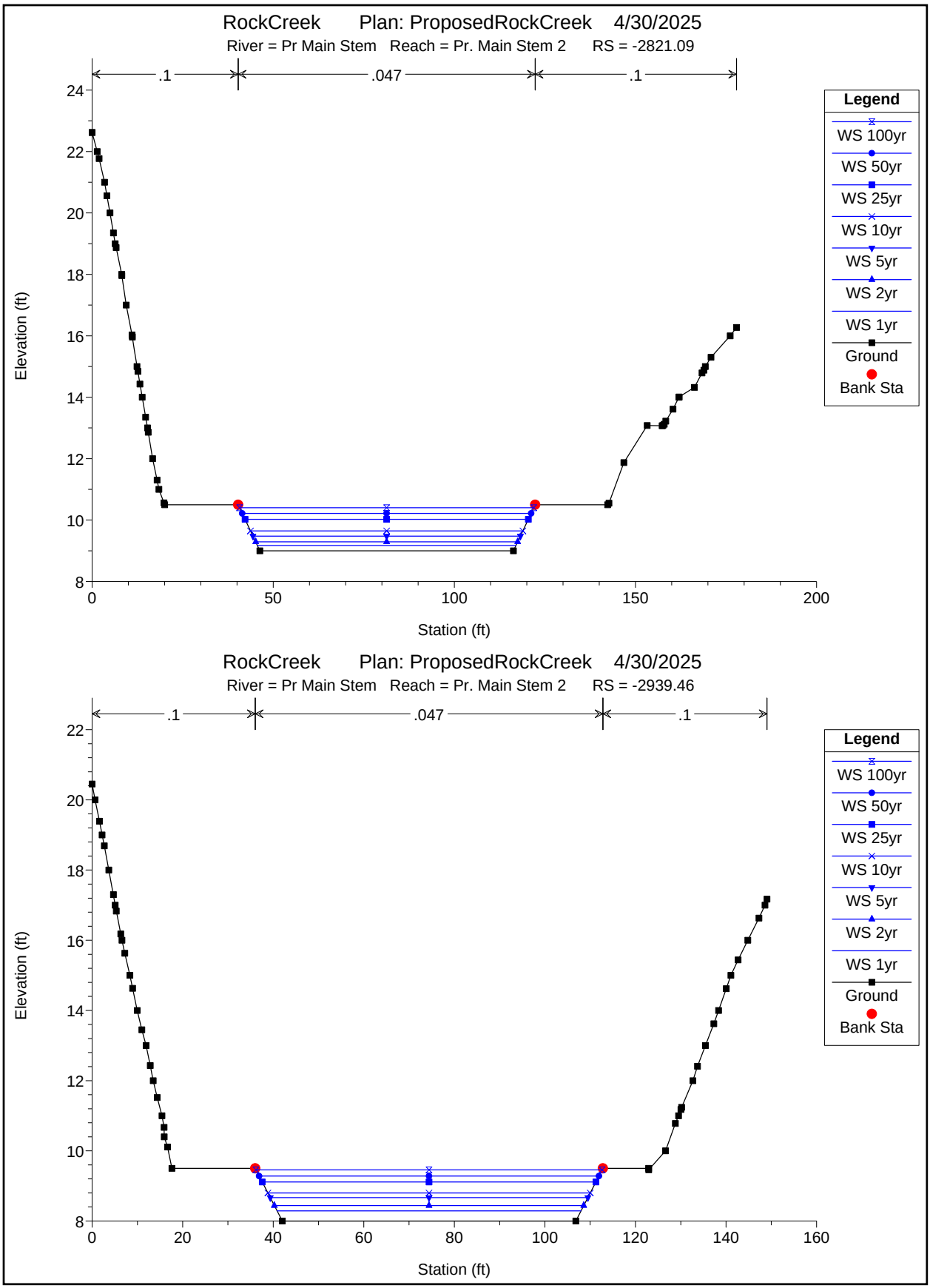

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2041.37
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2095.29
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta

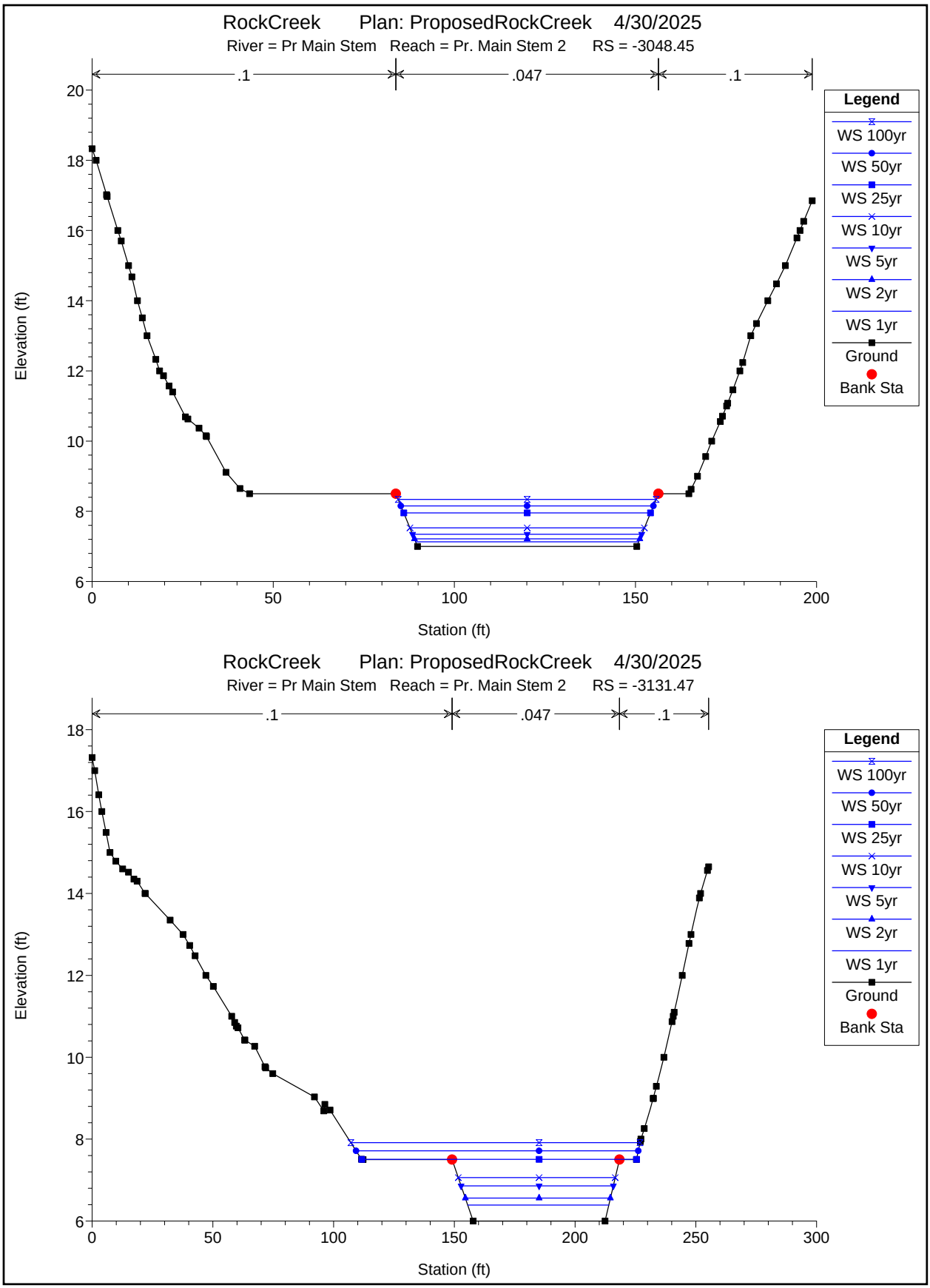

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2142.27
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2241
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta

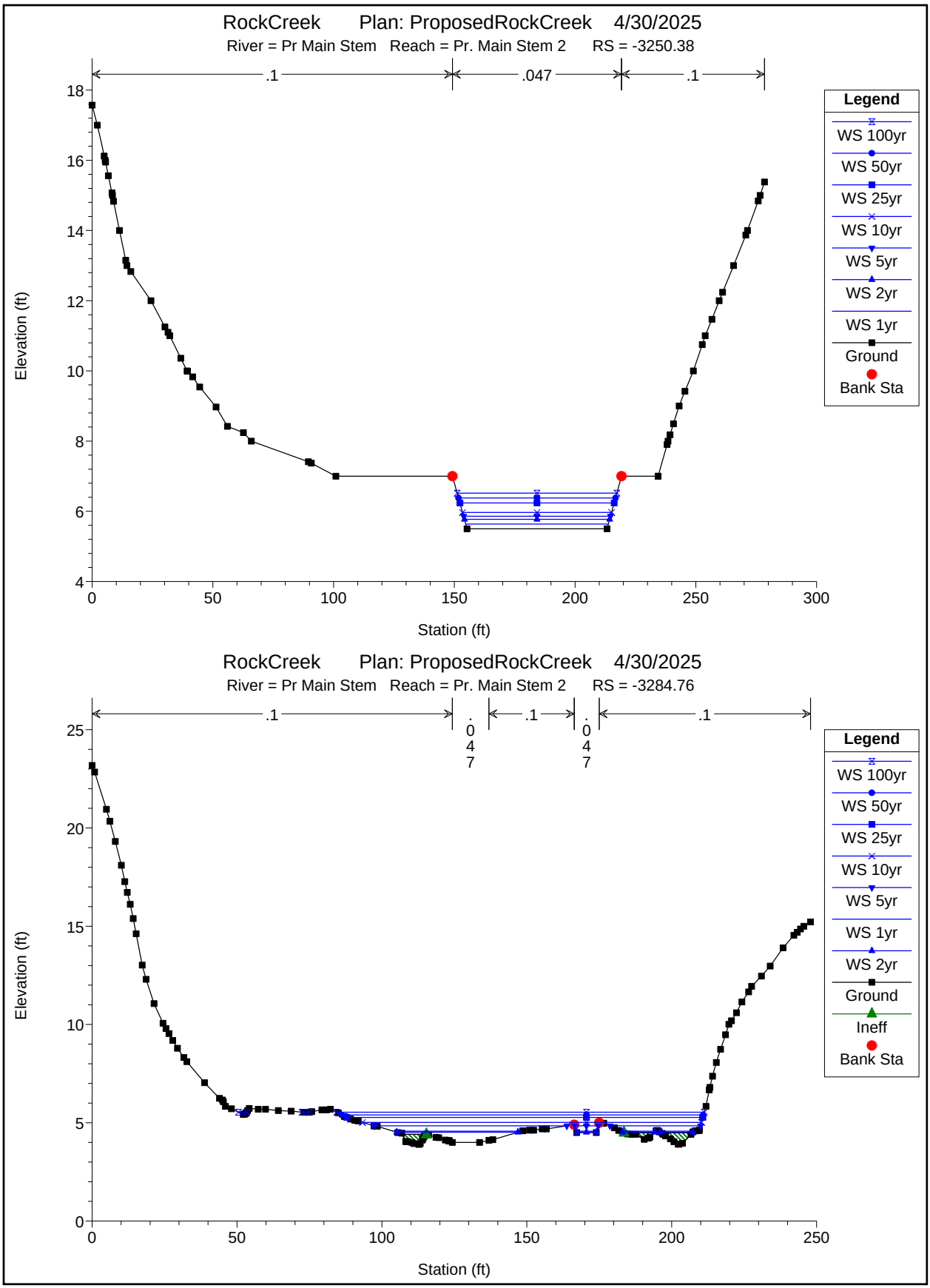

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2324.97
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2425
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta

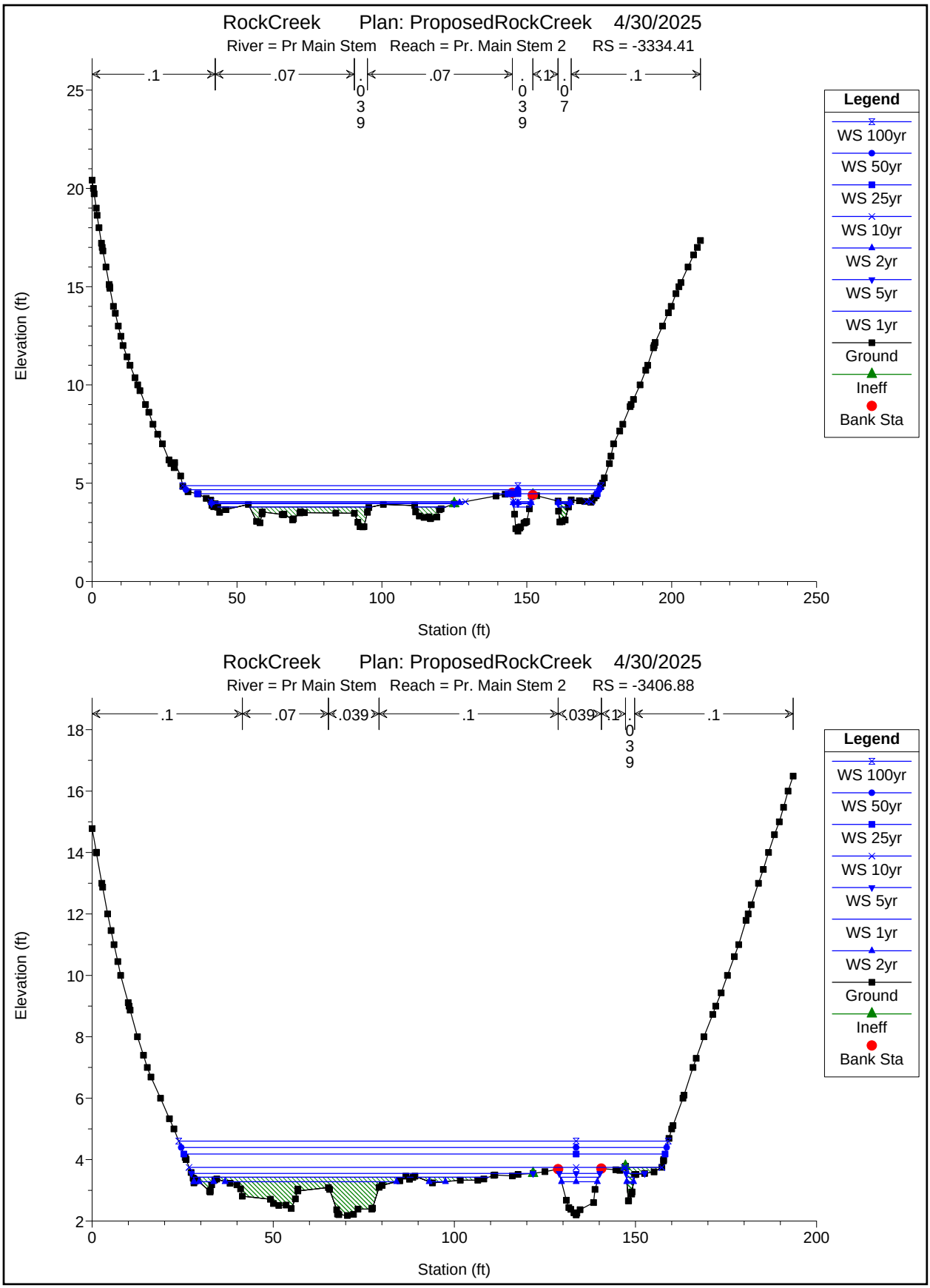

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2496.87
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2574.84
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta

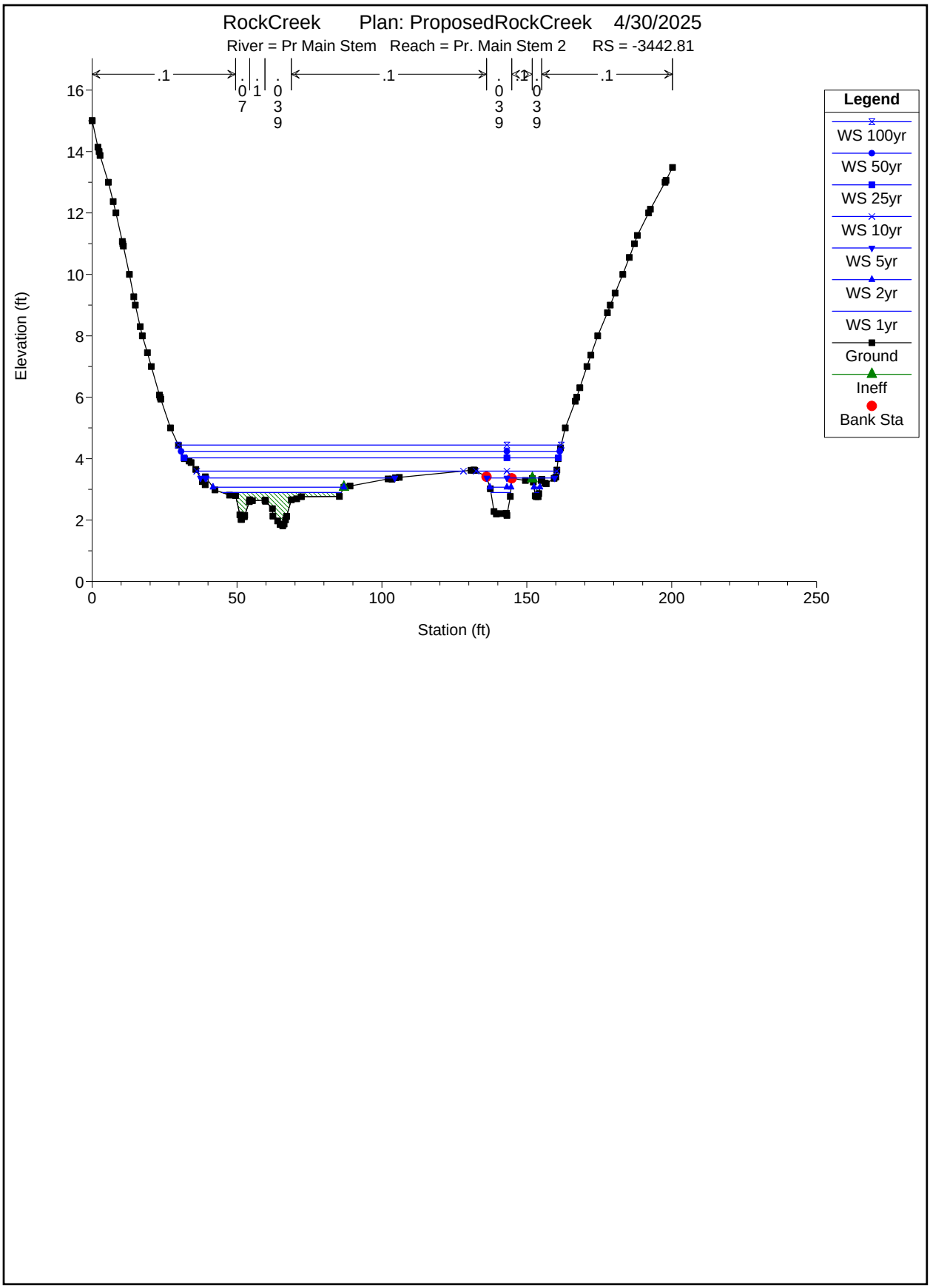

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2653.46
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2703.16
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta

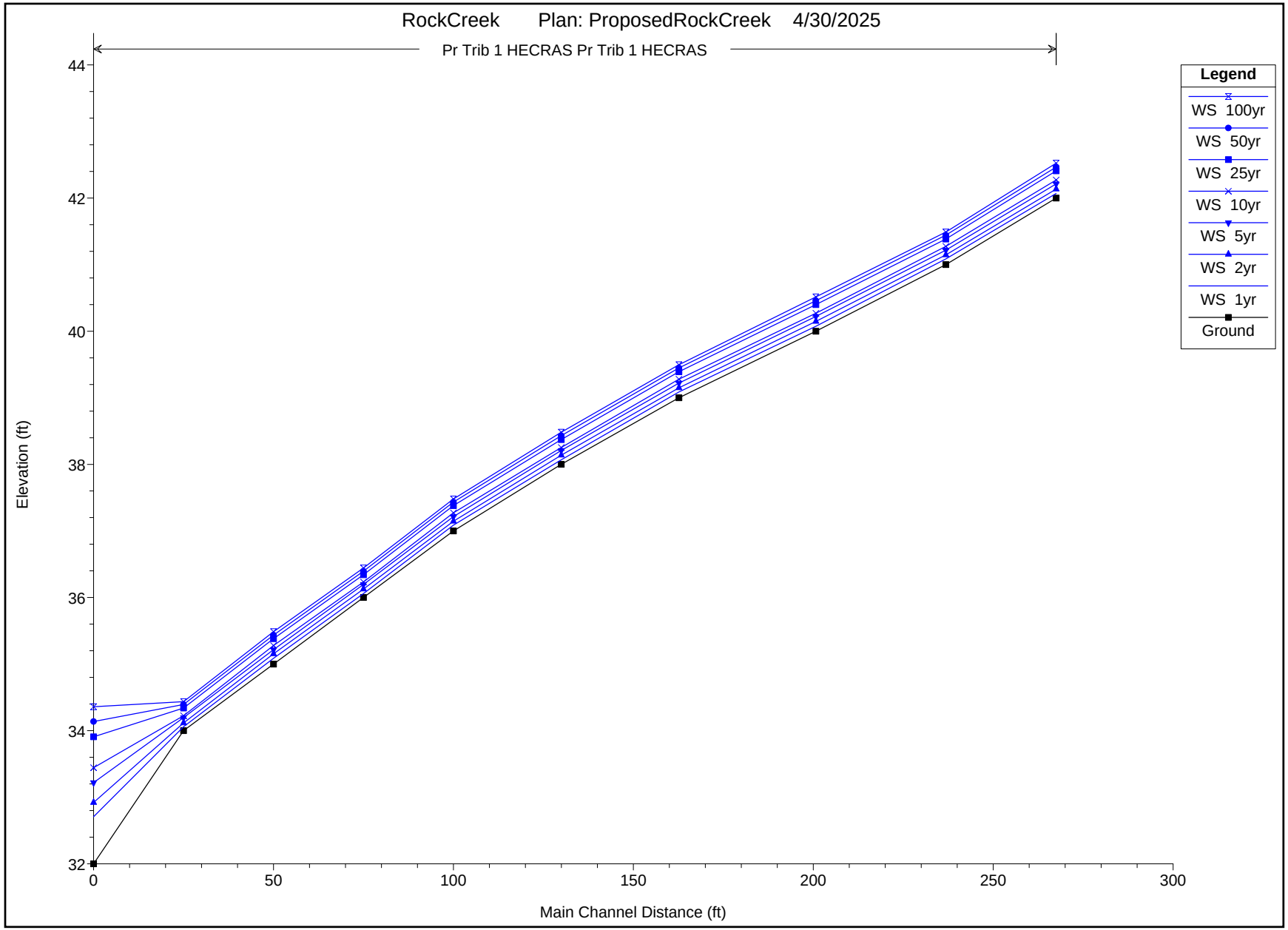

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2821.09
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -2939.46
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta


RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -3048.45
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -3131.47
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta


RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -3250.38
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -3284.76
.1
.047
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 1yr
WS 2yr
Ground
Ineff
Bank Sta

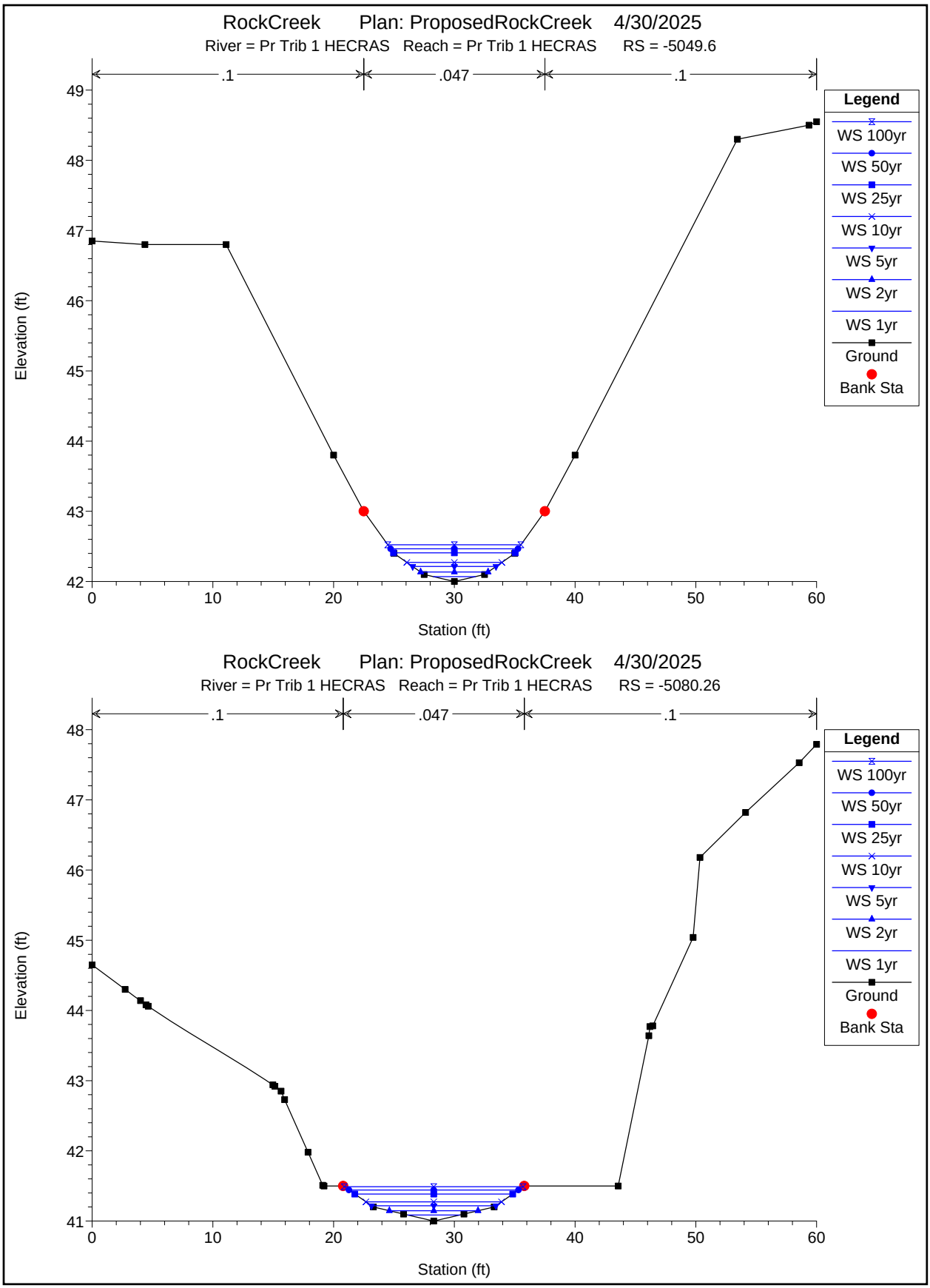

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -3334.41
.1
.07
.039
.07
.039
.1
.07
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 2yr
WS 5yr
WS 1yr
Ground
Ineff
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -3406.88
.1
.07
.039
.1
.039
.1
.039
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 1yr
WS 2yr
Ground
Ineff
Bank Sta

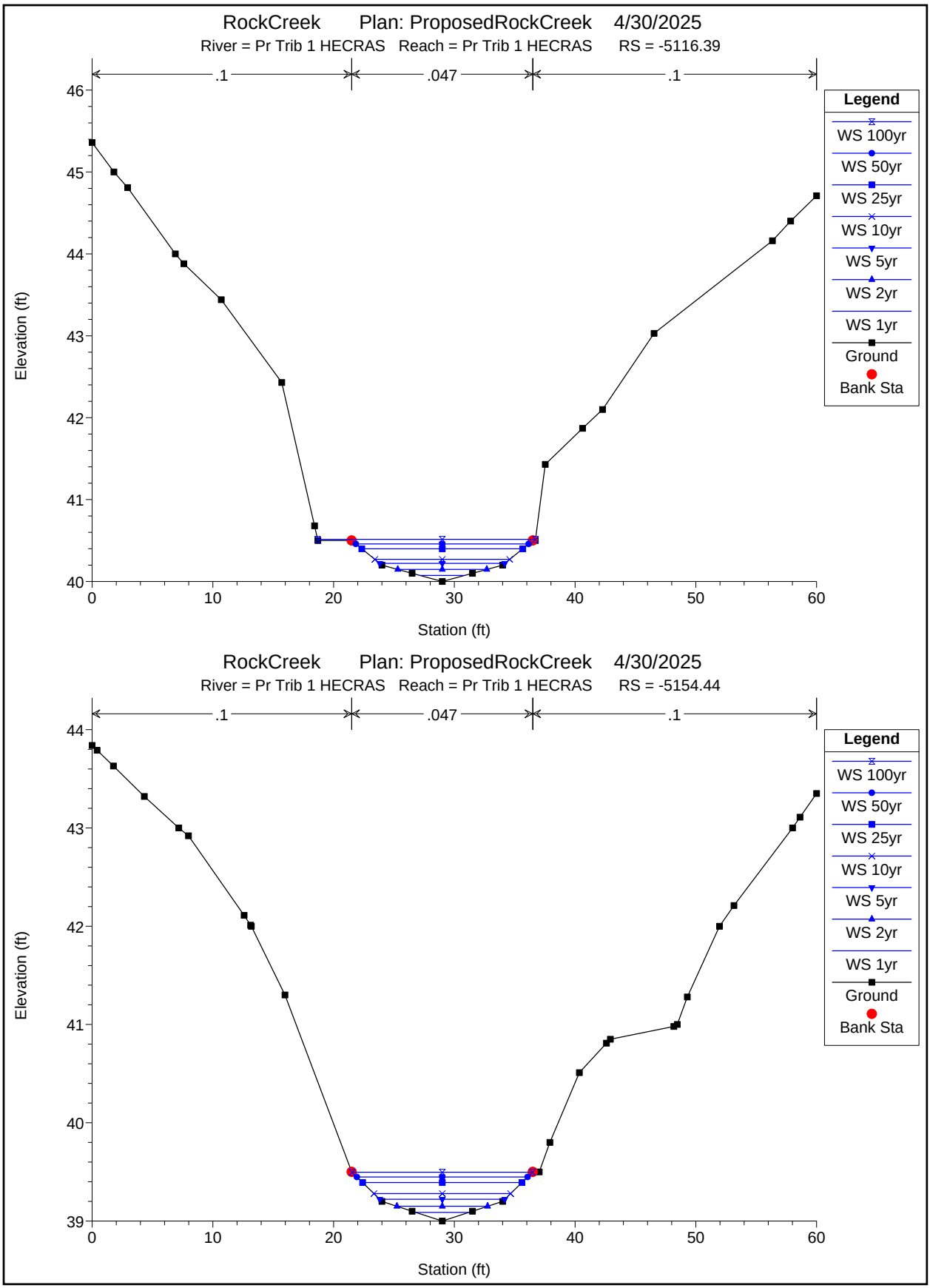

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Main Stem Reach = Pr. Main Stem 2 RS = -3442.81
.1
.07
.1
.039
.1
.039
.039
.1
Elevation (ft)
Station (ft)
0
2
4
6
8
10
12
14
16
0
50
100
150
200
250
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Ineff
Bank Sta

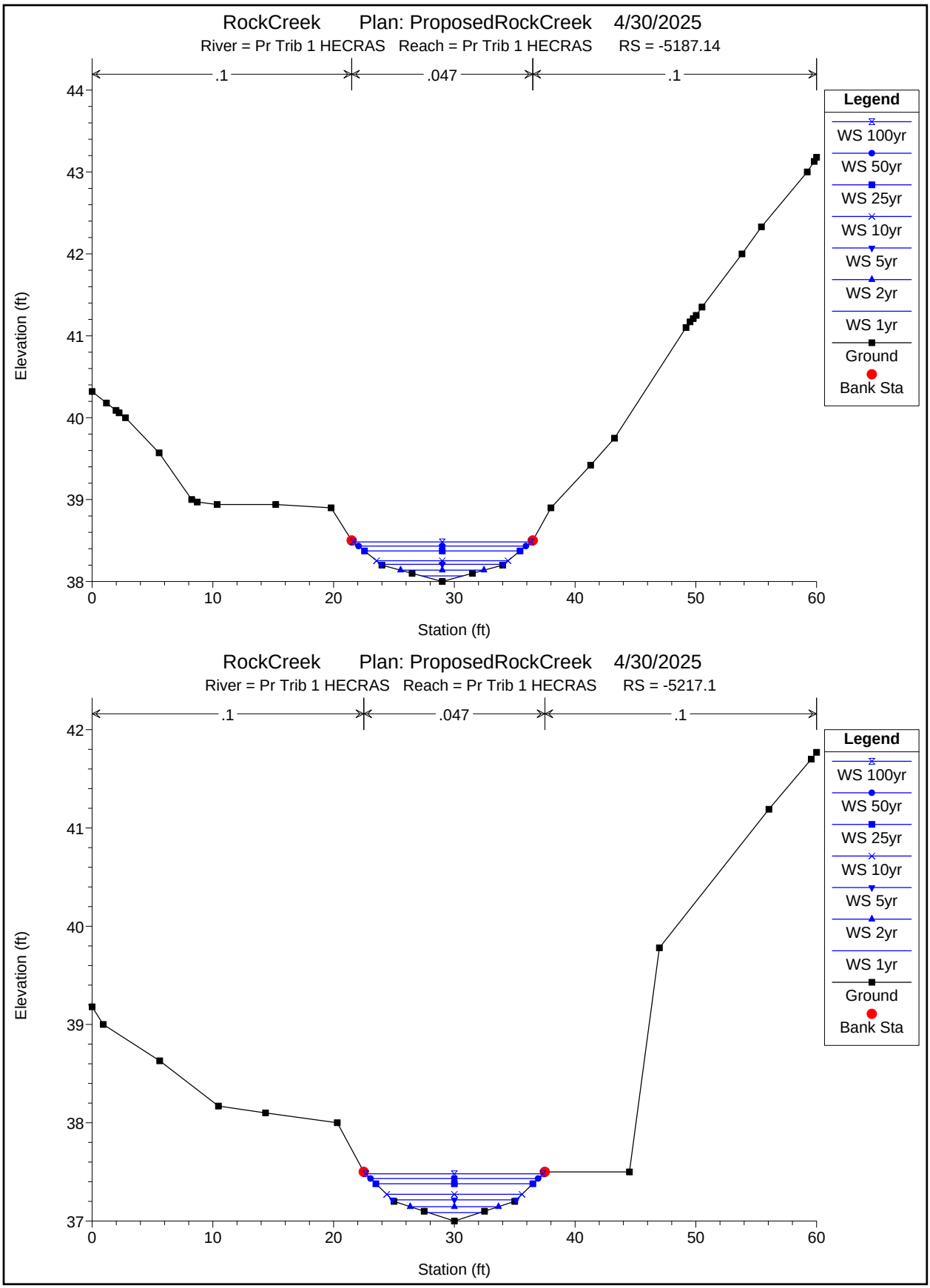

RockCreek Plan: ProposedRockCreek 4/30/2025
Pr Trib 1 HECRAS Pr Trib 1 HECRAS
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Elevation (ft)
Main Channel Distance (ft)
32
34
36
38
40
42
44
0
50
100
150
200
250
300

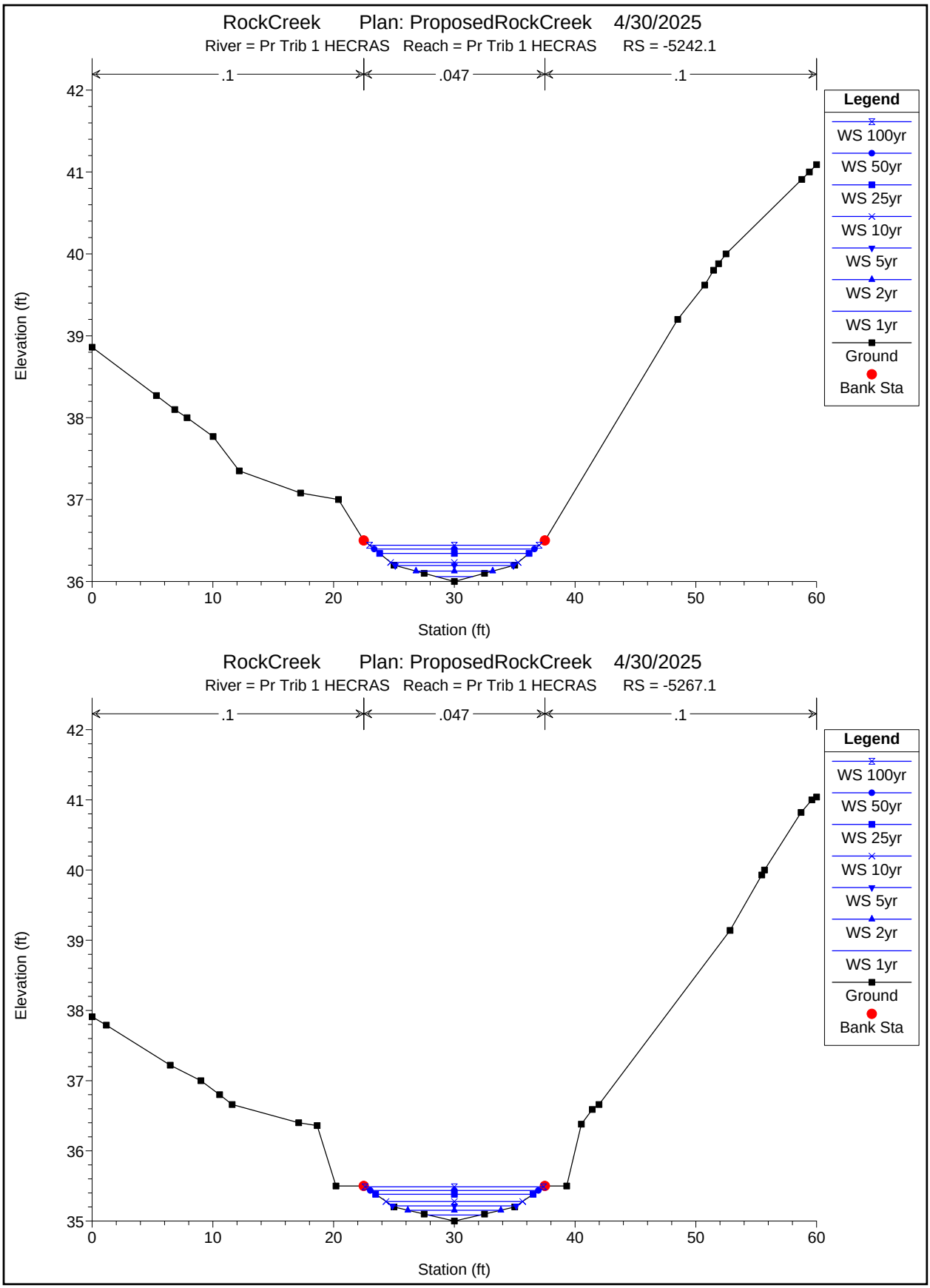
HEC-RAS Plan: Proposed River: Pr Trib 1 HECRAS Reach: Pr Trib 1 HECRAS

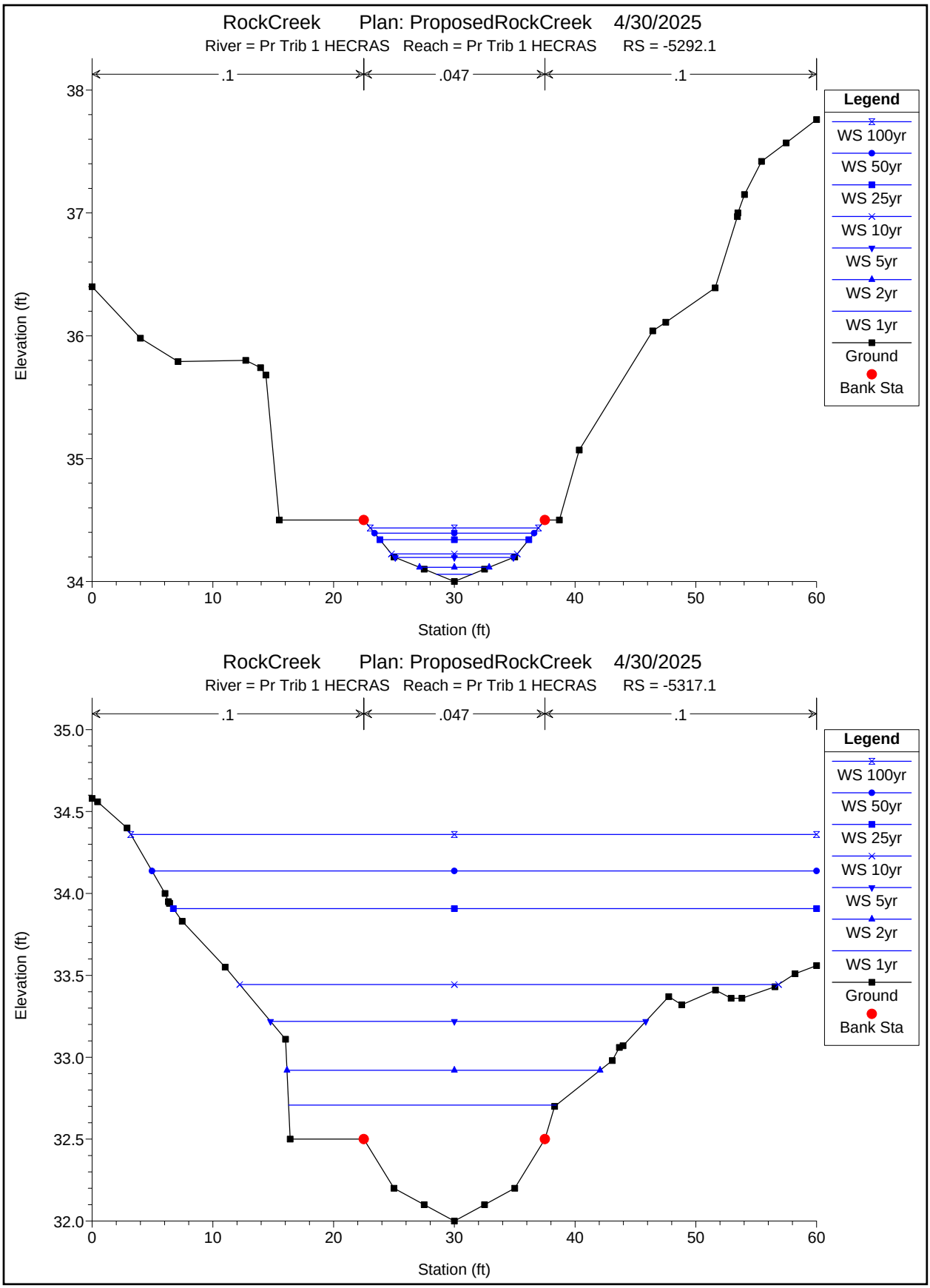
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
Pr Trib 1 HECRAS	-5049.6	1yr	0.10	42.00	42.07	42.06	42.08	0.060904	0.83	0.12	3.47	0.79	0.13		
Pr Trib 1 HECRAS	-5049.6	2yr	0.50	42.00	42.14	42.12	42.16	0.038818	1.14	0.44	5.59	0.72	0.19		
Pr Trib 1 HECRAS	-5049.6	5yr	1.50	42.00	42.21	42.20	42.25	0.038313	1.62	0.93	6.89	0.78	0.32		
Pr Trib 1 HECRAS	-5049.6	10yr	2.70	42.00	42.27	42.25	42.33	0.041741	1.99	1.35	7.86	0.85	0.45		
Pr Trib 1 HECRAS	-5049.6	25yr	6.60	42.00	42.41	42.39	42.51	0.039886	2.55	2.59	10.08	0.89	0.64		
Pr Trib 1 HECRAS	-5049.6	50yr	9.10	42.00	42.47	42.45	42.59	0.040845	2.86	3.18	10.55	0.92	0.76		
Pr Trib 1 HECRAS	-5049.6	100yr	11.70	42.00	42.52	42.50	42.67	0.039664	3.08	3.80	11.03	0.93	0.85		
Pr Trib 1 HECRAS	-5080.26	1yr	0.10	41.00	41.09		41.09	0.019820	0.54	0.18	4.28	0.46	0.05		
Pr Trib 1 HECRAS	-5080.26	2yr	0.50	41.00	41.15		41.16	0.027873	0.93	0.54	7.35	0.60	0.13		
Pr Trib 1 HECRAS	-5080.26	5yr	1.50	41.00	41.22	41.18	41.24	0.028788	1.27	1.18	10.30	0.66	0.21		
Pr Trib 1 HECRAS	-5080.26	10yr	2.70	41.00	41.27		41.31	0.026663	1.51	1.78	11.23	0.67	0.26		
Pr Trib 1 HECRAS	-5080.26	25yr	6.60	41.00	41.38	41.34	41.45	0.029971	2.11	3.13	13.08	0.76	0.45		
Pr Trib 1 HECRAS	-5080.26	50yr	9.10	41.00	41.44	41.39	41.53	0.029840	2.33	3.91	14.04	0.78	0.52		
Pr Trib 1 HECRAS	-5080.26	100yr	11.70	41.00	41.49	41.44	41.59	0.031177	2.55	4.59	14.82	0.81	0.60		
Pr Trib 1 HECRAS	-5116.39	1yr	0.10	40.00	40.07	40.06	40.08	0.042189	0.72	0.14	3.72	0.66	0.10		
Pr Trib 1 HECRAS	-5116.39	2yr	0.50	40.00	40.15		40.16	0.027544	0.92	0.54	7.37	0.60	0.13		
Pr Trib 1 HECRAS	-5116.39	5yr	1.50	40.00	40.22	40.19	40.24	0.026528	1.23	1.22	10.35	0.63	0.19		
Pr Trib 1 HECRAS	-5116.39	10yr	2.70	40.00	40.27	40.23	40.31	0.028767	1.55	1.74	11.17	0.69	0.28		
Pr Trib 1 HECRAS	-5116.39	25yr	6.60	40.00	40.40		40.46	0.025102	1.98	3.33	13.33	0.70	0.39		
Pr Trib 1 HECRAS	-5116.39	50yr	9.10	40.00	40.46		40.53	0.025217	2.19	4.15	14.31	0.72	0.45		
Pr Trib 1 HECRAS	-5116.39	100yr	11.70	40.00	40.51		40.60	0.024287	2.35	5.01	18.05	0.72	0.50	0.02	
Pr Trib 1 HECRAS	-5154.44	1yr	0.10	39.00	39.09		39.09	0.017328	0.52	0.19	4.39	0.44	0.05		
Pr Trib 1 HECRAS	-5154.44	2yr	0.50	39.00	39.15	39.13	39.16	0.024916	0.89	0.56	7.51	0.57	0.12		
Pr Trib 1 HECRAS	-5154.44	5yr	1.50	39.00	39.22	39.19	39.24	0.026533	1.23	1.22	10.35	0.63	0.19		
Pr Trib 1 HECRAS	-5154.44	10yr	2.70	39.00	39.28		39.31	0.024087	1.46	1.85	11.32	0.64	0.24		
Pr Trib 1 HECRAS	-5154.44	25yr	6.60	39.00	39.39		39.46	0.027638	2.05	3.22	13.19	0.73	0.42		
Pr Trib 1 HECRAS	-5154.44	50yr	9.10	39.00	39.45		39.53	0.028095	2.28	3.99	14.14	0.76	0.49		
Pr Trib 1 HECRAS	-5154.44	100yr	11.70	39.00	39.50		39.59	0.029032	2.49	4.70	14.95	0.78	0.57		
Pr Trib 1 HECRAS	-5187.14	1yr	0.10	38.00	38.07	38.06	38.08	0.068918	0.87	0.12	3.39	0.83	0.15		
Pr Trib 1 HECRAS	-5187.14	2yr	0.50	38.00	38.14	38.12	38.16	0.038834	1.05	0.48	6.91	0.70	0.17		
Pr Trib 1 HECRAS	-5187.14	5yr	1.50	38.00	38.21		38.24	0.036321	1.37	1.10	10.16	0.73	0.24		
Pr Trib 1 HECRAS	-5187.14	10yr	2.70	38.00	38.25	38.23	38.30	0.040276	1.73	1.56	10.89	0.81	0.36		
Pr Trib 1 HECRAS	-5187.14	25yr	6.60	38.00	38.37	38.34	38.45	0.034763	2.22	2.98	12.88	0.81	0.50		
Pr Trib 1 HECRAS	-5187.14	50yr	9.10	38.00	38.43	38.39	38.52	0.033232	2.41	3.77	13.87	0.82	0.56		
Pr Trib 1 HECRAS	-5187.14	100yr	11.70	38.00	38.48	38.44	38.59	0.032846	2.60	4.51	14.73	0.83	0.63		
Pr Trib 1 HECRAS	-5217.1	1yr	0.10	37.00	37.09	37.07	37.09	0.019278	0.54	0.19	4.31	0.46	0.05		
Pr Trib 1 HECRAS	-5217.1	2yr	0.50	37.00	37.15		37.16	0.028710	0.94	0.53	7.31	0.61	0.13		
Pr Trib 1 HECRAS	-5217.1	5yr	1.50	37.00	37.22		37.24	0.030647	1.29	1.16	10.26	0.68	0.22		
Pr Trib 1 HECRAS	-5217.1	10yr	2.70	37.00	37.27	37.24	37.31	0.027710	1.53	1.76	11.20	0.68	0.27		
Pr Trib 1 HECRAS	-5217.1	25yr	6.60	37.00	37.38	37.34	37.45	0.031725	2.15	3.07	13.00	0.78	0.47		
Pr Trib 1 HECRAS	-5217.1	50yr	9.10	37.00	37.43	37.39	37.52	0.032928	2.41	3.78	13.88	0.81	0.56		
Pr Trib 1 HECRAS	-5217.1	100yr	11.70	37.00	37.48	37.44	37.59	0.033887	2.63	4.46	14.67	0.84	0.64		
Pr Trib 1 HECRAS	-5242.1	1yr	0.10	36.00	36.06	36.06	36.08	0.132804	1.11	0.09	3.00	1.13	0.25		
Pr Trib 1 HECRAS	-5242.1	2yr	0.50	36.00	36.13	36.13	36.15	0.060895	1.24	0.40	6.35	0.87	0.24		
Pr Trib 1 HECRAS	-5242.1	5yr	1.50	36.00	36.20	36.19	36.23	0.054298	1.56	0.96	9.79	0.88	0.33		
Pr Trib 1 HECRAS	-5242.1	10yr	2.70	36.00	36.23	36.23	36.30	0.063442	2.01	1.34	10.55	0.99	0.50		
Pr Trib 1 HECRAS	-5242.1	25yr	6.60	36.00	36.34	36.34	36.44	0.052233	2.55	2.59	12.37	0.98	0.68		
Pr Trib 1 HECRAS	-5242.1	50yr	9.10	36.00	36.40	36.39	36.52	0.049753	2.77	3.28	13.27	0.98	0.77		
Pr Trib 1 HECRAS	-5242.1	100yr	11.70	36.00	36.44	36.44	36.58	0.049088	2.99	3.92	14.05	1.00	0.85		
Pr Trib 1 HECRAS	-5267.1	1yr	0.10	35.00	35.09	35.06	35.09	0.018723	0.53	0.19	4.33	0.45	0.05		
Pr Trib 1 HECRAS	-5267.1	2yr	0.50	35.00	35.15	35.12	35.17	0.021651	0.84	0.59	7.71	0.53	0.10		
Pr Trib 1 HECRAS	-5267.1	5yr	1.50	35.00	35.22		35.24	0.030590	1.29	1.16	10.26	0.68	0.22		
Pr Trib 1 HECRAS	-5267.1	10yr	2.70	35.00	35.28	35.23	35.31	0.024478	1.47	1.84	11.31	0.64	0.25		
Pr Trib 1 HECRAS	-5267.1	25yr	6.60	35.00	35.38	35.34	35.45	0.031071	2.13	3.09	13.03	0.77	0.46		
Pr Trib 1 HECRAS	-5267.1	50yr	9.10	35.00	35.44	35.39	35.52	0.032115	2.39	3.81	13.92	0.80	0.55		
Pr Trib 1 HECRAS	-5267.1	100yr	11.70	35.00	35.49	35.44	35.59	0.031687	2.56	4.56	14.79	0.81	0.61		
Pr Trib 1 HECRAS	-5292.1	1yr	0.10	34.00	34.06	34.06	34.08	0.143711	1.15	0.09	2.96	1.17	0.26		
Pr Trib 1 HECRAS	-5292.1	2yr	0.50	34.00	34.12	34.12	34.15	0.101676	1.50	0.33	5.77	1.10	0.37		
Pr Trib 1 HECRAS	-5292.1	5yr	1.50	34.00	34.20	34.20	34.23	0.054445	1.57	0.96	9.79	0.88	0.33		
Pr Trib 1 HECRAS	-5292.1	10yr	2.70	34.00	34.22	34.22	34.30	0.078215	2.15	1.25	10.41	1.09	0.59		
Pr Trib 1 HECRAS	-5292.1	25yr	6.60	34.00	34.34	34.34	34.44	0.053995	2.57	2.56	12.33	1.00	0.70		
Pr Trib 1 HECRAS	-5292.1	50yr	9.10	34.00	34.39	34.39	34.52	0.051518	2.81	3.24	13.22	1.00	0.79		
Pr Trib 1 HECRAS	-5292.1	100yr	11.70	34.00	34.44	34.44	34.58	0.053004	3.07	3.82	13.92	1.03	0.90		
Pr Trib 1 HECRAS	-5317.1	1yr	0.10	32.00	32.71	32.06	32.71	0.000000	0.01	9.24	22.17	0.00	0.00	0.00	0.00
Pr Trib 1 HECRAS	-5317.1	2yr	0.50	32.00	32.92	32.13	32.92	0.000003	0.04	14.35	25.93	0.01	0.00	0.00	0.00
Pr Trib 1 HECRAS	-5317.1	5yr	1.50	32.00	33.22	32.19	33.22	0.000007	0.09	22.77	31.08	0.01	0.00	0.00	0.00
Pr Trib 1 HECRAS	-5317.1	10yr	2.70	32.00	33.44	32.22	33.44	0.000011	0.12	30.94	44.62	0.02	0.00	0.00	0.00
Pr Trib 1 HECRAS	-5317.1	25yr	6.60	32.00	33.91	32.34	33.91	0.000019	0.20	54.15	53.28	0.03	0.00	0.00	0.00
Pr Trib 1 HECRAS	-5317.1	50yr	9.10	32.00	34.14	32.39	34.14	0.000021	0.23	66.61	55.04	0.03	0.00	0.00	0.00
Pr Trib 1 HECRAS	-5317.1	100yr	11.70	32.00	34.36	32.44	34.36	0.000023	0.25	79.06	56.79	0.03	0.00	0.00	0.00

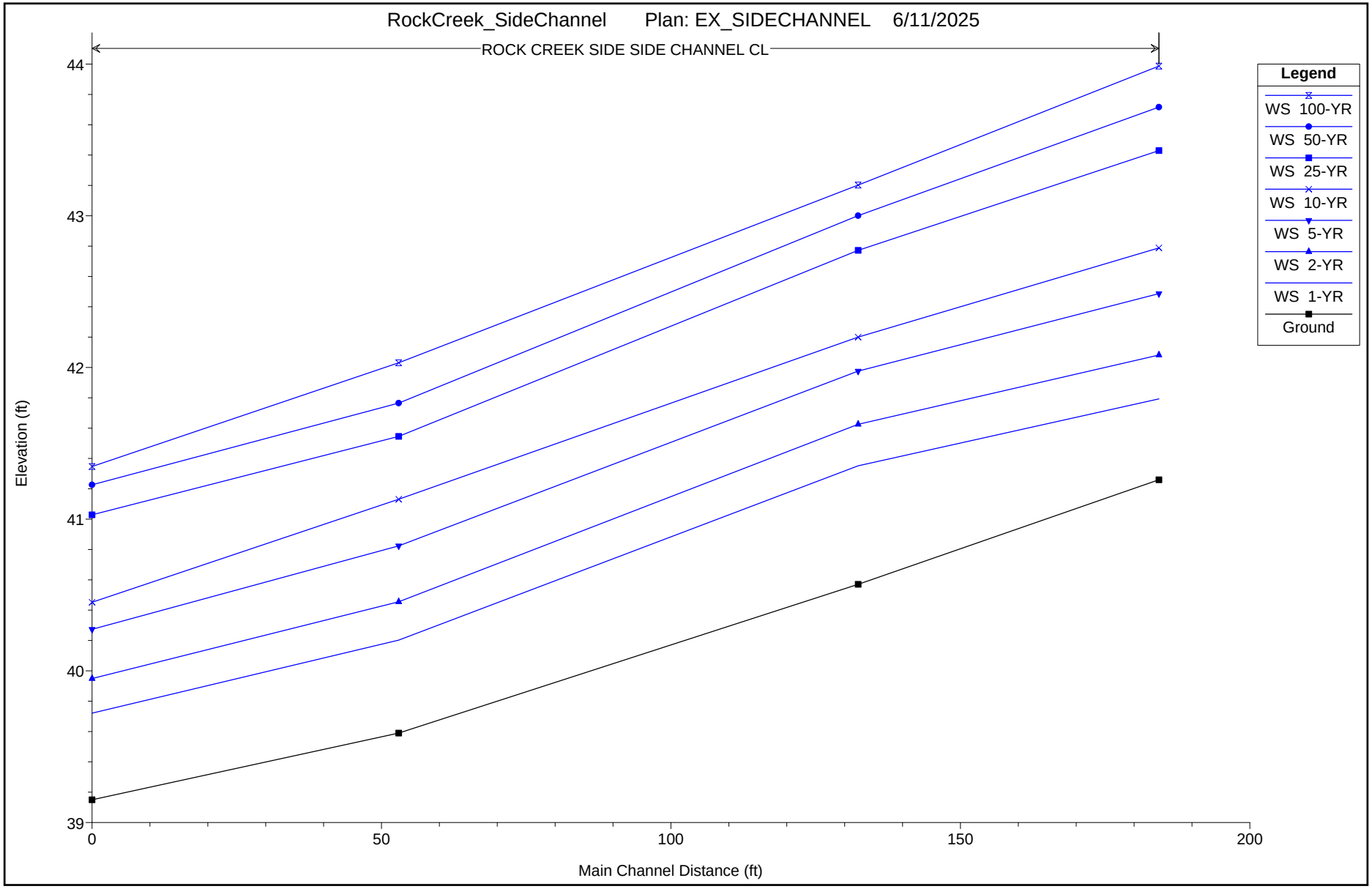

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Trib 1 HECRAS Reach = Pr Trib 1 HECRAS RS = -5049.6
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Trib 1 HECRAS Reach = Pr Trib 1 HECRAS RS = -5080.26
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta


RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Trib 1 HECRAS Reach = Pr Trib 1 HECRAS RS = -5116.39
.1
.047
.1
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Trib 1 HECRAS Reach = Pr Trib 1 HECRAS RS = -5154.44
.1
.047
.1
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Trib 1 HECRAS Reach = Pr Trib 1 HECRAS RS = -5187.14
.1
.047
.1
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Trib 1 HECRAS Reach = Pr Trib 1 HECRAS RS = -5217.1
.1
.047
.1
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

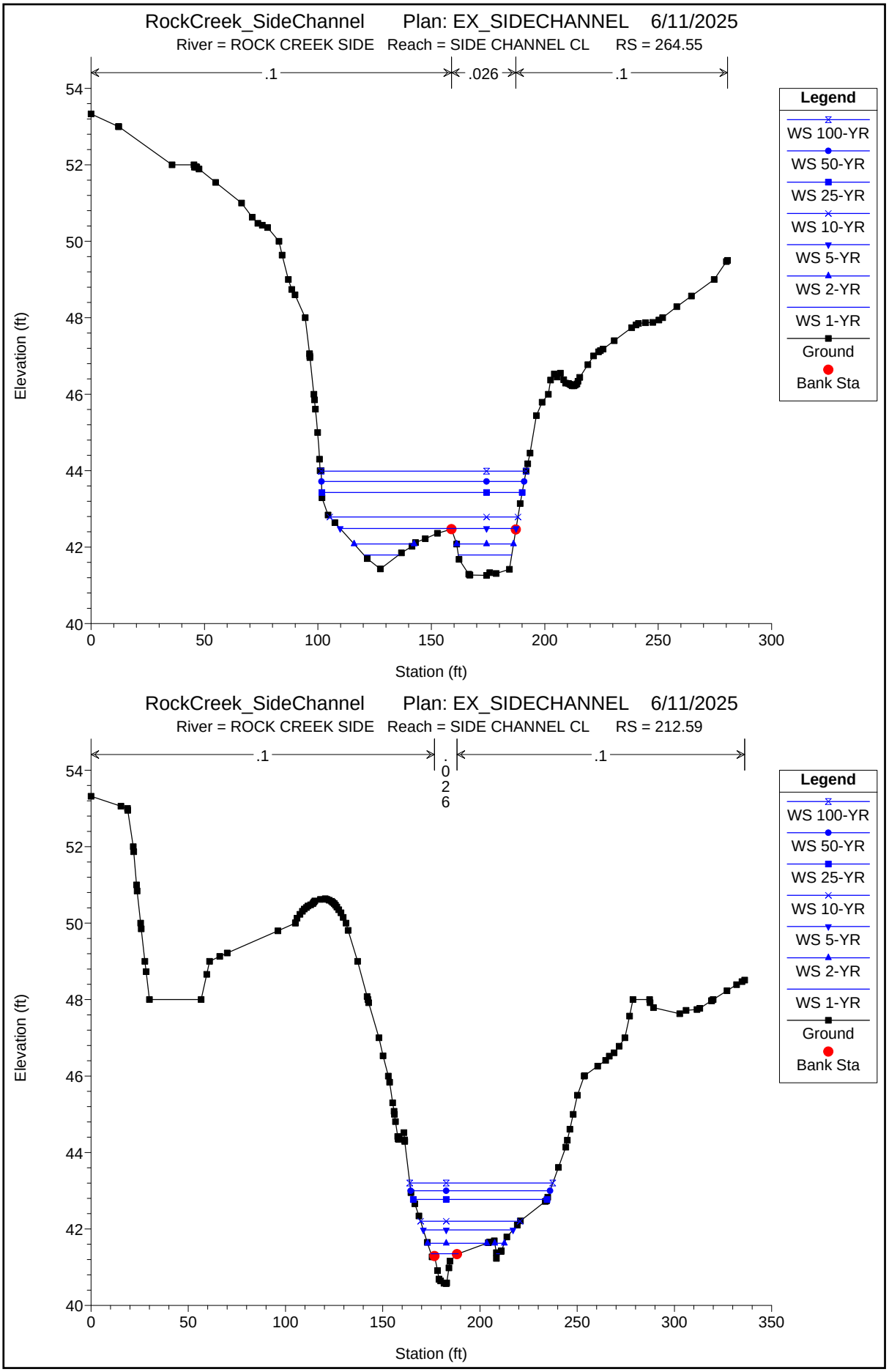

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Trib 1 HECRAS Reach = Pr Trib 1 HECRAS RS = -5242.1
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Trib 1 HECRAS Reach = Pr Trib 1 HECRAS RS = -5267.1
.1
.047
.1
Elevation (ft)
Station (ft)
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta

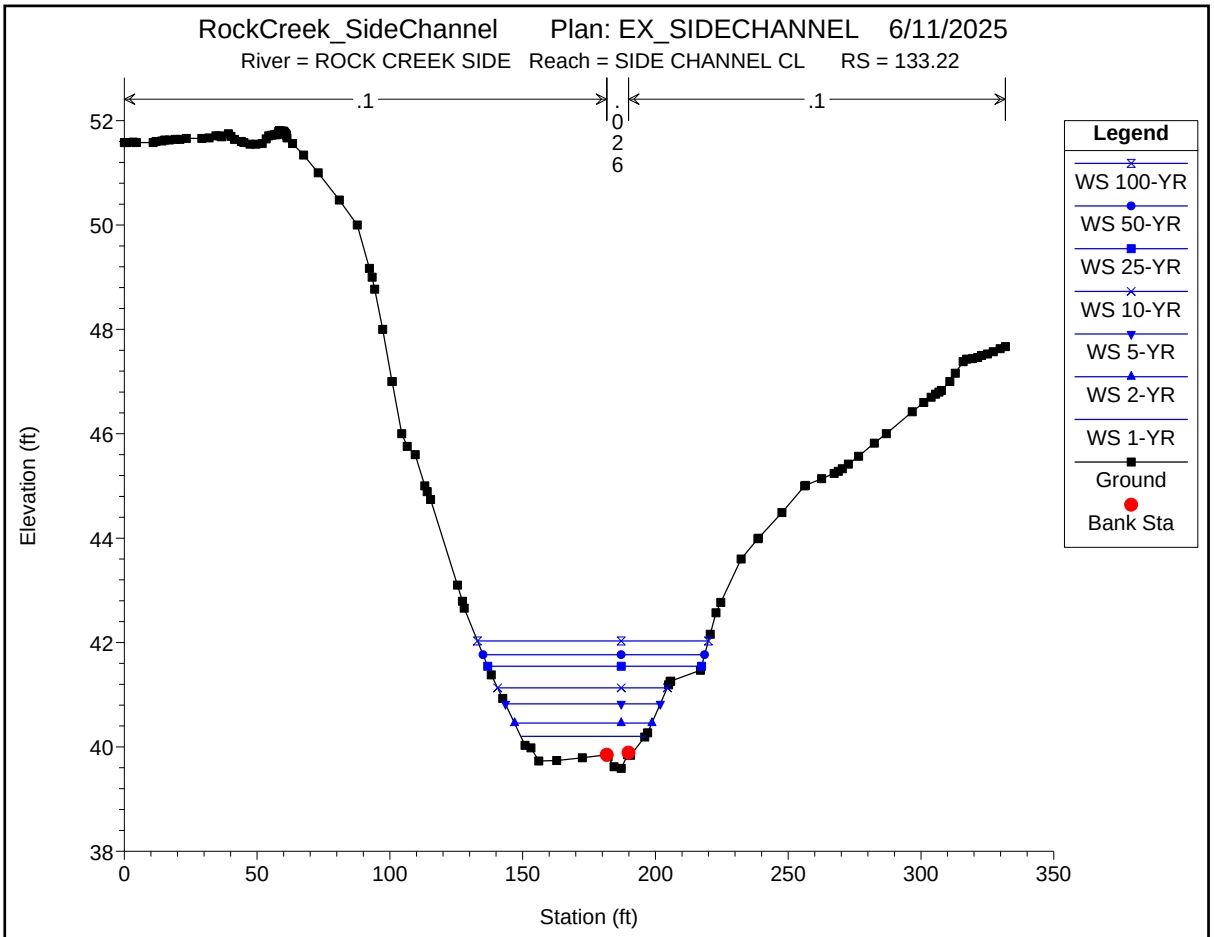

RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Trib 1 HECRAS Reach = Pr Trib 1 HECRAS RS = -5292.1
.1
.047
.1
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
RockCreek Plan: ProposedRockCreek 4/30/2025
River = Pr Trib 1 HECRAS Reach = Pr Trib 1 HECRAS RS = -5317.1
.1
.047
.1
Legend
WS 100yr
WS 50yr
WS 25yr
WS 10yr
WS 5yr
WS 2yr
WS 1yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

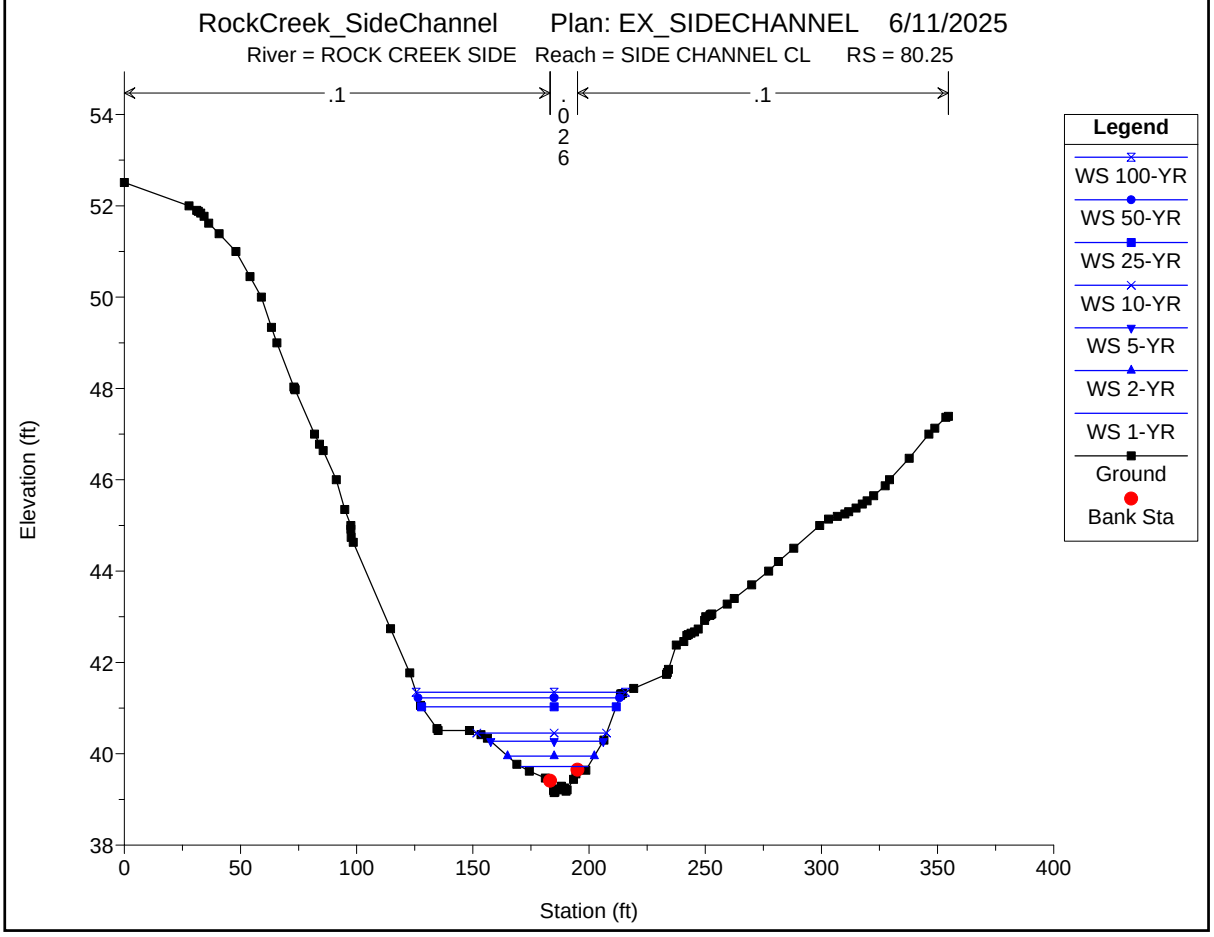

RockCreek_SideChannel Plan: EX_SIDECHANNEL 6/11/2025
ROCK CREEK SIDE SIDE CHANNEL CL
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
WS 1-YR
Ground
Elevation (ft)
44
43
42
41
40
39
0
50
100
150
200
Main Channel Distance (ft)

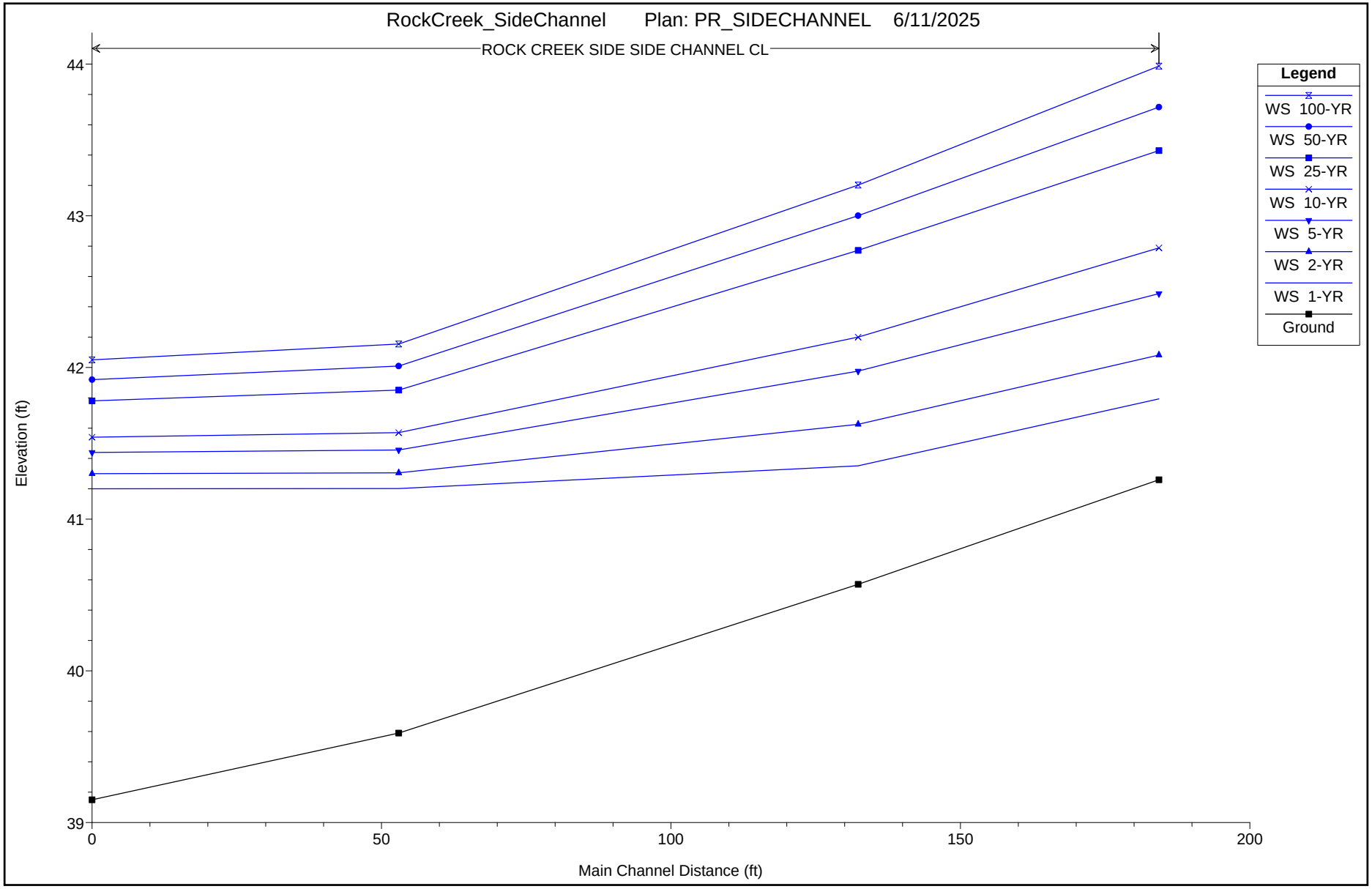
HEC-RAS Plan: EX_SIDECHANNEL River: ROCK CREEK SIDE Reach: SIDE CHANNEL CL

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
SIDE CHANNEL CL	264.55	1-YR	17.90	41.26	41.79	41.61	41.84	0.002672	1.69	13.02	38.72	0.45	0.07	0.03	
SIDE CHANNEL CL	264.55	2-YR	37.50	41.26	42.08	41.78	42.14	0.002063	2.01	26.11	51.52	0.43	0.09	0.04	
SIDE CHANNEL CL	264.55	5-YR	76.20	41.26	42.49	42.03	42.56	0.001789	2.38	52.02	77.52	0.42	0.11	0.05	
SIDE CHANNEL CL	264.55	10-YR	113.00	41.26	42.79	42.22	42.88	0.001474	2.58	76.24	82.92	0.40	0.12	0.07	0.01
SIDE CHANNEL CL	264.55	25-YR	213.40	41.26	43.43	42.61	43.54	0.001192	3.04	131.48	88.33	0.39	0.14	0.10	0.03
SIDE CHANNEL CL	264.55	50-YR	272.40	41.26	43.72	42.77	43.85	0.001172	3.30	156.90	89.36	0.39	0.16	0.12	0.04
SIDE CHANNEL CL	264.55	100-YR	334.50	41.26	43.99	42.94	44.14	0.001164	3.56	181.26	90.34	0.40	0.18	0.13	0.05
SIDE CHANNEL CL	212.59	1-YR	17.90	40.57	41.35	41.35	41.56	0.012873	3.62	5.14	15.68	0.98	0.34	0.05	0.04
SIDE CHANNEL CL	212.59	2-YR	37.50	40.57	41.63	41.63	41.91	0.009781	4.40	12.15	35.45	0.93	0.42	0.14	0.10
SIDE CHANNEL CL	212.59	5-YR	76.20	40.57	41.98	41.98	42.35	0.008370	5.34	26.87	46.15	0.92	0.54	0.22	0.22
SIDE CHANNEL CL	212.59	10-YR	113.00	40.57	42.20	42.20	42.68	0.008594	6.16	37.82	51.17	0.96	0.67	0.29	0.31
SIDE CHANNEL CL	212.59	25-YR	213.40	40.57	42.77	42.77	43.36	0.007203	7.22	72.14	68.75	0.94	0.82	0.37	0.40
SIDE CHANNEL CL	212.59	50-YR	272.40	40.57	43.00	43.00	43.66	0.007217	7.81	88.24	71.67	0.96	0.92	0.43	0.49
SIDE CHANNEL CL	212.59	100-YR	334.50	40.57	43.20	43.20	43.95	0.007408	8.42	102.89	73.57	0.98	1.04	0.51	0.58
SIDE CHANNEL CL	133.22	1-YR	17.90	39.59	40.20	40.07	40.26	0.004869	2.54	17.93	46.88	0.63	0.15	0.12	0.06
SIDE CHANNEL CL	133.22	2-YR	37.50	39.59	40.46	40.24	40.55	0.004751	3.28	30.43	51.73	0.66	0.23	0.18	0.11
SIDE CHANNEL CL	133.22	5-YR	76.20	39.59	40.82	40.51	40.97	0.004599	4.20	50.70	58.32	0.70	0.32	0.26	0.17
SIDE CHANNEL CL	133.22	10-YR	113.00	39.59	41.13	40.71	41.31	0.004186	4.70	69.50	63.89	0.69	0.37	0.30	0.20
SIDE CHANNEL CL	133.22	25-YR	213.40	39.59	41.55	41.19	41.89	0.005986	6.65	99.26	80.51	0.86	0.69	0.54	0.27
SIDE CHANNEL CL	133.22	50-YR	272.40	39.59	41.77	41.26	42.17	0.006261	7.33	117.24	83.44	0.90	0.81	0.62	0.35
SIDE CHANNEL CL	133.22	100-YR	334.50	39.59	42.03	41.68	42.46	0.005870	7.69	139.86	86.98	0.89	0.85	0.65	0.41
SIDE CHANNEL CL	80.25	1-YR	17.90	39.15	39.72	39.72	39.90	0.011838	3.45	7.18	28.91	0.94	0.31	0.12	0.05
SIDE CHANNEL CL	80.25	2-YR	37.50	39.15	39.95	39.95	40.20	0.010378	4.33	14.79	37.33	0.95	0.42	0.20	0.15
SIDE CHANNEL CL	80.25	5-YR	76.20	39.15	40.27	40.27	40.64	0.009264	5.37	28.71	48.38	0.96	0.56	0.29	0.24
SIDE CHANNEL CL	80.25	10-YR	113.00	39.15	40.45	40.45	40.96	0.010805	6.49	37.93	55.81	1.07	0.77	0.38	0.36
SIDE CHANNEL CL	80.25	25-YR	213.40	39.15	41.03	41.03	41.55	0.007379	7.04	81.88	83.79	0.94	0.79	0.39	0.42
SIDE CHANNEL CL	80.25	50-YR	272.40	39.15	41.23	41.23	41.82	0.007574	7.66	98.73	86.74	0.97	0.90	0.48	0.48
SIDE CHANNEL CL	80.25	100-YR	334.50	39.15	41.35	41.35	42.08	0.008914	8.66	109.32	90.04	1.07	1.13	0.62	0.56


RockCreek_SideChannel Plan: EX_SIDECHANNEL 6/11/2025
River = ROCK CREEK SIDE Reach = SIDE CHANNEL CL RS = 264.55
.1
.026
.1
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
WS 1-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
RockCreek_SideChannel Plan: EX_SIDECHANNEL 6/11/2025
River = ROCK CREEK SIDE Reach = SIDE CHANNEL CL RS = 212.59
.1
.026
.1
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
WS 1-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

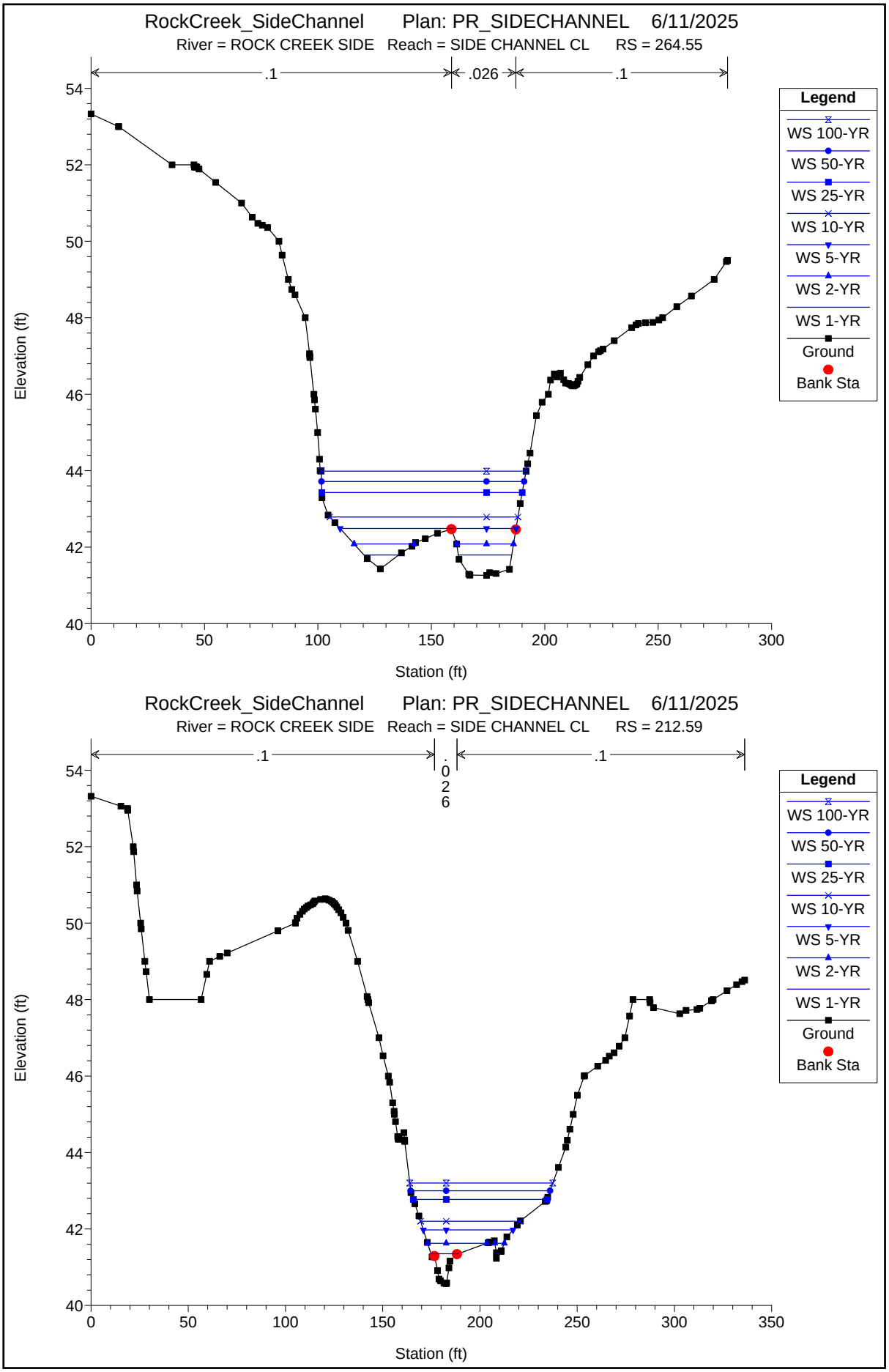

RockCreek_SideChannel Plan: EX_SIDECHANNEL 6/11/2025
River = ROCK CREEK SIDE Reach = SIDE CHANNEL CL RS = 133.22
.1
.026
.1
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
WS 1-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

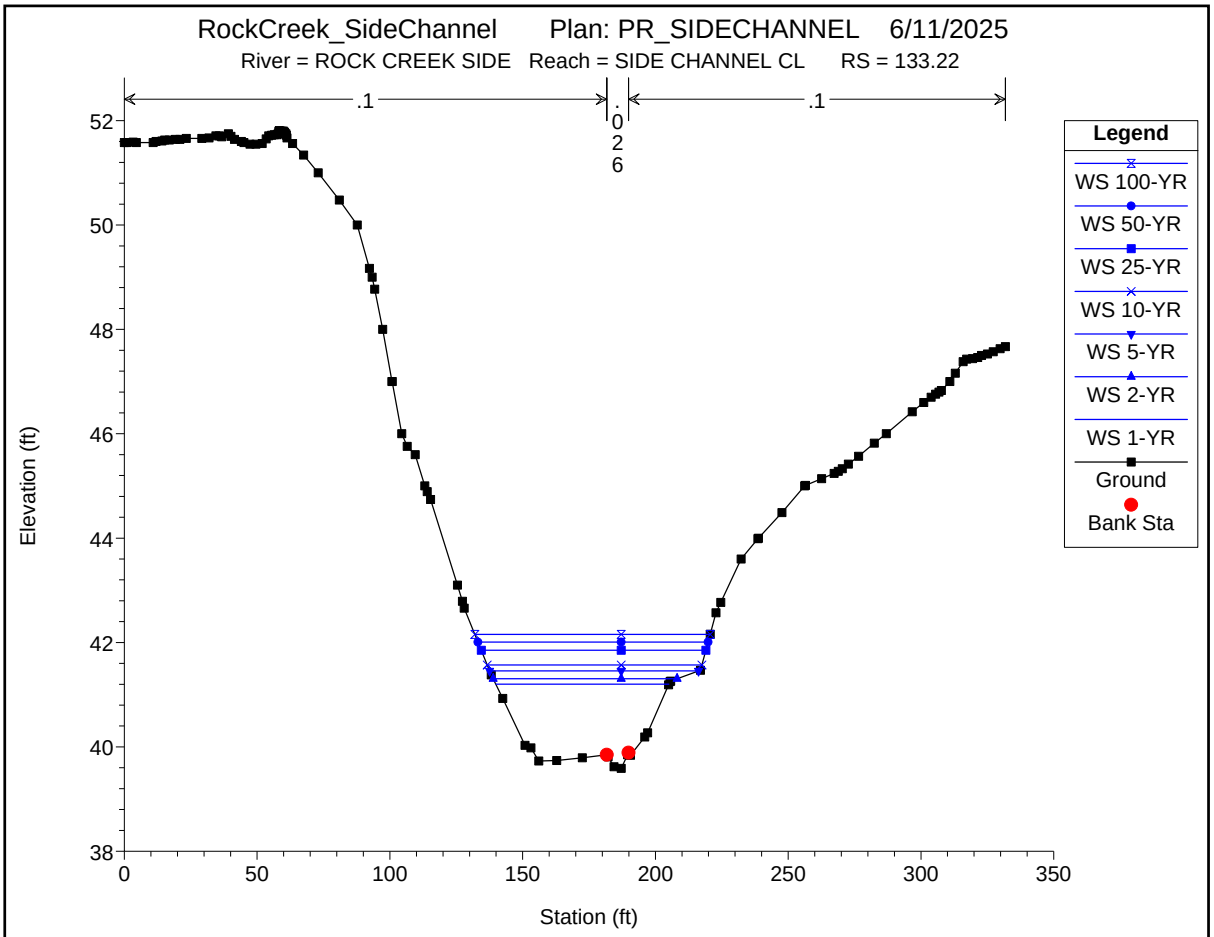

RockCreek_SideChannel Plan: EX_SIDECHANNEL 6/11/2025
River = ROCK CREEK SIDE Reach = SIDE CHANNEL CL RS = 80.25
.1
.026
.1
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
WS 1-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)


RockCreek_SideChannel Plan: PR_SIDECHANNEL 6/11/2025
ROCK CREEK SIDE SIDE CHANNEL CL
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
WS 1-YR
Ground
Elevation (ft)
44
43
42
41
40
39
0
50
100
150
200
Main Channel Distance (ft)

HEC-RAS Plan: PR_SIDECHANNEL River: ROCK CREEK SIDE Reach: SIDE CHANNEL CL

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
SIDE CHANNEL CL	264.55	1-YR	17.90	41.26	41.79	41.61	41.84	0.002672	1.69	13.02	38.72	0.45	0.07	0.03	
SIDE CHANNEL CL	264.55	2-YR	37.50	41.26	42.08	41.78	42.14	0.002063	2.01	26.11	51.52	0.43	0.09	0.04	
SIDE CHANNEL CL	264.55	5-YR	76.20	41.26	42.49	42.03	42.56	0.001789	2.38	52.02	77.52	0.42	0.11	0.05	
SIDE CHANNEL CL	264.55	10-YR	113.00	41.26	42.79	42.22	42.88	0.001474	2.58	76.24	82.92	0.40	0.12	0.07	0.01
SIDE CHANNEL CL	264.55	25-YR	213.40	41.26	43.43	42.61	43.54	0.001192	3.04	131.48	88.33	0.39	0.14	0.10	0.03
SIDE CHANNEL CL	264.55	50-YR	272.40	41.26	43.72	42.77	43.85	0.001172	3.30	156.90	89.36	0.39	0.16	0.12	0.04
SIDE CHANNEL CL	264.55	100-YR	334.50	41.26	43.99	42.94	44.14	0.001164	3.56	181.26	90.34	0.40	0.18	0.13	0.05
SIDE CHANNEL CL	212.59	1-YR	17.90	40.57	41.35	41.35	41.56	0.012873	3.62	5.14	15.68	0.98	0.34	0.05	0.04
SIDE CHANNEL CL	212.59	2-YR	37.50	40.57	41.63	41.63	41.91	0.009781	4.40	12.15	35.45	0.93	0.42	0.14	0.10
SIDE CHANNEL CL	212.59	5-YR	76.20	40.57	41.98	41.98	42.35	0.008370	5.34	26.87	46.15	0.92	0.54	0.22	0.22
SIDE CHANNEL CL	212.59	10-YR	113.00	40.57	42.20	42.20	42.68	0.008594	6.16	37.82	51.17	0.96	0.67	0.29	0.31
SIDE CHANNEL CL	212.59	25-YR	213.40	40.57	42.77	42.77	43.36	0.007203	7.22	72.14	68.75	0.94	0.82	0.37	0.40
SIDE CHANNEL CL	212.59	50-YR	272.40	40.57	43.00	43.00	43.66	0.007217	7.81	88.24	71.67	0.96	0.92	0.43	0.49
SIDE CHANNEL CL	212.59	100-YR	334.50	40.57	43.20	43.20	43.95	0.007408	8.42	102.89	73.57	0.98	1.04	0.51	0.58
SIDE CHANNEL CL	133.22	1-YR	17.90	39.59	41.20	40.07	41.21	0.000088	0.70	74.02	65.16	0.10	0.01	0.01	0.00
SIDE CHANNEL CL	133.22	2-YR	37.50	39.59	41.31	40.24	41.32	0.000307	1.37	80.93	69.25	0.19	0.03	0.02	0.01
SIDE CHANNEL CL	133.22	5-YR	76.20	39.59	41.46	40.51	41.51	0.000928	2.53	92.07	78.63	0.34	0.10	0.08	0.04
SIDE CHANNEL CL	133.22	10-YR	113.00	39.59	41.57	40.71	41.66	0.001594	3.46	101.20	80.83	0.45	0.19	0.14	0.07
SIDE CHANNEL CL	133.22	25-YR	213.40	39.59	41.85	41.19	42.07	0.003275	5.45	124.43	84.58	0.65	0.44	0.34	0.20
SIDE CHANNEL CL	133.22	50-YR	272.40	39.59	42.01	41.26	42.30	0.004038	6.34	137.97	86.69	0.73	0.58	0.45	0.28
SIDE CHANNEL CL	133.22	100-YR	334.50	39.59	42.15	41.68	42.52	0.004791	7.19	150.74	88.64	0.81	0.73	0.56	0.36
SIDE CHANNEL CL	80.25	1-YR	17.90	39.15	41.20	39.72	41.20	0.000035	0.51	96.46	86.38	0.07	0.00	0.00	0.00
SIDE CHANNEL CL	80.25	2-YR	37.50	39.15	41.30	39.95	41.31	0.000122	1.00	105.17	87.72	0.12	0.02	0.01	0.01
SIDE CHANNEL CL	80.25	5-YR	76.20	39.15	41.44	40.27	41.47	0.000389	1.86	117.93	94.66	0.22	0.05	0.03	0.02
SIDE CHANNEL CL	80.25	10-YR	113.00	39.15	41.54	40.45	41.60	0.000712	2.60	127.65	99.88	0.31	0.10	0.06	0.04
SIDE CHANNEL CL	80.25	25-YR	213.40	39.15	41.78	41.03	41.95	0.001661	4.25	153.10	110.93	0.48	0.26	0.15	0.09
SIDE CHANNEL CL	80.25	50-YR	272.40	39.15	41.92	41.23	42.14	0.002126	4.99	168.78	113.03	0.54	0.35	0.21	0.13
SIDE CHANNEL CL	80.25	100-YR	334.50	39.15	42.05	41.35	42.33	0.002596	5.69	183.60	114.97	0.61	0.44	0.27	0.18


RockCreek_SideChannel Plan: PR_SIDECHANNEL 6/11/2025
River = ROCK CREEK SIDE Reach = SIDE CHANNEL CL RS = 264.55
.1
.026
.1
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
WS 1-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
RockCreek_SideChannel Plan: PR_SIDECHANNEL 6/11/2025
River = ROCK CREEK SIDE Reach = SIDE CHANNEL CL RS = 212.59
.1
.026
.1
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
WS 1-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)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.1
.026
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Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
WS 1-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
38
40
42
44
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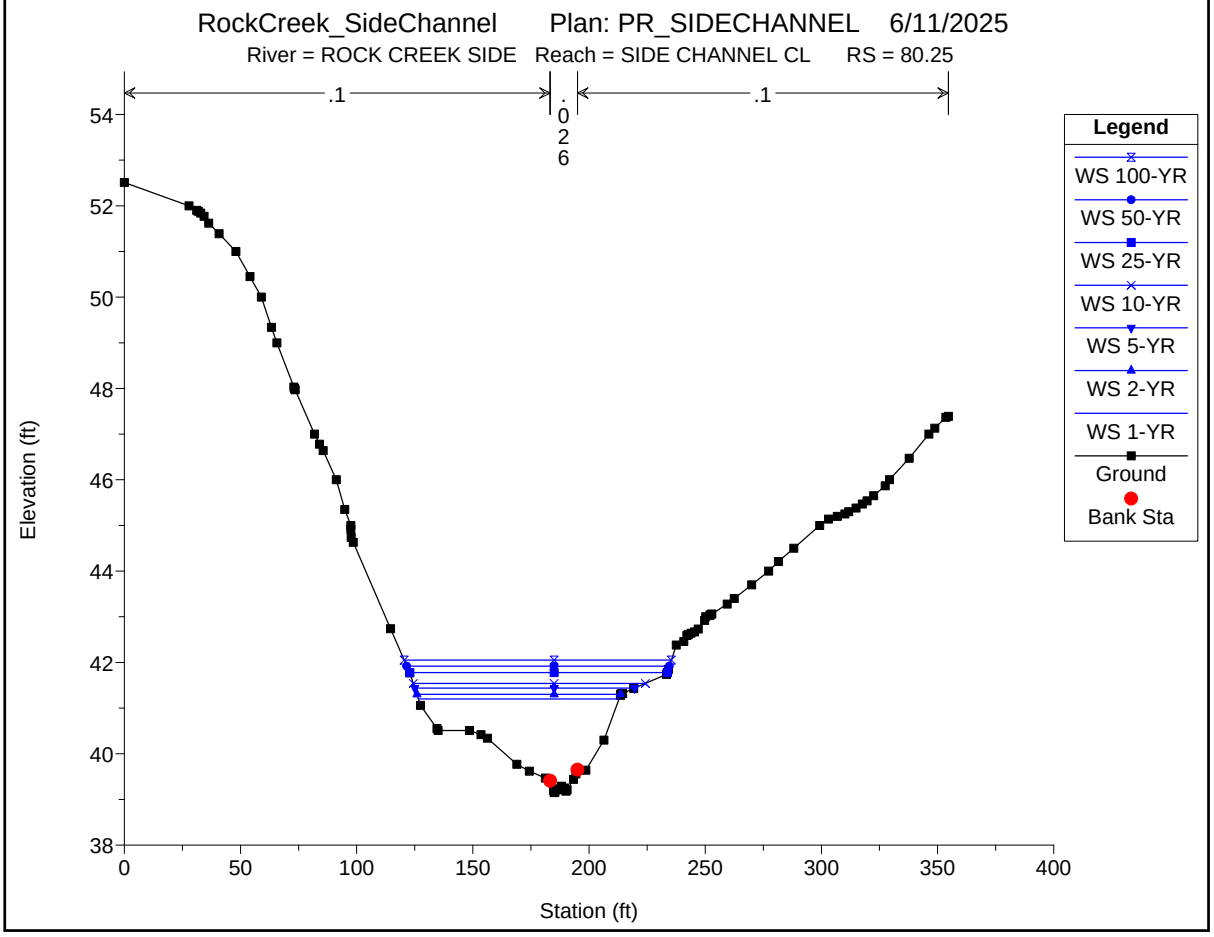
RockCreek_SideChannel Plan: PR_SIDECHANNEL 6/11/2025
River = ROCK CREEK SIDE Reach = SIDE CHANNEL CL RS = 80.25
.1
.026
.1
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
WS 1-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
38
40
42
44
46
48
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54
0
50
100
150
200
250
300
350
400

PR. 10YR HGL
ROCK CREEK STREAM RESTORATION

Outfall SO9B4O00016 HGL @ 10-YR WSE							43.87										
STRUCTURE		PIPE EQUIV.		FLOW	LENGTH	DOWN STREAM	UP STREAM	Sf, SLOPE	VELOCITY	STRUCTURE	ANGLE	Kb	Hb	NORMAL DEPTH DOWN STREAM	NORMAL DEPTH UP STREAM	ELEVATION	DETERMINATION METHOD
FROM	TO	(in)		(cfs)	(ft)	INV.	INV.	(ft/ft)	(ft/s)	TYPE	°	(ft)	(ft)	(ft)	(ft)	(ft)	
HW18	M17A	15		4.0	152.00	42.60	53.90	0.0032	12.34	MANHOLE	45	0.75	1.775	0.39	0.53	56.06	DOWN
M17A	I17	15		4.0	26.00	54.10	54.70	0.0032	8.18	INLET	0	0.50	0.519	0.53	0.53	56.67	LOSSES

APPENDIX L

Function Based Assessment

APPENDIX L – FUNCTION BASED ASSESSMENT

1. INTRODUCTION

The Stream Functions Pyramid Framework (SFPF) from *A Function-Based Framework for Stream Assessment and Restoration Projects* (Harman et. al, 2012) was utilized throughout the entire project process to ensure that the most appropriate design approach would be selected. The SFPF consists of four components. The first component, the broad-level view, consists of the five functional categories (levels) with the underlying controlling variables of geology and climate (Figure 1). The second component is the function-based parameters, which are provided for each functional category. The third component is the measurement methods, which are provided for each function-based parameter, and the fourth component is the performance standards, which are provided for the measurement methods.

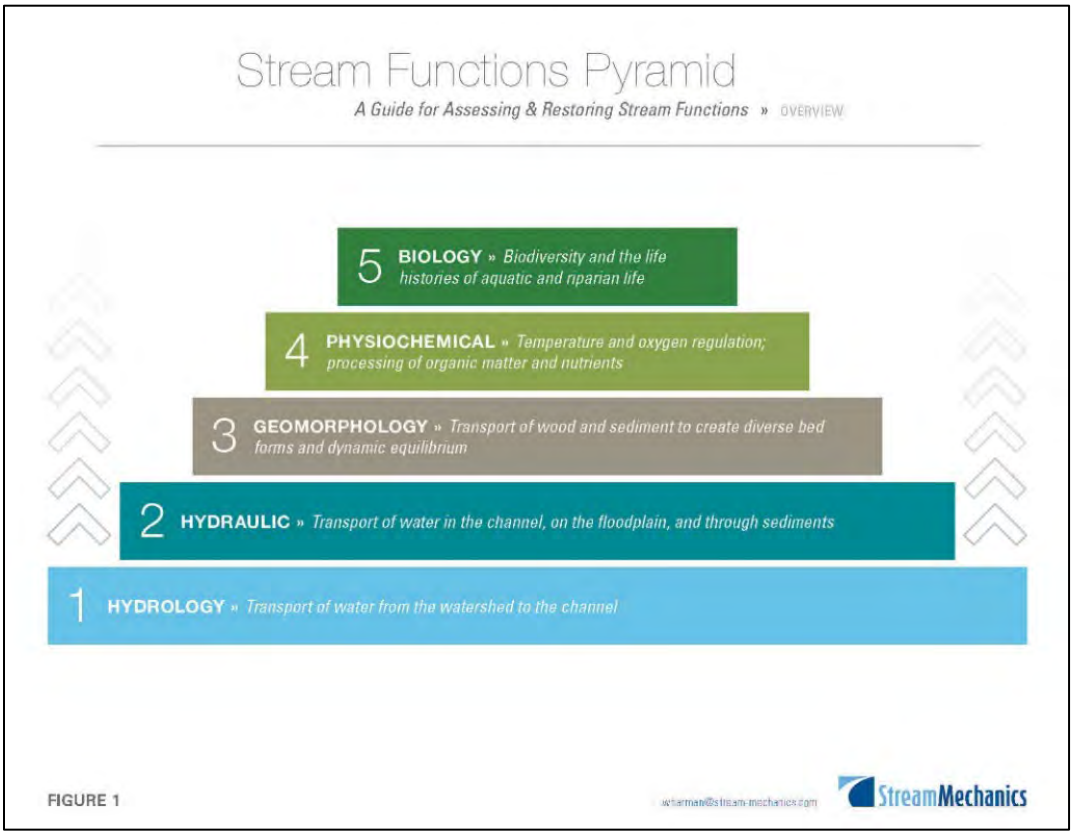

Figure 1 – Stream Functions Pyramid

Table 1 shows the assessment parameters by SFPF pyramid level that were evaluated as part of this project. Table 1 also includes the measurement method(s) used to quantify the existing function-based condition.

Table 1 – Assessment Parameters by Pyramid Level		
Level and Category	**Parameter**	**Measurement Method**
Level 1 – Hydrology	Runoff	Flow Regime (Flashiness)
Level 2 – Hydraulics	Floodplain Connectivity	Maximum Velocity
	Floodplain Drainage	Concentrated Flow
	Vertical Stability	Head cuts
Level 3 – Geomorphology	Riparian Vegetation	Riparian Buffer Width
	Lateral Stability	BEHI/NBS
Level 4 – Physicochemical	Water Quality	Conductivity (µS/cm)
		DO (mg/L)
		pH
		Temperature (ºC)
Level 5 – Biology	Habitat & Macroinvertebrate Communities	RBP Score
		MPHI Score
		BIBI Score

2. REACH SCALE FUNCTION BASED ASSESSMENT

Using the assessment parameters and associated measurement methods in Table 1, the existing function-based condition for each reach was quantified. Each measurement method value was rated as either "Functioning," "Functioning-at-Risk," or "Not Functioning" based on a set of performance standards. After reviewing the various parameters and measurement methods, an overall rating for each level of the stream functions pyramid was assigned the reaches.

2.1. Level 1 – Hydrology

2.1.1. Level 1 – Hydrology Parameters & Measurement Methods

The project watershed has been altered over the past century, which is known to alter flow volumes and duration. One measurement of runoff, Flow Regime (Flashiness), was used to describe the hydrologic function of the project reaches.

Flow Regime (Flashiness)

Rainfall patterns, geology, soils and percent imperviousness of the contributing drainage area were examined to help determine flow regime. According to *Is Impervious Cover Still Important?* (Schueler, 2009), streams that possess between 10 and 25 percent subwatershed impervious cover behave as impacted streams and show clear signs of declining health.

Table 2 shows the performance standards used to determine the runoff rating of the reaches. The performance standards were adapted from the USFWS report, *Navy Dairy Farm Stream Restoration, Anne Arundel County Maryland: Function-Based Project Summary and Design Report* (Hutzell, 2016).

Table 2 – Runoff Performance Standards

Measurement Method	Functioning	Functioning-at-Risk	Not Functioning
Flow Regime (Flashiness)	Non-flashy flow regime as a result of rainfall patterns, geology, and soils, percent 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%

2.1.2. Level 1 – Hydrology Results

The existing flow regime is characterized by a drainage area with approximately 28% impervious cover and is considered "Not Functioning" (Table 3).

Table 3 – Level 1 Hydrology Ratings

Parameter	Measurement Method	Pre-Restoration Condition Rating	
		Value	Rating
Runoff	Flow Regime (Flashiness)	Flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover greater than 15%	**Not Functioning**

2.2. Level 2 – Hydraulics

2.2.1. Level 2 – Hydraulics Parameters & Measurement Methods

Evaluating the hydraulics of a stream system is essential to understanding how water and sediment are transported through the channel and interact with the associated floodplain. Three parameters were used to describe the hydraulic function of the reaches: Floodplain Connectivity, Floodplain Drainage, and Vertical Stability.

Floodplain Connectivity

Floodplain connectivity describes how often stream flows access the adjacent floodplain. In high-functioning alluvial valleys, flows spread across a wide floodplain, encouraging the development of riparian wetlands. Floodplain connectivity is a driving force for many of the geomorphic and ecologic functions within a stream (Wohl, 2004). Therefore, reconnecting streams to their floodplain is typically a goal when working in watersheds that have channelized and/or incised streams. For this project, the measurement method for floodplain connectivity is the maximum velocity up the 100-year recurrence interval storm event, obtained from the hydraulic model. Performance standards (Table 4) were developed using permissible velocities from *Stability Thresholds for Stream Restoration Materials* (Fischenich, 2001). The performance standards vary according to the permissible velocities of the associated boundary type/underlying material.

Table 4 – Floodplain Connectivity Performance Standards

Measurement Method	Functioning	Functioning-at-Risk	Not Functioning
Maximum Velocity (up to the 100-year storm event; sand, silt and fine gravel)	Less than 2.0	2.0 to 4.0	> 4.0
Maximum Velocity (up to the 100-year storm event; vegetation)	Less than 7.0	7.0 to 8.0	> 8.0
Maximum Velocity (up to the 100-year storm event; 9inch D50 Riprap)	Less than 9.0	9.0 to 11.0	> 11.0
Maximum Velocity (up to the 100-year storm event; 12inch D50 Riprap)	Less than 11.0	11.0 to 13.0	> 13.0
Maximum Velocity (up to the 100-year storm event; 18inch D50 Riprap)	Less than 14.0	14.0 to 16.0	> 16.0
Maximum Velocity (up to the 100-year storm event; 24inch D50 Riprap)	Less than 16.0	16.0 to 18.0	> 18.0

Floodplain Drainage

The measurement of floodplain drainage is made based on the existence or prevalence of concentrated flow entering the stream. Concentrated flows, defined as surface stormwater entering the stream at a fixed point (Starr et al. 2015), are a cause of channel erosion and transport higher levels of channel pollutants. Greater hillslopes closer to the stream channel also typically result in greater concentrated flows entering the channel, increasing the likelihood of erosion. Performance standards for floodplain drainage are shown in Table 5.

Table 5 – Floodplain Drainage Performance Standards			
Measurement Method	**Functioning**	**Functioning-at-Risk**	**Not Functioning**
Left and Right Floodplain Concentrated Flows	• No concentrated flow, runoff is primarily sheet flow • Hillslopes < 10% • Hillslopes >200 ft from stream • Ponding or wetland areas and leaf litter, rack lines, 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 leaf litter, rack lines, 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, rack lines, and leaf litter or debris jams are not well represented or absent.

Vertical Stability

Vertical stability is a measure of how much the stream bed elevation and profile are changing. Vertical instabilities result in response to disturbance and indicate that the stream channel is degrading, oftentimes due to an altered flow regime associated with increased runoff. An increase in runoff resulting from impervious surfaces causes greater forces to be exerted on the stream banks and the stream bed, resulting in the formation of head cuts in the stream channel. A head cut is a sudden, near-vertical drop in the stream profile. The development of head cuts within the stream channel is associated with channel widening and bank incision downstream. As channel erosion continues, head cuts migrate upstream, progressively lowering the elevation of the stream bed and incising the channel. The presence of head cuts, therefore, indicate vertical instability (Harman et al, 2012). Performance standards for vertical stability based on the presence of head cuts in the stream channel are shown in Table 6.

Table 6 – Vertical Stability Performance Standards			
Measurement Method	**Functioning**	**Functioning-at-Risk**	**Not Functioning**
Channel Head Cuts	Stable	Localized instabilities	Widespread instabilities; migrating head cuts throughout the channel

2.2.2. Level 2 – Hydraulics Results

The hydraulic function of the project reaches is summarized in Table 7. Based on the above parameters, all reaches have an overall rating of “Not Functioning”.

Table 7 – Level 2 Hydraulics Ratings					
Reach	**Parameter**	**Measurement Method**	**Pre-Restoration Condition Rating**		
			Value	**Rating**	**Overall Rating**
RC-1	Floodplain Connectivity	Maximum Velocity (up to the 100-year storm event; sand, silt and fine gravel)	9.98 fps (RS 3392.25 in channel, 100-year storm event)	**Not Functioning**	**Not Functioning**
	Floodplain Drainage	Concentrated Flow (Left Floodplain)	• Concentrated flows present • Hillslopes >10-40% • Hillslopes <50 ft from stream • Ponding or wetland areas, rack lines, and leaf litter or debris jams minimally represented.	**Not Functioning**	
		Concentrated Flow (Right Floodplain)	• Concentrated flows present • Hillslopes >40% • Hillslopes <50 ft from stream • Ponding or wetland areas, rack lines, and leaf litter or debris jams are not well represented or absent.	**Not Functioning**	
	Vertical Stability	Channel Head Cuts	Localized instabilities	**Functioning-at-Risk**	
RC-2	Floodplain Connectivity	Maximum Velocity (up to the 100-year storm event; sand, silt and fine gravel)	20.54 fps (RS 3057.41 in channel, 100-year storm event)	**Not Functioning**	**Not Functioning**
	Floodplain Drainage	Concentrated Flow (Left Floodplain)	• Concentrated flows present • Hillslopes >40% • Hillslopes <50 ft from stream • Ponding or wetland areas, rack lines, and leaf litter or debris jams are not well represented or absent.	**Not Functioning**	
		Concentrated Flow (Right Floodplain)	• Runoff is equally sheet and concentrated flow • Hillslopes >40% • Hillslopes <50 ft from stream • Ponding or wetland areas and leaf litter, rack lines, or debris jams are minimally represented.	**Not Functioning**	
	Vertical Stability	Channel Head Cuts	Widespread instabilities; migrating head cuts throughout the channel	**Not Functioning**	

Table 7 – Level 2 Hydraulics Ratings					
Reach	**Parameter**	**Measurement Method**	**Pre-Restoration Condition Rating**		
			Value	**Rating**	**Overall Rating**
RC-3	Floodplain Connectivity	Maximum Velocity (up to the 100-year storm event; vegetation)	9.94 fps (RS 1619.34 in channel, 100-year storm event)	**Not Functioning**	**Not Functioning**
	Floodplain Drainage	Concentrated Flow (Left Floodplain)	• Concentrated flows present • Hillslopes >10-40% • Hillslopes <50 ft from stream • Ponding or wetland areas, rack lines, and leaf litter or debris jams minimally represented.	**Not Functioning**	
		Concentrated Flow (Right Floodplain)	• Concentrated flows present • Hillslopes >40% • Hillslopes <50 ft from stream • Ponding or wetland areas, rack lines, and leaf litter or debris jams are not well represented or absent.	**Not Functioning**	
	Vertical Stability	Channel Head Cuts	Localized instabilities	**Functioning-at-Risk**	
RC-4	Floodplain Connectivity	Maximum Velocity (up to the 100-year storm event; vegetation)	17.65 fps • (RS 322.25 in channel, 100-year storm event)	**Not Functioning**	**Not Functioning**
	Floodplain Drainage	Concentrated Flow (Left Floodplain)	• Concentrated flows present • Hillslopes >10-40% • Hillslopes <50 ft from stream • Ponding or wetland areas, rack lines, and leaf litter or debris jams minimally represented.	**Not Functioning**	
		Concentrated Flow (Right Floodplain)	• Concentrated flows present • Hillslopes >40% • Hillslopes <50 ft from stream • Ponding or wetland areas, rack lines, and leaf litter or debris jams are not well represented or absent.	**Not Functioning**	
	Vertical Stability	Channel Head Cuts	Widespread instabilities; migrating head cuts throughout the channel	**Not Functioning**	

2.3. Level 3 – Geomorphology

2.3.1. Level 3 – Geomorphology Parameters & Measurement Methods

Geomorphology functions transport and store organic matter (wood) and sediment to create diverse bed forms and dynamic equilibrium. These functions include the interaction of flowing water with the stream bed, streambanks, and sediment supply. Two parameters were used to describe the geomorphology of each project reach: Riparian Vegetation and Lateral Stability.

Riparian Vegetation

Riparian vegetation plays a crucial role in maintaining stream health, extending beyond its influence on the Bank Erosion Hazard Index measurements of lateral stability. A vegetative stream buffer absorbs Nitrogen and Phosphorus entering the stream, provides a source of wood and carbon, provides landscape connectivity for wildlife, and has been shown to improve riparian habitat, water quality, and benthic macroinvertebrate scores (Harman at al, 2012). The health of a riparian buffer, and its ability to provide the aforementioned services to the health of the stream, is adversely affected by soil compaction, vegetation loss and channel incision, all of which are caused by human activities encroaching upon the riparian buffer area.

The health of riparian vegetation can be evaluated using several factors including the buffer width; the vegetation density and composition; and the presence of native or invasive species. The performance standards for riparian vegetation are found in Table 8.

Table 8 – Riparian Vegetation Performance Standards

Measurement Method	Functioning	Functioning-at-Risk	Not Functioning
Left Bank and Right Bank Riparian Vegetation	• Riparian buffer 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 buffer 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 plant community	• Riparian buffer extends to a width of <25 feet • Little or no riparian vegetation due to human activities • Majority of vegetation is invasive

Lateral Stability

Morphological response to disturbance typically includes vertical adjustment followed by lateral adjustment involving retreat and advance of the banks (Cluer and Thorne, 2014). Bank migration and lateral stability was determined for the reaches using Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS) rating methods. BEHI/NBS ratings can be used to estimate the annual amount of lateral erosion/migration. BEHI and NBS

methodologies and results for the project reaches are provided in the Design Report. The performance standards for BEHI/NBS are presented in Table 9.

Table 9 – Lateral Stability Performance Standards			
Measurement Method	**Functioning**	**Functioning-at-Risk**	**Not Functioning**
Lateral Erosion rate-Low BEHI Curve	Very low to Moderate NBS	Moderate to Very High NBS	Extreme NBS
Lateral Erosion rate-Moderate BEHI Curve	Very Low to Low NBS	Low to High NBS	High to Extreme NBS
Lateral Erosion rate-High and Very High BEHI Curve	N/A	Low to Moderate NBS	Moderate to Extreme NBS
Lateral Erosion rate-Extreme BEHI Curve	N/A	Low NBS	Low to Extreme NBS

2.3.2. Level 3 – Geomorphology Results

The geomorphologic function of each reach is summarized in Table 10. Based on the above performance standards RC-1 has an overall rating of “Not Functioning” and RC-2, RC-3 and RC-4 have an overall rating of “Functioning-at-Risk”.

Table 10 – Level 3 Geomorphology Ratings					
Reach	**Parameter**	**Measurement Method**	**Pre-Restoration Condition Rating**		
			Value	**Rating**	**Overall Rating**
RC-1	Riparian Vegetation	Left Bank Riparian Vegetation	• Riparian buffer 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 plant community	**Functioning-at-Risk**	**Not Functioning**
		Right Bank Riparian Vegetation	• Riparian buffer extends to a width of <25 feet • Little or no riparian vegetation due to human activities • Majority of vegetation is invasive	**Not Functioning**	
	Lateral Stability	BEHI/NBS	High/ Moderate	**Not Functioning**	
RC-2	Riparian Vegetation	Left Bank Riparian Vegetation	• Riparian buffer 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 plant community	**Functioning-at-Risk**	**Functioning-at-Risk**
		Right Bank Riparian Vegetation	• Riparian buffer 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 plant community	**Functioning-at-Risk**	
	Lateral Stability	BEHI/NBS	Very High/ High	**Not Functioning**	

Table 10 – Level 3 Geomorphology Ratings					
Reach	**Parameter**	**Measurement Method**	**Pre-Restoration Condition Rating**		
			Value	**Rating**	**Overall Rating**
RC-3	Riparian Vegetation	Left Bank Riparian Vegetation	• Riparian buffer 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 plant community	**Functioning-at-Risk**	**Functioning-at-Risk**
		Right Bank Riparian Vegetation	• Riparian buffer 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 plant community	**Functioning-at-Risk**	
	Lateral Stability	BEHI/NBS	High/ Moderate	**Not Functioning**	
RC-4	Riparian Vegetation	Left Bank Riparian Vegetation	• Riparian buffer 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 plant community	**Functioning-at-Risk**	**Functioning-at-Risk**
		Right Bank Riparian Vegetation	• Riparian buffer 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 plant community	**Functioning-at-Risk**	
	Lateral Stability	BEHI/NBS	Very High/Very High	**Not Functioning**	

2.4. Level 4 – Physicochemical

2.4.1. Level 4 – Physicochemical Parameters & Measurement Methods

Physiochemical functions include the interaction of physical and chemical processes to create the basic water quality of the stream, as well as to facilitate nutrient and organic carbon processes. One parameter, Water Quality, was used to describe the physicochemical function of the reaches.

Water Quality

Per the Anne Arundel County DPW report, *Aquatic Biological Assessment of the Watersheds of Anne Arundel County, Maryland: 2023* (AACO, 2009), water quality assessments were completed in Spring 2009 at a site located in RC-3. Water quality was assessed through measurements of temperature, conductivity, dissolved oxygen (DO), and pH.

Performance standards were developed from Maryland water quality standards for Class I Waters for DO, pH, temperature, and normal levels for conductivity. DO concentrations may not be below 5 mg/L, pH values must be at or between 6.5 and 8.5, and temperature may not exceed 32 degrees Celsius or the ambient temperature, whichever is greater. Conductivity levels consistently higher than 300 µS/cm and any levels that exceed 500 µS/cm were considered a potential concern, as conductivity levels exceeding 500 µS/cm are detrimental to freshwater fish populations. The performance standards are shown in Table 11.

Table 11 – Water Quality Performance Standards

Measurement Method	Functioning	Functioning-at-Risk	Not Functioning
Conductivity (µS/cm)	< 300 µS/cm	300 to 499 µS/cm	≥ 500 µS/cm
DO (mg/L)	≥ 5 mg/L	N/A	< 5 mg/L
pH	6.5 ≥ 8.5	N/A	< 6.5 or > 8.5
Temperature (ºC)	≤ 32 ºC or ambient temperature	N/A	> 32 ºC or ambient temperature

2.4.2. Level 4 – Physicochemical Parameter Results

Water quality measurement values from Spring 2009 are included in Table 12. The values were functioning, but this may be due to the sampling location.

Table 12 – Level 4 Physiochemical Ratings

Parameter	Measurement Method	Pre-Restoration Condition Rating		
		Value	Rating	Overall Rating
Water Quality	Conductivity (µS/cm)	225	**Functioning**	**Functioning**
	DO (mg/L)	7.6	**Functioning**	
	pH	6.24	**Not Functioning**	
	Temperature (ºC)	16.2	**Functioning**	

2.5. Level 5 – Biology

2.5.1. Level 5 – Biology Parameters & Measurement Methods

Achieving biologic function is the result of the hydrology, hydraulic, geomorphology, and physicochemical functions as described previously. *Aquatic Biological Assessment of the Watersheds of Anne Arundel County, Maryland: 2023* (AACO, 2009) baseline biological and habitat assessments were completed in 2009. Aquatic habitat was evaluated using the EPA Rapid Bioassessment Protocol (RBP) for low-gradient streams and the Maryland DNR Physical Habitat Index (MPHI). Biological monitoring was conducted in accordance with Maryland Department of Biological Stream Survey (MBSS) protocols, including benthic macroinvertebrate sampling during the Spring Index.

The RBP assessment was conducted to provide an efficient determination of substrate, streambank, riparian corridor, and habitat conditions. The MPHI assessment was conducted to determine remoteness, shading, epifaunal substate, instream habitat, instream woody debris, and bank stability. The RBP and MPHI scores were utilized to create performance standards in accordance with the SFPF (Harman et. al., 2012) (Table 13).

Table 13 – Biology Performance Standards

Measurement Method	Functioning	Functioning-at-Risk	Not Functioning
RBP Score	126 to 151	100 to 125	< 100
MPHI Score	81 to 100	66 to 80.9	< 66
BIBI Score	4.0 to 5.0	3.0 to 3.9	1.0 to 2.9

2.5.2. Level 5 – Biology Results

The project has a pre-restoration condition rating of “Not Functioning” for Level 5- Biology (Table 14). RBP and MPHI are considered “Functioning-at-Risk”, however, the BIBI score which is considered to more heavily influence the overall Biology rating is considered “Not Functioning”.

Table 14 – Level 5 Biology Ratings

Parameter	Measurement Method	Pre-Restoration Condition Rating		
		Value	Rating	Overall Rating
Habitat and Macroinvertebrate Communities	RBP Score	105	Functioning-at-Risk	**Not Functioning**
	MPHI Score	79.24	Functioning-at-Risk	
	BIBI Score	2.14	Not Functioning	

3. DESIGN OBJECTIVES

Design objectives are quantifiable and describe how the Project will be implemented (Harman et al., 2012). The design objectives for each reach are shown in Table 15.

Table 15 – Design Objectives

Level and Category	Parameter	Objectives	Reach Designation
Level 1 – Hydrology	Flow Regime	Reduce hydrograph peaks and increase duration compared to existing conditions by increasing floodplain retention time.	RC-1, RC-2, RC-3, RC-4
Level 2 – Hydraulics	Floodplain Connectivity	Reduce velocities to non-erosive conditions (less than 7 fps for vegetated areas, less than 14 fps for weir areas).	RC-1, RC-2, RC-3, RC-4
	Floodplain Drainage	Reduce potential for floodplain concentrated flows to impair the channel by increasing wetland area.	RC-1, RC-2, RC-3, RC-4
	Vertical Stability	Eliminate channel head cuts.	RC-1, RC-2, RC-3, RC-4
Level 3 – Geomorphology	Riparian Vegetation	Increase native vegetation community diversity and density compared to existing conditions.	RC-1, RC-2, RC-3, RC-4
	Lateral Stability	Stabilize banks (bank migration/lateral stability). Reduce BEHI/NBS ratings to low or very low.	RC-1, RC-2, RC-3, RC-4

4. FUNCTIONAL UPLIFT AND PROPOSED CONDITION

The project will result in quantitative functional uplift for Level 2-hydraulics and Level 3-geomorphology. Although only functional uplift for Levels 2 and 3 can be constructed and are therefore considered definitive Project goals, it is important to consider the effect the uplift will have on higher level functions, Level 4-physicochemical and Level 5-biology. Level 4 functionality will likely be improved by achieving annual mass nutrient and sediment reduction credit. Level 5 functionality will likely be increased by improvements in aquatic and terrestrial habitats.

The proposed condition is the highest level of restoration or functional lift that can be achieved given the watershed health, reach-level function-based condition, stressors, and constraints (Harman et al., 2012). Tables 16 to 19 summarize the anticipated proposed condition for Level 2-hydraulics and Level 3-geomorphology for each reach.

For all reaches, floodplain connectivity and vertical stability will be restored to a fully functional level. However, floodplain drainage will only be improved to a “Functioning-at-Risk” condition due to site constraints. Although ponding, wetland areas, leaf litter and debris jams will become well represented along the reaches and the impact of concentrated flows on the system will be reduced, hillslopes and hillslope proximity cannot be changed. For most reaches riparian vegetation will be restored to a Functioning or Functioning-at-Risk condition by improving vegetation community diversity and density and reducing invasive species through increased floodplain inundation and competition from native species. It should be noted that without ongoing invasive species management it is likely that some invasive species will remain. Some of the banks can only be restored to Functioning-at-Risk condition since the riparian buffer width is limited due to infrastructure.

For all reaches, lateral stability will become fully functional since BEHI/NBS ratings will be reduced to low or very low.

Table 16 – RC-1, Level 2 Hydraulics and Level 3 Geomorphology Proposed Ratings				
Level	**Parameter**	**Measurement Method**	**Pre-Restoration Rating**	**Proposed Rating**
Level 2 – Hydraulics	Floodplain Connectivity	Maximum Velocity	**Not Functioning**	**Functioning**
	Floodplain Drainage	Concentrated Flow (Left Floodplain)	**Not Functioning**	**Functioning-at-Risk**
		Concentrated Flow (Right Floodplain)	**Not Functioning**	**Functioning-at-Risk**
	Vertical Stability	Channel Head Cuts	**Functioning-at-Risk**	**Functioning**
Level 3 – Geomorphology	Riparian Vegetation	Left Bank Riparian Vegetation	**Functioning-at-Risk**	**Functioning-at-Risk**
		Right Bank Riparian Vegetation	**Not Functioning**	**Functioning-at-Risk**
	Lateral Stability	BEHI/NBS	**Not Functioning**	**Functioning**

Table 17 – RC-2, Level 2 Hydraulics and Level 3 Geomorphology Proposed Ratings				
Level	**Parameter**	**Measurement Method**	**Pre-Restoration Rating**	**Proposed Rating**
Level 2 – Hydraulics	Floodplain Connectivity	Maximum Velocity	**Not Functioning**	**Functioning**
	Floodplain Drainage	Concentrated Flow (Left Floodplain)	**Not Functioning**	**Functioning-at-Risk**
		Concentrated Flow (Right Floodplain)	**Not Functioning**	**Functioning-at-Risk**
	Vertical Stability	Channel Head Cuts	**Not Functioning**	**Functioning**
Level 3 – Geomorphology	Riparian Vegetation	Left Bank Riparian Vegetation	**Functioning-at-Risk**	**Functioning**
		Right Bank Riparian Vegetation	**Functioning-at-Risk**	**Functioning**
	Lateral Stability	BEHI/NBS	**Not Functioning**	**Functioning**

Table 18 – RC-3, Level 2 Hydraulics and Level 3 Geomorphology Proposed Ratings				
Level	**Parameter**	**Measurement Method**	**Pre-Restoration Rating**	**Proposed Rating**
Level 2 – Hydraulics	Floodplain Connectivity	Maximum Velocity	**Not Functioning**	**Functioning**
	Floodplain Drainage	Concentrated Flow (Left Floodplain)	**Not Functioning**	**Functioning-at-Risk**
		Concentrated Flow (Right Floodplain)	**Not Functioning**	**Functioning-at-Risk**
	Vertical Stability	Channel Head Cuts	**Functioning-at-Risk**	**Functioning**
Level 3 – Geomorphology	Riparian Vegetation	Left Bank Riparian Vegetation	**Functioning-at-Risk**	**Functioning**
		Right Bank Riparian Vegetation	**Functioning-at-Risk**	**Functioning**
	Lateral Stability	BEHI/NBS	**Not Functioning**	**Functioning**

Table 19 – RC-4, Level 2 Hydraulics and Level 3 Geomorphology Proposed Ratings				
Level	**Parameter**	**Measurement Method**	**Pre-Restoration Rating**	**Proposed Rating**
Level 2 – Hydraulics	Floodplain Connectivity	Maximum Velocity	**Not Functioning**	**Functioning**
	Floodplain Drainage	Concentrated Flow (Left Floodplain)	**Not Functioning**	**Functioning-at-Risk**
		Concentrated Flow (Right Floodplain)	**Not Functioning**	**Functioning-at-Risk**
	Vertical Stability	Channel Head Cuts	**Not Functioning**	**Functioning**
Level 3 – Geomorphology	Riparian Vegetation	Left Bank Riparian Vegetation	**Functioning-at-Risk**	**Functioning**
		Right Bank Riparian Vegetation	**Functioning-at-Risk**	**Functioning-at-Risk**
	Lateral Stability	BEHI/NBS	**Not Functioning**	**Functioning**

5. REFERENCES

Anne Arundel County Department of Public Works, 2009. Targeted Biological Assessment of Streams in Patapsco Tidal and Bodkin Creek Watersheds, Anne Arundel County, Maryland: 2009. https://www.aacounty.org/sites/default/files/2023-04/2009PatapscoBodkinTargetedBioMonitoring.pdf

Allan, J.D., 2004. Landscapes and Riverscapes: The Influence of Land Use on Stream Ecosystems. Annual Review of Ecology, Evolution, and Systematics 35:257-284.

Carpenter, S.R., N.F. Caraco, D.L. Correll, R.W Howarth, A.N. Sharpley and V.H. Smith, 1998. Nonpoint Pollution of Surface Waters with Phosphorus and Nitrogen. Ecological Applications 8:559-568.

Cluer, B. and Thorne, C., 2014. A Stream Evolution Model Integrating Habitat and Ecosystem Benefits. River Res. Applic. 30: 135-154.

Fischenich, Craig, Stability Thresholds for Stream Restoration Materials, May 2001. USAE Research and Development Center, Environmental Laboratory, 3909 Halls Ferry Rd., Vicksburg MS 39180, ERDC TN-EMRRP-SR-29.

Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. A Function Based Framework for Stream Assessment and Restoration Projects. U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds, Washington D.C. EPA 843-K-12-006.

Hutzell, J.B. Starr, R. R. Carpenter, C.A. 2016, Navy Dairy Farm Stream Restoration, Anne Arundel County, Maryland: Function-Based Project Summary and Design Report. Stream Habitat Assessment and Restoration Program, U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, CBFO – S16-01.

Schueler, T., Fraley-McNeal, L., and Cappiella, K., 2009. Is Impervious Cover Still Important? Review of Recent Research. Journal of Hydrologic Engineering. DOI:10.1061/(ASCE) 1084- 0699 (2009) 14:4(309).

Starr, R., W. Harman, S. Davis. 2015. FINAL DRAFT Function-Based Rapid Field Stream Assessment Methodology. U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD. CAFE S15-06.

United States Environmental Protection Agency (EPA), 2009. National Water Quality Inventory: Report to Congress for the 2004 Reporting Cycle. US Environmental Protection Agency, Washington, D.C. Retrieved from: water.epa.gov/ lawsregs/guidance/cwa/305b/upload/2009_01_22_305b_2004report_2004_305Breport.pdf.

APPENDIX M

TMDL & MS4 Credit Computations

BayLand Consultants & Designers

Protocol 1- Credit for Prevented Sediment During Storm Flow

By: HH
Date: 12/14/2023

Project Name: Rock Creek Stream Restoration
County: Anne Arundel County
Reach: Main Stem (Boring 2)

Project Number: 5_20201

Step 1: Estimate Stream Erosion Rate

Multiply the pre-project erosion rate by the bank height, qualifying stream bank length, and a bulk density factor to estimate the annual sediment loading rate (tons/year).

$$\text{(Eqn. 1)}\ S = \frac{\sum(cAR)}{2000}$$

where,

c (bulk density of the soil)= 90.52 lbs/ft^3
R (bank erosion rate)= From BEHI/NBS ft/year
2000= conversion constant from lbs to tons

$S =$ **615.3** **tons/year**

Step 2: Convert Stream Bank Erosion Rate to Nutrient Loading

The prevented sediment loading rates are multiplied by TP and TN concentrations from soil samples.

$$\text{(Eqn. 2)}\ S \times TN = N$$
$$S \times TP = P$$

where,

TN (Pounds Nitrogen/Ton Sediment)= 0.51 lbs N/ton
TP (Pounds Phosphorus/Ton Sediment)= 0.11 lbs P/ton

$N =$ **313.80** **lbs N/year**
$P =$ **68.79** **lbs P/year**
$Sediment =$ **615.30** **tons/year**

Step 3: Estimate Restoration Efficiency

Assume restoration to be 50% Efficient.

$$\text{(Eqn. 3)}\ (N, P, Sediment)\ x\ 50\% = (N, P, Sediment)\ Credit$$

$N\ Credit =$ **156.90** **lbs N/year**
$P\ Credit =$ **34.40** **lbs P/year**
$Sediment\ Credit =$ **307.65** **tons/year**

BayLand Consultants & Designers

Protocol 1- Credit for Prevented Sediment During Storm Flow

By:	HH	Project Name:	Rock Creek Stream Restoration	Project Number:	5_20201
Date:	12/14/2023	County:	Anne Arundel County		
		Reach:	Main Stem (Boring 4)		

Step 1: Estimate Stream Erosion Rate

Multiply the pre-project erosion rate by the bank height, qualifying stream bank length, and a bulk density factor to estimate the annual sediment loading rate (tons/year).

$$\text{(Eqn. 1)}\ S = \frac{\sum(cAR)}{2000}$$

where,

c (bulk density of the soil)=	112.99	lbs/ft^3
R (bank erosion rate)=	From BEHI/NBS	ft/year
2000=	conversion constant from lbs to tons	

$S =$ **541.6** **tons/year**

Step 2: Convert Stream Bank Erosion Rate to Nutrient Loading

The prevented sediment loading rates are multiplied by TP and TN concentrations from soil samples.

$$\text{(Eqn. 2)}\ S \times TN = N$$
$$S \times TP = P$$

where,

TN (Pounds Nitrogen/Ton Sediment)=	0.84	lbs N/ton
TP (Pounds Phosphorus/Ton Sediment)=	0.36	lbs P/ton

$N =$	**454.94**	**lbs N/year**
$P =$	**196.06**	**lbs P/year**
$Sediment =$	**541.60**	**tons/year**

Step 3: Estimate Restoration Efficiency

Assume restoration to be 50% Efficient.

$$\text{(Eqn. 3)}\ (N, P, Sediment)\ x\ 50\% = (N, P, Sediment)\ Credit$$

$N\ Credit =$	**227.47**	**lbs N/year**
$P\ Credit =$	**98.03**	**lbs P/year**
$Sediment\ Credit =$	**270.80**	**tons/year**

BayLand Consultants & Designers

Protocol 1- Credit for Prevented Sediment During Storm Flow

By: HH
Date: 12/14/2023

Project Name: Rock Creek Stream Restoration
County: Anne Arundel County
Reach: Main Stem (Boring 7)

Project Number: 5_20201

Step 1: Estimate Stream Erosion Rate

Multiply the pre-project erosion rate by the bank height, qualifying stream bank length, and a bulk density factor to estimate the annual sediment loading rate (tons/year).

$$\text{(Eqn. 1)}\ S = \frac{\sum(cAR)}{2000}$$

where,

c (bulk density of the soil)= 87.4 lbs/ft^3
R (bank erosion rate)= From BEHI/NBS ft/year
2000= conversion constant from lbs to tons

$S =$ **14.9** **tons/year**

Step 2: Convert Stream Bank Erosion Rate to Nutrient Loading

The prevented sediment loading rates are multiplied by TP and TN concentrations from soil samples.

$$\text{(Eqn. 2)}\ S \times TN = N$$
$$S \times TP = P$$

where,

TN (Pounds Nitrogen/Ton Sediment)= 1.32 lbs N/ton
TP (Pounds Phosphorus/Ton Sediment)= 0.15 lbs P/ton

$N =$ **19.64** **lbs N/year**
$P =$ **2.23** **lbs P/year**
$Sediment =$ **14.90** **tons/year**

Step 3: Estimate Restoration Efficiency

Assume restoration to be 50% Efficient.

$$\text{(Eqn. 3)}\ (N, P, Sediment)\ x\ 50\% = (N, P, Sediment)\ Credit$$

$N\ Credit =$ **9.82** **lbs N/year**
$P\ Credit =$ **1.11** **lbs P/year**
$Sediment\ Credit =$ **7.45** **tons/year**

BayLand Consultants & Designers

Protocol 1- Credit for Prevented Sediment During Storm Flow

By: HH
Date: 12/14/2023

Project Name: Rock Creek Stream Restoration
County: Anne Arundel County
Reach: All Reaches

Project Number: 5_20201

Protocol 1 Totals

$N\ Credit =$	**394.19**	**lbs N/year**
$P\ Credit =$	**133.54**	**lbs P/year**
$Sediment\ Credit =$	**585.90**	**tons/year**

BayLand Consultants & Designers

Protocol 2-Credit for In-Stream Riparian Nutrient Processing within the Hyporheic Zone during Base Flow

Consensus Recommendations to Improve Protocols 2 and 3 for Defining Stream Restoration Pollutant Removal Credits, October 27, 2020

By: MJG
Date: 5/15/2025

Project Name: Rock Creek Stream Restoration
County: Anne Arundel
Reach: Main Stem Restoration Reaches

Project Number: 5_20201

Proposed Conditions

Step 1a: Define the Extent of the Effective Hyporheic Zone (EHZ) for Post Restoration

where,

SECTION 1 STA 5+14.4 to 7+32.8

L (Total Restoration Length)=	218.4	LF
Post Restoration Channel Width =	1	ft
Lateral length of the area where the post-restoration floodplain surface is less than 18" above the channel bed or low flow water elevation (Any area of high floodplain is excluded from P-2 Credit) =	87	ft
Floodplain EHZ =	18,782	sq ft
Channel EHZ =	218.4	sq ft

SECTION 2 STA 7+32.8 to 12+42.7

L (Total Restoration Length)=	509.9	LF
Post Restoration Channel Width =	1	ft
Lateral length of the area where the post-restoration floodplain surface is less than 18" above the channel bed or low flow water elevation (Any area of high floodplain is excluded from P-2 Credit) =	71	ft
Floodplain EHZ =	35,693	sq ft
Channel EHZ =	509.9	sq ft

SECTION 3 STA 12+42.7 to 32+84.8

L (Total Restoration Length)=	2,042	LF
Post Restoration Channel Width =	1	ft
Lateral length of the area where the post-restoration floodplain surface is less than 18" above the channel bed or low flow water elevation (Any area of high floodplain is excluded from P-2 Credit) =	75	ft
Floodplain EHZ =	151,115	sq ft
Channel EHZ =	2042.1	sq ft

Step 2a: Apply the Denitrification Rate to the EHZ for Post Restoration

$$Denitrification\ rate = 2.69\ x\ 10^{-3}\ lbs\ NO_3/sq\ ft/year$$

SECTION 1 STA 5+14.4 to 7+32.8

Floodplain Dentrification Rate =	50.5	lbs NO_3/year
Channel Dentrification Rate=	0.6	lbs NO_3/year

SECTION 2 STA 7+32.8 to 12+42.7

Floodplain Dentrification Rate =	96.0	lbs NO_3/year
Channel Dentrification Rate=	1.4	lbs NO_3/year

SECTION 3 STA 12+42.7 to 32+84.8

Floodplain Dentrification Rate =	406.5	lbs NO_3/year
Channel Dentrification Rate=	5.5	lbs NO_3/year

Step 3a: Apply the Site Specific Discount Factors to determine Effective Hyporheic Zone N credit for Post Restoration

From Table 10: Site Specific Discount Factors for Adjusting the Denitrification Rate (Parola et al, 2019)

$$Effective\ Hyporheic\ Zone\ N\ credit = (Base\ Rate)(EHZ\ area)(Bf)(Sf)(Af)$$

SECTION 1 STA 5+14.4 to 7+32.8

Floodplain Factors:

Baseflow Reduction Factor, Bf	0.1	
Floodplain Height Factor, Sf	1	
Aquifer Conductivity Reduction Factor, Af	0.6	
Floodplain Effective Hyporheic Zone N Credit=	3.03	lbs NO_3/year

Channel Factors:

Appendix M-5

Table 10: Site Specific Discount Factors for Adjusting the Denitrification Rate (Parola et al, 2019)

Effective Hyporheic Zone N credit = (Base Rate) (EHZ area) (B_f) (H_f) (A_f)

Baseflow Reduction Factor (B_f)		Floodplain Height Factor (S_f)		Aquifer Conductivity Reduction Factor (A_f)	
Perennial baseflow	1.0	0 – 0.75 ft	1.0	Gravel, Sandy Gravel, Sand, and Peat	1.0
Baseflow in all but late summer/fall	0.75	0.76 ft – 1.00 ft	0.75	Silty gravel, Silty Sand **or** Loamy Sand, Sandy Loam, and Organic Silt with no coarse grain layer in connected to channel	0.6

Baseflow in winter/spring	0.50	1.01 ft – 1.25 ft	0.50	Clayey Gravel, Sandy Silt or Sandy Clay Loam, Loam, Silt Loam, Silt	0.4
Baseflow only during wet seasons	0.25	1.20 ft – 1.50	0.10	Sandy Clay, Clay Loam, Silty Clay Loam, Organic Clay with no coarse grain layer in connected to channel	0.1
Flow only during runoff events	0.10	>1.50	0.00	Silty Clay and Clay with no coarse grain layer in connected to channel	0.01

[1] The floodplain height factor is determined by the height of the floodplain surface above the riffle crest (high point in the channel profile). While most gravel bed streams should have a riffle that can be used, sand bed channels or silty clay beds may use the high points in their profiles that would maybe be considered a run. Low base-flow (lowest 10% of flows) could also be used as a suitable alternative.

[2] This refers to a hyporheic aquifer capacity factor based on the dominant materials immediately below the floodplain soil (see Figure 4). Soil texture based on NRCS standard soil classifications (Schoeneberger et al., 2012).

[3] "Base Rate" is the mean areal floodplain denitrification rate (lbs/sq ft/yr), as recommended by Group 4.

Baseflow Reduction Factor, Bf: 0.1

Floodplain Height Factor, Sf: 1

Aquifer Conductivity Reduction Factor, Af: 0.6

Channel Effective Hyporheic Zone N Credit= 0.04 lbs NO_3/year

SECTION 2 STA 7+32.8 to 12+42.7

Floodplain Factors:

Baseflow Reduction Factor, Bf: 0.5

Floodplain Height Factor, Sf: 1

Aquifer Conductivity Reduction Factor, Af: 0.6

Floodplain Effective Hyporheic Zone N Credit= 28.80 lbs NO_3/year

Channel Factors:

Baseflow Reduction Factor, Bf: 0.5

Floodplain Height Factor, Sf: 1

Aquifer Conductivity Reduction Factor, Af: 0.6

Channel Effective Hyporheic Zone N Credit= 0.41 lbs NO_3/year

SECTION 3 STA 12+42.7 to 32+84.8

Floodplain Factors:

Baseflow Reduction Factor, Bf: 1

Floodplain Height Factor, Sf: 1

Aquifer Conductivity Reduction Factor, Af: 0.6

Floodplain Effective Hyporheic Zone N Credit= 243.90 lbs NO_3/year

Channel Factors:

Baseflow Reduction Factor, Bf: 1

Floodplain Height Factor, Sf: 1

Aquifer Conductivity Reduction Factor, Af: 0.6

Channel Effective Hyporheic Zone N Credit= 3.30 lbs NO_3/year

Step 4a: Calculate the Total Nitrate Removed for Post Restoration

If the pre-restoration floodplain area includes existing wetlands or areas that are within 18" of the low flow water elevation, the protocol should be run on both pre- and post- restoration conditions and credit is earned for the difference. Procotol 2 is based on nitrate removal due to denitrification. The CBP only accepts TN as a reportable unit. The value calculated in Step 4 should be reported as TN, without further adjustment.

279.5 lbs /year

Existing Conditions

Step 1b: Define the Extent of the Effective Hyporheic Zone (EHZ) for Pre Restoration

where, **SECTION 1**

L (Total Channel Length)= 234 LF

Pre Restoration Channel Width = 25 ft

Lateral length of the area where the pre-restoration floodplain surface is less than 18" above the channel bed or low flow water elevation (Any area of high floodplain is excluded from P-2 Credit) = 25 ft

Floodplain EHZ = 0 sq ft

Channel EHZ = 5,850 sq ft

SECTION 2

L (Total Channel Length)= 572 LF

Pre Restoration Channel Width = 12 ft

Lateral length of the area where the pre-restoration floodplain surface is less than 18" above the channel bed or low flow water elevation (Any area of high floodplain is excluded from P-2 Credit) = 12 ft

Floodplain EHZ = 0 sq ft

Channel EHZ = 6,864 sq ft

where, **SECTION 3**

L (Total Channel Length)= 2,245 LF

Pre Restoration Channel Width = 15 ft

Lateral length of the area where the pre-restoration floodplain surface is less than 18" above the channel bed or low flow water elevation (Any area of high floodplain is excluded from P-2 Credit) = 15 ft

Floodplain EHZ = 0 sq ft

Channel EHZ = 33,675 sq ft

Step 2b: Apply the Denitrification Rate to the EHZ for Pre Restoration

$$Denitrification\ rate = 2.69\ x\ 10^{-3}\ lbs\ NO_3/sq\ ft/year$$

SECTION 1

Floodplain Dentrification Rate = 0.0 lbs NO_3/year

Channel Dentrification Rate= 15.7 lbs NO_3/year

SECTION 2

Floodplain Dentrification Rate = 0.0 lbs NO_3/year

Channel Dentrification Rate= 18.5 lbs NO_3/year

SECTION 3

Floodplain Dentrification Rate = 0.0 lbs NO_3/year

Channel Dentrification Rate= 90.6 lbs NO_3/year

Step 3b: Apply the Site Specific Discount Factors to determine Effective Hyporheic Zone N credit for Pre Restoration

From Table 10: Site Specific Discount Factors for Adjusting the Denitrification Rate (Parola et al, 2019)

$$Effective\ Hyporheic\ Zone\ N\ credit = (Base\ Rate)(EHZ\ area)(Bf)(Sf)(Af)$$

SECTION 1

Floodplain Factors:

Baseflow Reduction Factor, Bf 0.1

Floodplain Height Factor, Sf 0

Aquifer Conductivity Reduction Factor, Af 0.6

Floodplain Effective Hyporheic Zone N Credit= 0.00 lbs NO_3/year

Channel Factors:

Baseflow Reduction Factor, Bf 0.1

Floodplain Height Factor, Sf 0

Aquifer Conductivity Reduction Factor, Af 0.6

Channel Effective Hyporheic Zone N Credit= 0.00 lbs NO_3/year

SECTION 2

Floodplain Factors:

Baseflow Reduction Factor, Bf 0.5

Floodplain Height Factor, Sf 0

Aquifer Conductivity Reduction Factor, Af 0.6

Floodplain Effective Hyporheic Zone N Credit= 0.00 lbs NO_3/year

Channel Factors:

Baseflow Reduction Factor, Bf 0.5

Floodplain Height Factor, Sf 0

Aquifer Conductivity Reduction Factor, Af 0.6

Channel Effective Hyporheic Zone N Credit= 0.00 lbs NO_3/year

SECTION 3

Floodplain Factors:

Baseflow Reduction Factor, Bf 1

Floodplain Height Factor, Sf 0

Aquifer Conductivity Reduction Factor, Af 0.6

Floodplain Effective Hyporheic Zone N Credit= 0.00 lbs NO_3/year

Table 10: Site Specific Discount Factors for Adjusting the Denitrification Rate (Parola et al, 2019)

Effective Hyporheic Zone N credit = (Base Rate) (EHZ area) (B_f) (H_f) (A_f)

Baseflow Reduction Factor (B_f)		Floodplain Height Factor [1] (S_f)		Aquifer Conductivity Reduction Factor [2] (A_f)	
Perennial baseflow	1.0	0 – 0.75 ft	1.0	Gravel, Sandy Gravel, Sand, and Peat	1.0
Baseflow in all but late summer/fall	0.75	0.76 ft – 1.00 ft	0.75	Silty gravel, Silty Sand **or** Loamy Sand, Sandy Loam, and Organic Silt with no coarse grain layer in connected to channel	0.6
Baseflow in winter/spring	0.50	1.01 ft – 1.25 ft	0.50	Clayey Gravel, Sandy Silt **or** Sandy Clay Loam, Loam, Silt Loam, Silt	0.4
Baseflow only during wet seasons	0.25	1.26 ft – 1.50	0.10	Sandy Clay, Clay Loam, Silty Clay Loam, Organic Clay with no coarse grain layer in connected to channel	0.1
Flow only during runoff events	0.10	>1.50	0.00	Silty Clay and Clay with no coarse grain layer in connected to channel	0.01

[1] The floodplain height factor is determined by the height of the floodplain surface above the riffle crest (high point in the channel profile). While most gravel bed streams should have a riffle that can be used, sand bed channels or silty clay beds may use the high points in their profiles that would maybe be considered a run. Low base-flow (lowest 10% of flows) could also be used as a suitable alternative.

[2] This refers to a hyporheic aquifer capacity factor based on the dominant materials immediately below the floodplain soil (see Figure 4). Soil texture based on NRCS standard soil classifications (Schoeneberger et al., 2012).

"Base Rate" is the mean areal floodplain denitrification rate (lbs/sq ft/yr), as recommended by Group 4.

Channel Factors:

Baseflow Reduction Factor, Bf	1	
Floodplain Height Factor, Sf	0	
Aquifer Conductivity Reduction Factor, Af	0.6	
Channel Effective Hyporheic Zone N Credit=	0.00	lbs NO_3/year

Step 4b: Calculate the Total Nitrate Removed for Pre Restoration

0.0 lbs /year

Step 5: Calculate the Difference of Total Nitrate Removed Between Post- and Pre-Restoration

279.5 lbs /year

BayLand Consultants & Designers

Protocol 3 - Floodplain Treatment Volume

Consensus Recommendations to Improve Protocols 2 and 3 for Defining Stream Restoration Pollutant Removal Credits, October 27, 2020

By: MJG
Date: 5/16/2025

Project Name: Rock Creek Stream Restoration
County: Anne Arundel
Reach: Main Stem Restoration Reaches
Project Number: 5_20201

Proposed Conditions

Step 1a: Determine the Floodplain Treatment Zone (FTZ) using LiDAR and hydraulic modeling

FTZ = 5.86 ac

Step 2a: Determine the treatment depth in the Floodplain Treatment Zone (FTZ)

Note: May use 1-foot depth as a default, but check to see if a larger depth can be used. This occurs when modeled floodplain flow velocities are below 2 fps (up to 3 feet or the 10 year WSE, whichever is lower). When doing this analysis, the floodplain n must be 0.07 and the stream n must be 0.035. If velocities are greater than 2 fps at the 1-foot depth, can still use 1-foot depth default.

Treatment Depth = 1.0 ft

Step 3a: Identify channel flow, floodplain flow at the treatment depth in the FTZ

Top of Bank Channel Capacity (from hydraulic modeling) = 0.1 cfs

Floodplain Capacity (from hydraulic modeling) = 213.6 cfs

Step 4a: Select a USGS gauge station with similar watershed characteristics and/or within the same watershed

USGS Gage Station Number = 01589795
USGS Gage Station Name = SOUTH FORK JABEZ BRANCH AT MILLERSVILLE, MD

USGS Gage Drainage Area (Sq. miles)= 1
USGS Gage DA Percent Forest=
USGS Gage DA Percent Impervious=
USGS Gage DA Percent Agriculture=

Project Drainage Area Watershed= Rock Creek
Project Drainage Area (Sq. miles)= 0.51549
Project DA Percent Forest=
Project DA Percent Impervious=
Project DA Percent Agriculture=

Step 5a: Use GW Toolbox to determine 50% exceedance baseflow

Fixed Baseflow	0.29	cfs
Locmin Baseflow	0.287	cfs
Slide Baseflow	0.29	cfs
BFIStandard Baseflow		cfs
BFIModified Baseflow		cfs
Part Baseflow		cfs
Average	**0.29**	**cfs**

Step 6a: Develop a flow duration curve from the USGS gage station (use supplemental spreadsheet and FLOWDURATION tab)

Step 7a: Determine Treatable Flow (see FLOWDURATION Tab)

where,

$$Treatable\ Flow = (Total\ Flow) - (Channel\ Flow) - (Flow\ over\ max\ treatment\ depth) + (Baseflow)$$

Note: Areas under the curve

Total Flow = 1.54
Channel Flow = 0.00
Flow over max treatment depth (1ft default) = 0.00
Baseflow = 0.15

Treatable Flow = 1.7

Step 8a: Convert to % Flow Treated

Percent Flow Treated (Proposed) = 1.097

Existing Conditions

Step 1b: Determine the Floodplain Treatment Zone (FTZ) using LiDAR and hydraulic modeling

FTZ = 0.77 ac

Step 2b: Determine the treatment depth in the Floodplain Treatment Zone (FTZ)

Note: May use 1-foot depth as a default, but check to see if a larger depth can be used. This occurs when modeled floodplain flow velocities are below 2 fps (up to 3 feet or the 10 year WSE, whichever is lower). When doing this analysis, the floodplain n must be 0.07 and the stream n must be 0.035. If velocities are greater than 2 fps at the 1-foot depth, can still use 1-foot depth default.

Treatment Depth = 1.0 ft

Step 3b: Identify channel flow, floodplain flow at the treatment depth in the FTZ

Top of Bank Channel Capacity (from hydraulic modeling) = 16.5 cfs

Floodplain Capacity (from hydraulic modeling) = 0.0 cfs

Step 4b: Select a USGS gauge station with similar watershed characteristics and/or within the same watershed

USGS Gage Station Number = 01589795
USGS Gage Station Name = SOUTH FORK JABEZ BRANCH AT MILLERSVILLE, MD

USGS Gage Drainage Area (Sq. miles)= 1
USGS Gage DA Percent Forest=
USGS Gage DA Percent Impervious=
USGS Gage DA Percent Agriculture=

Project Drainage Area Watershed= Rock Creek
Project Drainage Area (Sq. miles)= 0.51549
Project DA Percent Forest=
Project DA Percent Impervious=
Project DA Percent Agriculture=

Step 5b: Use GW Toolbox to determine 50% exceedance baseflow

Fixed Baseflow	0.29	cfs
Locmin Baseflow	0.287	cfs
Slide Baseflow	0.29	cfs
BFIStandard Baseflow		cfs
BFIModified Baseflow		cfs
Part Baseflow		cfs
Average	**0.29**	**cfs**

Step 6b: Develop a flow duration curve from the USGS gage station (use supplemental spreadsheet and FLOWDURATION tab)

Step 7b: Determine Treatable Flow (see FLOWDURATION Tab)

where,

$$Treatable\ Flow = (Total\ Flow) - (Channel\ Flow) - (Flow\ over\ max\ treatment\ depth) + (Baseflow)$$

Note: Areas under the curve

Total Flow = 1.54
Channel Flow = 1.06
Flow over max treatment depth (1ft default) = 0.00
Baseflow = 0.15

Treatable Flow = 0.626

Step 8b: Convert to % Flow Treated

Percent Flow Treated (Existing) = 0.40759

Step 9: Determine load delivered to the project site

Note: Use CAST (Appendix H, #10 page 77) to determine total load delivered to project site

Stream Bed and Bank Load Rates from CAST:

TN = 231.94 lbs/mile
TP = 32.62 lbs/mile
TSS = 708,081.09 lbs/mile

Length of Stream Upstream of the Project Reach = 0.325 miles

Loads Delivered to the Project:
(Stream Bed and Bank Load Rates from CAST) x (Length of Stream Upstream of the Project Reach)

TN = 75.38 lbs TN
TP = 10.60 lbs TP
TSS = 230,126.35 lbs TSS

Step 10: Spatially Adjust the credit based on sediment storage effectiveness

Step 10a: Determine the annual sediment volume delivered

TSS delivered to site =	230,126.35	lbs TSS/year
Bulk Density from the CDFN =	55.00	lbs/cf
Volume Delivered =	4184.12	cf
Volume Delivered =	0.0961	ac-ft

Step 10b: Determine floodplain sediment storage at 0.33 inches per year

Existing =	0.0213	ac-ft sediment storage
Proposed =	0.1612	ac-ft sediment storage

Step 10c: Determine sediment storage (trapping) effectiveness

Existing =	0.2214	22.14%
Proposed =	1.6779	167.79%

Step 10d: Determine the weighted P3 credits as a function of FTZ effectiveness

Existing =	20,767.84	lbs/yr	10.38	tons
Proposed =	423,560.19	lbs/yr	211.78	tons

Step 10e: Determine the credit as the difference between existing and proposed

Proposed - Existing =	201.40	tons

Step 10f: Multiply credit by soil nutrient concentrations

Soil Nutrient Concentration Defaults

	4.82	lb/ton TN		
	1.13	lb/ton TP		
TN Removed =	970.73	lb/yr TN credit		
TP Removed =	227.58	lb/yr TP credit		
TSS Removed =	402,792.36	lb/yr TSS credit	201.40	tons/yr

Check: Credit capped at Loads Delivered to the Project

TN Removed =	75.38	lb/yr TN credit		
TP Removed =	10.60	lb/yr TP credit		
TSS Removed =	230,126.35	lb/yr TSS credit	115.06	tons/yr

Notes:
-Type: ESD=Environmental Site Design; ST=Structural; SR-CP=Stream Restoration Coastal Plain; SR-NCP=Stream Restoration Non-Coastal Plain; SLM=Shoreline Management; RIMPV=Reforestation of Impervious Area; RPERV=Reforestation of Pervious Area; IR=Impervious Area Reduction; VSS=Vacuum Street Sweeping
-Provided WQv only applies to ESD and ST practices, do not insert a value for alternative BMPs.
-For RIMPV, IR, and VSS, the Drainage Area and Impervious Area must be equal.

BMP	TYPE	Stream/ Shoreline Length	Drainage Area	Impervious Area	Impervious Area	Direct Annual Pollutant Loads			BMP Pollutant Removal Rate			Target DA WQv	Provided WQv	Rainfall Depth Treated	Proposed Annual Pollutant Load Removal			Impervious Area Treated
						TN	TP	TSS	TN	TP	TSS				TN	TP	TSS	
		LF	Acres	Acres	%	lbs/yr	lbs/yr	tons/yr	% or per LF	% or per LF	% or per LF	ac-ft	ac-ft	inches	lbs/yr	lbs/yr	tons/yr	Acres
Trib 1 SPSC	ST		7.25	2.55	35.2%	89.8	6.3	1.8	24.5	38.6	49.2	0.221	0.100	0.45	22.0	2.4	0.9	1.15

*Assessed using the MDE guidance document Stream Resotration Crediting Clarification for MS4 permitting Purposes, (November 2021).

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BayLand Consultants & Designers

Alternative Headwater Channel and Outfall Crediting Protocol
Credit for Prevented Sediment During Storm Flow

By: MKS
Date: 1/25/2024

Project Name: Rock Creek
County: Anne Arundel County
Reach: Tributary 1

Project Number: 5_20201

Step 1: Estimate Sediment Mass to be Eroded

Determine the difference in volume between the existing and future channel conditions utilizing the calculated bottom width, equilibrium slope, and stable bank angle. Multiply this volume by the soil density to determine the amount of material having potential to be eroded.

$V =$	4,536	cy
$\rho =$	92.39	lbs/ft^3
$=$	2,494.53	lbs/cy
$S =$	**5,657**	**tons**

Step 2: Convert Sediment Volume to Nutrient Loading

The prevented sediment loading rates are multiplied by TP and TN concentrations from soil samples and divided by the 30 year time period stuided in this protocol.

(Eqn. 1) $(S \times TN)/30 = N$

where, $(S \times TP)/30 = P$

TN (Pounds Nitrogen/Ton Sediment)= 0.572 lbs N/ton
TP (Pounds Phosphorus/Ton Sediment)= 0.178 lbs P/ton

$N =$	**107.87**	**lbs N/year**
$P =$	**33.53**	**lbs P/year**
$Sediment =$	**188.58**	**tons/year**

Step 3: Estimate Restoration Efficiency

Assume restoration to be 50% Efficient.

(Eqn. 2) $(N, P, Sediment)\ x\ 50\% = (N, P, Sediment)\ Credit$

$N\ Credit =$	**53.93**	**lbs N/year**
$P\ Credit =$	**16.76**	**lbs P/year**
$Sediment\ Credit =$	**94.29**	**tons/year**

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Equivalent Impervious Acres
2021 MS4 Accounting Guidance Document - 6.0 CBWM

By:	KM	Project Name:	Rock Creek Stream Restoration	Project Number:	5_20201
Date:	5/20/2025	County:	Anne Arundel County		
		Reach:	All Reaches		

Step 1: Estimate Stream Erosion Rate

Multiply the pre-project erosion rate by the bank height, qualifying stream bank length, and a bulk density factor to estimate the annual sediment loading rate (tons/year). Apply 50% reduction factor.

TN EOF =	803	**lbs N/year**
TP EOF =	160.9	**lbs P/year**
Sediment EOF =	795.25	**tons S/year**
Sediment EOF =	1,590,500.0	**lbs S/year**

Step 2: Calculate delta for pollutant loads between impervious and forest cover. See Table 5 (MDE, 2020)

Parameter	MDE Impervious (lbs/acre/yr)	MDE Forest (lbs/acre/yr)	Delta of Impervious Surface and Forest (lbs/acre/yr)
TN	20.39	2.31	18.08
TP	2.55	0.32	2.23
TSS	8,793	747	8,046

Step 2: Calculate Impervious Acre Equivalent

$$Equivalent\ Impervious\ Acres = \frac{Load\ Reduction\ (lbs\ per\ year)}{Delta\ (lbs\ per\ acre\ per\ year)}$$

Parameter	Estimated Pollutant Loads (lbs/acre/yr)	Delta of Impervious Surface and Forest (lbs/acre/yr)	Equivalent Impervious Acres
TN	803.0	18.1	44.4
TP	160.9	2.2	72.2
TSS	1,590,500.0	8,046.0	197.7
		Average:	**104.7**

APPENDIX N

Cost Estimate

ROCK CREEK STREAM RESTORATION
90% CONSTRUCTION DOCUMENTS
PROBABLE COST ESTIMATE WORKSHEET

Project	Rock Creek Stream Restoration	Project No. B553800	Contract No. B553802
Developer	Anne Arundel County BWPR	**Engineer:**	BayLand Consultants & Designers, Inc
	Attn: Gerald Inglesby		
Address	2662 Riva Road - 2nd Floor	**Address**	7455 New Ridge Road, Suite T
	Annapolis, MD 21401		Hanover, Maryland 21076
Phone	410-222-7908	**Phone**	410-694-9401
Fax		**Fax**	410-694-9405

Opinion of Probable Costs

Item No.	Description	Quantity		Unit Price	Extension
1	Mobilization & Demobilization	1	LS	$196,704.00	$196,704.00
2	Construction Stakeout	1	LS	$65,568.00	$65,568.00
3	Maintenance of Traffic	1	LS	$7,000.00	$7,000.00
4	High Visibility Fence	7,524	LF	$6.00	$45,144.00
5	Stabilized Construction Entrance	3	EA	$3,300.00	$9,900.00
6	Temporary Stabilization	8,863	SY	$1.50	$13,294.50
7	Reinforced Silt Fence	424	LF	$6.00	$2,544.00
8	Mountable Berm	5	EA	$2,500.00	$12,500.00
9	Temporary Access Bridge	1	EA	$2,500.00	$2,500.00
10	Temporary Access Culvert	1	EA	$2,500.00	$2,500.00
11	Wetland Protection Matting	165	SY	$50.00	$8,250.00
12	Clearing & Grubbing	1	LS	$70,000.00	$70,000.00
13	Tree Planking	8	EA	$200.00	$1,600.00
14	Tree Felling (DBH ≥ 30")	10	EA	$1,200.00	$12,000.00
15	Construction Access Road, Stage/Stockpile Area (6" Mulch)	1,883	SY	$10.00	$18,830.00
16	Maintenance of Streamflow (Includes Dewatering)	1	LS	$60,000.00	$60,000.00
17	On Site Earthwork	1	LS	$15,660.00	$15,660.00
18	Excavation & Offsite Disposal	3,739	CY	$60.00	$224,340.00
19	Sand Fill	6,165	CY	$80.00	$493,200.00
20	Sand/Woodchip Filter Media	702	CY	$90.00	$63,180.00
21	Bank Run Gravel	6,394	TONS	$10.00	$63,940.00
22	Cobble (d50=5.5")	300	TONS	$220.00	$66,000.00
23	Class 0 Riprap	7,034	TONS	$120.00	$844,080.00
24	Class I Riprap	7,739	TONS	$120.00	$928,680.00
25	Boulders	36	TONS	$250.00	$9,000.00
26	Woody Debris Placement	1	LS	$30,000.00	$30,000.00
27	Sanitary Sewer Manhole Risers	1	LS	$22,500.00	$22,500.00
28	Sewer Pipe Protection	1	LS	$4,000.00	$4,000.00
29	Guardrail Removal and Replacement	34	LF	$50.00	$1,700.00
30	Adaptive Management Path (Mulch)	23	CY	$60.00	$1,380.00
31	Placement of Salvaged Topsoil	12,811	SY	$2.00	$25,622.00
32	Permanent Seeding (turfgrass)	1,075	SY	$2.00	$2,150.00
33	Native Wetland Seeding	14,975	SY	$2.00	$29,950.00
34	Native Floodplain Seeding	13,845	SY	$2.00	$27,690.00
35	Native Upland Seeding	4,000	SY	$2.00	$8,000.00
36	Cover Nurse Crop Seeding	22,640	SY	$1.00	$22,640.00
37	Trees - 3/4" caliper	422	EA	$80.00	$33,760.00
38	Trees - 1/2" caliper	130	EA	$65.00	$8,450.00
39	Trees - 1-2' height	1,314	EA	$25.00	$32,850.00
40	Shrubs - >3' height	108	EA	$38.00	$4,104.00
41	Shrubs - 1-2' height	506	EA	$25.00	$12,650.00
42	Herbaceous Quarts	200	EA	$9.00	$1,800.00
43	As-Builts	1	LS	$35,000.00	$35,000.00
	Sub-Total Estimated Construction Cost				$3,540,660.5
	10% Contingency Total Estimated Construction Cost				$354,066.0
	Total Estimated Construction Cost				$3,894,726.5

Estimate Prepared by:

Kaitlyn Mayberry **8/4/2025**

Print Name Signature Date

Approved: _____ Date

As Revised: _____ Date