Appendix E. Engineering Appendix

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E-1: Civil Engineering Appendix

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Engineering Appendix – Civil Engineering
Anacostia Watershed Restoration- Prince George's County, MD

October 2017

Site 3 (Northwest Br.)

Introduction
This site starts from a point approximately 1000 LF upstream of Route 410 (East-West Hwy) and extends downstream to a point approximately 1900 LF upstream of Queens Chapel Road. The total length is approximately 6600 L.F.

Geospatial Data:
Surveys and mapping were provided by Prince George's County in the form of GIS shape files for contours, utilities, and property lines. Contour data was dated 2009. Additional GIS files were provided by WSSC for sewers and water mains. Additional information on gas mains, electric lines, telephone lines, etc. was requested, but not received. Site visits were made to verify existence of these and other utilities.

Horizontal control: Maryland State Plane, NAD83.
Vertical control: NAVD88

The contours appear to be detailed enough for the overbank areas and channel riffles, but not the pools. During the plans & specs phase, a detailed topographic and utility survey should be acquired to more accurately depict the existing conditions.

CADD:
A digital surface model of the existing topography was created by importing the County GIS shape file (2' contour interval) into Civil3D. A surface was created directly from the contours with the addition of a breakline along the approximate stream centerline. Proposed conditions were modeled based on channel sections and profiles provided by the H&H engineer.

Existing Flood Risk Management Project:
The downstream portion of the stream lies within an existing Corps of Engineers flood risk management project (Anacostia River and Tributaries). Constructed in the early 1970's, it consists of an improved channel, 70-feet wide. According to the O&M manual, the channel and floodway are to be kept clear of debris, wild growth, shoals, and encroachments. This USACE channel starts at approximately sta. 61+00 and extends downstream.

A comparison between the existing cross-section, the proposed cross-section, and the 1974 as-built section, is shown on the cross-section drawing for station 65+00. The invert elevation was obtained by reviewing the as-built drawings. Station 65+00 (proposed) is located approximately at station 60+78 on the as-built drawings. The as-built invert elevation at that location is 122.6. It was converted to el. 121.5 NAVD88 using the datum diagram in the CEPD report.

Refer to Appendix E-3 (HEC-RAS Model Appendix) for hydraulic impacts.

Utility Impacts

One of the design constraints was to avoid relocation of utilities. Gas main markers were observed along the western side of the stream channel, and a 54" sanitary sewer parallels the stream. The proposed stream channel for most of the reach has been shifted eastward to avoid impacts to utilities.

Pedestrian Bridge

The existing pedestrian bridge over Northwest Branch crosses the stream askew. To allow for a wider channel, relocation of the bridge is proposed so that it can be aligned perpendicular to the stream. The existing bridge abutments should be removed to allow for improved conveyance. It is assumed that the existing bridge can be relocated onto newly constructed abutments.

Site Access and Staging

Possible access routes and staging areas have been shown on the drawings. These locations were chosen based on the desire to avoid private properties. These locations are tentative, and can be finalized during the final design phase.

Estimated Construction Quantities

Orange construction fence 5450 lf
Clearing 5.2 ac.
Excavation 21,500 cy
Fill 49,300 cy
Cross-vanes stone 1500 cy
J-hook stones 300 cy
Miscellaneous stone 30 cy
Log structures 20 ea.
Replace damaged path 500 sf
Topsoil 13.5 ac.
Seed & mulch 13.5 ac.
Forest planting, trees 1100 ea.
Forest plant, shrubs 1300 ea.
Salvage and relocate existing pedestrian bridge on new abutments
Stabilized construction entrances 5 ea.
Silt fence 1500 lf
Mulch for access roads 2900 cy
Temporary seed & mulch 13.5 ac.

Site 9 (Sligo Cr.)

Introduction

This site starts from a point approximately 2500 LF upstream of the confluence with Northwest Branch (Site 3), and extends downstream to the confluence. The total length is approximately 2500 L.F.

Geospatial Data:

Surveys and mapping were provided by Prince George's County in the form of GIS shape files for contours, utilities, and property lines. Contour data was dated 2009. Additional GIS files were provided by WSSC for sewers and water mains. Additional information on gas mains, electric lines, telephone lines, etc. was requested, but not received. Site visits were made to verify existence of these and other utilities.

Horizontal control: Maryland State Plane, NAD83.
Vertical control: NAVD88

The contours appear to be detailed enough for the overbank areas and channel riffles, but not the pools. During the plans & specs phase, a detailed topographic and utility survey should be acquired to more accurately depict the existing conditions.

CADD:

A digital surface model of the existing topography was created by importing the County GIS shape file (2' contour interval) into Civil3D. A surface was created directly from the contours with the addition of a breakline along the approximate stream centerline. Proposed conditions were modeled based on channel sections and profiles provided by the H&H engineer.

Utility Impacts

One of the design constraints was to avoid relocation of utilities. 48" and 30" sanitary sewer pipes parallel most of the stream, and cross it at one location. At the crossing, the existing channel invert elevation will be maintained. Impacts to the sewer are not expected.

Site Access and Staging

Possible access routes and staging areas have been shown on the drawings. These locations were chosen based on the desire to avoid private properties. These locations are tentative, and can be finalized during the final design phase.

Estimated Construction Quantities

Orange construction fence 1400 lf
Clearing 3.0 ac.
Excavation 1380 cy
Fill 11,400 cy

Cross-vanes stone 400 cy
J-hook stones 100 cy
Miscellaneous stone 25 cy
Log structures 15 ea.
Replace damaged path 300 sf
Topsoil 5.0 ac.
Seed & mulch 5.0 ac.
Forest planting, trees 480 ea.
Forest plant, shrubs 580 ea.
Stabilized construction entrances 1 ea.
Silt fence 300 lf
Mulch for access roads 950 cy
Temporary seed & mulch 5.0 ac.

Site 13 (Northwest Br.)

Introduction

This site starts from a point approximately 700-feet downstream of Riggs Road (route 412) and extends 8100 LF downstream. The total length is approximately 8100 L.F.

Geospatial Data:

Surveys and mapping were provided by Prince George's County in the form of GIS shape files for contours, utilities, and property lines. Contour data was dated 2009. Additional GIS files were provided by WSSC for sewers and water mains. Additional information on gas mains, electric lines, telephone lines, etc. was requested, but not received. Site visits were made to verify existence of these and other utilities.

Horizontal control: Maryland State Plane, NAD83.
Vertical control: NAVD88

The contours appear to be detailed enough for the overbank areas and channel riffles, but not the pools. During the plans & specs phase, a detailed topographic and utility survey should be acquired to more accurately depict the existing conditions.

CADD:

A digital surface model of the existing topography was created by importing the County GIS shape file (2' contour interval) into Civil3D. A surface was created directly from the contours with the addition of a breakline along the approximate stream centerline. Proposed conditions were modeled based on channel sections and profiles provided by the H&H engineer.

Utility Impacts

One of the design constraints was to avoid relocation of utilities. 30" and 36" sanitary sewer pipes parallel the stream, but no impacts are expected. Several sewers cross the stream. The existing channel bottom elevation at the crossings will be maintained to avoid impacts.

Stream Realignment

A portion of the stream near station 16+00 will be realigned. This will create an abandoned oxbow bend. Since this bend is on private property, filling in the abandoned channel is not proposed at this time. Coordination and approval with the property owner will be required.

Pedestrian Bridge

The proposed stream realignment near station 16+00 will require relocating the existing pedestrian bridge over Northwest Branch. It is assumed that the existing bridge can be relocated onto newly constructed abutments.

Site Access and Staging

Possible access routes and staging areas have been shown on the drawings. These locations were chosen based on the desire to avoid private properties. These locations are tentative, and can be finalized during the final design phase.

Estimated Construction Quantities

Orange construction fence 3600 lf
Clearing 4.5 ac.
Excavation 20,500 cy
Fill 23,200 cy
Cross-vanes stone 1700 cy
J-hook stones 600 cy
Miscellaneous stone 200 cy
Log structures 15 ea.
Replace damaged path 3000 sf
Topsoil 7.1 ac.
Seed & mulch 13.5 ac.
Forest planting, trees 800 ea.
Forest plant, shrubs 960 ea.
Streambank plantings 1900 ea.
Salvage and relocate existing pedestrian bridge on new abutments
Stabilized construction entrances 3 ea.
Silt fence 1400 lf
Mulch for access roads 2800 cy
Temporary seed & mulch 7.1 ac.

Site 5 (Paint Br.)

Introduction
This site starts from the Route 1 bridge (Baltimore Avenue) and extends downstream to the confluence with Northeast Branch (Site 15). The total length is approximately 6300 L.F.

Geospatial Data:
Surveys and mapping were provided by Prince George's County in the form of GIS shape files for contours, utilities, and property lines. Contour data was dated 2009. Additional GIS files were provided by WSSC for sewers and water mains. Additional information on gas mains, electric lines, telephone lines, etc. was requested, but not received. Site visits were made to verify existence of these and other utilities.

Horizontal control: Maryland State Plane, NAD83.
Vertical control: NAVD88

The contours appear to be detailed enough for the overbank areas and channel riffles, but not the pools. During the plans & specs phase, a detailed topographic and utility survey should be acquired to more accurately depict the existing conditions.

CADD:
A digital surface model of the existing topography was created by importing the County GIS shape file (2' contour interval) into Civil3D. A surface was created directly from the contours with the addition of a breakline along the approximate stream centerline. Proposed conditions were modeled based on channel sections and profiles provided by the H&H engineer.

Existing Flood Risk Management Project:
This portion of Paint Branch lies within an existing Corps of Engineers flood risk management project (Anacostia River and Tributaries). Constructed in the early 1970's, it consists of an improved channel, 50-feet wide, transitioning to 135-feet in the vicinity of the railroad bridge, and a two-foot drop structure located 400-feet upstream of the confluence with Northeast Branch. According to the O&M manual, the channel and floodway are to be kept clear of debris, wild growth, shoals, and encroachments.

The proposed design includes channel modifications and removal of the sheet pile drop structure. A comparison between the existing cross-section, the proposed cross-section, and the 1974 as-built section, is shown on the cross-section drawings. The invert elevations were obtained by reviewing the as-built drawings, and converting to NAVD88 using the datum diagram in the CEPD report:

Proposed station 15+00 = as-built station 73+75, invert el. = 55.8 = 54.8 NAVD88
Proposed station 20+00 = as-built station 68+75, invert el. =54.2 = 53.2 NAVD88
Proposed station 25+00 = as-built station 63+75, invert el. =52.7 = 51.6 NAVD88

Proposed station 30+00 = as-built station 58+75, invert el. =51.2 = 50.1 NAVD88
Proposed station 35+00 = as-built station 53+75, invert el. =49.6 = 48.6 NAVD88
Proposed station 40+00 = as-built station 48+75, invert el. =46.2 = 45.1 NAVD88
Proposed station 45+00 = as-built station 43+75, invert el. =44.9 = 43.8 NAVD88
Proposed station 50+00 = as-built station 38+75, invert el. =43.3 = 42.2 NAVD88
Proposed station 55+00 = as-built station 33+75, invert el. =41.8 = 40.7 NAVD88
Proposed station 60+00 = as-built station 28+75, invert el. =40.7 = 39.6 NAVD88
Proposed station 65+00 = as-built station 23+75, invert el. =39.5 = 38.4 NAVD88
Proposed station 70+00 = as-built station 18+75, invert el. =38.4 = 37.3 NAVD88

Refer to Appendix E-3 (HEC-RAS Model Appendix) for hydraulic impacts.

Utility Impacts

One of the design constraints was to avoid relocation of utilities. 36” and 54” sanitary sewer pipes parallel the stream. No impacts are expected.

Site Access and Staging

Possible access routes and staging areas have been shown on the drawings. These locations were chosen based on the desire to avoid private properties. These locations are tentative, and can be finalized during the final design phase.

Estimated Construction Quantities

Orange construction fence 1400 lf
Clearing 7.2 ac.
Excavation 17,100 cy
Fill 34,400 cy
Cross-vanes stone 1100 cy
J-hook stones 500 cy
Miscellaneous stone 100 cy
Log structures 10 ea.
Topsoil 10.0 ac.
Seed & mulch 13.5 ac.
Forest planting, trees 1100 ea.
Forest plant, shrubs 1300 ea.
Streambank plantings, willow stakes 7800 ea.
Stabilized construction entrances 1 ea.
Silt fence 300 lf
Mulch for access roads 2700 cy
Temporary seed & mulch 10.0 ac.

Site 11 (Indian Cr.)

Introduction
This site starts from a point approximately 400 feet downstream of Interstate 495 and extends downstream to a point 500-feet downstream of Berwyn Road. The total length is approximately 9200 L.F.

Geospatial Data:
Surveys and mapping were provided by Prince George's County in the form of GIS shape files for contours, utilities, and property lines. Contour data was dated 2009. Additional GIS files were provided by WSSC for sewers and water mains. Additional information on gas mains, electric lines, telephone lines, etc. was requested, but not received. Site visits were made to verify existence of these and other utilities.

Horizontal control: Maryland State Plane, NAD83.
Vertical control: NAVD88

The contours appear to be detailed enough for the overbank areas and channel riffles, but not the pools. During the plans & specs phase, a detailed topographic and utility survey should be acquired to more accurately depict the existing conditions.

CADD:
A digital surface model of the existing topography was created by importing the County GIS shape file (2' contour interval) into Civil3D. A surface was created directly from the contours with the addition of a breakline along the approximate stream centerline. Proposed conditions were modeled based on channel sections and profiles provided by the H&H engineer.

Existing Flood Risk Management Project:
The downstream portion of the stream lies within an existing Corps of Engineers flood risk management project (Anacostia River and Tributaries). Constructed in the early 1970's, it consists of an improved channel, 30-feet wide. According to the O&M manual, the channel and floodway are to be kept clear of debris, wild growth, shoals, and encroachments. This USACE channel starts at approximately sta. 74+00 and extends downstream to the confluence with Paint Branch. A comparison between the existing cross-section, the proposed cross-section, and the 1974 as-built section, is shown on the cross-section drawings. The invert elevations were obtained by reviewing the as-built drawings, and converting to NAVD88 using the datum diagram in the CEPD report:

Proposed station 80+00 = as-built station 72+00, invert el. = 47.9 = 46.8 NAVD88
Proposed station 85+00 = as-built station 67+00, invert el. = 46.5 = 45.4 NAVD88
Proposed station 90+00 = as-built station 62+00, invert el. = 45.7 = 44.6 NAVD88
Proposed station 95+00 = as-built station 57+00, invert el. = 44.9 = 43.8 NAVD88

Refer to Appendix E-3 (HEC-RAS Model Appendix) for hydraulic impacts.

Utility Impacts

One of the design constraints was to avoid relocation of utilities. A 48” sanitary sewer parallels the downstream portion of the site. The proposed stream channel for most of the reach has been shifted eastward to avoid impacts to utilities.

Site Access and Staging

Possible access routes and staging areas have been shown on the drawings. These locations were chosen based on the desire to avoid private properties. These locations are tentative, and can be finalized during the final design phase.

Estimated Construction Quantities

Orange construction fence 3300 lf
Clearing 9.6 ac.
Excavation 20,800 cy
Fill 21,200 cy
Cross-vanes stone 1100 cy
J-hook stones 300 cy
Miscellaneous stone 100 cy
Log structures 15 ea.
Topsoil 10.2 ac.
Seed & mulch 10.2 ac.
Forest planting, trees 1100 ea.
Forest plant, shrubs 1400 ea.
Streambank plantings 7800 ea.
Stabilized construction entrances 4 ea.
Silt fence 890 lf
Mulch for access roads 3600 cy
Temporary seed & mulch 10.2 ac.

Site 15 (Northeast Br.)

Introduction

This site starts at the confluence with Paint Branch (Site 5) and extends downstream to a point approximately 300-feet downstream of River Road. The total length is approximately 4700 L.F.

Geospatial Data:

Surveys and mapping were provided by Prince George's County in the form of GIS shape files for contours, utilities, and property lines. Contour data was dated 2009. Additional GIS files were provided by WSSC for sewers and water mains. Additional information on gas mains, electric lines, telephone lines, etc. was requested, but not received. Site visits were made to verify existence of these and other utilities.

Horizontal control: Maryland State Plane, NAD83.
Vertical control: NAVD88

The contours appear to be detailed enough for the overbank areas and channel riffles, but not the pools. During the plans & specs phase, a detailed topographic and utility survey should be acquired to more accurately depict the existing conditions.

CADD:

A digital surface model of the existing topography was created by importing the County GIS shape file (2' contour interval) into Civil3D. A surface was created directly from the contours with the addition of a breakline along the approximate stream centerline. Proposed conditions were modeled based on channel sections and profiles provided by the H&H engineer.

Existing Flood Risk Management Project:

The upstream portion of this stream lies within an existing Corps of Engineers flood risk management project (Anacostia River and Tributaries). Constructed in the early 1970's, it consists of an improved channel, 50-feet wide. According to the O&M manual, the channel and floodway are to be kept clear of debris, wild growth, shoals, and encroachments. This USACE channel starts at the confluence with the Paint Branch channel (station 78+00) and extends downstream to approximate station 85+00.

A comparison between the existing cross-section, the proposed cross-section, and the 1974 as-built section, is shown on the cross-section drawings. The invert elevations were obtained by reviewing the as-built drawings, and converting to NAVD88 using the datum diagram in the CEPD report:

Proposed station 80+00 = as-built station 7+00, invert el. = 31.9 = 30.8 NAVD88

Refer to Appendix E-3 (HEC-RAS Model Appendix) for hydraulic impacts.

Utility Impacts

One of the design constraints was to avoid relocation of utilities. A 60” water main and two 24” sanitary sewer pipes cross the stream. The existing stream channel invert elevation will be maintained at the crossings to avoid impacts.

Site Access and Staging

Possible access routes and staging areas have been shown on the drawings. These locations were chosen based on the desire to avoid private properties. These locations are tentative, and can be finalized during the final design phase.

Estimated Construction Quantities

Orange construction fence 3460 lf
Clearing 2.7 ac.
Excavation 22,600 cy
Fill 14,300 cy
Cross-vanes stone 1500 cy
J-hook stones 200 cy
Miscellaneous stone 100 cy
Log structures 8 ea.
Replace damaged path 300 sf
Topsoil 5.5 ac.
Seed & mulch 5.5 ac.
Forest planting, trees 600 ea.
Forest plant, shrubs 740 ea.
Streambank plantings, willow stakes 5900 ea.
Stabilized construction entrances 3 ea.
Silt fence 890 lf
Mulch for access roads 2100 cy
Temporary seed & mulch 5.5 ac.

E-2: Hydrology and Hydraulics Appendix

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Anacostia Watershed Study/Prince George's County
USACE Stream Restoration Project

Hydrology and Hydraulics Appendix
Updated October 2017

TABLE OF CONTENTS

Attachments	**Includes:**
Attachment 1	Proposed feasibility level designs (35%)
Attachment 2	Conceptual (10%) designs used for project planning

INTRODUCTION

Located in Prince George's County, Maryland, most of the streams in this study have their headwaters in Montgomery County except Indian Creek and the Chillum Road tributary. These streams are generally third order stream or larger, except the Chillum Road tributary is a second order stream. Almost all systems cross the Capital Beltway (I-495) or other major state and county roads through different types of stream crossings. The watershed is urbanized and there is high resident and commercial concentration throughout the entire stream system. The stream network draining into Northwest and Northeast Branch of the Anacostia River watershed are shown in Figure 1. Each of the tributaries has experienced significant urbanization and suburban growth, resulting in degraded biological health. The storm flow characteristics and concentrations have been altered due to stressors in the watersheds such as increased impervious surface areas and storm drain construction. Other manmade impacts such as stream crossings, channelization, floodplain impacts, channel/bank armoring, utility crossings has caused sediment loading, lateral erosion tree uprooting, fish blockage and other environmental impacts.

Almost all the projects are nested in high-density residential/commercial neighborhoods. Most of the watershed is part of the suburban network surrounding Washington, D.C., and demand for housing is very high. Large areas of the stream valleys have been dedicated to or purchased by Maryland-National Capital Park and Planning Commission (M-NCPPC) for preservation of natural resources or for use as green or open space. Although County zoning regulations restrict development from floodplain areas to some extent, residential areas and neighborhoods have encroached onto floodplains. Table 1, below, shows the flows, drainage area, and percent forest cover of each stream system that is part of our study in Prince George's County.

Table 1. Data compiled from GISHYDRO-2000

Stream	2-Yr Q (cfs)	10-Yr Q (cfs)	50-Yr Q (cfs)	100-Yr Q (cfs)	DA (mi^2)	% Forest
Indian Creek #1	165	420	820	1060	2.6	29
Northwest Branch #3	2143	5245	9514	11879	48.8	17.8
Paint Branch #5	1451	3618	5230	8445	31.3	20.4
Paint Branch #7	988	2513	3645	5868	16.4	21.2
Sligo Creek #9	900	2207	3155	4994	10.7	8.7
Chillum #10	188	407	685	841	1.2	5.6
Indian Creek #11	856	2330	4740	6230	29.3	40.4
Little Paint Branch #12	596	1497	2805	3580	10.6	21.3
Northwest Branch #13	1652	4116	5905	9385	34.6	21.5
Northeast Branch #15	2091	5414	10407	13400	70.0	29.8

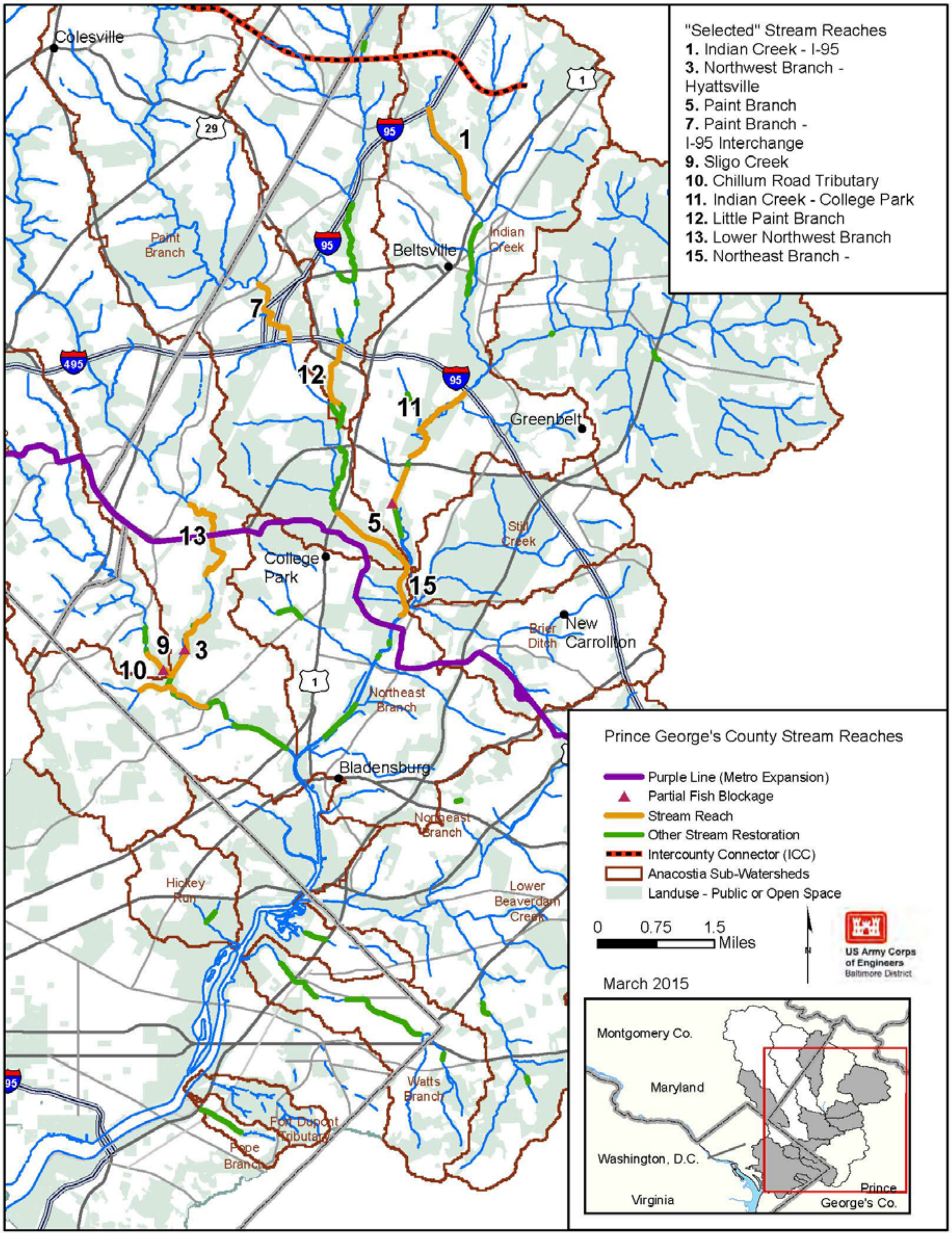


Figure 1: Location of tributaries in Anacostia River watershed in Prince George's County.

EXISTING CONDITIONS

Geology, Topography, and Soils

The Anacostia River Watershed spans two physiographic provinces, the Piedmont Plateau and the Atlantic Coastal Plain, which reflect differences in geological composition and topography. The Prince George's County portion of the watershed primarily lies within the Coastal Plain Province. The stream segments selected for study in this project are primarily within the Coastal Plain Province, however, the upstream end of the Paint Branch segment and Northwest Branch are located at the transition zone between the Piedmont and Coastal Plain Provinces. Both physiographic provinces are described below.

The Piedmont Plateau Province is composed of hard, crystalline igneous and metamorphic rocks and extends from the Coastal Plain westward to Catoctin Mountain, the eastern boundary of the Blue Ridge Province. Bedrock in the eastern part of the Piedmont consists of schist, gneiss, gabbro, and other highly metamorphosed sedimentary and igneous rocks of probable volcanic origin (MGS, 2014). These rocks range in age from Precambrian to late Paleozoic. Bedrock is often exposed in the channel beds of streams in the Piedmont, and river sections are steeper with coarser sediment than those of streams in the Coastal Plain Province (Devereux et al., 2010). Soils of the Piedmont are mostly finer-grained micaceous silt loams (MWCOG, 2010). Stream bed materials are predominantly gravel to cobble-sized sediments (ARWP, 2010).

The Atlantic Coastal Plain Province is comprised of sedimentary rocks of fluvial, deltaic, estuarine, and marine origin, deposited since the beginning of the Cretaceous Period, 144 million years ago (MDDNR, 1987). These generally unconsolidated sediments, including gravel, sand, silt, and clay, form a wedge that thins out onto the crystalline Piedmont to the west, and thickens eastward to more than 8,000 feet in thickness at the Atlantic Ocean coastline (Csato, et al., 2013; MGS, 2014). The Coastal Plain Province has flatter topography and lower gradient streams with finer bed materials. Thicker soil zones than in the Piedmont, tend to be present. The highest elevation in the Coastal Plain is 400 feet above mean sea level (AWRP, 2010), and slopes in the Coastal Plain are usually less than 8 degrees (USGS, 2007). River valleys are incised into the Coastal Plain alluvium. The river valleys consist of gently dipping beds, and locally, Tertiary terraces on either side of the main channels (USGS, 2007).

The fall line, the geomorphologic break between the hard, crystalline rocks of the Piedmont and the softer sedimentary rocks of the Coastal Plain, roughly parallels U.S. Route 29/Colesville Road. Small to medium sized cataracts or waterfalls are present along the fall line as water moves down in elevation from the Piedmont to the Coastal Plain. These features are present in Sligo Creek, Northwest Branch, Paint Branch, and Little Paint Branch, and act as natural barriers for anadromous fish such as alewife and blueback herring (AWRP, 2010).

Soil maps for Prince George's County (USDA, 2014) indicate that soils adjacent to most of the project streams (Table 2) include the following classifications: Codorus and Hatboro soils (CF), Codorus-Hatboro-Urban land complex (Ch), Zekiah and Issue soils (ZS), and Udorthents, highway (UdaF). The CF association consist of loamy alluvial material that occurs mainly on stream floodplains. The Ch land complex consists of Codorus and Hatboro series soils with an equal component of soils in community development. This component includes fill material to facilitate the construction of buildings, streets, and parklands, etc. The Indian Creek project site primarily consists of the ZS soils, which consist of loamy alluvium present on floodplains and drainage ways. Human emplaced materials also border some of the stream sites, especially close to the highways (e.g. soil classification UdaF at Paint Branch at I-95). Hydric soils account for about 16 percent of the Anacostia River watershed in Prince George's County (MDDNR, 2005). Table 2 shows the hydric rating for soils adjacent to the study stream sites, which range from partially hydric to nonhydric.

Table 2. Primary soil map units and presence of hydric soils adjacent to project sites.

Site	Stream Name	Primary Soil Map Units (Symbol)	Hydric Rating*
1	Indian Creek at I-95	Zejiah and Issue (ZS)	60
3	Northwest Branch	Codorus and Hatboro (CF) Codorus-Hatboro-Urban land complex (Ch)	40 30
5	Paint Branch	Codorus and Hatboro (CF) Codorus-Hatboro-Urban land complex (Ch) Fallsington-Urban Land Complex (FbB)	40 30 55
7	Paint Branch at I-95	Codorus and Hatboro (CF) Udorthents, highway (UdaF) Glenelg-Wheaton-Urban land complex (GfB)	40 0 0
9	Sligo Creek	Codorus and Hatboro (CF) Codorus-Hatboro-Urban land complex (Ch)	40 30
10	Chilllum Road Tributary	Issue –Urban land complex (lu)	10
11	Indian Creek	Zejiah and Issue (ZS) Udorthents, reclaimed gravel pits (UdgB)	60 0
12	Little Paint Branch	Codorus and Hatboro (CF)	40
13	Northwest Branch Riggs Rd	Codorus and Hatboro (CF) Codorus-Hatboro-Urban land complex (Ch)	40 30
15	Northeast Branch Calvert Rd	Codorus and Hatboro (CF) Codorus-Hatboro-Urban land complex (Ch)	40 30

*Hydric rating indicates the proportion of the map unit that meets the criteria for hydric soils. A rating of 66-99 percent indicates "Predominantly hydric" soils; 33 to 66 percent indicates "partially hydric" soils; 1 to 33 percent indicates "predominantly nonhydric"; 0 percent indicates "nonhydric".

Site Descriptions

Existing conditions for the ten sites evaluated are described below. Table 3 shows the drainage area, stream order, and length of the sites evaluated. Channel dimensions are found in Attachment

1 to this appendix. Descriptions of aquatic physical habitat, including parameters used in the environmental benefits model (Physical Habitat Index) are found in Appendix B.

Table 3. Characteristics of the project streams selected for study.

Reach	Drainage Area (mi^2)	Stream Order (Strahler)	Length (mi)
Northwest Branch			
Northwest Branch – Hyattsville (Site 3)	35.6	3	1.38
Northwest Branch - Chillum Rd Tributary (Site 10)	2.02	1	0.40
Northwest Branch - Riggs Rd (Site 13)	34.1	3	1.46
Sligo Creek			
Sligo Creek (Site 9)	11.2	2	0.42
Northeast Branch			
Northeast Branch – Calvert Rd Disc Golf Park (Site 15)	69.2	4	1.04
Indian Creek			
Indian Creek -I-95 (Site 1)	2.52	1	1.32
Indian Creek – College Park (Site 11)	27.4	4	1.98
Paint Branch			
Paint Branch (Site 5)	31.1	3	1.30
Paint Branch –I-95 (Site 7)	16.4	2	1.11
Little Paint Branch			
Little Paint Branch (Site 12)	10.5	2	0.86

Indian Creek (Site 1)

At the northern (upstream) end of the selected reach, Indian Creek crosses I-95 through two 11 ft by 8 ft box culverts and daylights in a wooded area. The stream is entrenched and is experiencing bank and bed erosion. Some trees are uprooted due to lateral erosion. Further downstream there are two large areas with many dead trees, which may be due to beaver activity. During a 2014 site visit near Ammendale Road, a beaver dam was present. Frequent flooding could have oversaturated some of the trees, causing mortality and resulting in a bare area. A gully is present resulting from erosion from flow from an inlet at Gordon Avenue, just downstream of Flash Drive. The stream then crosses Ammendale Road through a triple box culvert to a regional pond for flood control. The pond conveys the flow through a row of gabion baskets and then under the embankment via two concrete circular pipes. Downstream of this area, the stream is channelized through a monastery and then becomes relatively scenic with good tree canopy and native vegetation (primarily ferns) on the floodplain. The last portion of project reach is a concrete channel that was constructed by USACE in the 1960s to reduce flooding. Three shallow ponds next to each other at the right bank are separated from the residential neighborhood by a berm. It is assumed that the ponds were excavated in order use the fill for levee construction in 1960's.

Northwest Branch (Site 3)

Improvements to Northwest Branch were included in the "Anacostia River Local Flood Protection Project", authorized in 1950, and constructed between 1973 and 1974. Northwest Branch was widened to 70-feet upstream of Queens Chapel Road, and 80-feet downstream. The improved channel capacity was 5000 cfs upstream and 8000 cfs downstream of Queens Chapel Road. Section 7.5 of the O&M manual states that the improved channels and floodways are to be kept clear of wild growth, encroachments, and shoals (33 CFR Part 208 – Flood Control Regulations). The channel has not been maintained for many years, and therefore the channel capacity may have been reduced, but this has not been confirmed through modeling yet.

Northwest Branch is an entrenched system in an urbanized area that experiences frequent flashy flows. The study reach is located on the mainstem of Northwest Branch, approximately from Queens Chapel Road to north of East-West Highway (MD Route 410). Some of the bridges within the site 3 reach are tightly angled (i.e. are skewed) relative to the direction of flow. This creates back eddies and bed and bank erosion. High sinuosity upstream of the bridges is directly related to the existing hydraulic opening (i.e. backwater caused by constriction during high flow). Spot bank armoring is present along the reach and a number of riffle grade controls exist to improve potential fish passage. USACE and MWCOG have identified a blockage for anadromous fish downstream of Ager Road, just upstream of the confluence with Sligo Creek. Utility crossings (sewer, gas, and water lines) within the stream act as grade control structures, without which the stream would have become even more entrenched and less stable. Along the reach, there are long, deep pools loaded with soft sediment. Additionally, a thick layer of sand has been deposited on both sides of the floodplain, indicating out of bank activity from larger storms.

Paint Branch (Site 5)

Improvements to Paint Branch were included in the "Anacostia River Local Flood Protection Project", authorized in 1950, and constructed between 1973 and 1974. Paint Branch was widened and deepened, and a portion of the floodway was cleared. The channel was widened to 50-feet, transitioning to 135-feet in the vicinity of the railroad bridge. A two-foot drop structure was constructed 400-feet upstream of the confluence with Indian Creek to maintain acceptable grade. The improved channel capacity was 2500 cfs from Route 1 to the railroad bridge, and 3000 cfs downstream of the railroad bridge. Section 7.5 of the O&M manual states that the improved channels and floodways are to be kept clear of wild growth, encroachments, and shoals (33 CFR Part 208 – Flood Control Regulations). The channel has not been maintained for many years, and therefore the channel capacity has likely been reduced, but this has not been confirmed through modeling yet.

Based on the presence of channel-parallel berms, it is likely that spoil from past channel alterations was placed parallel to the channel along much of the stream. Currently, the stream flows primarily through an earthen channel with minimal stabilization. Boulders have been placed for stabilization in the vicinity of sewer infrastructure and bridges. The stream is very unstable and there is sediment loading throughout the system. During the site visit, it was noted that there are a number of alternating transverse bars that divert the flow such that the toe of the bank is being undermined and trees are being uprooted. The stream is very wide in some areas and sediment has formed islands creating a braided system. The coarse sediment provides some protection, but during high flows cobble sized sediment becomes mobilized. The stream habitat has been simplified by the historic channelization and there are long reaches with homogenous habitat conditions. Conditions are drastically different in the vicinity of woody debris jams. In these places, habitat is heterogeneous, but unstable.

Paint Branch, I-95 Interchange (Site 7)

The upper portion of this reach is located at the transition between the Piedmont physiographic province and the Coastal Plain province. The reach starts downstream of Powder Mill Road (MD 212, at a concrete bridge with a 38 ft span) and extends to downstream to I-495. There are eight stream crossings, four of which are box culverts and the others are bridges. Two of the culverts act as fish blockages, but contain fish ladder like structures constructed by the Maryland State Highway Administration in the late 1990's. Siltation of these structures and constant debris jams have altered the function of the fish passage structures. A maintained right-of-way for a high power electric line results in a lack of vegetation to hold the banks together. A portion of the stream is lined with concrete at the outer bound of I-95 to protect the bridge piers. Many trees are being uprooted, causing sediment loading and a maintenance problem.

Sligo Creek (Site 9)

Northwest Branch is highly entrenched (U-shape channel) and carries a significant volume of flow compared to Sligo Creek. During flood events, Northwest Branch acts as a hydraulic dam forcing back eddies within Sligo Creek toward its confluence, and creating a wide, shallow stream. A fish blockage consisting of a steel weir with a one foot drop is present on Sligo Creek upstream of the Northwest Branch confluence.

Field observations indicate that the stream has shifted laterally to the left due to deposition on the right side of the channel (where the stream originally flowed). The right bank of the upper portion of the stream near the baseball field is severely eroded. This may be due to the shape of a riffle grade control that directs the flow (velocity vector) to the toe of the embankment. Point bars on the left side of the stream are expected to further increase the erosion potential at the right toe of the embankment. This is a very urban environment with turbulent flow. Additionally, almost the entirety of the stream system has been channelized with boulders on both banks, defining a wide engineered channel.

Northwest Branch, Chillum Rd Tributary (Site 10)

This stream is a tributary to the mainstem Northwest Branch, entering the mainstem downstream of the mainstem-Sligo Creek confluence. The stream is highly unstable and has steep vertical banks. There is little hydrologic connection with the floodplain, even at very high flow. The upper watershed is a concrete channel that carries a lot of debris to this reach. A metal sanitary sewer line crosses the stream, suspended in the air with attached rock.

Indian Creek, College Park (Site 11)

Upper Portion

This area is wide and flat along the upper reach and turns into a narrow and constricted area at MD 193. Historically, this area had a substantial network of wetlands. Over the last half century, this area was converted to an upland housing community on one side and a metal scrap yard on the other side. Prince George's County is currently considering a proposal for a multi-use development at the current site of the D.C. metro adjacent to Indian Creek.

Abandoned and active sand and gravel operations are present within the subwatershed. The Indian Creek subwatershed contributes the highest suspended sediment load of all the subwatersheds to the Anacostia River (MWCOG, 2009i). A large intact area of forested wetland is still present in the upstream valley. Downstream of MD 193, substantial channelization was implemented by USACE, including straightening the reach. Some channel alteration is also visible upstream of MD 193. A concrete plant on one side of the stream has clearly dumped excess concrete into the stream. During the site visit, a network of exposed pipes (mostly metal) was observed that are not shown on GIS maps of utility lines. There are many braided channels carrying a lot of sediment. The vegetation here is primarily invasive. There are two stormwater outfalls that have created a gully. One of these gullies is next to a large sized pond that is covered with invasive vegetation. At the end of this reach, the concrete channel upstream of a four cell box culvert (MD Route 193) acts to pond water and create pooled conditions.

Lower Portion

Improvements to Indian Creek were included in the "Anacostia River Local Flood Protection Project", authorized in 1950, and constructed between 1973 and 1974. Indian Creek was widened to 30-feet, and straightened to provide a capacity of 1000 cfs. A two-foot drop structure was constructed 400-feet upstream of the confluence with Paint Branch to maintain acceptable grade. Section 7.5 of the O&M manual states that the improved channels and floodways are to be kept clear of wild growth, encroachments, and shoals (33 CFR Part 208 – Flood Control Regulations). The channel has not been maintained for many years, and therefore the channel capacity has likely been reduced, but this has not been confirmed through modeling yet.

This is a channelized system with washed out riffle grade controls at the outfall of the four-cell box culvert transitioning into an entrenched system with vertical banks. There are some mature trees with a lot of Sumac on the right bank, which is disconnected from the stream. There is a sewer line and housing on the left bank. The stream crosses Berwyn Road through a single span bridge over a fish blockage. Severe bank erosion is present on the left bank downstream of the bridge. There are grout bags placed around the bridge abutment to protect the bridge from scour.

Little Paint Branch (Site 12)

Little Paint Branch is loaded with sediment (gravel/cobble). The section between I-495 and Cherry Hill Road was channelized when the Capital Beltway (I-495) was constructed. The stream has very high width-depth ratio and the active channel is full of coarse sediment upstream of Cherry Hill Road. During the field visit, a day after a minor rainfall event, the floodplain showed signs of out-of-bank activity. Downstream of Cherry Hill Road the stream is more sinuous but then becomes channelized. The excess sediment is creating lateral erosion and local scour. A good portion of the concrete sewer line is exposed in the channel very close to the hiker-biker path.

Northwest Branch, Riggs Rd (Site 13)

This site is located at the transition between the Piedmont and the Coastal Plain provinces. The reach starts downstream of Riggs Road and ends adjacent to Drexel Street. This system is severely incised and experiencing major lateral erosion. There have been some spot fixes to protect existing utilities; however, this system is extremely unstable and utilities continue to be undermined. A bridge at Riggs Road consists of an undersized concrete arch that acts to dams the stream. A utility line crosses the stream under the bridge at Riggs Road, which maintains the stream grade to prevent headcutting until the stream crosses under the power lines downstream. At the power line crossing, vegetation is controlled (removed) which has resulted severe erosion and many trees have been uprooted. Downstream of the power line crossing, the high sinuosity in the upstream portion of the reach is not natural and is caused by the bridge at MD 193. The bridge acts as a hydraulic dam creating erosive back eddies on alternating sides of the stream upstream of the bridge, resulting in increased sinuosity.

Northeast Branch, Calvert Rd Disc Golf Park (Site 15)

The stream reach is entirely channelized and stabilized with boulders. The upper portion of this channelization was conducted by USACE (USACE, 1975). Channelization for flood risk management consisted of widening and deepening and varied amounts of overbank clearing. The project consisted of the creation of a 50 foot wide trapezoidal channel starting 540 feet upstream of the Calvert Road Bridge and extending to the Paint Branch-Indian Creek confluence and into sites 5 and 11 (described above). Most of the suspended and some of bed load that efficiently move through lower portion of Indian Creek (site 11) ends in this reach causing alternating bars (sediment loading) and a shallow wide channel with homogeneous habitat. There are five locations where utilities cross the stream creating small vertical drops. With increased erosion around and beneath these crossings, fish passage could become more difficult. Under the River Road Bridge, sheet pile was placed across the stream to provide grade control. A vertical drop of a half foot to one foot is present here. Fish passage would be blocked, except that a notch has been cut into the center of the stream to provide passage. However, this collects sediment and traps debris. This stream system is powerful (high energy) during high flow. The banks along the entirety of the project reach have been armored with revetment.

ENGINEERING OBJECTIVES

The planning objectives for the study include:

1. Restore physical habitat within streams with degraded aquatic conditions in the mainstem and tributaries of both the Northwest and Northeast Branch subwatersheds of the Anacostia River in Prince George's County.

2. Enhance aquatic ecosystem resilience by restoring fish passage for migratory and non-migratory fish and connecting existing higher quality habitat in the mainstem and tributaries of both the Northwest and Northeast Branch subwatersheds of the Anacostia River in Prince George's County.

Engineering designs conform to USACE guidance, including ER 1110-2-1150, Engineering and Design for Civil Works Projects; EP 1110-2-9, Hydrologic Engineering Studies Design; and ER 1100-2-8153, Sedimentation Investigations.

The goal of the engineering design team is to restore aquatic and riparian habitat within the two major subwatersheds (Northwest Branch and Northeast Branch) by creating dynamically stable streams using natural stream channel (fluvial geomorphic) design techniques. Specifically, the engineering objectives developed by the design team are:

a. To maximize aquatic and riparian habitat;
b. To increase stability of the stream system;
c. To remove or ameliorate fish blockages;
d. To improve conveyance (water and sediment transport) through structures (e.g. bridges, culverts) crossing the stream by reducing back eddies and erosion while still meeting requirements for the existing flood risk management project;
e. To recommend culvert replacement and proper sizing for geomorphic stability where necessary (HEC-RAS modeling will be performed to design the restoration will allow identification of areas where conveyance through structures can be improved);
f. To provide self-sustaining geomorphic conditions (naturally dynamic) to reduce or eliminate the need for channel maintenance; and
g. To enhance community health by improving aesthetic value, allowing public access to the stream, and enhancing recreational opportunities per landowner agreement.

FLUVIAL GEOMORPHOLOGY

The fluvial geomorphology of a stream or river is influenced by seven major variables (Leopold et al., 1964):

1) channel slope,
2) width,
3) depth,
4) discharge,
5) velocity,
6) roughness of channel materials, and
7) sediment size.

A change in any one of these variables causes a series of channel adjustments, which leads to a change in the others, resulting in channel pattern alterations (Rosgen, 1996).

Stream Classification

Natural channel design[1] is proposed to restore the streams identified in this feasibility study. Natural channel design is a method of restoring a stream by engineering changes to mimic natural conditions. This includes the placement of in-stream features and structures to enable a stream to move water and sediment without causing aggradation or degradation. To design a restoration strategy that will effectively meet the engineering objectives, including providing habitat and stability, existing and future channel morphology must be determined. The Rosgen stream-classification system categorizes streams based on channel morphology so that consistent, reproducible, and quantitative descriptions can be made. While the Rosgen classification system was developed for rural streams in the western U.S., USACE has applied this system successfully to restore urban streams in the local area (e.g., Paint Branch in Prince George's County, Maryland). Other stream restoration methodologies were considered (see Section 3.2 of the main report), including ERDC streambank stabilization; however, were determined to be less conducive to the restoration and creation of aquatic habitat.

Rosgen (1996) developed a stream classification system based on the seven variables presented above. The classification system organizes the morphological variables of a stream into characteristics commonly observed, creating several stream types. The different stream types, or geomorphic characterizations, are classified as A, B, C, D, DA, E, F, or G. Figure 4 provides a summary of the geomorphology of each functional stream type within its valley type. Descriptions of each of the morphological variables contained in the classification system are addressed below.

One must inspect the floodplain valley of a stream to determine the stream type and dimension, pattern and profile for a properly functioning system, as specific stream types are only found in certain valley types (Table 2). For example, in Valley Type I ("V" notched canyons) A and G stream types will be found, while in Valley Type X (very broad and gentle slopes), C and D type

[1] In this report, reference to "natural channel design" includes the use of quantitative hydrologic and hydraulic analyses (e.g. sediment transport) and modeling to support the development of the engineering designs.

streams are predominantly found. For more information, Rosgen's *Applied River Morphology* (1996) contains a complete description of valley types.

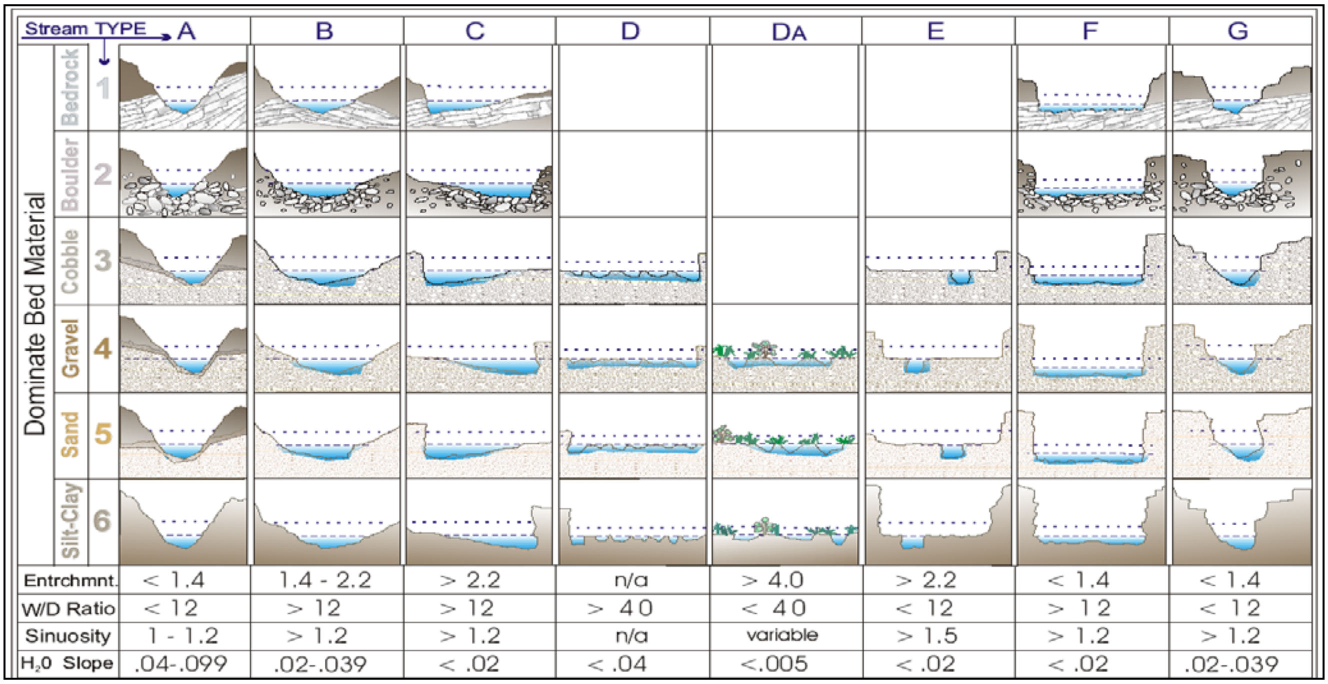


Figure 2. Stream classification system (from Rosgen, 1996).

Table 4. Valley types (Rosgen and Silvey, 1998).

Valley Type	Description	Stream Types
I	"V" notched canyons, rejuvenated side slopes	A and G
II	Moderately steep, gentle sloping side slopes often in colluvial valleys	B
III	Alluvial fans and debris cones	A, G, D and B
IV	Gentle gradient canyons, gorges and confined alluvial valleys	F and C
V	Moderately steep valley slopes, "U" shaped glacial trough valleys	D, C and Bc
VI	Moderately steep, fault controlled valleys	B, G and C
VII	Steep, highly dissected fluvial slopes	A and G
VIII	Wide, gentle valley slope with a well-developed	C, E and Bc

Valley Type	Description	Stream Types
	floodplain adjacent to river terraces	
IX	Broad, moderate to gentle slopes, associated with glacial outwash and/or aeolian sand dunes	Predominantly D and some C
X	Very broad and gentle slopes, associated with extensive floodplains – Great Plains, semi-desert and desert provinces; coastal plains and tundra; lacustrine valleys	C and D

Bankfull Discharge

The bankfull discharge is the "channel forming flow." "Effective discharge" is another approximation for the discharge that does the most work and transports the most sediment over time. Bankfull discharge is typically associated with an instantaneous peak discharge that occurs a few days a year and is often related to the 1.5-year recurrence interval but may vary depending on the level of urbanization in the watershed. For the purposes of HEC-RAS modeling for this project, which is located in a highly urban area, a 2-year recurrence interval will be used. Bankfull discharge is perhaps the most important variable in the classification system, as many of the other variables are dependent on it. Determination of the bankfull discharge is critical for proper application of the classification system. Discussions of bankfull discharge indicators and their significance are presented by Leopold et al. (1964), Dunne and Leopold (1978), Andrews (1980), Rosgen (1996), and Leopold (1994).

Width/Depth Ratio

The width/depth ratio is defined as the ratio of the bankfull channel width to the bankfull mean depth. The width and depth measurements used for the calculation are associated with the bankfull discharge.

Entrenchment Ratio

The entrenchment ratio describes the vertical containment of the stream or river and the degree to which it is incised in the valley floor (Kellerhals et al., 1972). The entrenchment ratio is defined as the ratio of the width of the flood-prone area to the bankfull width of the channel. The flood-prone area is defined as the width of the channel at an elevation of twice the maximum bankfull depth (Rosgen, 1996).

Sinuosity

Sinuosity is a parameter describing the meander pattern of a stream or river. It is defined as the ratio of channel length to valley length. It can also be described as the ratio of the valley slope to the channel slope (Rosgen, 1996).

A stream's meander length and the radius of curvature are closely related to sinuosity. The meander length is the straight-line length for one complete meander cycle, and the radius of curvature is a measure of the radius of the stream bend.

Langbein and Leopold (1966) developed the following relationship:

$$R_c = \frac{L_m K^{1.5}}{13 (K - 1)^{0.5}}$$

where, R_c = Radius of bend curvature (feet)
K = Channel sinuosity
L_m = Meander length (feet)

Meander Width Ratio

The meander width ratio is defined as the ratio of the belt width to the bankfull width of the channel and is related to stream type according to Rosgen's classification system. Thus, if the stream type (i.e. classification) is known, the most probable proper channel pattern may be determined and used in stream restoration efforts.

Channel Materials

Channel materials influence the ultimate shape of the channel, as different materials provide varying resistance to flow and consequently, require different energy levels for transport to occur. Field determination of the channel materials is accomplished using the "pebble count" method presented by Wolman (1954). The dominant bed material particle size, or d_{50}, is an important parameter for further classifying stream channels. Mathematically, d_{50} represents the particle size diameter for which 50% of the sampled population is equal to or finer. As shown in Figure 4, the d_{50} is broken into size classes, which are given a numeric value. For example, bedrock systems are given a value of 1 while streams containing mostly silt and clay are given a value of 6.

Slope

The slope of a stream channel is the final parameter used in the stream classification system presented by Rosgen. Channel slope affects the energy of a stream system and is an important factor in sediment (or bedload) transfer. The channel bottom slope is typically measured over at least 20 channel widths or 2 meander wavelengths and is used in the Manning equation to determine the cross-sectional average discharge. The energy slope (energy grade line) is a critical factor in determining water surface slope. Under the assumption of uniform flow conditions, the bottom slope is the same as the slope of the energy grade line and water surface slope. For this project, HEC-RAS has been used to determine the slope for the energy and water surfaces.

Along with stream type, the parameters discussed above are used to further organize and classify stream systems. A reference summary of the stream classification parameters is provided in Figure 4.

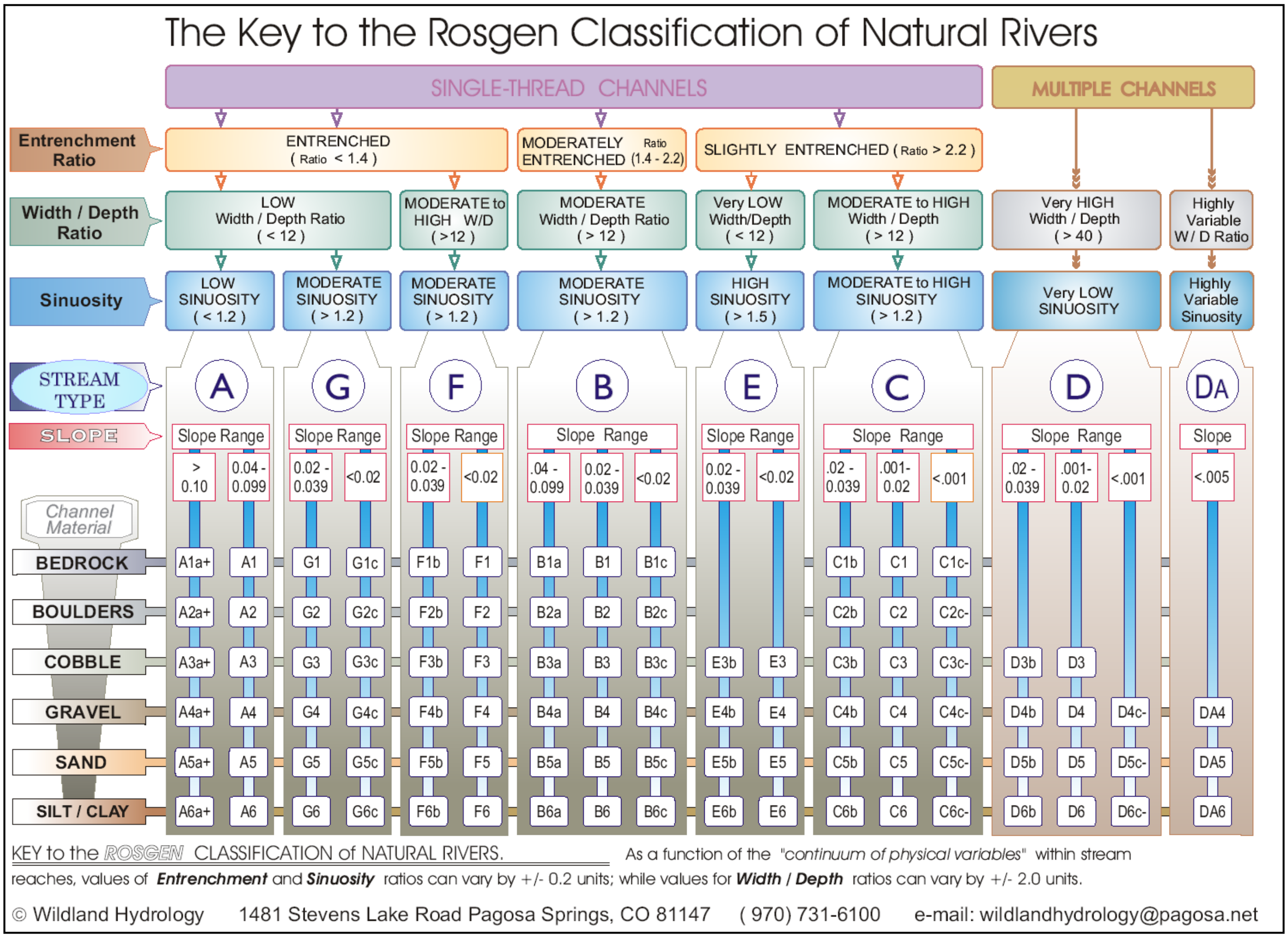


Figure 3: **Stream classification table (from Rosgen, 1996).**

FIELD DATA

The proposed stream reaches were assessed using Rosgen's methodology for Levels I through III analyses (Rosgen, 1996). Relative topographic surveys were conducted using a laser level and rod to obtain cross section and longitudinal profile data. Grab samples and pebble counts were used to assess the nature and distribution of channel materials.

Cross section data were collected at pool and riffle features of the proposed reaches and where the team determined useful design information could be obtained. A hypothetical base elevation of 100.00 feet was identified for the left bank station (0.00 feet) of each cross section.

Longitudinal profile data was collected along the proposed reaches of a representative segment the length of at least 20 bankfull widths or greater. An elevation of 1,000.00 feet was used as a baseline for the upstream limit of the profile.

Grab samples, indicative of the sub-pavement or bedload that is transported in the stream system, were taken from representative bar features in the proposed stream reaches. The grab samples were collected according to the procedures described in *Applied River Morphology* for determining bedload size distribution (Rosgen, 1996). A 5-gallon open bottom bucket was placed to a depth of twice the largest particle size diameter observed at the sampling location, and all of the sediment was removed and placed in a bag. A sieve analysis of these materials was then conducted at the Corps' Geotechnical Laboratory at Fort McHenry.

Pebble counts, which are used to classify and characterize the bed surface material or pavement of the stream channel, were conducted using a modified Wolman method (Rosgen, 1993). The pavement (surface) material collected in the count was used to determine the composition of the bed and banks for stream classification purposes.

The data collected in the field for each of the proposed reaches are found in Attachment A of this report.

ROSGEN ANALYSIS

Rosgen analyses (Levels I&II) were performed on all the proposed stream reaches.

Level I: Geomorphic Characterization

The Rosgen Level I analysis enables integration of basin characteristics, valley types, and landforms with stream system morphology, aiding the development of sound restoration solutions. The valley type is a general description of the valley in which the stream system is located. The general stream type uses variables including dominant slope range, cross-section view, plan view, entrenchment ratio, width/depth ratio, sinuosity, slope, landform/soils/features to broadly classify the stream as Type Aa+, A, B, C, D, DA, E, F, or G. The following broad-level descriptions were determined for the proposed stream reaches (Table 3).

Table 5. Rosgen Level I analysis results for the existing conditions of the proposed stream reaches.

PROPOSED STREAM REACH	VALLEY TYPE	EXISTING GENERAL STREAM TYPE
Indian Creek (site-1)	IV	E/C
Northwest Branch (site-3)	VIII	E/C
Paint Branch (site-5)	VIII	C
Paint Branch (site-7)	VIII	C
Sligo Creek (site-9)	V	Bc
Chillum (site-10)	IV	F
Indian Creek (site-11)	IV	D/G
Northwest Branch (site-13)	VIII	E/C
Northeast Branch (site-15)	VIII	Bc/C

Level II: Morphological Description

Morphological descriptions (Level II) of the proposed stream reaches include the parameters listed in Table 6. This information in combination with the sediment component (dominant bed materials) was used to determine the present stream type of each proposed reach.

Table 6. Rosgen Level II assessment parameters.

PARAMETER	DESCRIPTION
Bankfull Width (W_{bkf}) in feet	Width of the stream channel, at bankfull stage/elevation, in a riffle section
Mean Depth (d_{bkf}) in feet	Mean depth of the stream channel cross section, at bankfull stage/elevation, in a riffle section ($d_{bkf} = A/W_{bkf}$)
Bankfull Cross Section Area (A_{bkf}) in square feet	Area of the stream cross section, at bankfull stage/elevation, in a riffle section
Width/Depth Ratio (W_{bkf}/d_{bkf})	Bankfull width divided by bankfull mean depth, in a riffle section

PARAMETER	DESCRIPTION
Maximum Depth (d_{mrif}) in feet	Maximum bankfull depth of the bankfull channel cross section; or elevation between the bankfull stage and thalweg in a riffle section
Flood-Prone Area Width (W_{fpa}) in feet	Flood-prone area width is determined (in a riffle section) at the stage/elevation which is twice the maximum bankfull depth or (2 x d_{mrif})
Entrenchment ratio (ER)	The ratio of flood-prone area width divided by bankfull channel width (W_{fpa}/W_{bkf}) in a riffle section
Channel materials (d_{50} and d_{84}) in mm	The 50^{th} and 84^{th} percentiles or less than, from the pebble count frequency distribution of channel particles. The d_{50} is the median or dominant particle size.
Water surface slope (S) in feet/feet	Average water surface slope as measured between the same position of bed features in the profile over two meander wave lengths
Channel sinuosity (k)	An index of channel pattern determined from stream length/valley length (SL/VL); or estimated from a ratio of valley slope divided by channel slope (VS/S).

The values of these parameters for each of the proposed stream restoration sites are found in Table 7. The Manning equation was used to calculate bankfull discharge. A comparison of the calculated bankfull discharge using the Manning equation against GISHydro2000 showed results to be valid. Table 7 shows the calculation of bankfull discharge based on the Manning equation. Bankfull width and depth were determined in the field by visual inspection including evaluation of slope canges, erosional extent (e.g., undercuts), vegetation changes, and changes in soil profile.

Table 7. Calculation of Mannings n based on field data.

Project Site	Area (ft^2)	BFW (ft)	Depth (ft)	WP (ft)	R*	Slope	n	Q** (cfs)
Indian Creek #1	21	10.1	2	14	1.50	0.004	0.055	47
Northwest Branch#3	417	72.1	1.5	80.4	5.19	0.004	0.05	2325
Paint Branch#5	210	62	3.4	78	2.69	0.01	0.045	1346
Paint Branch#7	140	28	5	38	3.68	0.005	0.045	782
Sligo#9	151.9	48	3.16	105	1.45	0.006	0.04	542
Indian Creek#11	51.9	20	2.59	25.2	2.06	0.006	0.045	214
Little Paint Branch#12	103.8	45	2.28	50	1.66	0.009	0.045	457
Northwest Branch#13	190	57	3.3	62	3.00	0.004	0.05	754
Northeast Branch#15	290	70	4.1	90	3.22	0.021	0.04	3415

*	**R =** (Area/ WP)
**	**Q =** $(1.49/n)(A)(R^{2/3})(S^{1/2})$

Table 8. Length of stream reaches initially proposed for restoration.

Study Reach	Stream Length (mi)
Indian Creek (site-1)	1.32
Northwest Branch (site-3)	1.38
Paint Branch (site-5)	1.30
Paint Branch (site-7)	1.11
Sligo Creek(site-9)	0.42
Chillum (site-10)	0.40
Indian Creek (site-11)	1.98
Little Paint Branch (site-12)	0.86
Northwest Branch (site-13)	1.46
Northeast Branch (site-15)	1.04

PROPOSED CONDITIONS

Concept-level designs (10%) were initially developed for planning purposes for the proposed restoration. These designs were developed for all the sites of study (Figure 1) and were used in the Cost Effectiveness/Incremental Cost Analysis to select the Tentatively Selected Plan (TSP). The proposed concept designs are found in Attachment 3 of this report. Following public comment and agency review of the TSP, the TSP was endorsed as the agency recommended plan, and feasibility level (35%) designs were developed. The sub-sections below describe the conceptual designs that were used for selecting the TSP, and the feasibility level designs that are now proposed for the sites in the recommended plan. The recommended plan consists of sites 3, 9, and 13 on Northwest Branch, and sites 5, 15, and 11 on Northeast Branch.

The main engineering objective for restoration is to create stable and functional system using natural channel design principles that does not have any adverse impacts on flooding, trees, safety, and improves aesthetics for the local community. Natural channel design is a method of restoring a stream by engineering changes to mimic natural conditions. This includes the placement of in-stream features and structures to enable a stream to move water and sediment without causing aggradation or degradation. The natural channel design process is an iterative approach to fitting proper dimension, pattern, and profile to the stream based on restoration goals and the existing site conditions.

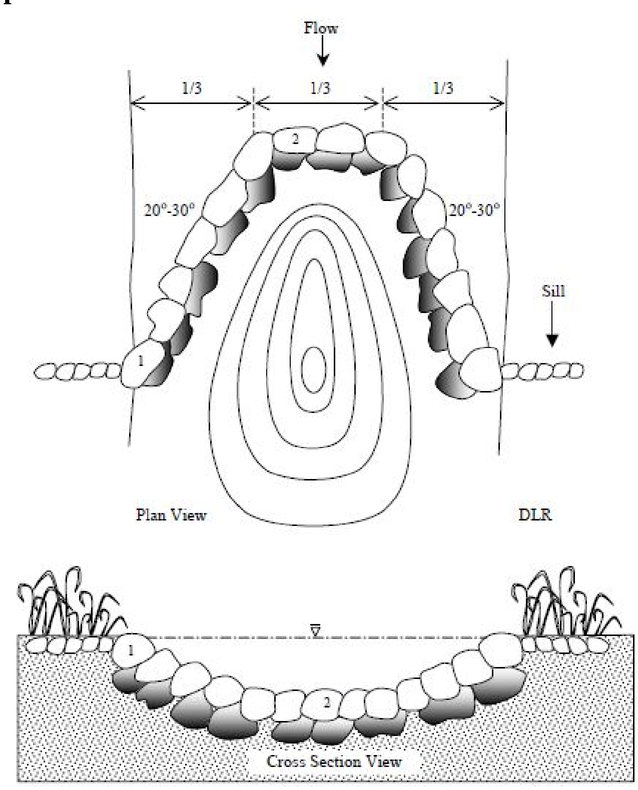
In-stream structures proposed will provide bed and bank grade control in combination with planting. Proposed structures include vanes, j-hooks, and weirs. In general, these structures are used to deflect flow in order to increase stream stability and decrease erosion, as well as enhance fish habitat. Stream stability, as used in the below descriptions, refers to the Rosgen definition (1996): "The ability of a stream, over time, in the present climate, to transport the sediment and flows produced by its watershed in such a manner that the stream maintains its dimension, pattern, and profile without either aggrading or degrading." A description and typical plan and section views for the structures as shown in Table 9. The descriptions below refer to these common structures as shown in the conceptual and feasibility level design drawings in Attachments 2 and 3. Optimized designs that best match the floodplain for long-term stability and ecosystem improvements were used. For example, where a wider and flatter valley is present, a more sinuous stream has been created; whereas, where a narrow and steeper valley is present, a more structured system is proposed (step-pool-system).

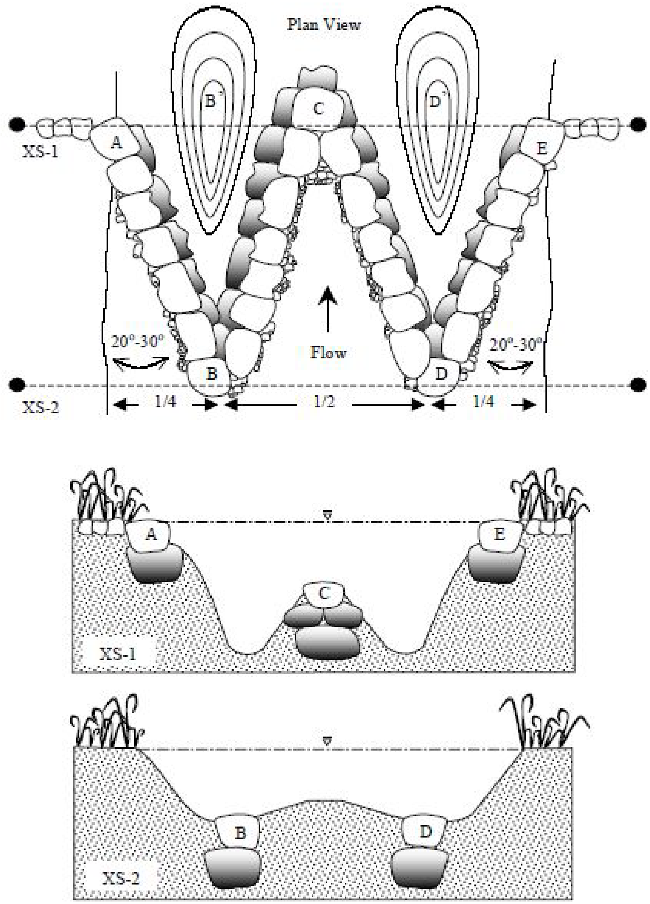
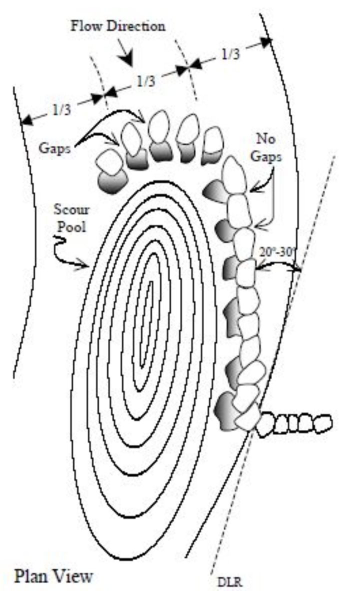
Designs are currently at a feasibility level (35%). As a result, and based on an abbreviated risk analysis which considers project risks and uncertainties (e.g., numbers of structures, quantities of materials, level of analyses, etc.), project costs still include a high level of contingency. These costs and associated assumptions as shown in the Cost Engineering portion of Appendix E. As the project progresses into the preconstruction, engineering, and design phase more detail will be added, including the specific locations of finer features such as woody debris rootwads and logs.

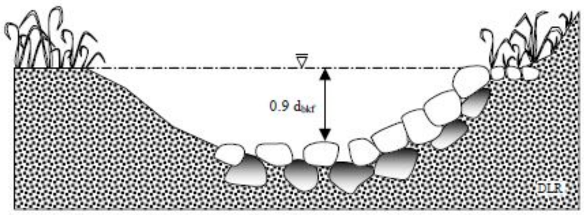
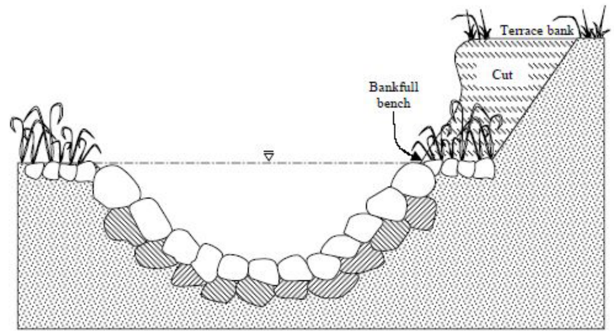
For the development of the conceptual and feasibility level designs, the engineering and environmental teams visually inspected the streams to identify the causes of instability and habitat degradation. The environmental assessment is located in Appendix B. Engineering assessments included visual evaluations of sediment loading, bank erosion, back eddies, velocity vectors, fish passage blockages, and measurement of stream dimensions. Visual geomorphic stream surveys were conducted to identify the stream orientation and relationship with the valley for geomorphic characterization and morphological description (described above in Rosgen Analysis). Velocity vectors for stream flow were evaluated to identify locations of erosion/scour and deposition. Based on this, in-stream structures were placed on designs as necessary to provide geomorphic stability, grade control, facilitate fish passage, and create fish habitat. Generally, for facilitation of fish passage, structures (e.g., nested cross-vanes) are designed to raise the bed gradually and narrow the channel to increase depth such that fish can navigate within a given velocity.

In addition to visual inspection, two models were run to confirm that negative impacts were not induced. HEC-RAS modeling was performed to ensure that there were no changes in the water surface elevation and to prepare 100-year flood maps of existing and proposed conditions. Sediment Impact Assessment Modeling (SIAM) was performed to evaluate sediment transport with the proposed design and to ensure against excessive erosion or aggradation. The modeling methodology and results are provided in Appendix E.

Table 9. Description and illustration of typical natural channel design features (figures from Rosgen, 2001).

Feature Description	Typical Plan and Section View
Cross vanes – rocks placed to guide the flow away from bank, to reduce bank erosion, promote local sedimentation, and encourage vegetation growth. Made up of a set of upstream angled lines of boulders, connected by a section of smaller rocks upstream. While water usually covers the shorter section during normal flows, the taller sections deflect flow away from the banks of the stream. Flow is diverted over the rock walls and concentrated down the center of the channel. The scouring associated with high flow velocities in the center of the channel and the "waterfalling" over the structure itself creates a deep, elongated pool. Cross vanes may also control the grade in meandering and step pool streams.	

W-Weir - similar to a cross-vane in that it maintains the grade of the streambed and provides aquatic habitat. The structure appears as a W formation in the downstream direction, similar to two cross-vanes joined in the center of the channel. The double-cross vane effect produces two thalwegs. The structure provides grade control, stabilizes stream banks, enhances fish habitat, and reduces bridge center pier and foundation scour.	
J-Hooks - an upstream pointing line of rocks (or log) that originates at one bank and terminates somewhere in the middle of the stream. These direct flow to the center of the channel, taking stress off banks, and allowing for re-vegetation. Usually placed just downstream of where the stream flow encounters the streambank at acute angles.	

	 Cross Section View
Benches – For channels that are too wide and carry most of the flood flows within the channel, a flat terrace is created within a channel to reconnect the stream with its floodplain and reduce the stress of high velocity flows within the channel. Vegetation on the floodplain benches will provide stability and catch suspended sediment. Bankfull benches can also be created at bankfull elevation.	

CONCEPT LEVEL DESIGNS (10%)

Indian Creek (Site 1)

Alternative Design 1

In the upper portion of reach (I-95 Box Culvert) a step-pool system will be proposed to reduce the erosive forces of flood waters (clear water scour) and convey the flow through the stream system with proper dimension , pattern and profile. A series of cross vanes and J-hooks are proposed to provide grade control and move the flood flows from the banks to center of channel. Ten structures have been designed to maintain stability from I-95 to Ammendale road. Four structures will be used downstream of the regional pond for stability (monastery area). No work should be performed below monastery since this area is stable and any construction traffic will be more damaging to the ecosystem.

Alternative Design 2

At the upstream reach, about half way between I-95 and Ammendale Road, there is an existing culvert that could be used (pending inspection of pipe condition near Flash Drive) for low-flow passage and a low berm over the pipe would be constructed to block the high flood flows for detention. This area could be transformed into a wetland. Five structures are proposed downstream of the berm to provide stability. The area upstream of Ammendale Road could be excavated to improve aquatic habitat and dissipate flood flows. Five structures are proposed for construction by the old monastery for stability. The three ponds at the end of the project would be combined into one and deepened to improve potential aquatic life and slow down the flood flows into the existing concrete channel. The stream will be reconnected to the floodplain and habitat will be improved. Woody debris and roots have been added to the design to provide habitat diversity.

Northwest Branch (Site 3)

Increased system stability will be provided to enhance habitat for fish and benthic organisms and reduce maintenance at utility crossings. This design includes minimal stream relocation. Appropriately placed armor stone will protect and guide flood flows away from eroded areas. Approximately 22 in-stream structures, including cross vanes, J-hook vanes, and W-weirs, are proposed to maintain grade and provide better connection with the floodplain. Fish passage is inhibited at Ager Road by utilities encased in concrete, forming a concrete sill with a one foot drop. Nested cross-vanes (made up of a set of upstream angled boulders) downstream of the fish blockage will provide fish passage by constricting flow and raising the water surface elevation. These will include a W-weir on Northwest Branch below its confluence with Sligo Creek.

Paint Branch (Site 5)

The stream will remain at its existing location. Twenty-five in-stream structures have been designed to reconnect the stream with its floodplain. A W-weir will be used on the upstream side of the railroad crossing, and a cross vane placed on the downstream side to provide grade control, fish passage and reduce the potential for debris jams.

Paint Branch, I-95 Interchange (Site 7)

Alternative Design 1
Twenty-eight in-stream structures are proposed to restore this site. Three of these structures will be W-weirs at the box culverts to conform to existing sediment deposition and provide fish passage. There will be some minor stream relocations to improve stability and function.

Alternative Design 2
Twenty-nine structures are proposed along existing flow paths to provide bed control, improve conveyance, and reduce debris jams. These improvements will provide fish passage throughout and upstream of the reach.

Sligo Creek (Site 9)

Sligo Creek is a tributary to Northwest Branch. Northwest Branch is very entrenched (U-shape channel) and larger system that carries most of the flood flows in the active channel. Therefore, during flooding events, Northwest Branch acts as a hydraulic dam forcing Sligo to create back eddies at its confluence and become much wider and shallower system. Thirteen in-stream structures are needed to improve geomorphic stability and fish passage, including cross-vanes and j-hooks. A nested cross-vane downstream of the fish blockage will provide fish passage at all flows. The last structure (downstream) is proposed to be a J-hook that leads to a deep pool before Sligo joins the Northwest Branch.

Northwest Branch, Chillum Rd Tributary (Site 10)

Alternative Design 1
It will be necessary to cut into the left or right bank to create a floodplain for this system. Eight in-stream structures are required to provide stability and function. These include a nested cross-vane at the upper end of the reach to provide grade control and create resting areas and habitat for fish. The other structures include a combination of j-hooks and cross-vanes to deflect flow and increase bank stability. During high flow events, backwater effects are created on this tributary, since this reach is just upstream of the Northwest Branch main stem. The main stem acts as a hydraulic dam for the tributary. To provide shelter/resting areas for fish during these high flow events, the stream will be widened and deepened upstream of the confluence.

Alternative Design 2
Three cross vanes will be placed to achieve stability and improve habitat.

Indian Creek, College Park (Site 11)

Upstream Segment

A total of 23 in-stream structures (log/stone) are proposed to provide a functional and stable system. In-stream utilities will be investigated beforehand and protected with structures. The area surrounding outfalls within the stream reach will be configured to mitigate erosive flows and prevent erosion. Originally, there were plans to enhance the braided stream system with the creation of small wetland ponds; however, due to the presence of a rare plant on the floodplain, restoration work will be required to remain within the stream channel. The downstream end of the reach close to Branchville Road (and just north Greenbelt Road/MD 193 - shown on design for Lower Segment) – will be designed to convey flood flows effectively and yet maintain stability. A large pond may be deepened at the downstream end of this reach if possible (this will be determined following plant surveys).

Downstream Segment

A more sinuous system will be achieved by using nine structures in total, seven of these upstream of Berwyn Road and two structures downstream of Berwyn Road to provide fish passage. Increased sinuosity will be achieved by using structures (e.g., j-hooks) to deflect flow from one bank to the other and encourage meandering. The stream will be raised along a short length of stream through the addition of fill materials to provide connectivity with the right floodplain.

Little Paint Branch (Site 12)

Alternative Design 1

Twenty-two structures will be used to stabilize the system at its present location. There will be some lateral shifting of the stream as sewer lines run parallel to the stream.

Alternative Design 2

A more sinuous system with a network of interconnected wetlands will be created on the right floodplain. A pedestrian bridge need to be realigned. Thirty-two structures are required to provide stability. A riffle grade control is proposed under the pedestrian bridge for stability.

Northwest Branch, Riggs Rd (Site 13)

This site is located within the geomorphic transition zone between the steeper Piedmont physiographic province and the flatter, low lying Coastal Plain physiographic province. High-energy flows originate from the steeper region and affect stream stability. Restoration will be designed to manage erosive flows through the alteration of channel dimension, pattern, and profile. Currently the stream is severely incised with steep vertical banks. Restoration of a more stable system will require increasing the channel cross sectional area while raising the bed to improve conveyance, reduce stress and improve habitat diversity. The sinuosity will be reduced, possibly by relocating the stream in a few locations, to increase stability. Forty-eight structures are proposed to meet these objectives. Restoration of this site will reduce sediment load downstream by eliminating bank erosion. Elimination of this source of suspended sediment will not negatively affect downstream stability and will enhance aquatic habitat through decreased turbidity and embeddedness.

Northeast Branch, Calvert Rd Disc Golf Park (Site 15)

This reach was straightened and widened in the 1970s and much of the stream banks were armored with large rip-rap. Most of the suspended and some of bed load that efficiently moves through lower portion of Indian Creek (site 11) is deposited within this reach causing alternating bars (sediment loading). The enlarged width of the stream and excessive sediment that moves through this reach results in sediment deposition and a shallow, wide channel with limited fish habitat. Seventeen structures will provide stability and enable fish passage over the utility crossings at all flows. The tributary that enters the reach at the downstream end will be stabilized to create a diversity of habitat conditions, including providing shelter for fish and creating wetland buffers. Structures will be placed at the bridges to include woody material to improve potential fish habitat.

RECOMMENDED PLAN - FEASIBILITY LEVEL DESIGNS (35%)

The intention of restoration is to design a self-maintaining system that minimizes and reduces continuous bed and bank erosion, and will improve aquatic habitat. The proposed designs provide floodplain benches to reconnect the stream with the floodplain, which will serve to reduce channel stress during higher flows. In-stream structures (Table 9) create narrower and deeper flow paths in the center of channel providing improved fish passage. The designs include riffle-pool system to increase depth and velocity diversity, to improve potential fish habitat, and to eliminate fish barriers where they exist. Nested cross vanes will be constructed around utility crossings (placed on the downstream side of the crossing) to allow fish passage during all seasons. The in-stream structures are placed in a horseshoe formation, with the arms extended toward and tied into the banks. Geotextile is used on the upstream of the structures behind the arms to minimize piping action during higher flow events. Structures are designed to accumulate varying sediment sizes where needed in order to meet project benefits for aquatic habitat.

The feasibility level design drawings are included in Appendix E. For spatial reference, Figure 4 provides an index of the design drawing sheets, which are referred to (in parentheses) in the descriptions below.

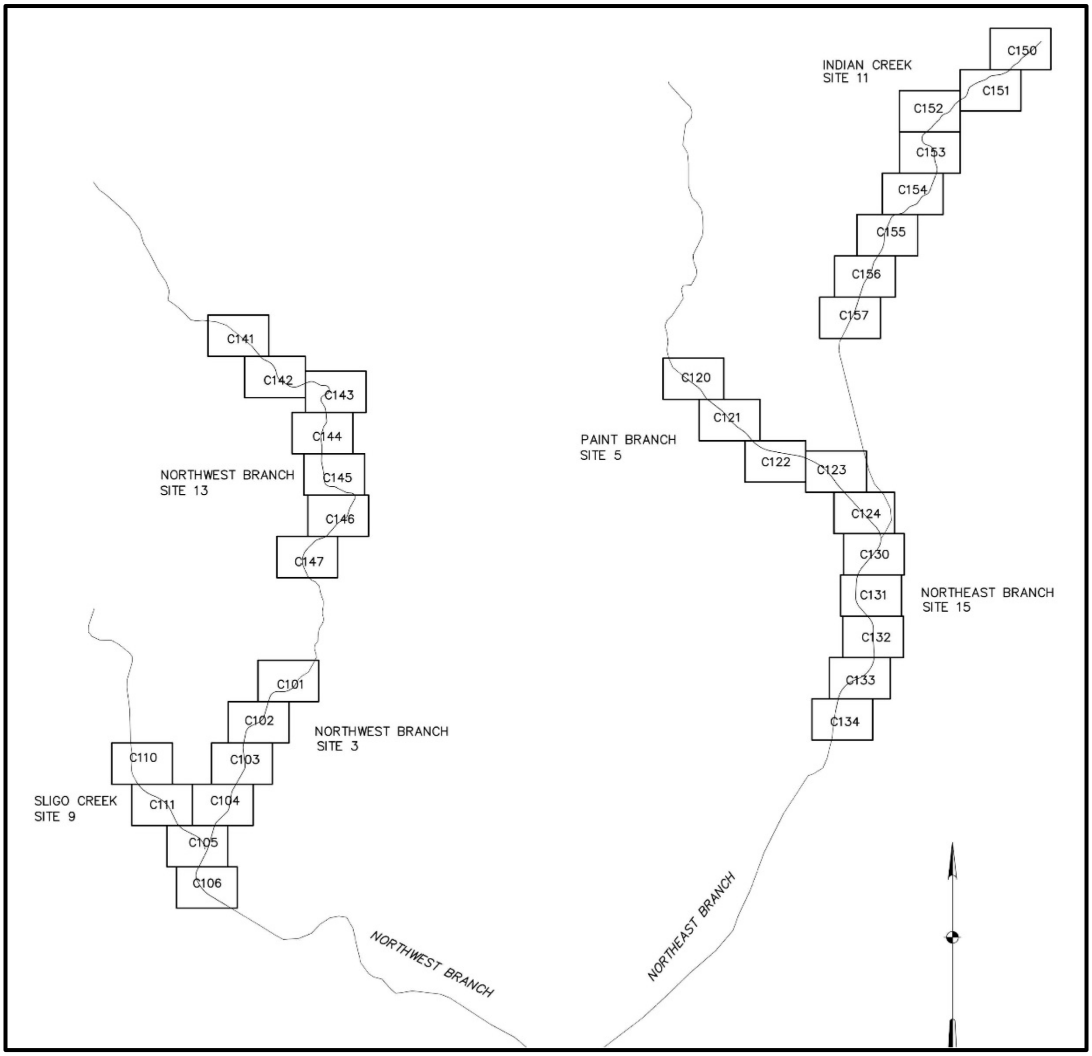


Figure 4. Sheet index and spatial reference for feasibility design descriptions.

Northwest Branch (Site 3)

The reach starts upstream of East-West Highway, (MD Route 410), and has a total restoration length of 1.25 miles (6,600 feet). Based on the existing stream valley, a C4 channel (gravel bed stream with moderate sinuosity) is proposed. At the upstream end (C-101), the channel has been shifted slightly to the right to make room for floodplain benches, thereby reconnecting the stream with the floodplain. This also provides better conveyance, stability, diversity and reduced channel stress.

Twenty-one in-stream structures are proposed to provide bed and bank stability, maintain grade control, and reduce bank and bed erosion. These structures direct and dissipate high flow velocities into the center of channel. The structures maintain a low-gradient riffle pool system that provides for fish passage and long-term stability for low and high flows. Woody debris will be included in the design at a higher level of design to improve potential aquatic habitat.

Downstream of East West Highway, a portion of the stream will be shifted to the left (C-102) and the pedestrian bridge located between East-West Highway and Ager Road will be relocated. The existing pedestrian bridge is skewed to the flow, constricting the hydraulic opening and causing a bottleneck and back eddies, which leads to lateral erosion. The relocation of the pedestrian bridge perpendicular to the flow will provide a better transition for flow under the Ager Road bridge. A fish blockage caused by utilities encased in concrete is present under the Ager Road bridge. This blockage will be ameliorated by the placement of a cross-vane downstream of the Ager Road bridge, which will raise the streambed behind the structure to eliminate the drop at the encased concrete (C-103).

Sligo Creek (Site 9)

Given the slightly steeper slope of this reach, the proposed stream restoration for Sligo Creek is to create a Bc stream channel. The total restoration length of this reach is 0.47 miles (2,500 feet). Six in-stream structures are proposed to direct flow and improve stability. The furthest upstream structure close to the baseball fields (C-110 and C-111) is a modified J-hook (just downstream of an existing RGC) that will redirect the velocity vectors away from the eroding embankment on the right. Downstream of this is an existing failed cross vane constructed by WSSC (C-111). The permit for this construction (Washington Suburban Sanitary Commission/Consent Decree Project, Permit Number CENAB-OP-RMS 2011-61493) requires repair of the failed structure. It is anticipated that these repairs will occur prior to implementation of the restoration proposed by this project. Slightly downstream of the failed structure, two cross vanes are proposed to provide grade control and create a series of pools for fish resting and refuge.

Further downstream (C-105), closer to the Sligo confluence with Northwest Branch, two cross vanes are proposed. One cross vane will be placed downstream of the sheet pile that creates a fish blockage on Sligo Creek. This cross vane will ameliorate the fish blockage by raising the streambed behind the structure. This will also add stability to the system. In this vicinity, the stream is wide and shallow, causing difficulty for fish passage. The proposed structures will provide pools to improve potential fish habitat and enhance passage. Additionally, throughout the reach, within the existing stream envelope, benches will be constructed to relieve stress within the main channel.

Northwest Branch (Site 13)

A C4/E4 channel is proposed here due to the natural sinuosity created by the Piedmont-Coastal Plain physiographic province transition. This will reconnect the stream with its floodplain, utilizing a total of 32 in-stream structures for the restoration of this entrenched stream system. The total restoration length of this reach is 1.53 miles (8,100 feet). The restoration starts just upstream of the power line crossing. At the power line crossing (C-142), floodplain benches will be created on both sides of the stream, a tight meander bend will be softened (i.e. sinuosity will be reduced), and a pedestrian bridge will be relocated to reduce erosion and tree uprooting. Downstream of the power line crossing, a very tight meander will be replaced with a new more stable channel, with several cross vanes to increase stability, connectivity with the floodplain, and create a riffle-pool system for habitat complexity. Further downstream (C-143), cross vanes and J-hooks are proposed to maintain a moderately tight meander bend.

Two cross-vanes, one upstream and one downstream of the Maryland Route 193 bridge are proposed to improve conveyance and provide stability during high and low flooding events (C-144). Extensive streambank plantings (willow cuttings) will improve aquatic habitat (i.e. root mass will provide stability and shelter for juvenile fish) in a segment of the stream that has an existing blanket of rip-rap on the bed and bank (C-145). Rip-rap will be not be removed here because it protects existing utilities and contains mature trees.

The lower portion of the project, downstream of an unnamed tributary, will be reconnected with the floodplain by constructing benches within the existing stream envelope and installing in-stream structures (cross vanes and J-hooks), modifying the stream cross section, and raising the stream bed (C-147). This will also provide stability and improve connectivity.

Paint Branch (Site 5)

Eighteen in-stream structures are proposed for to this system to create a functional C4 channel. The total restoration length of this reach is 1.19 miles (6,300 feet). Much of the purpose of these structures is to restore the aquatic habitat complexity that was lost when USACE straightened and channelized this reach for flood risk management purposes in the 1970s. At the furthest upstream portion of the reach, a cross-vane is proposed to maintain grade outside the existing Maryland Route 1 bridge right-of-way (C-120). This will increase the sinuosity of the stream and will add diversity of depth and velocity to the system while moving the stream away from the WSSC assets (sewer lines) located within the right bank. Several structures including cross vanes and J-hooks will improve stability (C-120 to C-122). Woody debris is proposed along this reach to improve potential aquatic habitat and enhance the aesthetics of the system to better blend in with the park setting.

A W-weir is proposed downstream of the railroad bridges (C-122) because the channel is so wide in this location and the flow is divided by a sediment bar. The W-weir will carry the base flow on one side and will become active on both sides during high flow. The weir will provide stability, as the bridge opening is twice as wide as the stream in this area. As the stream, gets closer to southeast end of Lake Artemesia the stream will be shifted away from the lake using J-hook with a cut-off sill to create a wide floodplain bench, which will prevent lateral erosion toward the lake and reconnect the stream with the floodplain (C-123).

A pedestrian bridge exists south of Lake Artemesia (bottom of C-123). Just upstream of the pedestrian bridge the stream is eroding into the right embankment behind the right bridge abutment. Dimension, pattern, and profile adjustment is necessary to eliminate the accumulation of sediment upstream of the bridge. The stream will be adjusted here using a cross-vane to direct the flow to the center of the channel and away from the banks. Sediment will be cut from the large sediment bar. The existing notched sheet pile structure downstream of the bridge will be removed (C-124). The downstream end of the reach is at the Paint Branch-Indian Creek confluence (C-130), where the Northwest Branch is formed (this is the upstream end of Northeast Branch).

Northeast Branch (Site 15)

Site 15 begins at the confluence of Paint Branch and Indian Creek to form Northeast Branch (C-130), with a total restoration length of 0.89 miles (4,700 ft). The upper portion of the reach, north of Calvert Road was impacted by the USACE flood risk management project, which widened and deepened the channel. As a result of the overwidened channel, sediment bars have formed. Just downstream of the Paint Branch and the Indian Creek confluence (C-130) a W-weir will be installed at the location of a large sediment bar (and utility crossings protected by gabion baskets). This will increase habitat depth and diversity by creating a deep pool. The W-weir will carry the base flow on the right side of the weir, but during high flow events, the left side will become active.

Downstream of the weir, eight in-stream structures (five cross-vanes and three J-hooks) will provide grade control and direct the flow to the center of the stream for stabilization of the stream banks (C-130 to C-134). Existing gabion baskets within the stream at Campus Drive will be covered with sediment after the construction of a cross vane downstream of campus drive (C-131). The proposed structures, combined with the addition of tree logs, will enhance aquatic habitat and diversity in depth and velocities for a functional system. Additionally, floodplain benches along the stream at several locations, including at the inside of the meander bend across the stream from the MNCPPC office, north of River Road (C-133), will reconnect the stream with the flood plain. At the meander bend north of River Road, a series of small pools will be excavated on the floodplain. This area will be planted with native wetland vegetation. A cross vane placed downstream of the River Road bridge will enhance fish passage through the notched sheet pile under the River Road bridge (C-134). The reach ends just south of River Road.

Indian Creek (Site 11)

The total restoration length of this reach is 1.74 miles (9,200 ft). At the upstream (north) end of the reach, Indian Creek is channeled through culverts under three bridges for I-95/I-495 and Greenbelt Metro Drive (C-150). A nested cross-vane is proposed downstream of these culverts to provide grade control and to dissipate the high-energy flows through the culvert in a deep pool created by the cross vane. A higher width/depth ratio with a combination of alternating tree logs is proposed to provide for a calmer system and enhance potential fish habitat (C-150). The proposed design north of Cherrywood Court is limited by the presence of a rare plant in low-energy braided channels on the floodplain. Accordingly, the design here is largely confined to the main channel and has been discussed with MDDNR. Only a few structures are proposed in this area (C-151 to C-153) to maintain the natural characteristic of the stream and floodplain. Along and within the main channel, floodplain plantings with a combination of minor grading will provide additional shade and stability.

South of Cherrywood Court, as the stream gets closer to development, a single and wider channel is proposed to replace the braided system for a more controlled transition into the constrained environment. More in-stream structures, including cross-vanes and J-hooks, are proposed downstream (C-154 to C-157) on to maintain stability and keep higher velocities within the channel. At the north end of a concrete plant (C-154), an existing pond (C-153) to contain stormwater outflow will be modified (deepened with invasive species removed) to improve habitat. Upstream of Greenbelt Road, adjacent to the concrete plant, a confined concrete channel exists, which will be removed (C-155). Downstream of the Branchville Road and Greenbelt Road culverts, a nested cross-vane is proposed downstream of an existing riffle grade control (C-155 and C-156). The cross-vane will have a longer left arm to direct the flow to the right, away from the eroded embankment. The design proposes a minor shift of the stream to the right to create a floodplain bench with plantings on the left side, which will increase stability and improve conveyance through the Berwyn Road single span bridge (C-157). Two nested cross-vane are proposed downstream of the Berwyn Road bridge to improve fish passage and bed stability. The structures will reduce scour at the Berwyn Road bridge. This portion of the reach (from Greenbelt Road down to the confluence with Paint Branch) was preciously channelized by USACE. The proposed design will decrease erosion; thereby, reducing the downstream sediment load and improving the quality of fish habitat.

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E-3: HEC-RAS Model Appendix & Attachment

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Hydrology and Hydraulic Modeling Report - HECRAS
Anacostia Watershed Restoration, Prince George's County, MD

Table of Contents

INTRODUCTION

As part of the Anacostia Watershed Restoration, Prince George's County Feasibility Study for aquatic habitat restoration, hydraulic and sediment analyses were performed for the preparation of feasibility level design plans. The purpose of the modeling is to ensure that water surface elevations are not negatively impacted (i.e. flooding is not induced) and to evaluate sediment transport within the reaches in the recommended plan. This appendix presents the hydraulic analyses, including the HEC-RAS models run to support the development of the feasibility level designs. Brief descriptions of the site existing conditions, hydrology, hydraulics, sediment transport, and design approach are presented below. All HEC-RAS model outputs, water surface profiles, and cross-section locations can be found in the Attachment to this appendix. The water surface profile was modelled for five scenarios: existing conditions, proposed conditions, design flood, and future flows with and without project conditions.

Mapping
GIS shapefiles, including two-foot contours, bridges, buildings, and streets were provided by Prince George's County in 2014 and 2015. Topographic data, which were produced in 2009, was provided in two formats: a digital elevation model (DEM) and 2-foot contour GIS shapefile. It has been determined that the above topographic data paired with field data gathered by the Hydraulics and Hydrology Section was adequate for designs. Therefore, no additional survey data were collected.

Horizontal control: Maryland State Plane, NAD83.
Vertical control: NAVD88

Aerial Imagery
High resolution aerial imagery used is Esri's World Imagery base map.

HEC-RAS
In order to provide a geo-referenced, updated hydraulic model for the purposes of this study, a new HEC-RAS model was created for the study area. HEC-RAS, Version 5.0 was used to calculate water surface elevations for this investigation. The HEC-GeoRAS pre- and post-processor utilities were utilized to assist in the development of input data and the creation of floodplain mapping.

The existing channel geometry was partially updated based on the HEC 2 model performed by Greenhorne and O'Mara, Inc in 1993 for the Anacostia River Watershed Study. The proposed conditions were modeled using the design profile and typical cross-sections. Two-foot GIS contours were also used to extend cross-sections on overbank areas. The existing channel geometry was updated based on 2-foot field run topography. The proposed conditions geometry were modeled using the proposed profile and typical cross-sections within the limits of construction foot-print and limit of disturbance.

HEC-RAS MODELING

SITE 3, NORTHWEST BRANCH

Improvements to Northwest Branch were included in the "Anacostia River Local Flood Protection Project", constructed between 1973 and 1974. Northwest Branch was widened to 70-feet upstream of Queens Chapel Road, and 80-feet downstream. The improved channel capacity was 5000 cfs, and 8000 cfs.

Hydrology and Hydraulics
Flows from the 1993 Anacostia River Watershed Study performed by Greenhorne and O'Mara, Inc. have been utilized to conduct this hydraulics analysis. The present study included the 1.5, 2, 10, and 100-year peak discharges for the study reach for both the existing and proposed use conditions. The HEC-2 model computed for the Anacostia River Watershed Study (1993) was used for specifying the starting water surface elevations at the downstream boundary. The existing conditions peak flows used for this study are shown in Table 1. The same discharges were used for the existing and proposed conditions.

Table 1. Discharge recurrence interval for Site 3, Northwest Branch.

Drainage Area (sq. mi)	Recurrence Interval (years) Discharge (cfs) - Existing and Proposed Conditions			
	1.5	2	10	100
34.95	2139	3138	7025	12941
46.58	3384	5164	10106	18931

Previous Hydraulic Studies

The most current hydraulic model for the study area is the HEC-2 model completed by Greenhorne and O'Mara, Inc in 1993 for the Anacostia River Watershed Study, and was converted to HEC-RAS in the March 2008 study. This conversion was executed with minimal modifications to input data, which resulted in a model without spatial reference.

Existing Conditions Hydraulic Analysis

The geo-referenced HEC-RAS model contains 38 (thirty-eight) cross-sections that have river stations generated from the HEC-GeoRAS program. The station identifier is the stream distance in feet just downstream of the confluence with Tributary 3 to Northwest Branch.

A total of three bridges were included in the HEC-RAS model (Table 2). For East-West Highway, and Ager Road, bridge geometry data was taken from the Prince George's County HEC-2/ HEC-RAS models, with slight modifications. These modifications included the modeling of the piers and contraction/expansion coefficients at bounding cross-sections. In the Prince George's County HEC-2 model, the piers were modeled as a component of the bridge deck. The piers in the present HEC-RAS model were modeled as piers. The momentum was chosen for the low flow bridge modeling approach, using the appropriate pier coefficients. In the Prince George's County HEC-2 model, expansion and contraction coefficients were set at 0.1 and 0.3, respectively, at the cross-sections bounding the bridges. These were set to the standard FEMA approved values of 0.3 and 0.5.

For the footbridge between Ager Road and East-West Highway, which was not included in the Prince George's County HEC-2 model, a general field survey was previously conducted in February 2010 by USACE to obtain required measurements. Elevations for the footbridge were selected from the County topographical data. Because minimal contraction and expansion occur at this crossing, the values were left at the standard 0.1 and 0.3, respectively, at the bounding cross-sections.

Table 2: Existing Conditions Bridges

Existing Conditions HEC-RAS Model Bridge	Name	Prince George's County HEC-2/ HEC-RAS Station
6828	East-West Highway	528.0
5752	Footbridge	*
4836	Ager Road	523.0

Channel roughness values (Manning's "n") from the Prince George's County HEC-2/HEC-RAS cross-sections were maintained for the current model. Overbank "n" values were estimated based upon engineering judgment, field observations, and the Prince George's County HEC-2 model. Channel "n" values ranged from 0.035 to 0.040, and over bank values ranged from 0.025 to 0.12. The low value of 0.025 was used for pavement where effective flood flow would occur. The high value of 0.12 was used for the residential areas where multiple obstructions would occur due to buildings impeding flood flow. Wooded areas were typically assigned a value of 0.08 or 0.10, and open grassy or bushy areas were assigned a value between 0.03 and 0.065. Ineffective flow areas were set appropriately at bridges, and other areas after analyzing the flood mapping generated in HEC-RAS Mapper. For the heavy residential areas in the overbanks, flow was kept as effective in the model, as the high “n” value of 0.12 accounted for the reduction in conveyance. Some obstructions in the model represent single buildings. Capture of the flood map for existing conditions is displayed in the Attachment to this report.

Proposed Conditions Hydraulic Analysis

The prepared concept design drawings were used to obtain the proposed stream centerline, in-stream structures, limit of disturbance (LOD), and the primary riparian restoration features for the hydraulic modelling. The proposed-conditions plan represents stream restoration project conditions that were analyzed in the present study. The geo-referenced HEC-RAS model contains 38 (thirty-eight) cross-sections, that have river stations generated from the HEC-GeoRAS program. Intermediate cross sections were placed where appropriate to account for the channel restoration segments of the reach. The station identifier is the stream distance in feet just downstream of the confluence with Tributary 3 to Northwest Branch.

The alignment for Site 3 design alternative was imported in the HEC-RAS model for the proposed conditions, and has been modified between stations 6931 and 2714, and between stations 1364 and 142. The East-West Highway Bridge and Ager Road bridge geometry is similar to the existing conditions, and therefore no change has been made to the two bridges (Table 3). However, the footbridge location was changed for this particular plan, and the bridge is planned for relocation approximately 200 feet downstream of its current site. Adjustments to the channel invert and banks elevations of the bridge cross-sections have been made according to the stream restoration design.

Table 3. Proposed Conditions - Bridges.

Proposed Conditions HEC-RAS Model Bridge	Name	Prince George’s County HEC-2/ HEC-RAS Station
6674	East-West Highway	528.0
5510	Footbridge	*
4773	Ager Road	523.0

Overbank values, ineffective flow areas, and obstructions were consistent with the existing conditions model. However, the channel and banks “n” Manning`s coefficients were set to 0.03 for the main channel, and ranged 0.065-0.1 for banks, due to modifications in the channel, future planting and potential added roughness in the channel invert due to channel restoration open channel work. Capture of the flood map for Proposed Conditions is displayed in the HEC-RAS Attachment.

Design Flood Hydraulic Analysis

The existing Flood Risk Management project was designed based on a flood of 8,000 cfs for the reaches upstream of the existing protective works. The drainage area is 49.1 sq. mi.

The design flood for the protective works was adopted from the Detailed Project Report for Local Flood Protection Project, dated April 1968. The design flood plan utilized the geometric file used for the Existing Conditions plan, and the results of the water surface elevations for the design flood are included in the Attachment, as are capture of the flood map for Design Flood conditions. The current analysis determined that the 100-year water surface profile for the stream restoration is lower than the profile for the original flood protection design.

Future Flows With and Without Project Hydraulic Analysis

Due to an expected increasing trend in precipitation, and consequently in riverine streamflows in the Mid-Atlantic region over the next 40 years, and based on the identification and detection of climate trends in recent historical records, a conservative value of 10% was added to the existing peak flows listed in Table 1. The Future Flows Without Project Conditions analysis utilized the same geometric file used for the Existing Conditions and water surface elevations are included in the Attachment.

Comparison of Results

Attachment 1 shows the water surface elevations for the design flood, future flows with and without project condition, existing conditions, and proposed conditions.

The condition of the Anacostia River and Tributaries Prince George County flood control project that is comprised in the geometric file of the Existing Condition hydraulic analysis is investigated by comparing water surface elevations of the cross sections of HEC-RAS Stations 142 through 1403.

For the 100-year storm event the water surface elevation (WSEL) for most cross sections decreased within a half a foot range in the upper portion of the model. For the most part, the 2-year WSEL is above the top of the channel banks. The average channel velocities for existing and proposed conditions range from 2.8 to 11.74 ft/sec. and from 3.0 to 13 ft/sec. for the 2 and 10-year storms, respectively.

Cross sections located at the lower reach, downstream of Ager Road, and at the location of the historic Flood Risk Management project, exhibited a drop in water surface elevation for the proposed conditions during a 100-year storm. Also, a slight increase in energy slope for the proposed conditions was noted at the top of the restoration reach where the existing conditions meet the proposed. Here, the decreases in proposed cross sectional area have resulted in a minimal higher energy slope elevations and but decreased shear stress in the channel.

The Site 3 Design Flood is based on 8,000 cfs as obtained from the Detailed Project Report dated April 1968, which is fully contained in the channel. The proposed condition flow is based on 12,940 cfs. The flow rate change can be attributed to the increased frequency due to the occurrence of additional significant events since 1968; the increase in flood record length and the urbanization within the basin. The higher flow of 12,940 cfs remains within the channel but with decreased freeboard.

SITE 9, SLIGO CREEK

Flows from the 1993 Anacostia River Watershed Study performed by Greenhorne and O'Mara, Inc. for Sligo Creek have been utilized to conduct this hydraulics analysis. The same flows are listed in the most recent FEMA Flood Insurance Study for Prince George`s County, Maryland (2016). The HEC-2 model computed for the Anacostia River Watershed Study (1993) was used for specifying the starting water surface elevations at the downstream boundary. This study included the 10, 50, 100, and 500-year peak discharges for the study reach for both the existing and project use conditions. The peak flows used in this hydraulic analysis are shown in Table 4.

Table 4. Discharge recurrence interval for Site 9 Sligo Creek.

Drainage Area (sq. mi)	**Discharge (cfs) Existing and Proposed Conditions**			
Recurrence Interval (years)	10	50	100	500
11.4	4380	7130	8540	10800

<u>Previous Hydraulic Studies</u>

The most current hydraulic model for the study area is the HEC-2 model completed by Greenhorne and O'Mara, Inc in 1993 for the Anacostia River Watershed Study, and was converted to HEC-RAS in the March 2008 study. This conversion was executed with minimal modifications to input data, which resulted in a model without spatial reference.

<u>Existing Conditions Hydraulic Analysis</u>

The geo-referenced HEC-RAS model contains 25 (twenty-five) cross-sections that have river stations generated from the HEC-GeoRAS program. The station identifier is the stream distance in feet just upstream of the confluence with Northwest Branch. There are no bridges that were included in the HEC-RAS model.

Channel roughness values (Manning's "n") from the Prince George's County HEC-2/HEC-RAS cross-sections were maintained for the current model. Overbank "n" values were estimated based upon engineering judgment, field observations, and the Prince George's County HEC-2 model. Channel "n" values ranged from 0.035 to 0.045, and over bank values ranged from 0.025 to 0.12. The high value of 0.12 was used for the residential areas where multiple obstructions would occur due to buildings impeding flood flow. Wooded areas were typically assigned a value of 0.08 or 0.10, and open grassy areas were assigned a value of 0.04 or 0.065. For the heavy residential areas in the overbanks, flow was kept as effective in the model, as the high "n" value of 0.12 accounted for the reduction in conveyance. Obstructions in the model represent buildings. Ineffective flow areas were set appropriately after analyzing the flood mapping generated in HEC-RAS Mapper.

<u>Proposed Conditions Hydraulic Analysis</u>

The proposed-conditions plan represents stream restoration project conditions that were analyzed in this study. The prepared concept design drawings were used to obtain the proposed stream centerline, in-stream structures, limit of disturbance (LOD), and the primary riparian restoration features for the hydraulic modeling.

The geo-referenced HEC-RAS model contains 25 (twenty-five) cross-sections, that have river stations generated from the HEC-GeoRAS program. The proposed conditions geometrics was consistent with the existing conditions analysis. The alignment for Site 9 design alternative was imported in the HEC-RAS model for the proposed conditions, and each cross section between stations 552 and 2484 was adjusted per design requirements within the limit of disturbance area.

Overbank values, ineffective flow areas, and obstructions were consistent with the existing conditions model. However, the channel and banks “n” Manning`s coefficients were set to 0.035 for the channel, and ranged 0.065-0.1 for banks, due to modifications in the channel, future planting and potential added roughness in the channel invert due to channel restoration open channel work.

Design Flood Hydraulic Analysis

The design flood is 7,200 cfs for the stream drainage area of 11.4 sq.mi at its mouth. The design flood was adopted from the Detailed Project Report for Local Flood Protection Project, dated April 1968. The design flood plan utilized the geometric file used for the Existing Conditions, and the results of the water surface elevations for the design flood are included in the Attachment.

Future Flows With and Without Project Hydraulic Analysis

Due to an expected increasing trend in precipitations, and consequently in riverine stream flows in the Mid-Atlantic region over the next 40 years, based on the identification and detection of climate trends in recent historical records, a conservative increase value of 10% was added to the existing peak flows listed in Table 4. The Existing Future Without Action analysis utilized the geometric file used for the Existing Conditions, and the results of the water surface elevations for the design flood are included in the Attachment.

Comparison of Results

For the 100-year storm event the water surface elevation (WSEL) in the design channel for the proposed conditions decreased within negligible values. For the most part, the 10-year WSEL is above the top of the channel banks. The average channel velocities for existing and proposed conditions range from 3.52 ft/sec. and 10 ft/sec. for 10-year storm.

SITE 13, NORTHWEST BRANCH

Flows from the 1993 Anacostia River Watershed Study performed by Greenhorne and O’Mara, Inc. have been utilized to conduct this hydraulics analysis. The HEC-2 model computed for the Anacostia River Watershed Study (1993) was used for specifying the starting water surface elevations at the downstream boundary. The present study included the 1.5, 2, 10, and 100-year peak discharges for the study reach for both the existing and proposed use conditions. The existing conditions peak flows used for this study are shown in Table 5.

Table 5. Discharge recurrence interval for Site 13 Northwest Branch.

Drainage Area (sq. mi)	**Discharge (cfs) Existing and Proposed Conditions**			
Recurrence Interval (years)	1.5	2	10	100
35.3	2139	3270	8105	14008

Previous Hydraulic Studies

The most current hydraulic model for the study area is the HEC-2 model completed by Greenhorne and O'Mara, Inc in 1993 for the Anacostia River Watershed Study, and was converted to HEC-RAS in the March 2008 study. This conversion was executed with minimal modifications to input data, which resulted in a model without spatial reference. Century Engineering performed an H&H analysis in 2013 based on the results of the initial HEC-2 study, and compared results of the proposed project conditions with the existing conditions at Site 13. Small to negligible increase in water surface elevation for the 100 year profiles, existing and proposed project conditions, have been determined in the 2013 study.

Existing Conditions Hydraulic Analysis

The existing-conditions plan represents existing-field conditions at the time of this study. The geo-referenced HEC-RAS model contains 46 (forty-six) cross-sections that have river stations generated from the HEC-GeoRAS program upstream and downstream of University Boulevard. There are a total of four bridges that were included in the HEC-RAS model (all scenarios) (Table 6). For the University Boulevard Bridge the bridge geometry data was taken from the Prince George's County HEC-2/ HEC-RAS models, with slight modifications. These modifications included the modeling of the piers and contraction/expansion coefficients at bounding cross-sections. In the Prince George's County HEC-2 model, the piers were modeled as a component of the bridge deck. The piers in the present HEC-RAS model were modeled as piers. The momentum was chosen for the low flow bridge modeling approach, using the appropriate pier coefficients. In the Prince George's County HEC-2 model, expansion and contraction coefficients were set at 0.1 and 0.3, respectively, at the cross-sections bounding the bridges. These were set to the standard FEMA approved values of 0.3 and 0.5.

For the footbridges between Ager Road and East-West Highway, which were not included in the Prince George's County HEC-2 model, a general field survey was conducted in February 2017 by USACE to obtain required measurements. Elevations for the footbridge were selected from the County topographical data. Because minimal contraction and expansion occur at this crossing, the values were left at the standard 0.1 and 0.3, respectively, at the bounding cross-sections.

Table 6. Existing Conditions Bridge Stations.

Existing Conditions HEC-RAS Model Bridge	Name	Prince George's County HEC-2/ HEC-RAS Station
5429	University Boulevard	538.0
4599	Footbridge	*
4520	Footbridge	*
3694	Footbridge	*

Channel roughness values (Manning's "n") from the Prince George's County HEC-2/HEC-RAS cross-sections were maintained for the current model. Overbank "n" values were estimated based upon engineering judgment, field observations, and the Prince George's County HEC-2 model. Channel "n" values ranged from 0.035 to 0.05, and over bank values ranged from 0.025 to 0.12. The low value of 0.025 was used for pavement where effective flood flow would occur. The high value of 0.12 was used for the residential areas where multiple obstructions would occur due to buildings impeding flood flow. Wooded areas were typically assigned a value of 0.08 or 0.10, and open grassy areas were assigned a value of 0.04 or 0.065. Ineffective flow areas were set appropriately at bridges, and other areas after analyzing the flood mapping generated in HEC-RAS Mapper. For the heavy residential areas in the overbanks, flow was kept as effective in the model, as the high "n" value of 0.12 accounted for the reduction in conveyance. Some obstructions in the model represent single buildings. Captures of the flood map for Existing conditions is displayed in Site 13, Figure 1 in Attachment 1.

Proposed Conditions Hydraulic Analysis

The proposed-conditions plan represents stream restoration project conditions that were analyzed in the present study. The geo-referenced HEC-RAS model contains 46 (forty-six) cross-sections that have river stations generated from the HEC-GeoRAS program. The alignment for Site 13 design alternative was imported in the HEC-RAS model for the proposed conditions, and has been modified between stations 8699 through 4656, stations 3412 through 2371, and stations 1875 through 1338. Adjustments to the channel invert and banks elevations of the bridge cross-sections have been made according to the stream restoration design.

Table 7. Proposed Project Conditions Bridge Stations.

Proposed Conditions HEC-RAS Model Bridge	Name	Prince George's County HEC-2/ HEC-RAS Station
5392	University Boulevard	538.0
4463	Footbridge	*
4383	Footbridge	*
3552	Footbridge	*

Overbank values, ineffective flow areas, and obstructions were consistent with the existing conditions model. However, the channel and banks "n" Manning`s coefficients were set to

0.035 for the channel, and ranged 0.065-0.1 for banks, due to modifications in the channel, future planting and potential added roughness in the channel invert due to channel restoration open channel work.

Design Flood Hydraulic Analysis

The design flood is 6,700 cfs for the drainage area of 35.3 sq. mi, at a location upstream of the confluence with Sligo Creek. The design flood was adopted from the Detailed Project Report for Local Flood Protection Project, dated April 1968. The design flood plan utilized the geometric file used for the Existing Conditions plan, and the results of the water surface elevations for the design flood are included in the Attachment.

Future Flows With and Without Project Hydraulic Analysis

Due to expected increasing trend in precipitations, and consequently in riverine stream flows in the Mid-Atlantic region over the next 40 years, and based on the identification and detection of climate trends in recent historical records, a conservative value of 10% was added to the existing peak flows listed in Table 5. The Existing Future Without Action analysis utilized the geometric file used for the Existing Conditions, and the results of the water surface elevations for the design flood are included in Attachment.

Comparison of Results

For the 100-year storm event the water surface elevation (WSEL) for most cross sections decreased less than a half foot in the upstream portion of the model. For the most part, the 2-year WSEL is above the top of the channel banks. However, few cross sections located at the lower reach, and downstream of the University Boulevard bridge are exhibiting minimal rise in water surface elevations for the proposed conditions during the 100-year storm, as a result of an increase in the energy slope at the top of the restoration reach. At the majority of the cross sections, changes in water surface elevation for the 100-year flood are exhibiting a decrease for the proposed conditions. The average channel velocities for existing and proposed conditions range from 3.72 to 9.46 ft/sec. and from 2.85 to 11.19 ft/sec. for the 2 and 10-year storms, respectively.

SITE 5, PAINT BRANCH

Improvements to Northeast Branch were included in the “Anacostia River Local Flood Protection Project”, authorized in 1950, and constructed between 1973 and 1974. The proposed improvement along the Paint Branch consists of an improved channel and varied amounts of overbank clearing. The improvement starts 540 feet upstream from the Calvert Road bridge, at the upstream limits of the 50 feet improved Northeast Branch in a trapezoidal channel of a 50 foot bottom width and 1 vertical on 3 horizontal side slope. The improvement continues upstream along Paint Branch for 2,540 feet to the start of a channel transition which widens to 135 feet under the Railroad Bridge. Upstream of the railroad bridge, the Paint Branch has been realigned in a new channel for its entire length to Baltimore Avenue, the upstream limits of the improvement. The improved Paint Branch channel capacity is 3,000 cfs downstream from the railroad bridge, and 2,500 cfs in the upper reach of the project. The design discharge for a drainage area of 31 square miles was considered 6,700 cfs.

Hydrology and Hydraulics:

Flows from FEMA Flood Insurance Study for Prince George`s County, effective September 2016, have been utilized to conduct this hydraulics analysis. This study included the 10-, 50-, 100-, and 500-year peak discharges for the study reach for both the existing use conditions. The existing conditions peak flows used for this study are shown in Table 8. Steady flow downstream boundary condition was based on the Normal Depth and energy slope assumptions.

Table 8. Discharge recurrence interval for Site 5 Paint Branch.

Drainage Area (sq. mi)	**Discharge (cfs) Existing and Proposed Conditions**			
Recurrence Interval (years)	**10**	**50**	**100**	**500**
17.31	4400	8100	11200	14500
31.10	12019	15377	17566	22500

Previous Hydraulic Studies

The most current hydraulic model for the study area is the HEC-2 model completed by Greenhorne and O'Mara, Inc in 1993 for the Anacostia River Watershed Study, and was converted to HEC-RAS in the March 2008 study. This conversion was executed with minimal modifications to input data, which resulted in a model without spatial reference.

Existing Conditions Hydraulic Analysis

The geo-referenced HEC-RAS model contains 43 (fourty-three) cross-sections that have river stations generated from the HEC-GeoRAS program. The station identifier is the stream distance in feet just upstream of the confluence with Northeast Branch. There are a total of three bridges that were included in the HEC-RAS model (Table 9). For the Railroad Bridge, all opening data and elevation data was taken from the Prince George's County HEC-2/ HEC-RAS models with slight modifications. In the Prince George's County HEC-2 model, the piers from the River Road Bridge were modeled as a component of the bridge deck. In the current HEC-RAS model it was chosen the same modeling approach. In the Prince George's County HEC-2 model, expansion and contraction coefficients were set at 0.1 and 0.3, respectively, at the cross-sections bounding the bridges. These were set to the standard FEMA approved values of 0.3 and 0.5.

Table 9. Bridges for the Existing and Proposed Conditions Geometries.

HEC-RAS Model Bridges	**Name**	**Prince George's County HEC-2/ HEC-RAS Station**
4979	Footbridge S27-BR07	N/A
3629	Railroad Bridge	51.015
1709	Footbridge N87-BR01	N/A

For the footbridges located downstream and upstream of the railroad, and were not included in the Prince George's County HEC-2 model, a general field survey was conducted in April 2017 by USACE to obtain required measurements. Elevations for the footbridges were taken from the DEM. Because minimal contraction and expansion occur at this crossing, the values were left at the standard 0.1 and 0.3, respectively, at the bounding cross-sections.

Channel roughness values (Manning's "n") from the Prince George's County HEC-2/HEC-RAS cross-sections were maintained for the current model. Overbank "n" values were estimated based upon engineering judgment, field observations, and the Prince George's County HEC-2 model. Channel "n" values ranged from 0.035 to 0.045, and over bank values ranged from 0.02 to 0.1. The low value of 0.02 was used for pavement where effective flood flow would occur. The high value of 0.15 was used for the residential areas where multiple obstructions would occur due to buildings impeding flood flow. Wooded areas were typically assigned a value of 0.08 or 0.10, and open grassy areas were assigned a value of 0.03 or 0.065. Ineffective flow areas were set appropriately at bridges, and other areas after analyzing the flood mapping generated in HEC-RAS Mapper. For the heavy residential areas in the overbanks, flow was kept as effective in the model, as the high "n" value of 0.15 accounted for the reduction in conveyance. Some obstructions in the model represent single buildings. Captures of the flood map for Existing conditions is displayed in Attachment 1, Site 5.

<u>Proposed Conditions Hydraulic Analysis</u>
The proposed-conditions plan represents stream restoration project conditions that were analyzed in this study. The geo-referenced HEC-RAS model contains 43 (fourty-three) cross-sections, that have river stations generated from the HEC-GeoRAS program. The alignment for Site 5 design alternative was imported in the HEC-RAS model for proposed conditions. The channel geometry was modified between stations 6638 and 1862, and between stations 1400 and 263, respectively.

The three bridges included in the Existing Conditions geometry are included in the Proposed Conditions geometry without any significant adjustments made to the channel and banks elevations of the bridge cross-sections. Overbank values, ineffective flow areas, and obstructions were consistent with the existing conditions model. The channel and banks "n" Manning`s coefficients were set to 0.03-0.035 for the channel, and ranged 0.065-0.1 for banks, due to modifications in the channel, future planting and reduced roughness in the channel invert due to channel restoration open channel work.

<u>Design Flood Hydraulic Analysis</u>
The Flood Risk management project was designed based on the design flood of 6,700 cfs for the reach located just upstream from the Paint Branch parkway crossing. The drainage area is 31 sq. mi. The design flood for the protective works was adopted from the Detailed Project Report for Local Flood Protection Project, dated April 1968. The design flood plan ran the Existing Conditions geometric file, and the results are included in the Attachment 1 for Site 5.

Future Flows With and Without Project Hydraulic Analysis

Due to an expected rising trend in precipitations, and consequently in riverine streamflows in the Mid-Atlantic region over the next 40 years, based on the identification and detection of climate trends in recent historical records, a conservative increase value of 10% was added to the existing peak flows listed in Table 8. The Future Flows Without Project analysis utilized the geometric file used for the Existing Conditions, and the results are included in Attachment 1 for Site 5.

Comparison of Results

The condition of the Anacostia River and Tributaries Prince George County flood control project that is comprised in the geometric files in the Existing and Proposed Condition hydraulic analysis is investigated by comparing water surface elevations of the cross sections of HEC-RAS Stations 263 through 6638.

Site 5 Design Flood is based on 6,700 cfs as obtained from the Detailed Project Report dated April 1968, which is fully contained within the channel. The proposed condition flow is based on 11,200 cfs. The flow rate change can be attributed to the increased frequency due to the occurrence of additional significant events since 1968, the increase in flood record length, and the urbanization within the basin. The higher flow of 11,220 cfs remains within the channel but with decreased freeboard.

For the 100-year storm event the water surface elevation (WSEL) for most cross sections decreased within less than a half a foot range in the upper portion of the model. The average channel velocities for existing and proposed conditions range from 2.09 to 14.49 ft/sec. and from 2.47 to 11.25 ft/sec. for the 10-year storm, respectively.

Cross sections located at lower reach of the HEC-RAS model, and upstream of the Railroad bridge, exhibited a drop in water surface elevations for the proposed conditions during the 100-yr storm, and resulted in decreased energy slope and shear stress. .

SITE 11, INDIAN CREEK

Improvements to Indian Creek were included in the “Anacostia River Local Flood Protection Project”, authorized in 1950, and constructed between 1973 and 1974. The improvements along the Indian Creek consist of a 30-foot-wide channel with some channel realignment, extending from the junction with Paint Branch to Greenbelt Road, a distance of 7,600 feet. The channel is flared at Berwin Road bridge and Greebelt Road box culvert to make maximum use of the available openings. The Indian Creek channel capacity is 1,000 cfs throughout its entire length.

Hydrology and Hydraulics

Flows from FEMA Flood Insurance Study for Prince George`s County, effective September 2016 have been utilized to conduct this hydraulics analysis. This study included the 10-, 50-, 100-, and 500-year peak discharges for the study reach for both the existing use conditions. Steady flow downstream boundary condition was based on the Normal Depth and energy slope assumptions. The existing and proposed conditions peak flows used for this study are shown in Table 10.

Table 10. FEMA Discharges Site 11 Indian Creek.

Drainage Area (sq. mi)	**Discharge (cfs) Existing and Proposed Conditions**			
Recurrence Interval (years)	**10**	**50**	**100**	**500**
25	4000	7100	8800	19000
29.2	4300	7600	10400	20500

Previous Hydraulic Studies

The most current hydraulic model for the study area is the HEC-2 model completed by Greenhorne and O'Mara, Inc in 1993 for the Anacostia River Watershed Study, and was converted to HEC-RAS in the March 2008 study. This conversion was executed with minimal modifications to input data, which resulted in a model without spatial reference.

Existing Conditions Hydraulic Analysis

The existing-conditions plan represents existing field conditions at the time of this study. The geo-referenced HEC-RAS model contains 43 (fourty-three) cross-sections that have river stations generated from the HEC-GeoRAS program. The station identifier is the stream distance in feet from 0.11 miles downstream of Berwin Road Bridge.

There are a total of three bridges that were included within the HEC-RAS model Existing Conditions (Table 11). For Paint Branch Parkway Bridge, and River Road Bridge, all opening data and elevation data was taken from the Prince George's County HEC-2/ HEC-RAS models, with slight modifications. These modifications included the modeling of the overbanks at the internal bridge cross sections based on the current LiDAR data. In the Prince George's County HEC-2 model, expansion and contraction coefficients were set at 0.3 and 0.5, respectively, at the cross-sections bounding the bridges. The present hydraulic analysis also set the expansion and contraction coefficients to the standard FEMA approved values of 0.3 and 0.5.

Table 11. Site 11 Crossings Existing Conditions Geometry

HEC-RAS Model Bridges	Name	Prince George's County HEC-2/ HEC-RAS Station
2686	Branchville Road Bridge	150.25
2471	Greenbelt Road Bridge	140.1
600	Berwin Road Bridge	120.15

Channel roughness values (Manning's "n") from the Prince George's County HEC-2/HEC-RAS cross-sections were maintained for the current model. Overbank "n" values were estimated based upon engineering judgment, field observations, and the Prince George's County HEC-2 model. Channel "n" values ranged from 0.035 to 0.045, and over bank values ranged from 0.02 to 0.1. The low value of 0.02 was used for pavement where effective flood flow would occur. Wooded areas were typically assigned a value of 0.08 or 0.10, and open grassy areas were assigned a value of 0.03 or 0.065.

Ineffective flow areas were set appropriately at bridges, and other residential areas with multiple obstructions after analyzing the flood mapping generated in HEC-RAS Mapper. For the heavy residential areas in the overbanks, flow was kept as effective in the model, as the high "n" value of 0.15 accounted for the reduction in conveyance. Some obstructions in the model represent single or groups of buildings. Captures of the flood map for Existing conditions is displayed in Attachment 1 for Site 11.

Proposed Conditions Hydraulic Analysis

The proposed-conditions plan represents stream restoration project conditions that were analyzed in this study. The geo-referenced HEC-RAS model contains 43 (fourty-three) cross-sections that have river stations generated from the HEC-GeoRAS program. The alignment for Site 11 Indian Creek design alternative was imported in the HEC-RAS model for proposed conditions, and the channel geometry has been modified between stations 9278 and 2980, and between stations 2088 and 131, respectively.

There are a total of three bridges that were included within the HEC-RAS model Proposed Conditions (Table 12). The bridges modelled in the Proposed Conditions geometry have the same geometry as in the existing conditions. Adjustments to the channel invert and banks elevations of the bridge cross-sections have been made according to the stream restoration design.

Table 12. Bridges Proposed Conditions Geometry.

HEC-RAS Model Bridges	Name	Prince George's County HEC-2/ HEC-RAS Station
2691	Branchville Road Bridge	150.25
2476	Greenbelt Road Bridge	140.1
600	Berwin Road Bridge	120.15

Overbank values, ineffective flow areas, and obstructions were consistent with the existing conditions model. The channel and banks "n" Manning`s coefficients were set to 0.03-0.035 for the channel, and ranged 0.05-0.1 for banks, due to modifications in the channel, future planting and reduced roughness in the channel invert due to channel restoration open channel work. Capture of the flood map for Proposed Conditions is displayed in Attachment 1 for Site 11.

Design Flood Hydraulic Analysis

The existing Flood Risk Management project was designed as based on a flood of 6,500 cfs for the entire Indian Creek reach. The drainage area is 29.2 sq. mi. The design flood for the protective works was adopted from the Detailed Project Report for Local Flood Protection Project, dated April 1968. The design flood plan ran the Existing Conditions geometric file, and the results are included in Attachment 1 for Site 11, as is the captures of the flood map for Design Flood conditions.

Future Flows With and Without Project Hydraulic Analysis

Due to an expected rising trend in precipitations, and consequently in riverine stream flows in the Mid-Atlantic region over the next 40 years, based on the identification and detection of climate trends in recent historical records, a conservative increase value of 10% was added to the existing peak flows listed in Table 10. The Future Flows Without Project analysis utilized the geometric file used for the Existing Conditions, and the results and capture maps are included in Attachment 1 for Site 11.

Comparison of Results

The current analysis determined that the 100-year water surface profile for the stream restoration is lower than the profile for the original flood protection design. Site 11 Design Flood is based on 6,500 cfs as obtained from the Detailed Project Report dated April 1968, which is fully contained within the channel. The proposed condition flow is based on 10,400 cfs. The flow rate change can be attributed to the increased frequency due to the occurrence of additional significant events since 1968, the increase in flood record length, and the urbanization within the basin. The higher flows of 10,400 cfs remain within the channel but with decreased freeboard.

For the 100-year storm event, the water surface elevation (WSEL) for most cross sections decreased within a half a foot range within the reach length. The average channel velocities for existing and proposed conditions range from 0.75 to 8.78 ft/sec. and from 1.18 to 10.49 ft/sec. for the 10-year storms, respectively.

Cross sections located at lower reach of the HEC-RAS model, and downstream of Berwin Road bridge, exhibited a drop in water surface elevations for the proposed conditions during the 100-yr storm, and resulted in decreased energy slope and shear stress.

SITE 15, NORTHEAST BRANCH

Improvements to Northeast Branch were included in the “Anacostia River Local Flood Protection Project”, authorized in 1950, and constructed between 1973 and 1974. The improvement along the Northeast Branch in the vicinity of Calvert Road consists of an improved channel and varied amounts of overbank clearing. The improvement starts 540 feet upstream from the Calvert Road bridge, at the upstream limits of the 50 feet improved

Northeast Branch in a trapezoidal channel of a 50 foot bottom width and 1 vertical on 3 horizontal side slope. The design discharge for a drainage area of 72.8 square miles was 10,000 cfs.

Hydrology and Hydraulics

Flows from FEMA Flood Insurance Study for Prince George`s County, effective September 2016 have been used to conduct this hydraulics analysis. This study included the 10-, 50-, 100-, and 500-year peak discharges for the study reach for both the existing use conditions. The existing and proposed conditions peak flows used for this study are shown in Table 13. Steady flow downstream boundary condition was based on the Normal Depth and energy slope assumptions.

Table 13. FEMA Discharge Site 15 Northeast Branch.

Drainage Area (sq. mi)	**Discharge (cfs) Existing and Proposed Conditions**			
Recurrence Interval (years)	10	50	100	500
72.3	9840	14430	17160	21390

Previous Hydraulic Studies

The most current hydraulic model for the study area is the HEC-2 model completed by Greenhorne and O'Mara, Inc in 1993 for the Anacostia River Watershed Study, and was converted to HEC-RAS in the March 2008 study. This conversion was executed with minimal modifications to input data, which resulted in a model without spatial reference.

Existing Conditions Hydraulic Analysis

The existing-conditions plan represents existing-field conditions at the time of this study. The geo-referenced HEC-RAS model contains 30 (thirty) cross-sections that have river stations generated from the HEC-GeoRAS program. The station identifier is the stream distance in feet upstream of the Highway 410 crossing.

There are a total of two bridges that were included in the HEC-RAS model (Table 14). For Paint Branch Parkway Bridge, and River Road Bridge, all opening data and elevation data was taken from the Prince George's County HEC-2/ HEC-RAS models, with slight modifications. These modifications included the modeling of the piers and contraction/expansion coefficients at bounding cross-sections. In the Prince George's County HEC-2 model, expansion and contraction coefficients were set at 0.1 and 0.3, respectively, at the cross-sections bounding the bridges. These were set to the standard FEMA approved values of 0.3 and 0.5.

Table 14. Bridges for the Existing and Proposed Conditions Geometries.

HEC-RAS Model Bridges	Name	Prince George's County HEC-2/ HEC-RAS Station
5463	Paint Branch Parkway	128.5
2238	River Road Bridge	123.33

Channel roughness values (Manning's "n") from the Prince George's County HEC-2/HEC-RAS cross-sections were maintained for the current model. Overbank "n" values were estimated based upon engineering judgment, field observations, and the Prince George's County HEC-2 model. Channel "n" values ranged from 0.035 to 0.040, and over bank values ranged from 0.02 to 0.1. The low value of 0.02 was used for pavement where effective flood flow would occur. The high value of 0.15 was used for the residential areas where multiple obstructions would occur due to buildings impeding flood flow. Wooded areas were typically assigned a value of 0.08 or 0.10, and open grassy or bushy areas were assigned a value between 0.03 and 0.065. Ineffective flow areas were set appropriately at bridges, and other areas after analyzing the flood mapping generated in HEC-RAS Mapper. For the heavy residential areas in the overbanks, flow was kept as effective in the model, as the high "n" value of 0.15 accounted for the reduction in conveyance. Some obstructions in the model represent single buildings. Captures of the flood map for Existing conditions is displayed in the Attachment 1 for Site 15.

Proposed Conditions Hydraulic Analysis

The prepared concept design drawings were used to obtain the proposed stream centerline, in-stream structures, limit of disturbance (LOD), and the primary riparian restoration features for the hydraulic modelling. The proposed-conditions plan represents stream restoration project conditions that were analyzed in this study. The geo-referenced HEC-RAS model contains 30 (thirty) cross-sections, that have river stations generated from the HEC-GeoRAS program. The alignment for Site 15 design alternative was imported in the HEC-RAS model for proposed conditions, and the channel geometry has been modified between stations 2021 and 5333, and between stations 5585 and 6345, respectively. The Paint Branch Parkway and River Road bridges have similar geometries as for the existing conditions, and therefore no change has been made.

Overbank values, ineffective flow areas, and obstructions were consistent with the existing conditions model. The channel and banks "n" Manning`s coefficients were set to 0.03-0.035 for the channel, and ranged 0.065-0.1 for banks, due to modifications in the channel, future planting and reduced roughness in the channel invert due to channel restoration open channel work. Capture of the flood map for Proposed Conditions is displayed in Attachment 1 for Site 15.

Design Flood Hydraulic Analysis

The existing Flood Risk Management project was designed based on a flood of 10,500 cfs for the reach located just upstream from the Paint Branch parkway crossing. The drainage area is 72.8 sq. mi. The design flood for the protective works was adopted from the Detailed Project Report for Local Flood Protection Project, dated April 1968. The design flood plan utilized the geometric file used for the Existing Conditions plan, and the results of the water surface elevations for the design flood are included in Attachment 1 for Site 15.

Future Flows With and Without Project Hydraulic Analysis

Due to an expected rising trend in precipitations, and consequently in riverine streamflows in the Mid-Atlantic region over the next 40 years, based on the identification and detection of climate trends in recent historical records, a conservative increase value of 10% was added to the existing peak flows listed in Table 13. The Future Flows Without Project analysis utilized the geometric file used for the Existing Conditions, and the results are included in Attachment 1 for Site 15.

Comparison of Results

The condition of the Anacostia River and Tributaries Prince George County flood control project that is comprised in the geometric file of the Existing Condition hydraulic analysis is investigated by comparing water surface elevations of the cross sections of Stations 126 through 6619. The current analysis determined that the 100-year water surface profile for the stream restoration is lower than the profile for the original flood protection design.

Site 15 Design Flood is based on 10,500 cfs as obtained from the Detailed Project Report dated April 1968, which is fully contained within the channel. The proposed condition flow is based on 17,160 cfs. The flow rate change can be attributed to the increased frequency due to the occurrence of additional significant events since 1968, the increase in flood record length, and the urbanization within the basin. The higher flow of 17,160 cfs remains within the channel but with decreased freeboard.

For the 100-year storm event at the location of the majority of HEC-RAS cross sections, the water surface elevation (WSEL) decreased within a half a foot range in the upper portion of the model. The average channel velocities for existing and proposed conditions range from 3.97 to 12.88 ft/sec. and from 34.0 to 11.0 ft/sec. for the 10-year storms, respectively.

Cross sections located at lower reach of the HEC-RAS model, and downstream of River Road bridge, exhibited a decrease in water surface elevations for the proposed conditions during the 100-yr storm, and resulted in decreased energy slope and shear stress.

ATTACHMENT - HEC-RAS MODEL TABLES AND FIGURES

SITE 3

Table 1: RAS Results Existing Conditions, Project Proposed Conditions, Design Flood, and Existing Conditions Without Project for Future Flows

		Water Surface Elevation (ft, NAVD88)	100-year Flood Water Surface Elevation (ft, NAVD88)				Difference Existing Conditions HEC-RAS vs Proposed Conditions
Site 3 HEC RAS Existing Conditions Model XS	**Site 3 HEC-RAS Proposed Conditions Model XS**	**Site 3 Design Flood**	**Site 3 HEC-RAS Existing Conditions**	**Site 3 HEC-RAS Proposed Conditions**	**Site 3 HEC-RAS Future Flows With Project**	**Site 3 HEC-RAS Future Flows Without Project**	
7551	7235	54.33	56.67	56.65	56.63	57.14	0.02
7333	7026	54.22	56.59	56.58	56.54	57.08	0.01
7196	6931	54.17	56.56	56.56	56.53	57.04	0.00
6767	6802	54.09	56.49	56.51	56.46	56.97	0.05
6607	6557	54.03	56.43	56.48	56.42	56.91	0.01
6464 BR	6398			56.33	56.23		
6362	6255BR	49.08	50.04			50.01	
6129	6153	48.00	49.34	49.91	50.01	49.05	0.13
5643	5921	47.71	49.11	48.67	49.05	48.91	0.67
5524	5461	47.68	49.08	48.58	48.91	48.91	0.53
5422	5240	47.65	49.05	48.58	48.91	48.82	0.50
5388 BR	5140						
5356	5091 BR	47.50	48.96			49.26	0.55
5232	5071	47.37	48.80	48.20	48.53	48.53	0.76
5082	4940	47.07	48.43	47.71	48.03	48.03	1.09
4854	4758	46.20	47.46	47.39	47.71	47.71	1.04
4714	4617	46.34	47.54	47.27	47.59	47.59	0.19
4561	4431	46.09	47.51	46.82	47.20	47.20	0.72
4472 BR	4354 BR						
4382	4268	45.33	46.56	45.49	45.62	45.62	1.07
4209	4088	43.75	45.02	44.78	44.92	44.92	0.24
4050	3936	43.47	44.91	44.48	44.55	44.55	0.43
3908	3795	43.41	44.81	44.23	44.26	44.26	0.58
3683	3581	43.28	44.69	44.02	43.99	43.99	0.67
3446	3366	43.07	44.53	43.68	43.45	43.45	0.85
3284	3206	42.30	44.22	43.64	43.39	43.39	0.58
3041	2962	40.97	43.41	43.02	42.21	42.21	0.39
2785	2714	40.49	42.71	42.64	42.18	42.18	0.07
2251	2212	39.20	40.82	40.48	41.59	41.59	0.34
2065*	2023*	37.42	40.08	39.85	40.06	40.06	0.23

		Water Surface Elevation (ft, NAVD88)	100-year Flood Water Surface Elevation (ft, NAVD88)				Difference Existing Conditions HEC-RAS vs Proposed Conditions
Site 3 HEC RAS Existing Conditions Model XS	**Site 3 HEC-RAS Proposed Conditions Model XS**	**Site 3 Design Flood**	**Site 3 HEC-RAS Existing Conditions**	**Site 3 HEC-RAS Proposed Conditions**	**Site 3 HEC-RAS Future Flows With Project**	**Site 3 HEC-RAS Future Flows Without Project**	
1911*	1872*	36.55	39.74	39.42	39.61	39.61	0.32
1403*	1364*	34.95	37.53	36.70	36.97	36.97	0.83
1242*	1204*	34.58	36.70	36.59	36.84	36.84	0.11
958*	950*	33.88	36.28	35.67	36.03	36.03	0.61
756*	750*	33.60	36.09	35.95	36.37	36.37	0.14
537*	532*	33.43	35.64	35.11	35.42	35.42	0.53
377*	377*	33.32	35.50	35.15	35.51	35.51	0.35
142*	142*	32.88	33.25	33.13	33.44	33.44	0.12

* Flood Risk Management Project Location

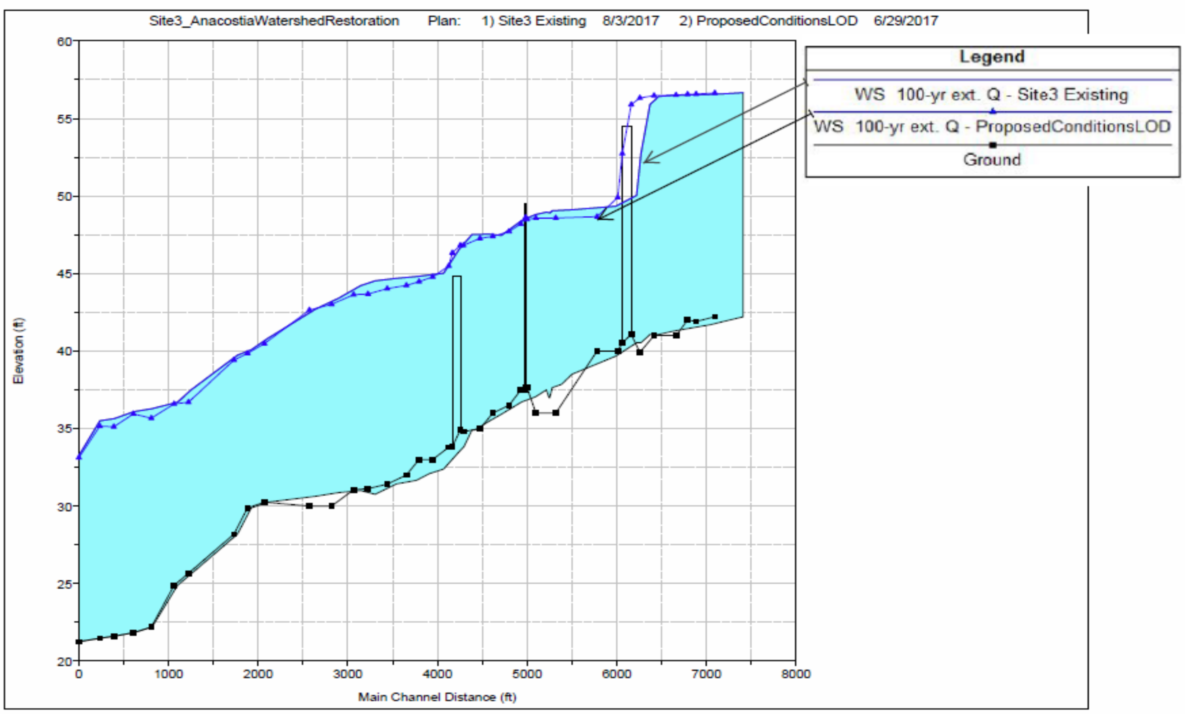

Figure 1: Site 3 Profiles compared - Existing and Proposed Project Conditions

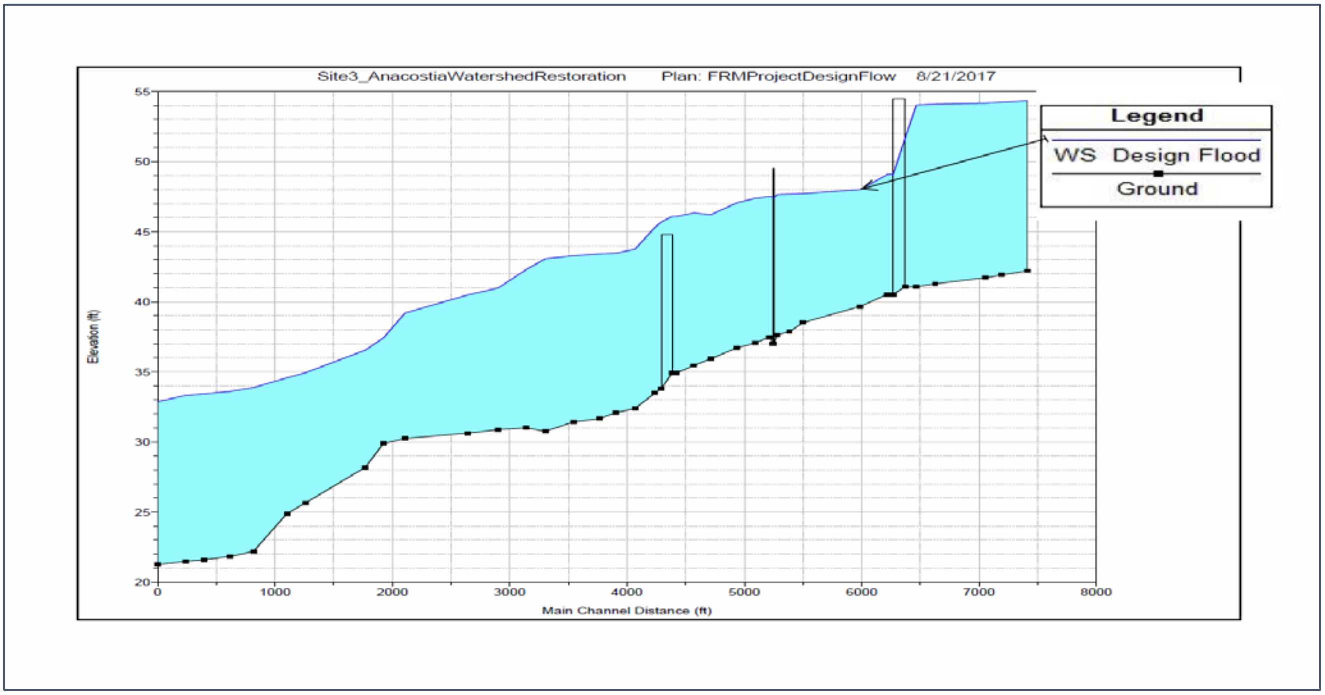

Figure 2: Site 3 Profile Design Flood

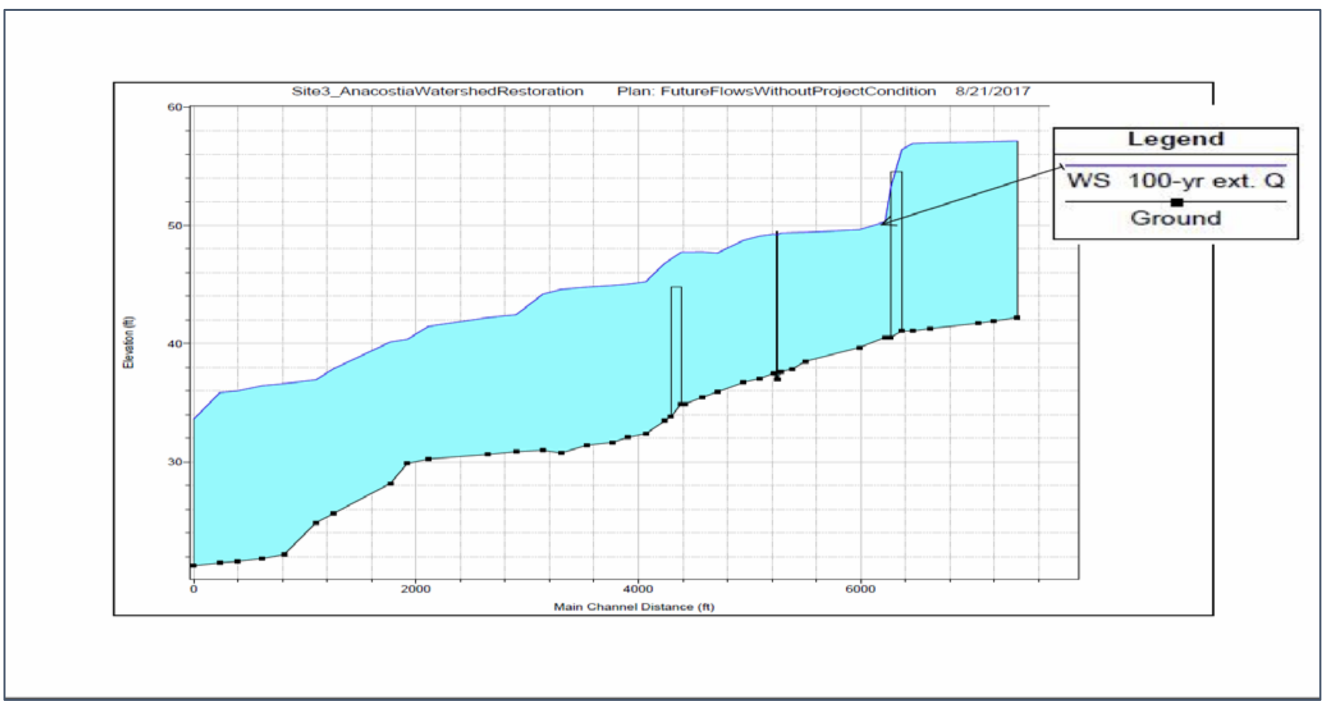

Figure 3: Site 3 Future Flows Without Project

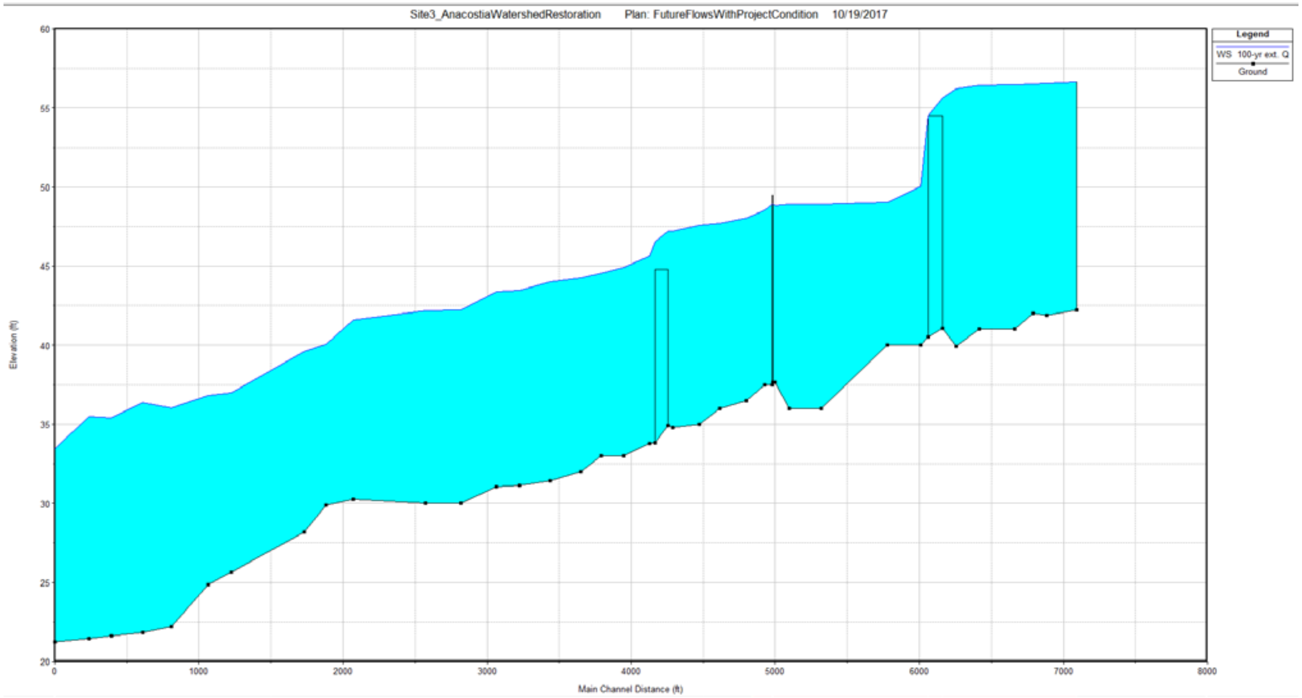

Figure 4. Site 3 Future Flows with Project

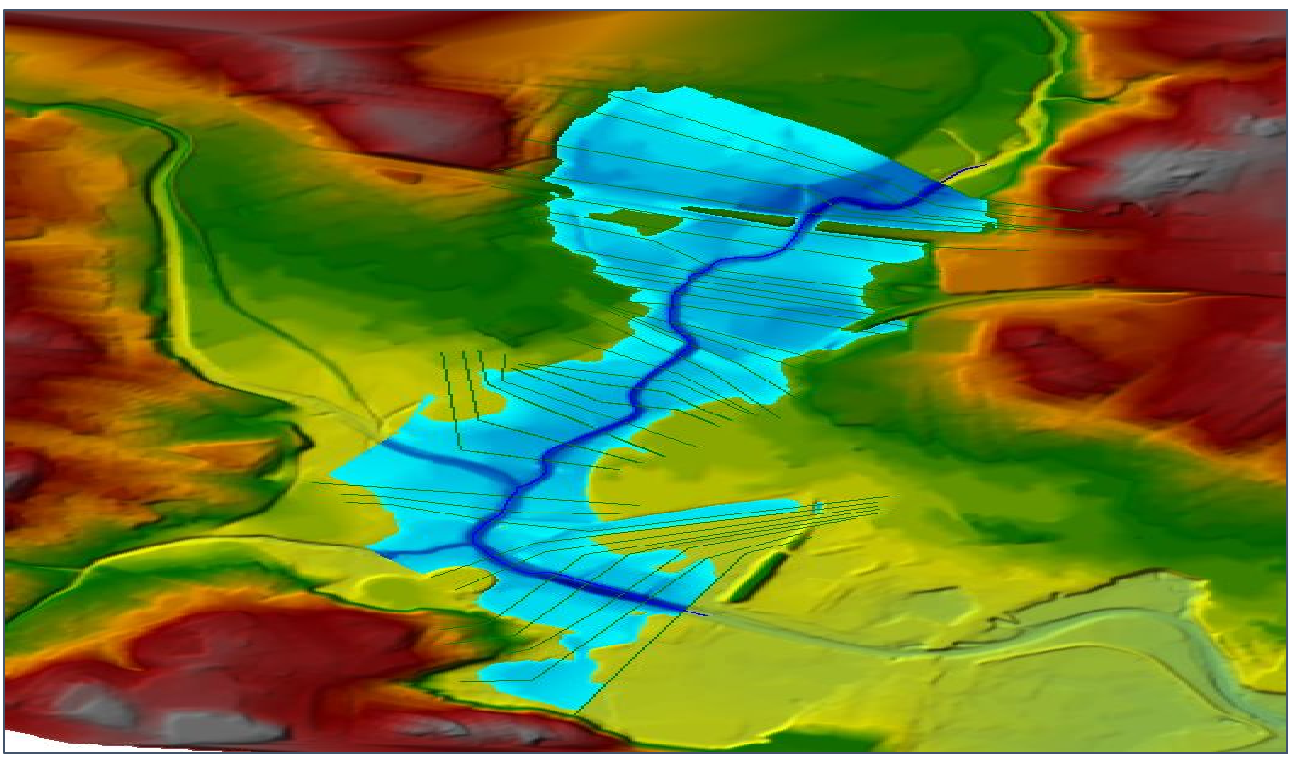

Figure 5: Site 3 Existing Conditions 100-year flood map

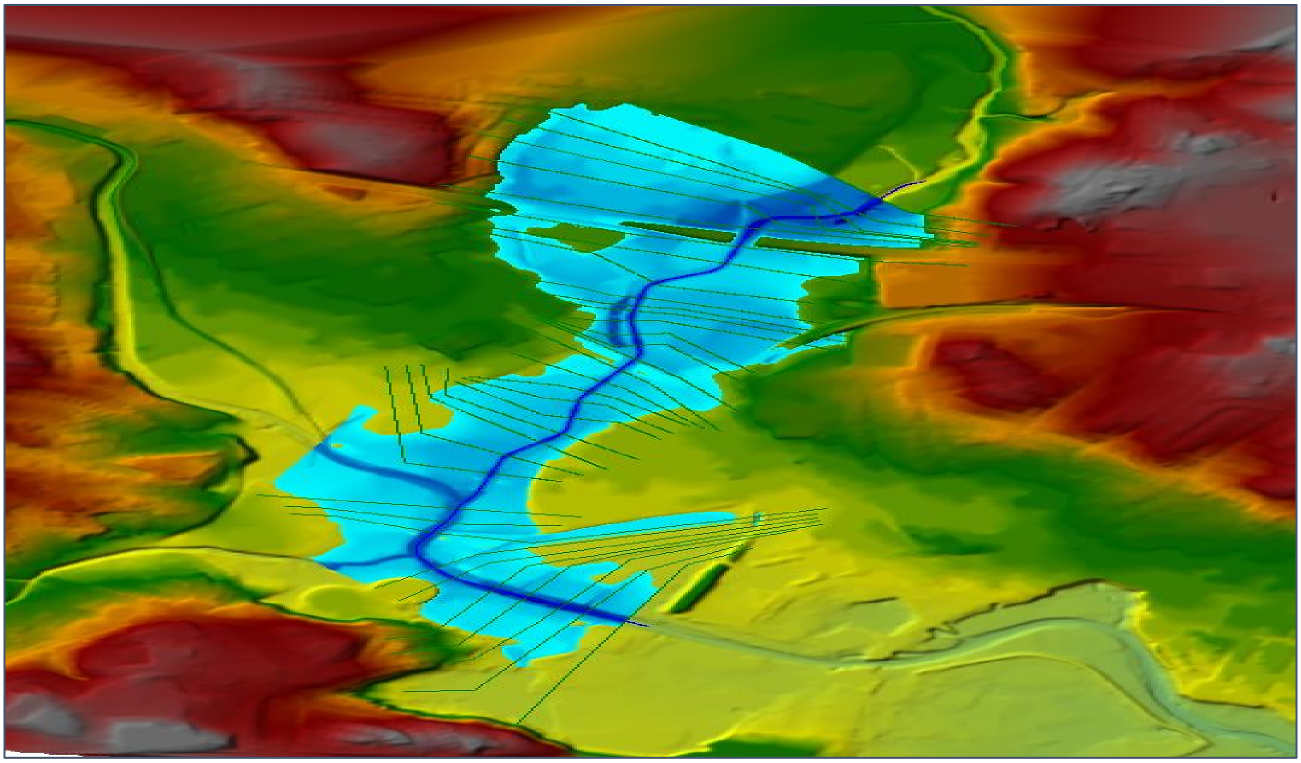

Figure 6: Site 3 Proposed Conditions 100-year flood map

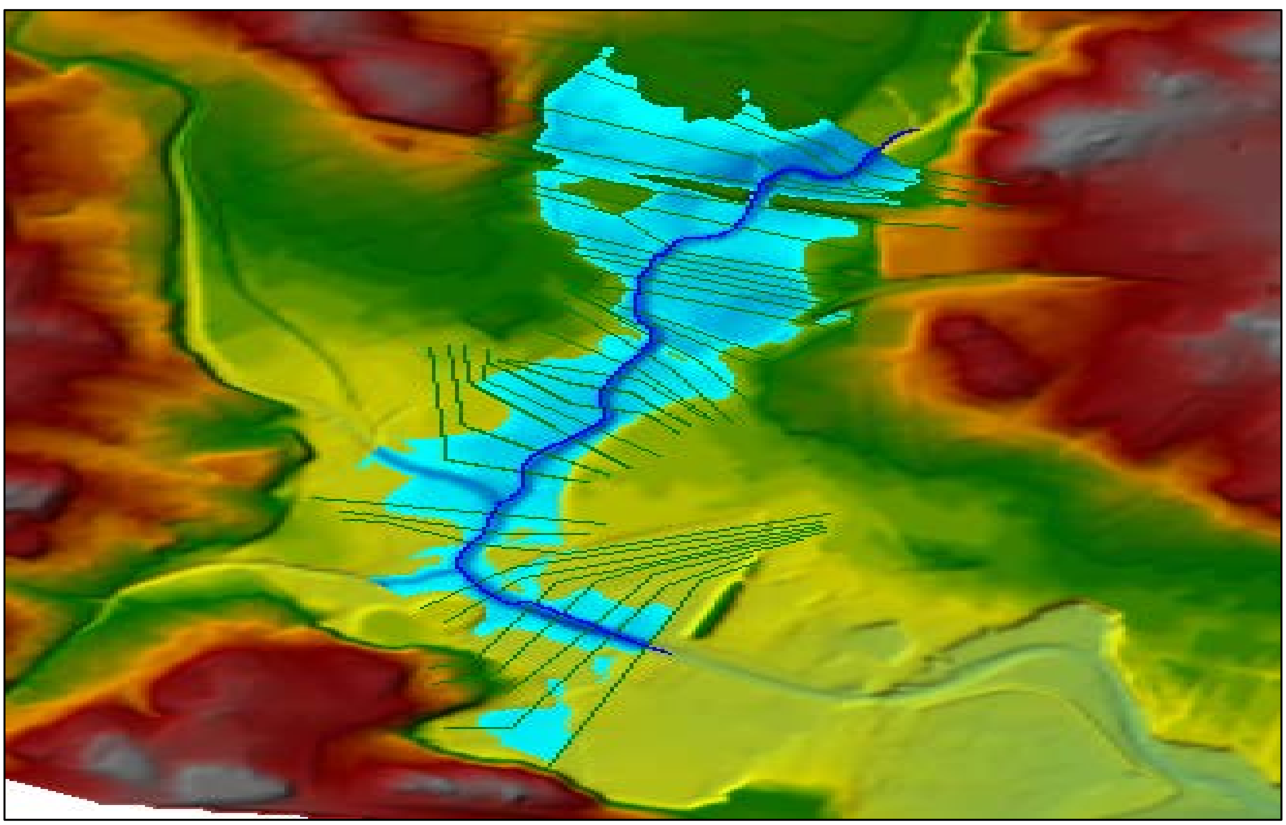

Figure 7: Site 3 Design Flood flood map

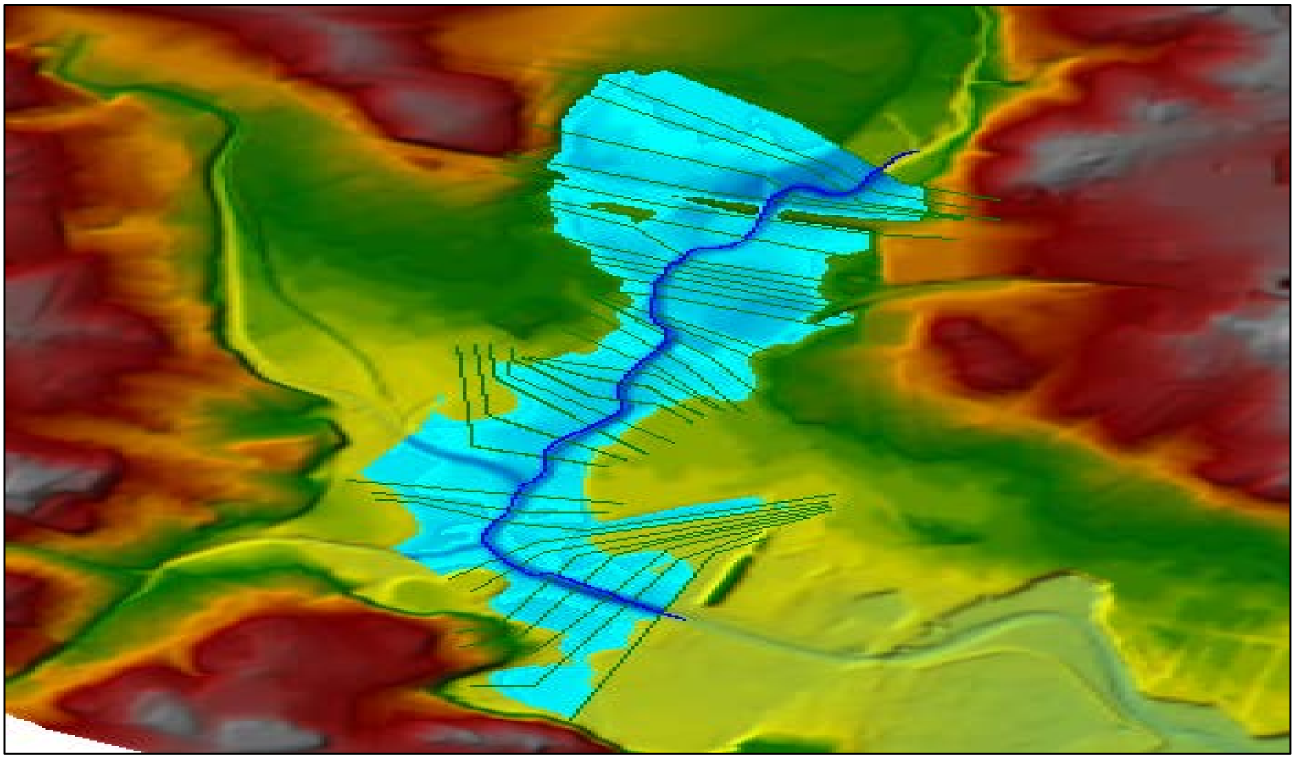

Figure 8: Site 3 Future Flows Without Project flood map

SITE 9

Table 1: RAS Results Existing Conditions, Project Proposed Conditions, Design Flood, and Existing Conditions Without Project for Future Flows

		Water Surface Elevation (ft, NAVD88)	100-year Flood Water Surface Elevation (ft, NAVD88)				Difference Existing Conditions HEC-RAS vs Proposed Conditions
Site 9 HEC RAS Existing Conditions Model XS	Site 9 HEC-RAS Proposed Conditions Model XS	Site 9 Design Flood	Site 9 HEC-RAS Existing Conditions	Site 9 HEC-RAS Proposed Conditions	Site 9 HEC-RAS Future Flows With Project	Site 9 HEC-RAS Future Flows Without Project	
5409	5372	61.00	61.05	60.00	58.18	61.00	0.00
4968	4932	59.10	59.14	58.20	60.11	59.10	0.00
4699	4663	57.70	57.71	56.90	58.32	57.70	0.00
4470	4435	55.90	55.88	55.20	56.27	55.90	0.00
4203	4167	54.30	54.31	53.80	54.45	54.30	0.00
3979	3944	54.10	54.13	53.60	54.26	54.10	0.00
3773	3738	52.10	52.12	51.60	52.57	52.10	0.00
3393	3359	51.40	51.15	51.00	51.67	51.40	0.10
3091	3057	49.80	49.71	49.60	49.82	49.80	0.10
2796	2762	48.00	47.81	47.50	47.91	48.00	0.10
2517	2484	47.70	47.25	47.20	47.70	47.70	0.50
2048	2017	46.00	45.82	45.50	46.63	46.00	0.20
1848	1816	45.20	45.21	44.80	46.32	45.20	0.00
1714	1682	45.00	44.73	44.50	44.81	45.00	0.30
1567	1535	44.90	44.89	44.30	45.52	44.90	0.00
1345	1314 *	44.20	43.21	43.80	44.06	44.20	1.00
1261	1230 *	43.00	42.80	42.50	43.49	43.00	0.20
1162	1132 *	42.90	42.34	42.50	42.95	42.90	0.50
1077	1047 *	42.80	42.42	42.40	43.12	42.80	0.40
960	931 *	42.00	41.89	41.40	42.26	42.00	0.10
881	852 *	42.00	41.55	41.40	42.07	42.00	0.50
786	757 *	41.90	41.29	41.20	41.62	41.90	0.60
699	671 *	41.30	41.37	40.40	41.46	41.30	0.00
575	552 *	41.30	41.24	40.30	41.24	41.30	0.00
508	484 *	41.20	41.19	40.10	41.19	41.20	0.00

*Stream Restoration - Proposed Project Location
**Although there is was no FRM project implemented here, the design flood was recommended in the 1968 Design Memorandum.

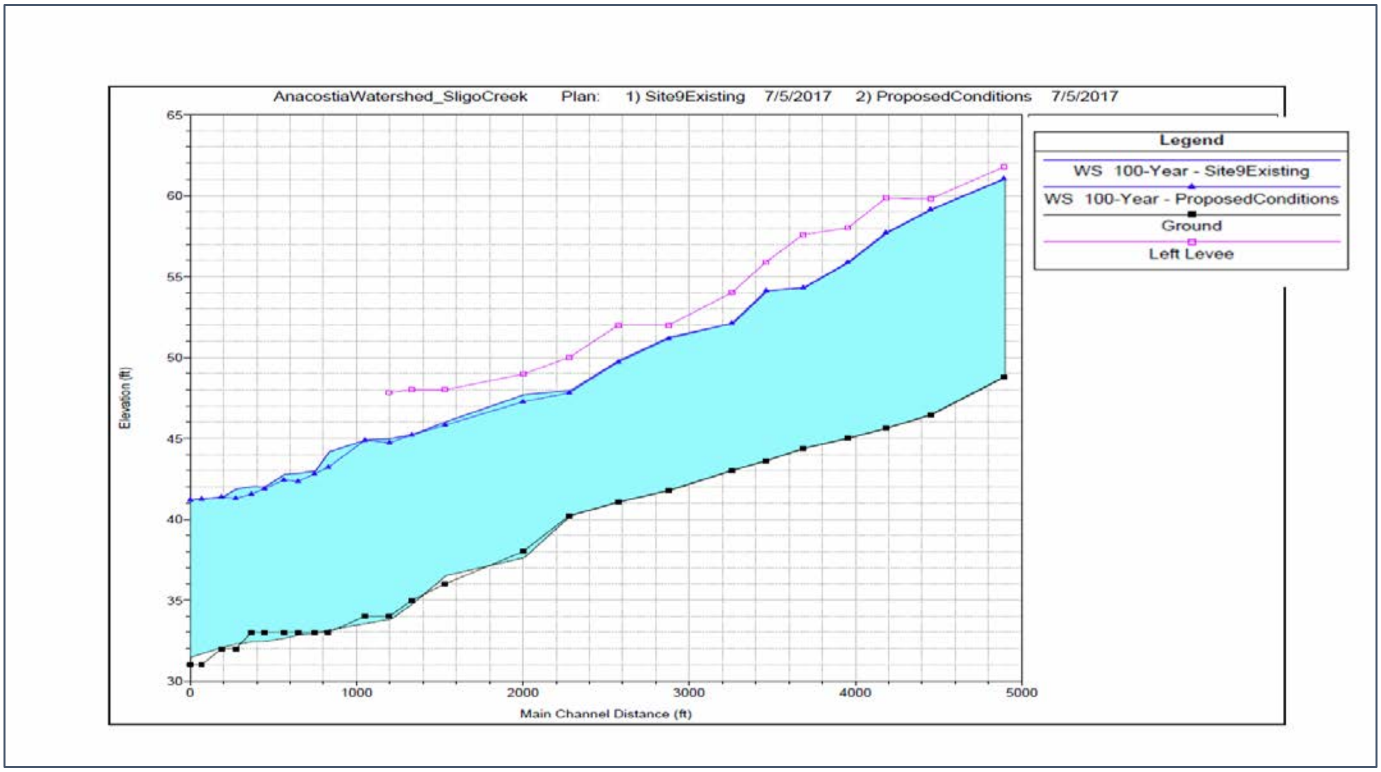

Figure 1: Site 9 Profiles compared: Existing and Proposed Project Conditions

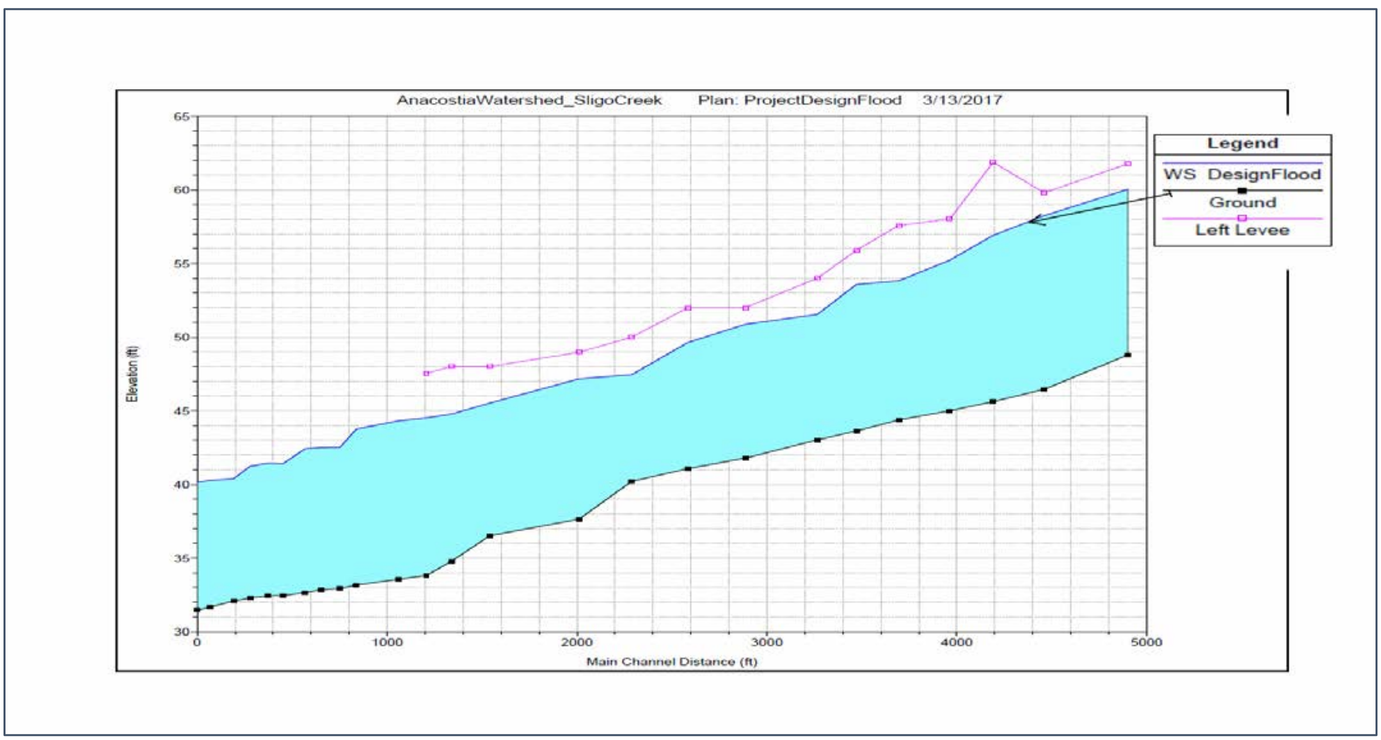

Figure 2: Site 9 Design Flood Profile

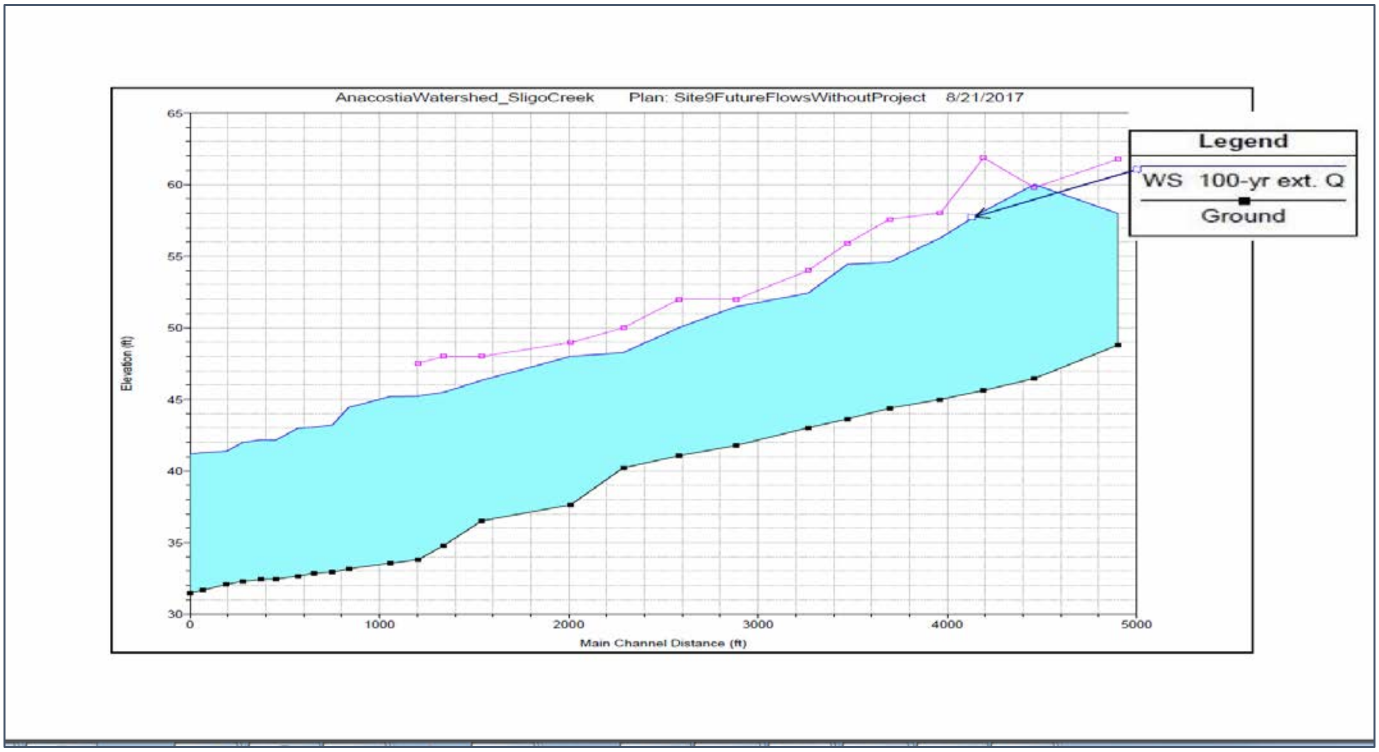

Figure 3: Site 9 Future Flows Without Project HEC-RAS Profile

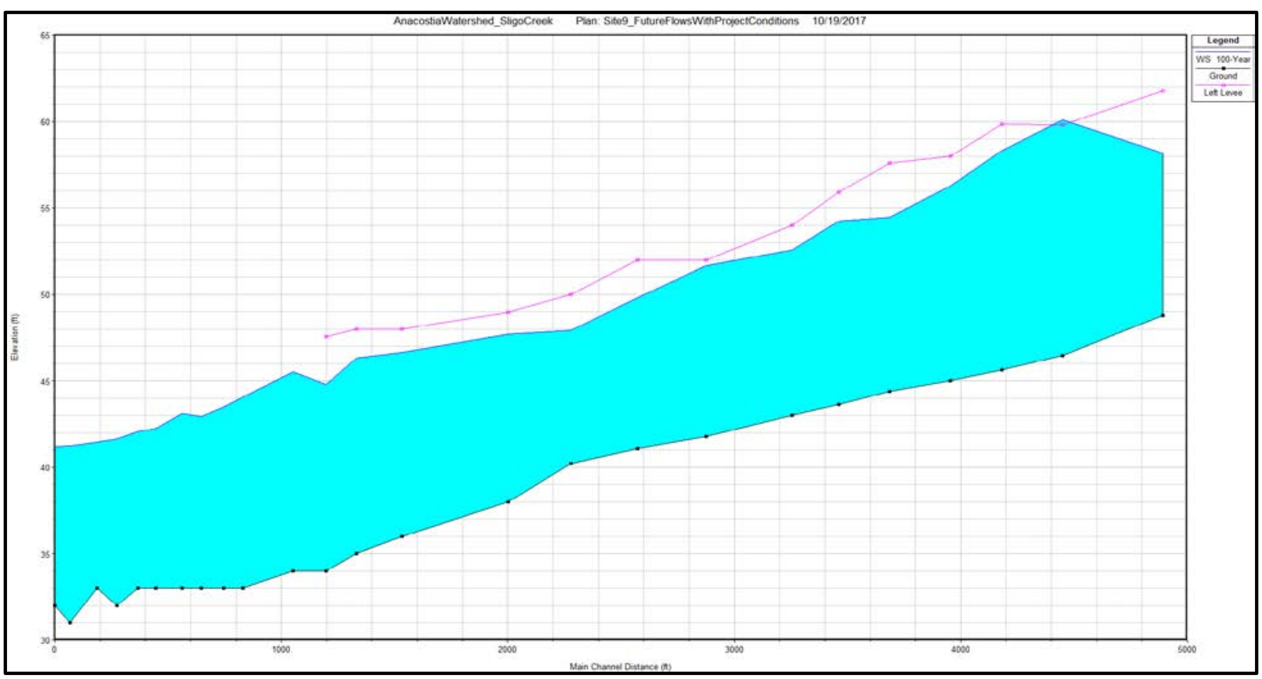

Figure 4. Site 9 Future Flows With Project HEC-RAS Profile

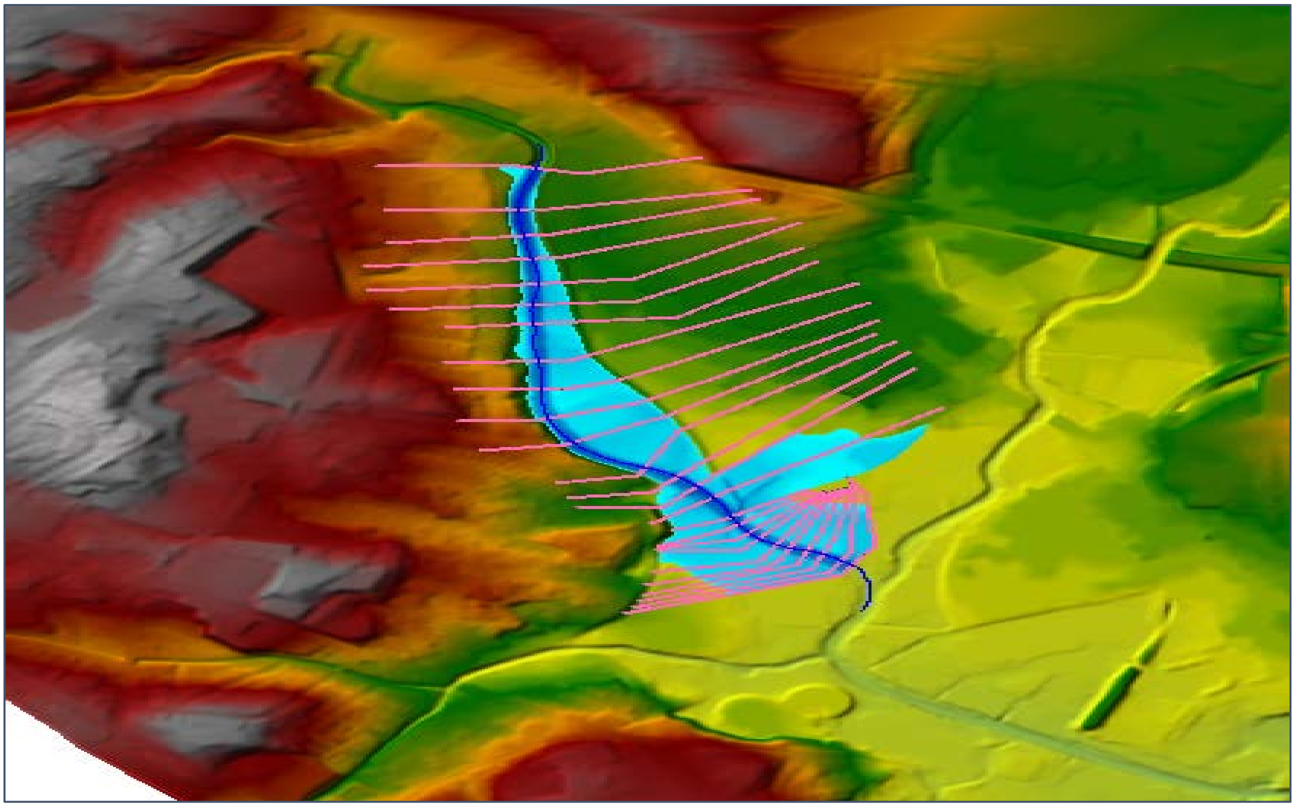

Figure 5: Site 9 Existing Conditions 100-year Flood Map

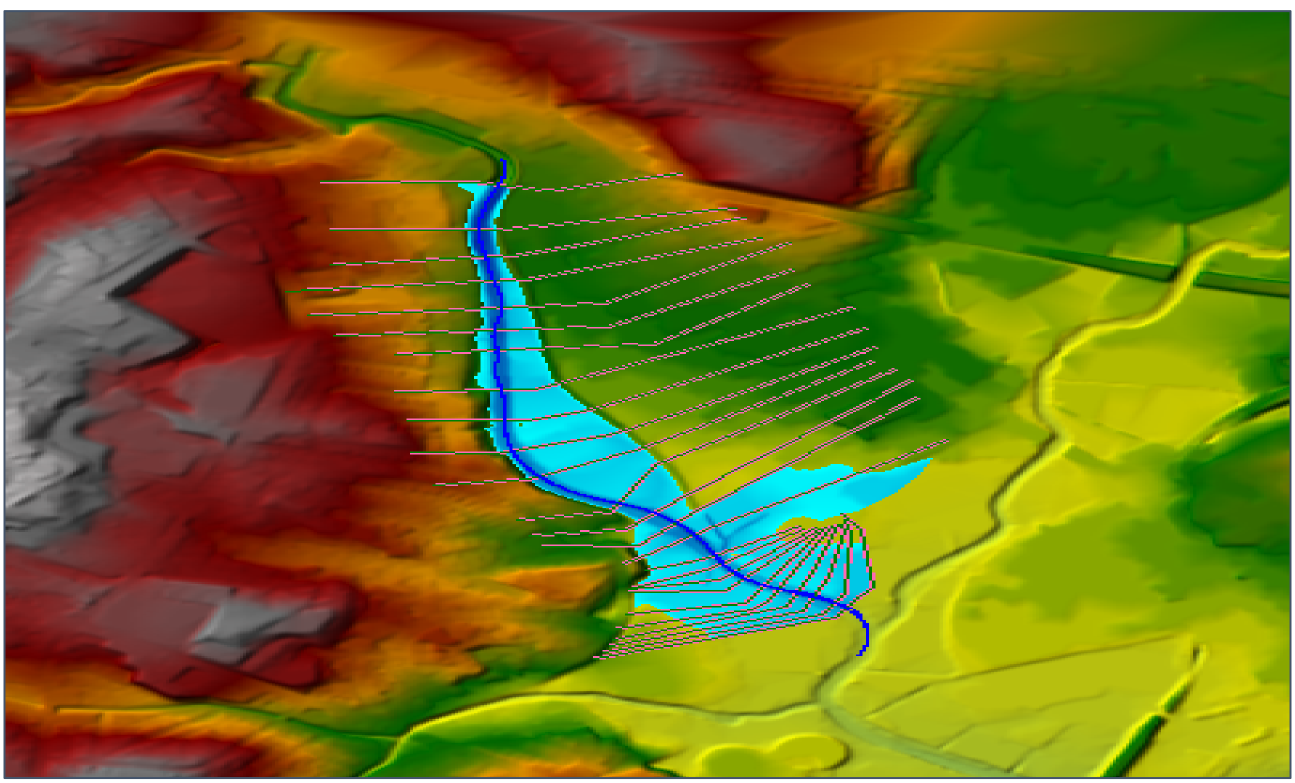

Figure 6: Site 9 Proposed Conditions 100-year Flood Map

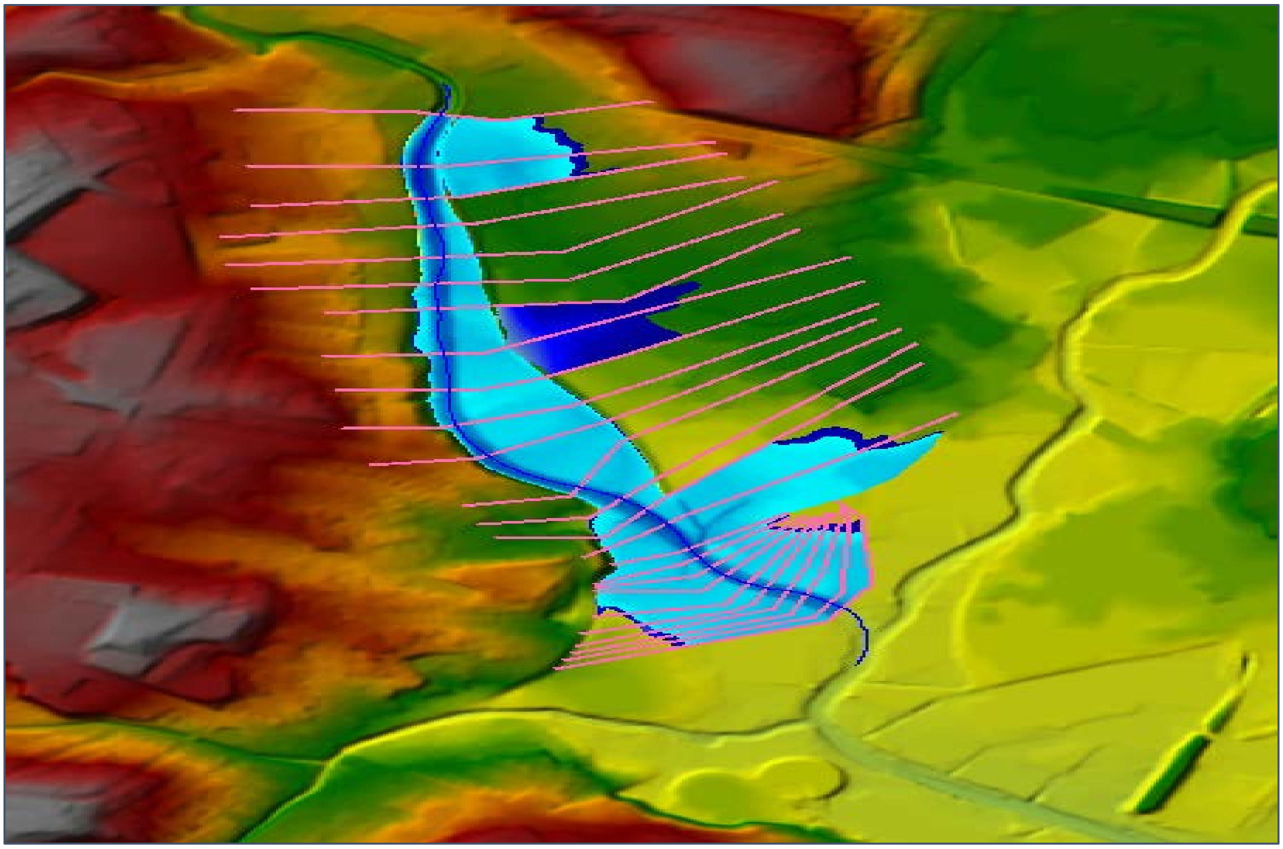

Figure 7: Site 9 Future Flows Without Project Flood Map

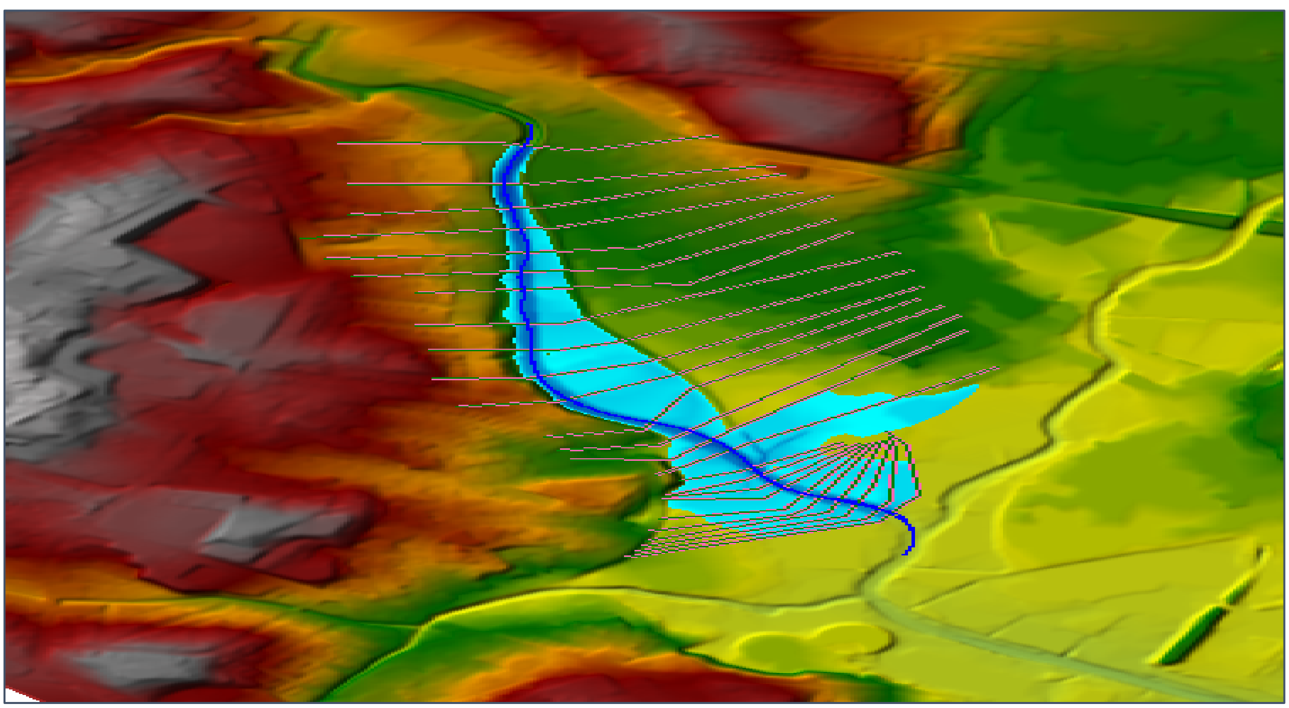

Figure 8: Site 9 Design Flood Map

SITE 13

Table 1: RAS Results Existing Conditions, Project Proposed Conditions, Design Flood, and Future Flows Without Project Conditions

		Water Surface Elevation (ft, NAVD88)	100-year Flood Water Surface Elevation (ft, NAVD88)				Difference Existing Conditions HEC-RAS vs Proposed Conditions
Site 13 HEC RAS Existing Conditions Model XS	**Site 13 HEC-RAS Proposed Conditions Model XS**	**Site 13 Design Flood**	**Site 13 HEC-RAS Existing Conditions**	**Site 13 HEC-RAS Proposed Conditions**	**Site 13 HEC-RAS Future Flows With Project**	**Site 13 HEC-RAS Future Flows Without Project**	
9801	9286	75.90	78.20	78.20	78.49	78.49	0.00
9647	9135	75.60	78.10	78.12	78.43	78.41	-0.02
9509	8993	75.40	77.93	77.89	78.21	78.25	0.04
9219	8699*	74.50	76.78	76.51	76.96	77.17	0.27
8949	8435*	73.90	76.36	76.21	76.67	76.78	0.15
8772	8255*	73.10	76.00	75.69	76.19	76.43	0.31
8614	8089*	72.90	75.73	75.42	75.87	76.18	0.31
8130	7702*	71.90	75.34	75.15	75.67	75.83	0.19
7971	7650*	71.80	75.28	74.86	75.40	75.77	0.42
7660	7488*	71.40	75.19	74.97	75.50	75.69	0.22
7337	7097*	70.80	75.05	74.83	75.38	75.57	0.22
7256	7017*	70.70	75.03	74.81	75.36	75.55	0.22
6918	6703*	70.40	74.95	74.75	75.30	75.48	0.20
6529	6355*	69.90	74.88	74.69	75.25	75.42	0.19
6455	6285*	69.90	74.87	74.69	75.24	75.41	0.18
6327	6165*	69.90	74.86	74.68	75.23	75.40	0.18
6226	6064*	69.80	74.86	74.66	75.22	75.39	0.20
6124	5961*	69.80	74.83	74.66	75.21	75.37	0.17
5984	5830*	69.70	74.83	74.65	75.21	75.36	0.18
5818	5670*	69.70	74.80	74.63	75.19	75.34	0.17
5709	5558*	69.70	74.80	74.62	75.18	75.33	0.18
5534	5397*	69.20	74.77	74.55	75.11	75.31	0.22
5429 BR	5292 BR						
5321	5184*	65.50	68.48	68.25	68.99	68.73	0.23
5030	4895*	64.70	66.11	66.00	66.42	66.40	0.11
4792	4656*	64.20	65.81	65.68	66.08	66.13	0.13
4616	4480	64.00	65.64	65.79	66.21	65.97	-0.15
4599 BR	4463 BR						
4582	4445	63.90	65.57	65.73	66.15	65.90	-0.16
4545	4408	63.90	65.55	65.66	66.12	65.88	-0.11
4520 BR	4383 BR						
``4489	4351	63.70	65.41	65.53	66.01	65.79	-0.12

		Water Surface Elevation (ft, NAVD88)	100-year Flood Water Surface Elevation (ft, NAVD88)				Difference Existing Conditions HEC-RAS vs Proposed Conditions
Site 13 HEC RAS Existing Conditions Model XS	**Site 13 HEC-RAS Proposed Conditions Model XS**	**Site 13 Design Flood**	**Site 13 HEC-RAS Existing Conditions**	**Site 13 HEC-RAS Proposed Conditions**	**Site 13 HEC-RAS Future Flows With Project**	**Site 13 HEC-RAS Future Flows Without Project**	
4320	4183	63.40	65.24	65.20	65.68	65.63	0.04
4059	3924	63.20	65.10	65.05	65.45	65.52	0.05
3740	3598	62.80	64.93	64.87	65.29	65.37	0.06
3694 BR	3552 BR						
3658	3516	62.60	64.85	64.77	65.23	65.32	0.08
3558	3412*	62.20	64.74	64.65	65.08	65.23	0.09
2941	2809*	61.50	64.45	64.33	64.78	64.96	0.12
2503	2371*	61.40	64.29	64.19	64.65	64.81	0.10
1956	1875*	60.80	63.68	63.01	63.46	64.32	0.67
1644	1647*	59.90	62.58	62.22	62.66	63.03	0.36
1337	1338*	59.10	61.70	61.60	61.98	62.07	0.10
984	985	56.40	58.64	58.64	58.95	58.95	0.00
684	684	56.90	58.38	58.38	59.65	59.65	0.00
413	413	56.40	56.17	56.17	59.03	59.03	0.00

*Stream Restoration Project Area

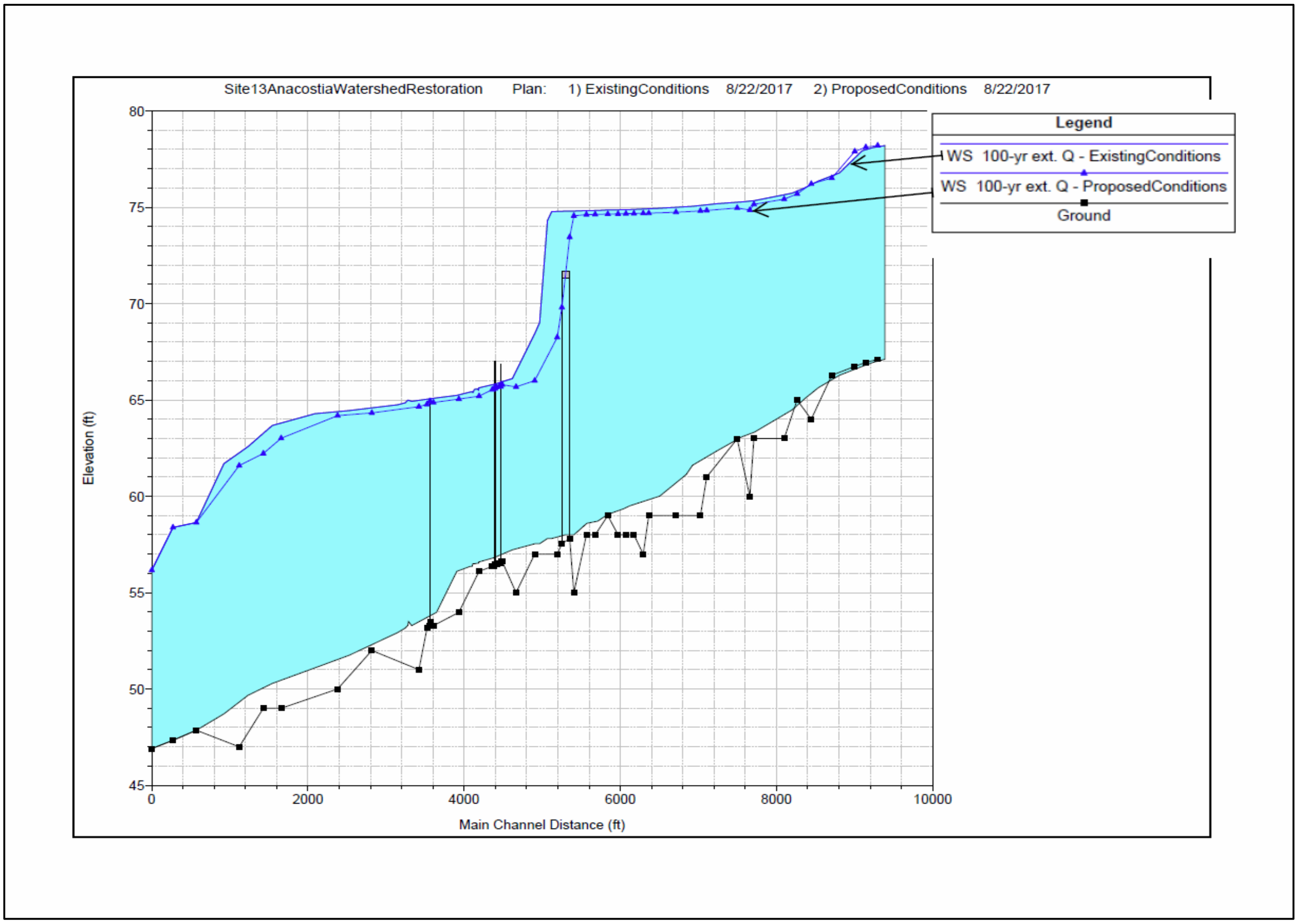

Figure 1: Site 13 Profiles compared: Existing and Proposed Project Conditions

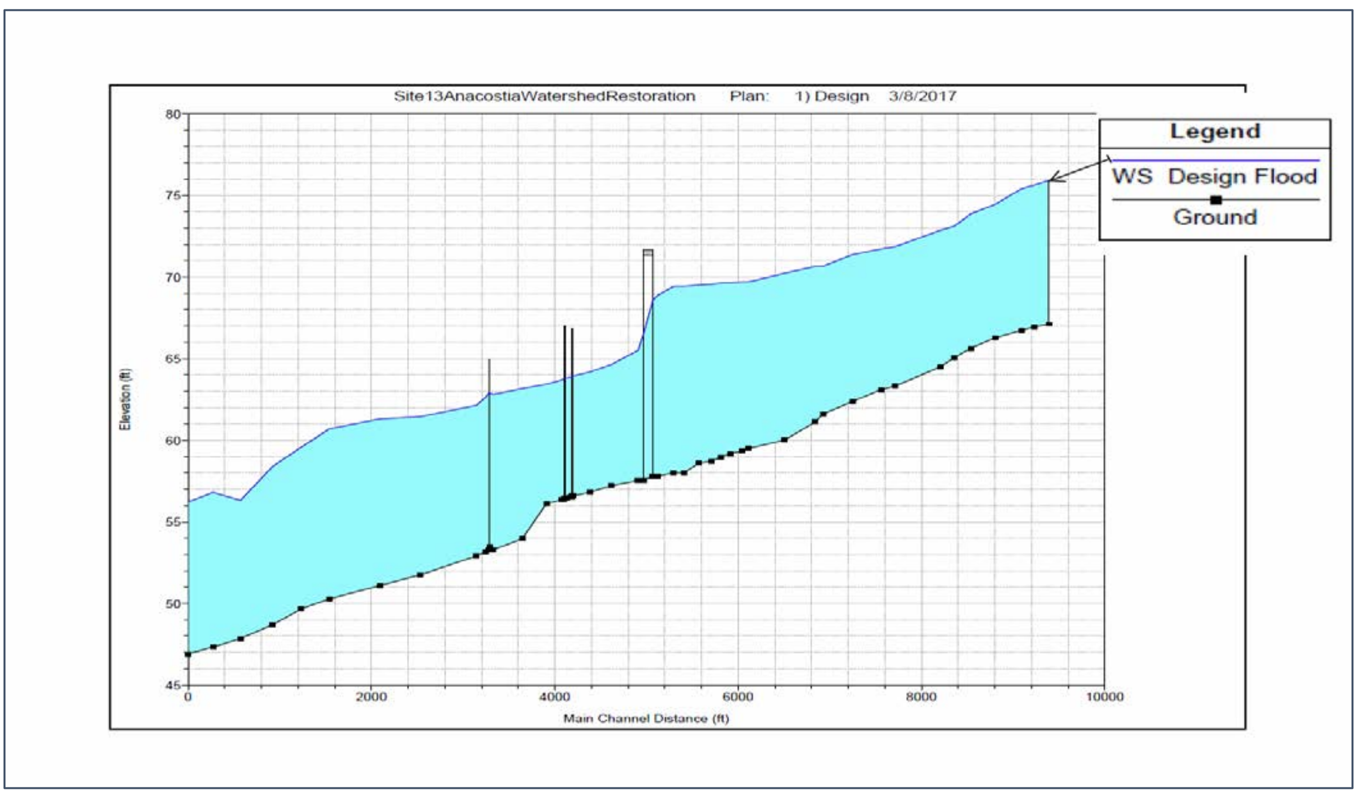

Figure 2: Site 13 Profile Design Flood

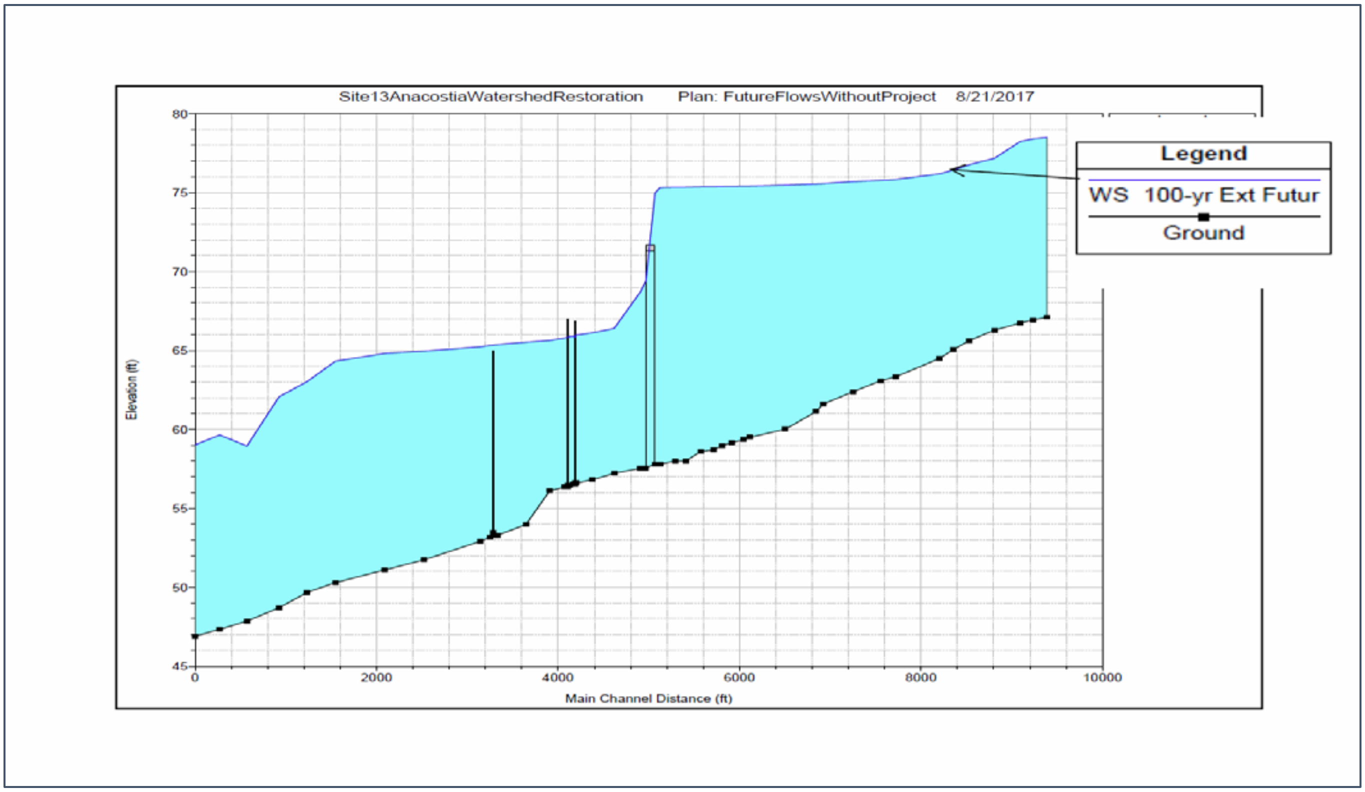

Figure 3: Site 13 Future Without Project HEC-RAS Analysis

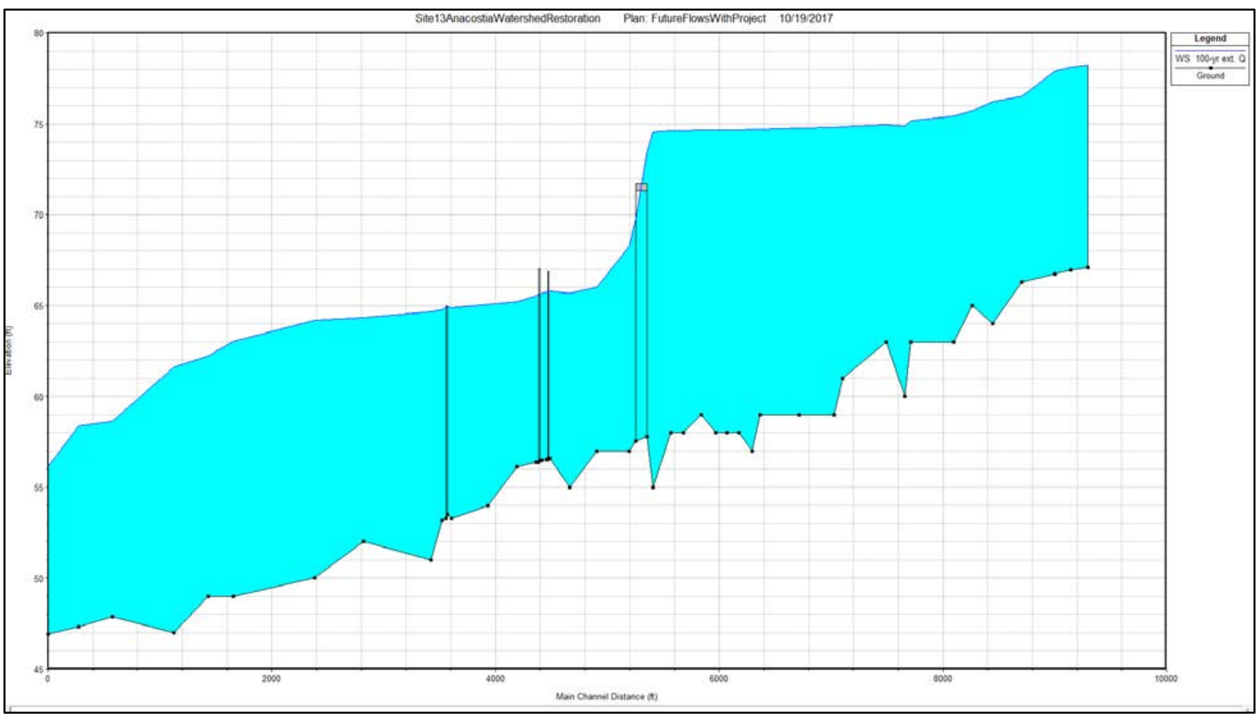

Figure 4: Site 13 Future Flows With Project HEC-RAS Analysis

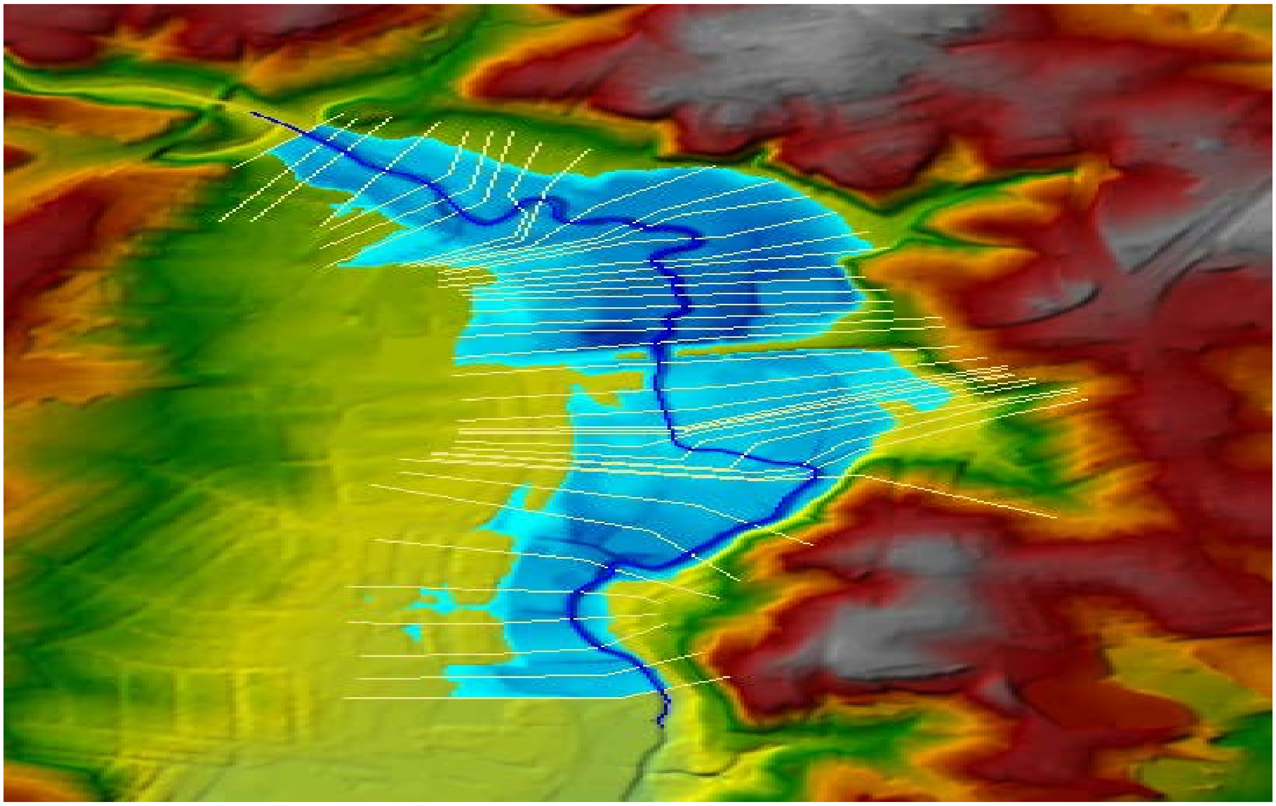

Figure 5: Site 13 Existing Conditions 100-year Flood Map

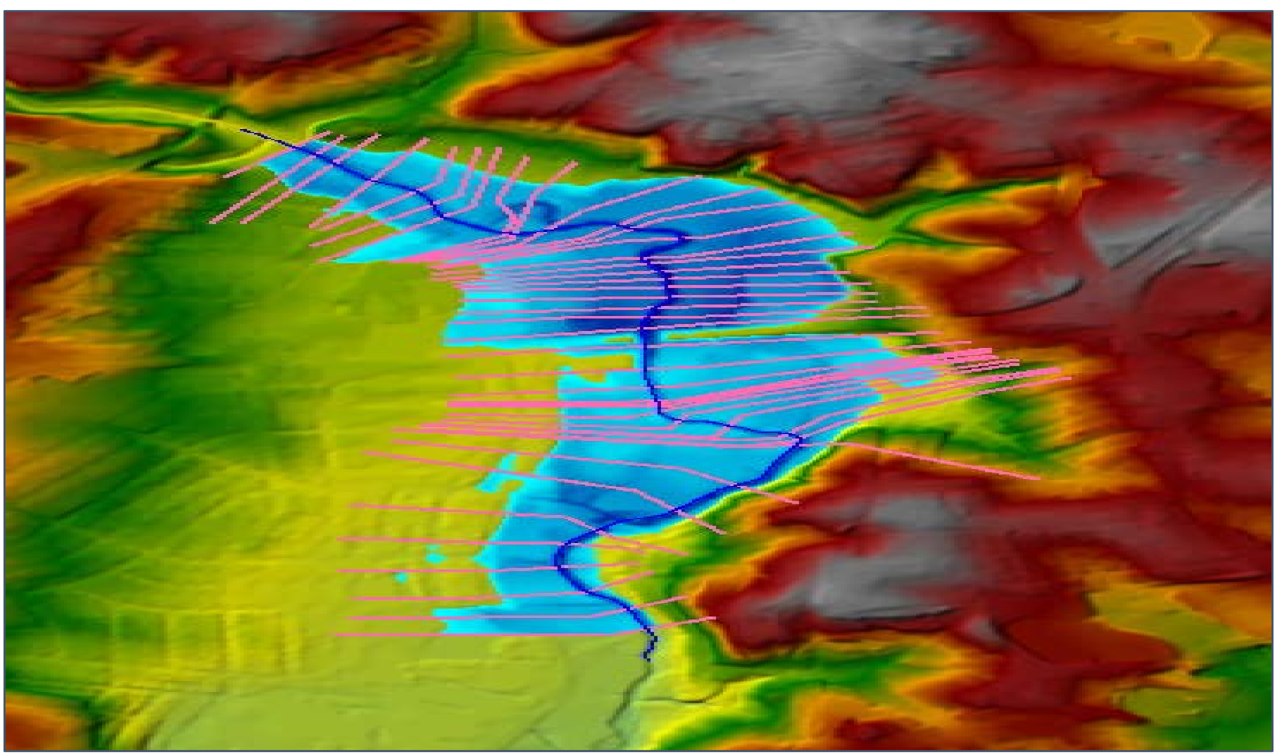

Figure 6: Site 13 Proposed Conditions 100-year Flood Map

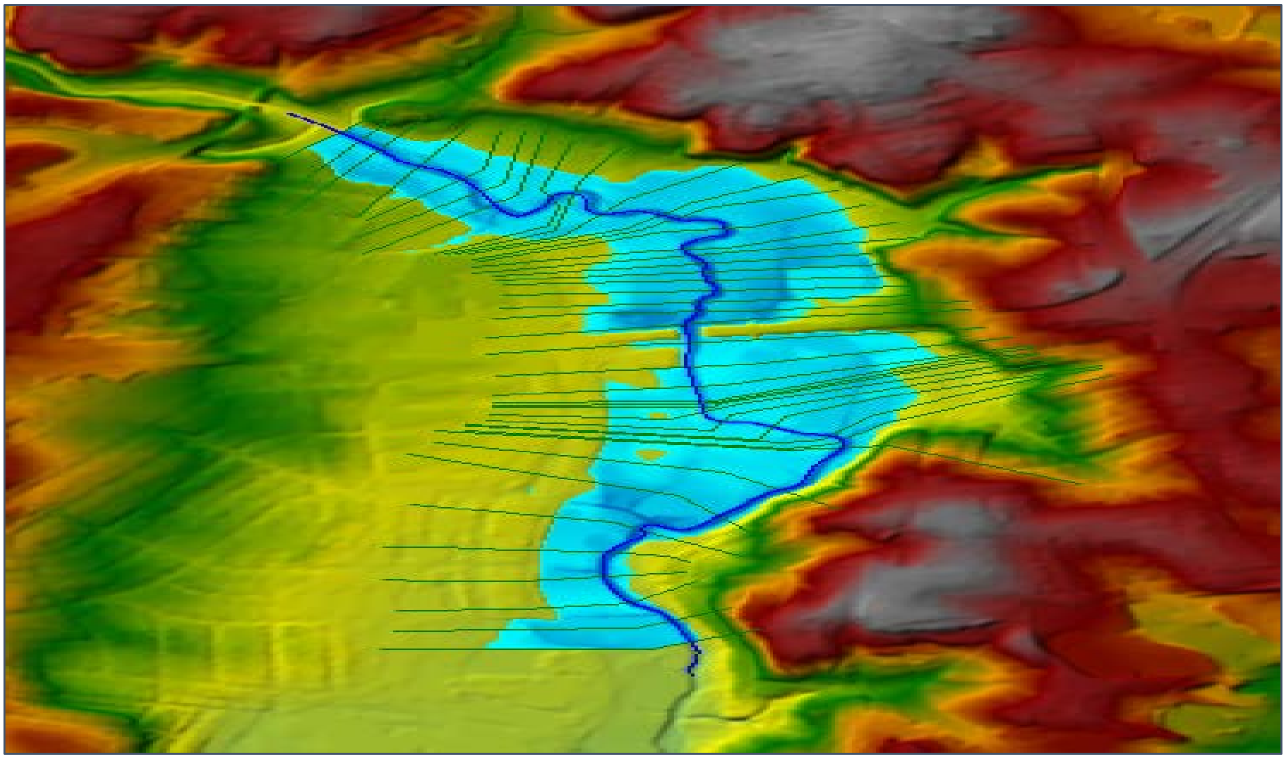

Figure 7: Site 13 Design Flood Map

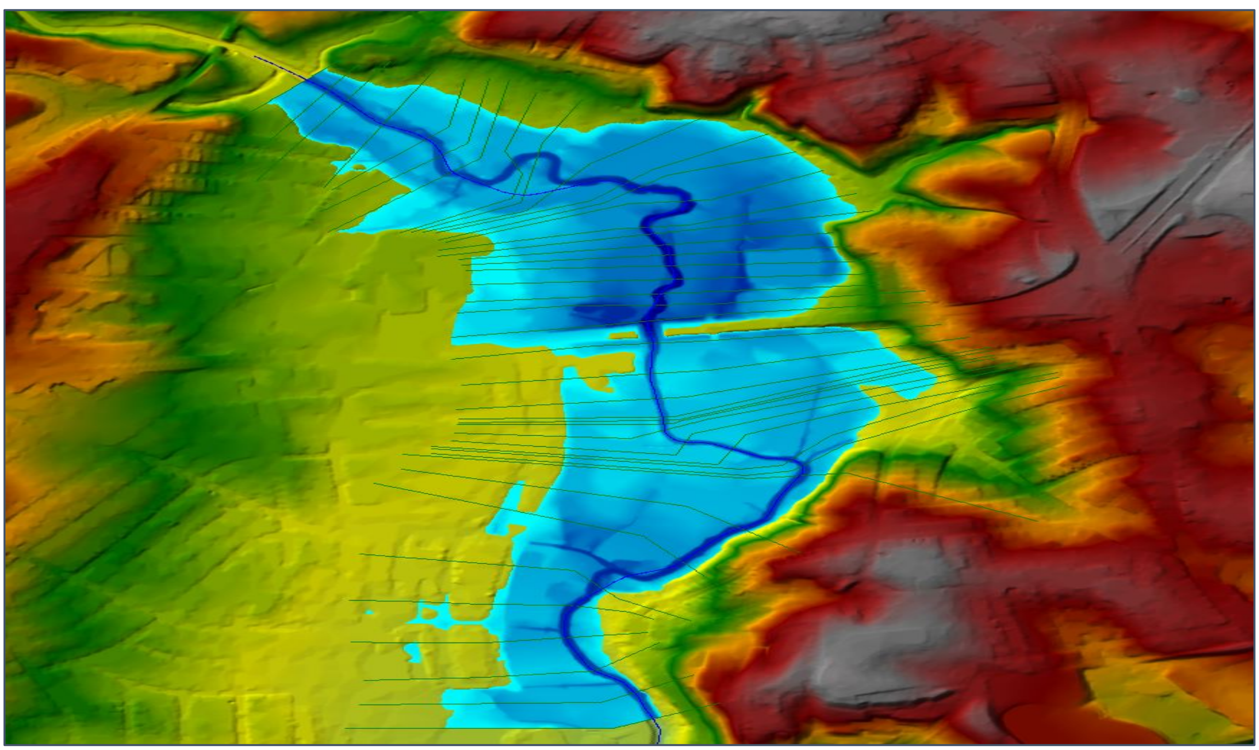

Figure 8: Site 13 Future Flows Without Project Conditions Flood Map

SITE 5

Table 1: RAS Results Existing Conditions, Project Proposed Conditions, Design Flood, Future Conditions With Project, and Future Conditions Without Project

		Water Surface Elevation (ft, NAVD88)	**100-year Flood Water Surface Elevation (ft, NAVD88)**				**Difference Existing Conditions HEC RAS vs Proposed Conditions**
Site 5 HEC RAS Existing Conditions Model XS	**Site 5 HEC-RAS Proposed Conditions Model XS**	**Site 5 Design Flood**	**Site 5 HEC-RAS Existing Conditions**	**Site 5 HEC-RAS Proposed Conditions**	**Site 5 HEC-RAS Future Flows With Project**	**Site 5 HEC-RAS Future Flows Without Project**	
6638	6638	61.9	63.30	62.9	62.9	63.3	0.39
6556	6556	61.1	62.42	62.15	62.18	62.46	0.27
6405	6405	60.4	61.37	61.35	61.38	61.39	0.02
6233	6233	58.2	60.42	60.42	60.44	60.45	0.00
6071	6071	58.5	59.74	59.75	59.77	59.77	-0.01
5970	5970	58.4	59.64	59.47	59.49	59.66	0.17
5855	5855	58.3	59.51	59.23	59.25	59.53	0.28
5776	5776	57.9	59.06	59.07	59.09	59.08	-0.01
5560	5560	57.8	59.01	59.00	59.02	59.03	0.01
5402	5402	56.3	57.58	57.59	57.62	57.62	-0.01
5287	5287	56.5	57.70	57.55	57.57	57.72	0.15
5124	5124	56.4	57.50	57.42	57.45	57.52	0.08
5044	5044	56.3	57.29	57.21	57.24	57.30	0.08
4979 BR	4979 BR						
4917	4917	55.3	56.21	56.12	56.14	56.26	0.09
4811	4811	54.7	56.42	56.01	56.06	56.46	0.41
4588	4588	54.0	56.07	55.72	55.77	56.12	0.35
4331	4331	53.6	55.78	55.64	55.69	55.83	0.14
4091	4091	53.2	55.42	55.31	55.36	55.47	0.11
3907	3907	53.0	55.27	55.06	55.11	55.32	0.21
3728	3728	52.0	54.83	54.71	54.76	54.89	0.12
3629 BR	3629 BR						
3518	3518	50.8	50.52	50.48	50.53	50.57	0.04
3225	3225	51.2	51.04	51.05	51.06	51.04	-0.01
2953	2953	51.2	51.01	51.02	51.03	51.01	-0.01
2806	2806	48.6	50.92	50.92	50.92	50.92	0.00
2655	2655	47.6	49.82	49.54	49.59	49.86	0.28
2535	2535	47.9	49.90	49.69	49.74	49.94	0.21
2337	2337	46.0	47.43	47.39	47.41	47.47	0.04
2167	2167	44.9	46.06	45.93	45.95	46.08	0.13
1957	1957	44.5	45.69	45.57	45.59	45.71	0.12
1862	1862	44.2	45.50	45.33	45.36	45.52	0.17
1723	1723	43.6	45.15	44.97	44.99	45.18	0.18
1709 BR	1709 BR						
1678	1678	43.4	45.01	44.95	44.97	45.04	0.06
1625	1625	43.3	44.98	44.90	44.93	45.00	0.08
1400	1400	42.4	44.63	44.30	44.33	44.66	0.33
1200	1200	42.2	44.52	44.22	44.25	44.54	0.30

1090	1090	42.0	44.44	44.15	44.17	44.46	0.29
960	960	41.8	44.38	44.09	44.11	44.40	0.29
781	781	41.4	44.09	43.65	43.68	44.12	0.44
569	569	40.8	43.80	43.39	43.41	43.82	0.41
263	263	38.9	42.04	42.04	42.07	42.07	0.00

*Flood risk management project location

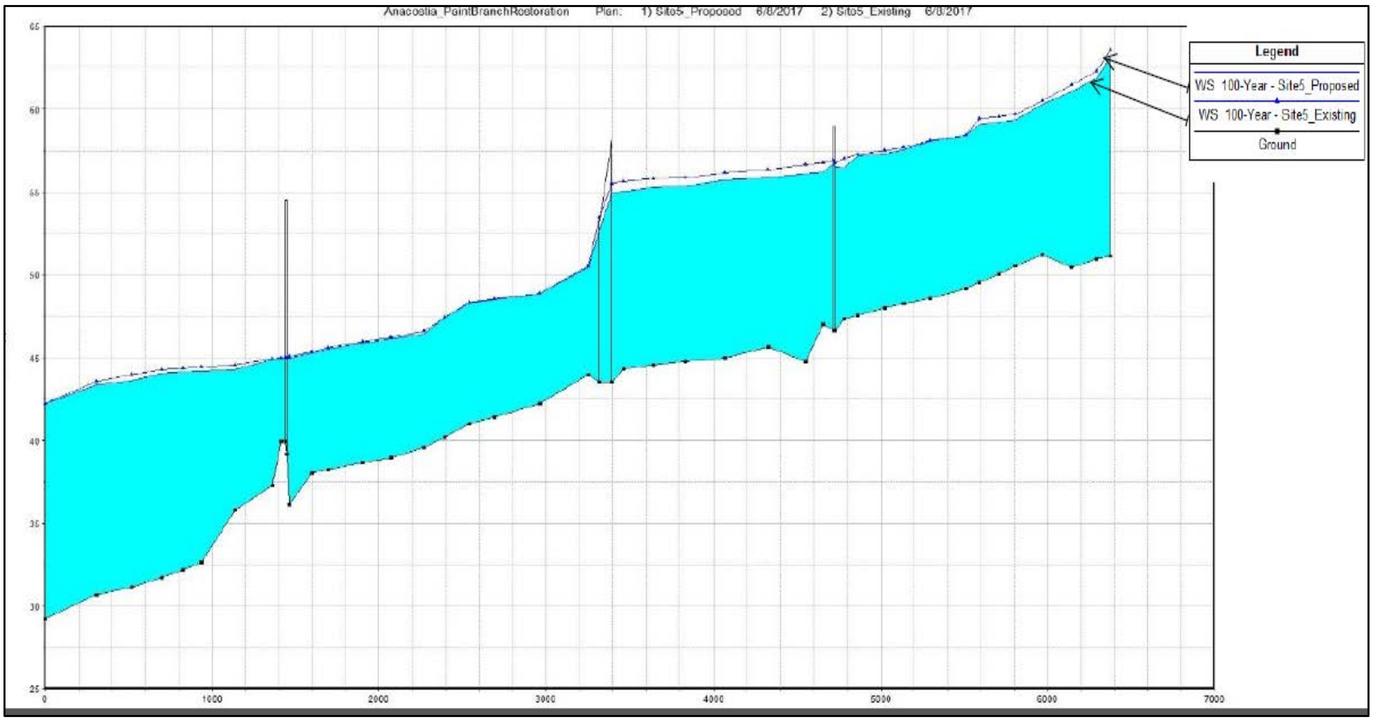

Figure 1: Site 5 Profiles compared - 100-Year Existing and Proposed Project Conditions

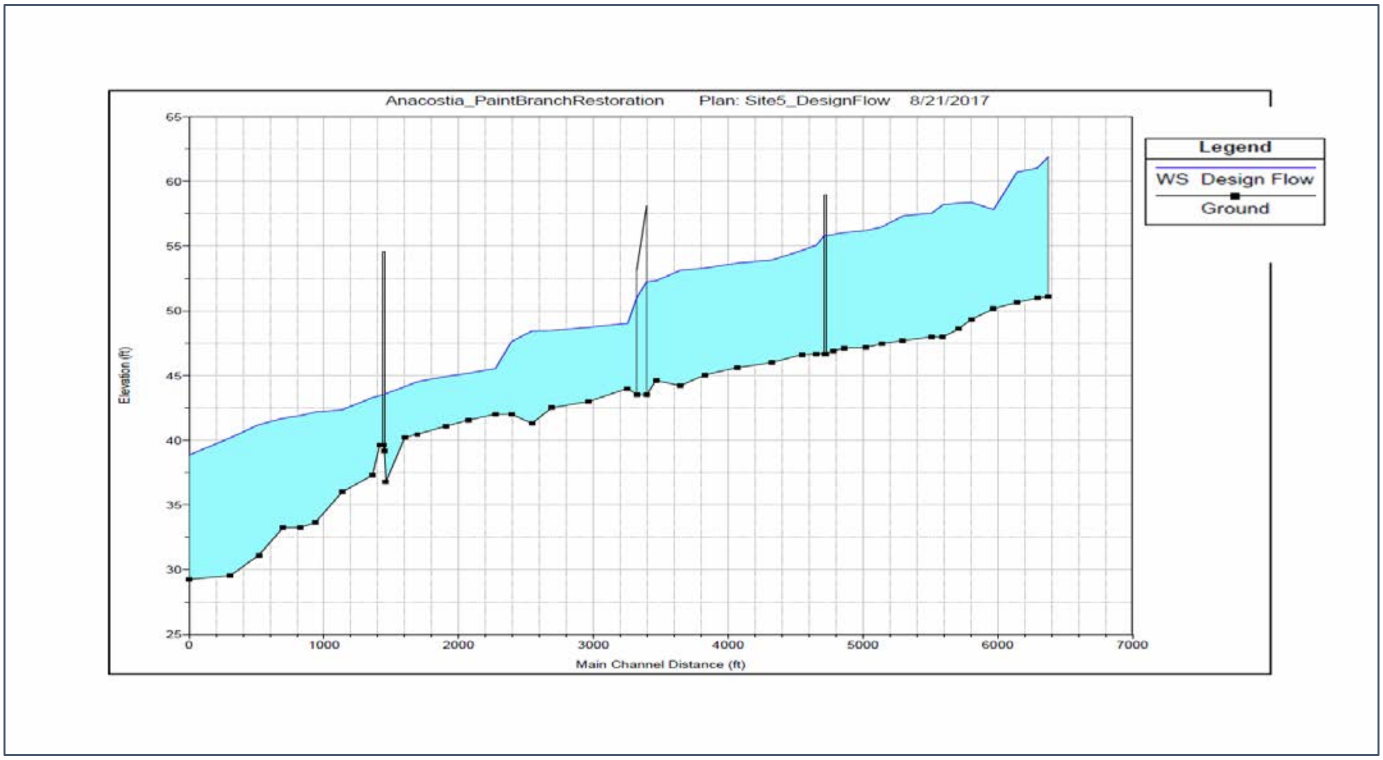

Figure 2: Site 5 Design Flood Profile

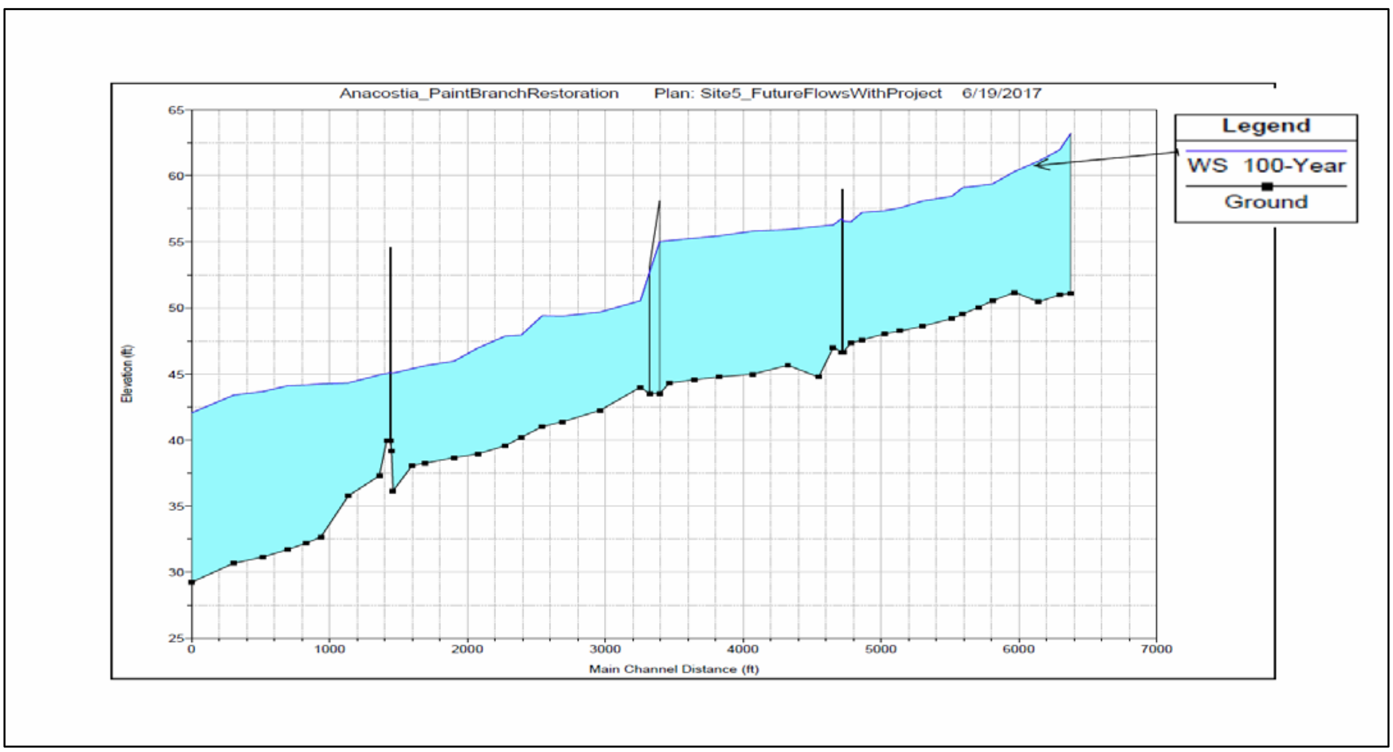

Figure 3: Site 5 Future Flows Without Project HEC-RAS Profile

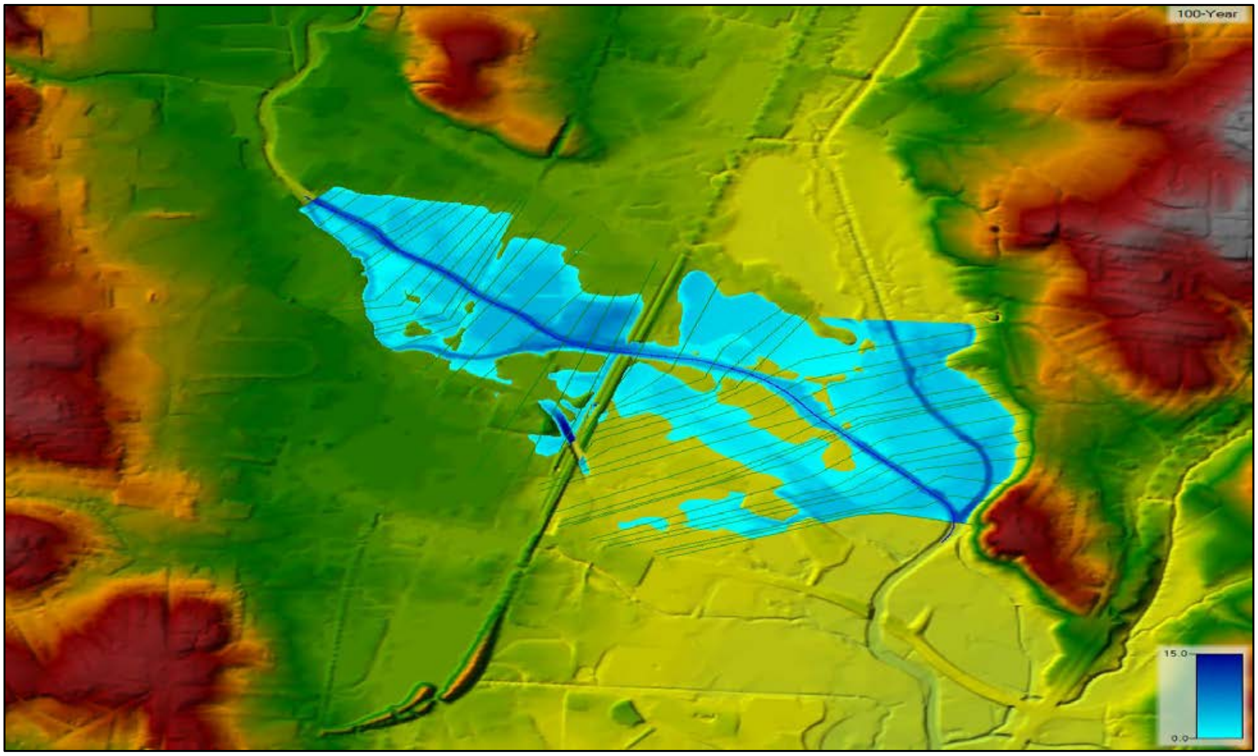

Figure 4: Site 5 Existing Conditions 100-Year Flood Map

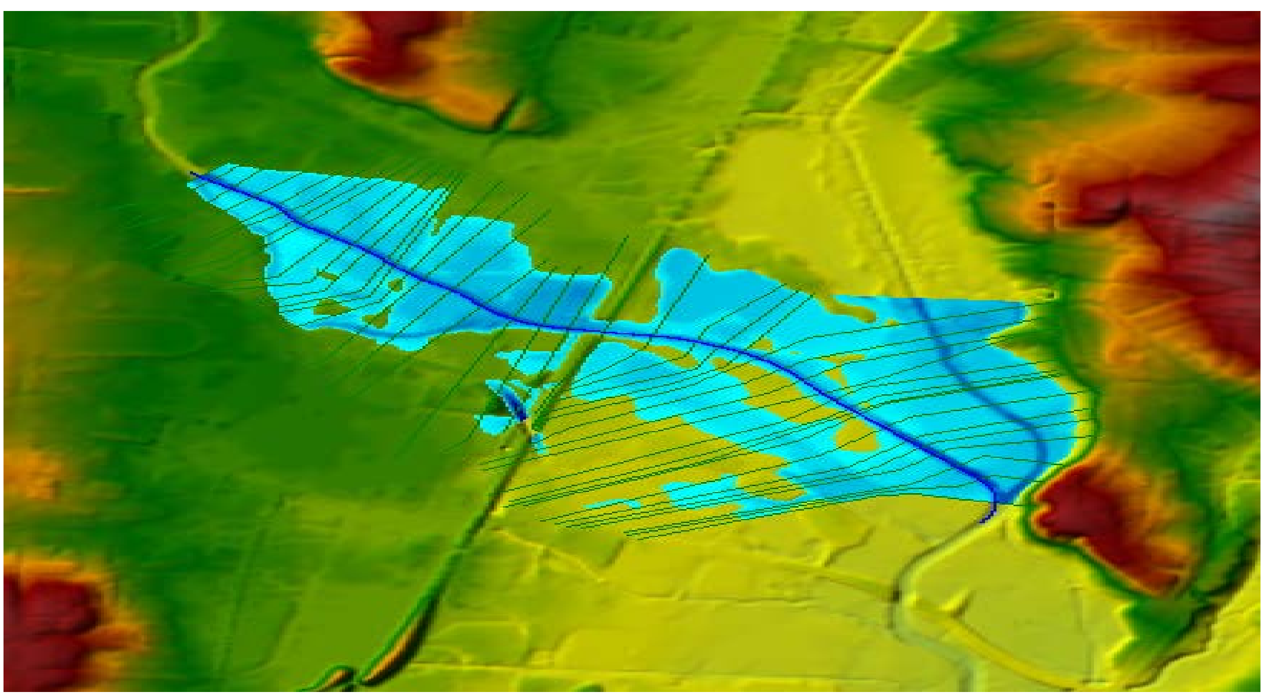

Figure 5: Site 5 Proposed Conditions 100-Year Flood Map

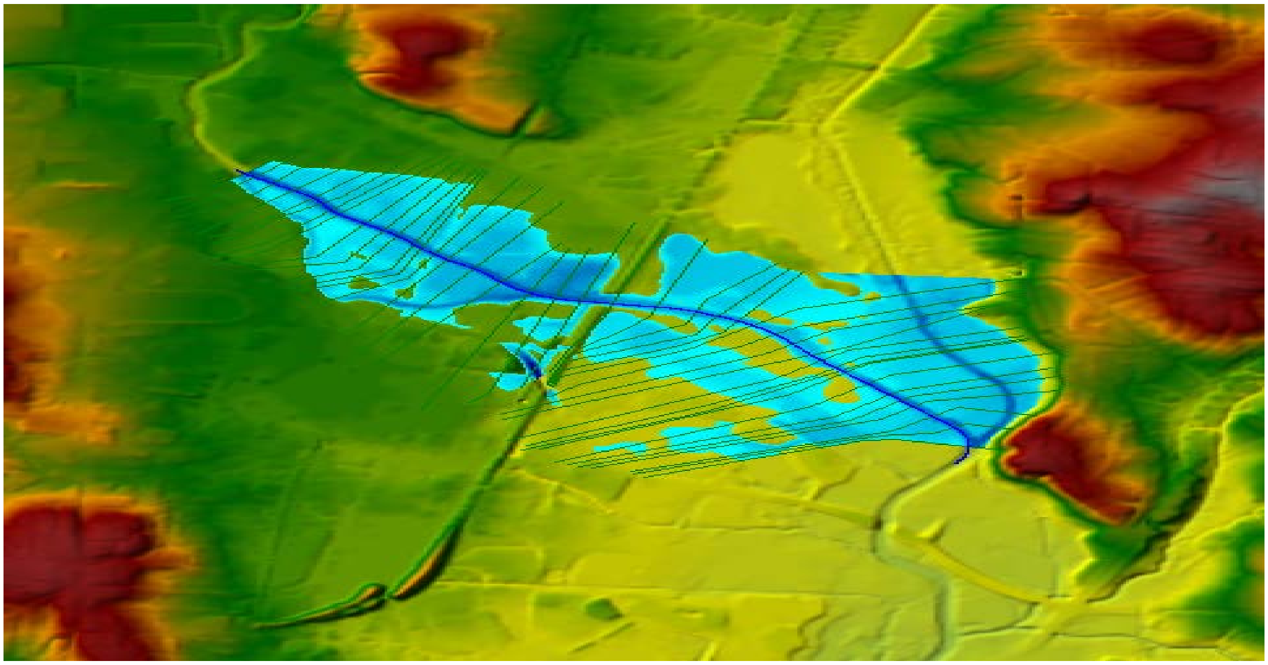

Figure 6: Site 5 Future Flows Without Project Conditions 100-Year Flood Map

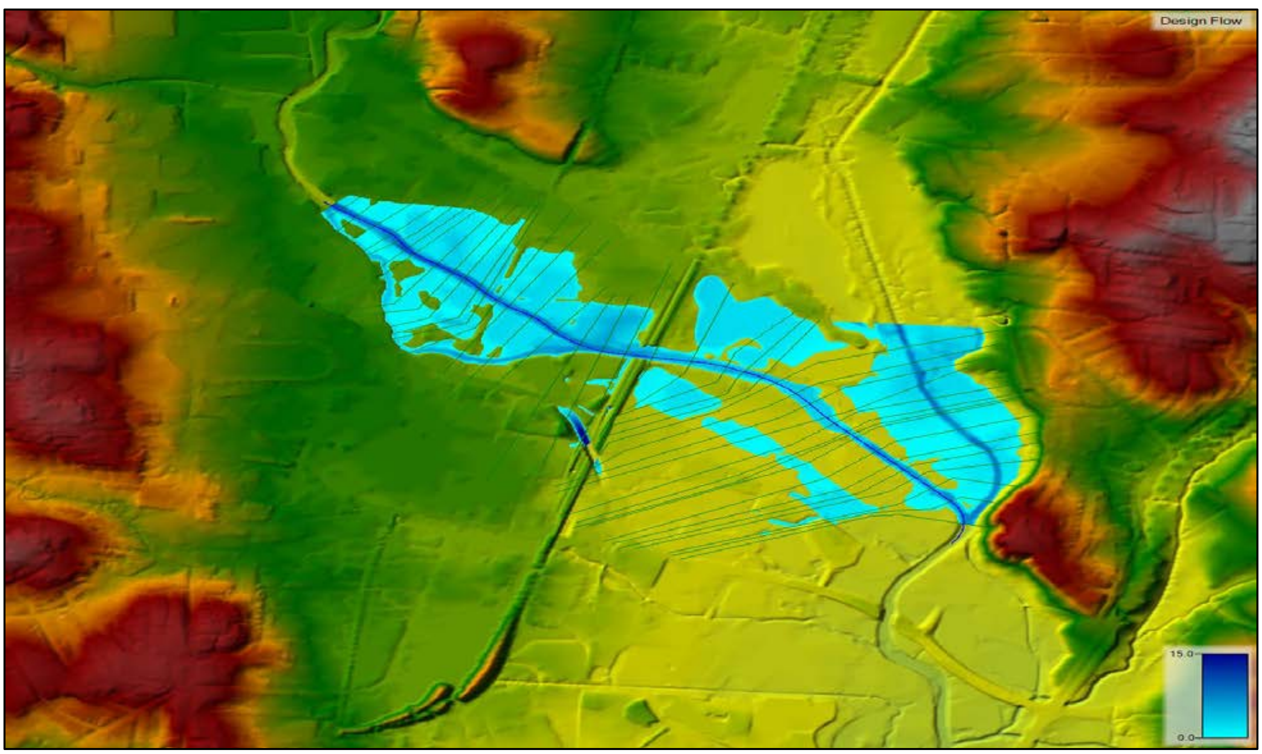

Figure 7: Site 5 Design Flow Flood Map

SITE 11

Table 1: RAS Results Existing Conditions, Project Proposed Conditions, Design Flood, Future Conditions With Project, and Future Conditions Without Project

		Water Surface Elevation (ft, NAVD88)	100-year Flood Water Surface Elevation (ft, NAVD88)				Difference Existing Conditions HEC-RAS vs Proposed Conditions
Site 11 HEC RAS Existing Conditions Model XS	**Site 11 HEC-RAS Proposed Conditions Model XS**	**Site 11 Design Flood**	**Site 11 HEC-RAS Existing Conditions**	**Site 11 HEC-RAS Proposed Conditions**	**Site 11 HEC-RAS Future Flows With Project**	**Site 11 HEC-RAS Future Flows Without Project**	
9793	9278	69.60	70.82	71.00	71.30	71.30	-0.22
9600	9084	69.30	70.96	70.25	71.94	72.65	0.71
9420	8904	68.90	70.75	69.98	71.79	72.54	0.77
9257	8741	68.40	70.47	69.36	71.69	72.47	1.11
9041	8525	67.70	70.22	69.43	71.56	72.35	0.79
8848	8332	67.10	70.03	69.41	71.60	72.27	0.62
8456	7940	66.40	69.84	69.31	71.54	72.18	0.53
8032	7516	65.80	69.71	69.20	71.48	72.12	0.51
7795	7279	65.50	69.67	69.17	71.48	72.10	0.50
7559	7043	65.20	69.62	69.13	71.48	72.10	0.49
7302	6787	65.10	69.58	69.11	71.47	72.09	0.47
6975	6459	65.00	69.57	69.10	71.46	72.08	0.47
6628	6178	64.90	69.55	69.08	71.46	72.07	0.47
6236	5807	64.90	69.54	69.08	71.45	72.06	0.46
6058	5628	64.90	69.54	69.07	71.45	72.06	0.47
5528	5299	64.90	69.53	69.06	71.44	72.05	0.47
5028	4928	64.80	69.51	69.04	71.43	72.04	0.47
4638	4632	64.80	69.50	69.04	71.43	72.04	0.46
4356	4361	64.70	69.44	68.96	71.39	72.00	0.48
4135	4141	64.40	69.39	68.90	71.35	71.97	0.49
3819	3825	64.20	69.35	68.84	71.31	71.94	0.51
3595	3600	64.10	69.32	68.82	71.31	71.93	0.50
3468	3474	64.00	69.32	68.81	71.30	71.92	0.51
3207	3213	62.90	69.12	68.50	71.18	71.85	0.62
2974	2980	62.90	69.19	68.62	71.23	71.88	0.57
2745	2751	63.10	69.20	68.63	71.24	71.88	0.57
2686 BR	2691 BR						
2640	2645	62.80	69.18	68.61	71.22	71.87	0.57
2583	2588	62.00	69.16	68.59	71.21	71.86	0.57
2471 BR	2476 BR						
2350	2355	57.00	58.54	57.98	58.34	58.99	0.56
2234	2239	56.80	58.46	57.80	58.11	58.91	0.66

		Water Surface Elevation (ft, NAVD88)	100-year Flood Water Surface Elevation (ft, NAVD88)				Difference Existing Conditions HEC-RAS vs Proposed Conditions
Site 11 HEC RAS Existing Conditions Model XS	Site 11 HEC-RAS Proposed Conditions Model XS	Site 11 Design Flood	Site 11 HEC-RAS Existing Conditions	Site 11 HEC-RAS Proposed Conditions	Site 11 HEC-RAS Future Flows With Project	Site 11 HEC-RAS Future Flows Without Project	
2082	2088	56.60	58.33	57.68	58.00	58.79	0.65
1817	1823	56.00	58.00	57.56	57.91	58.44	0.44
1491	1495	56.00	57.96	57.45	57.80	58.40	0.51
1162	1166	55.60	57.76	57.10	57.43	58.23	0.66
866	869	55.60	57.70	57.05	57.39	58.17	0.65
664	664	55.40	57.61	56.96	57.29	58.08	0.65
600 BR	600 BR						
545	546	52.70	56.57	55.11	55.37	57.27	1.46
393	394	53.00	56.64	54.49	54.87	57.32	2.15
244	245	52.80	56.58	54.30	54.69	57.27	2.28
130	131	52.30	56.41	53.73	54.10	57.11	2.68

* Flood Risk Management Project Location

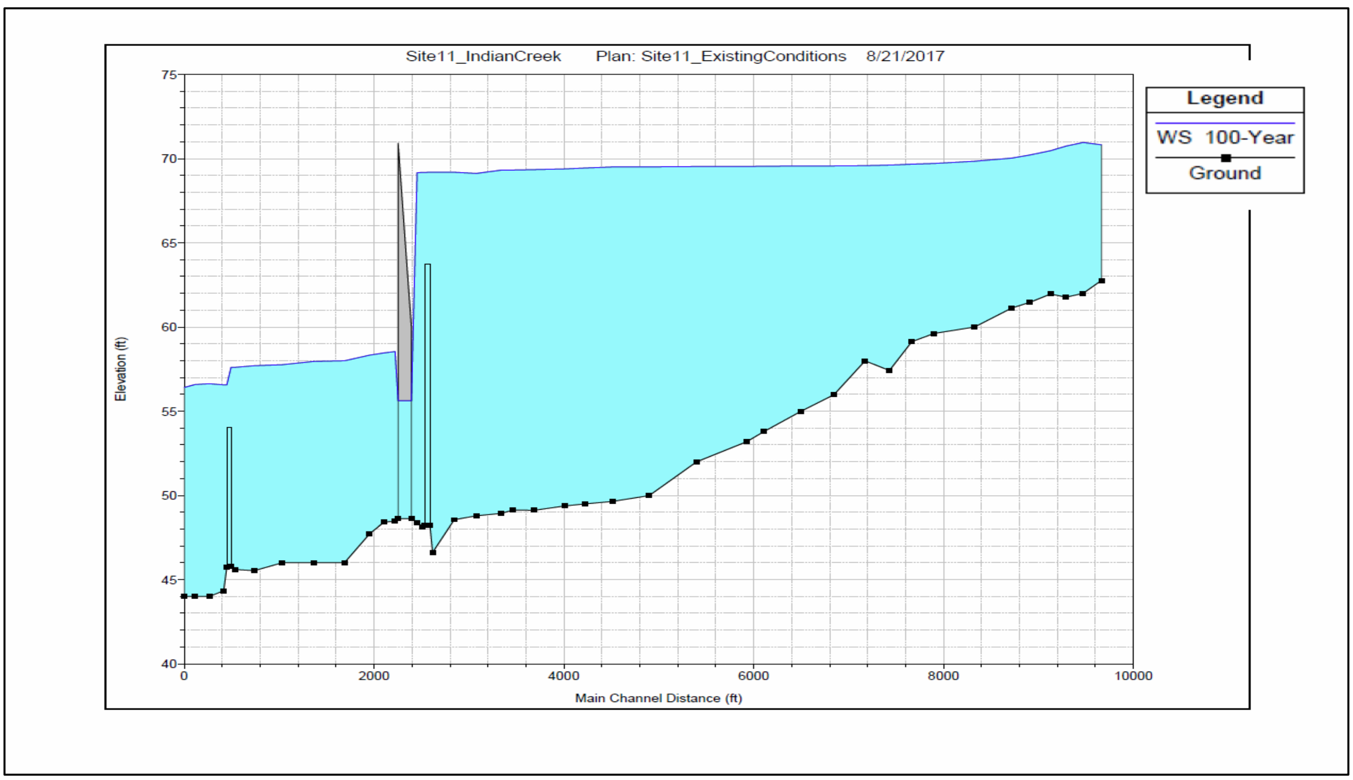

Figure 1: Site 11 Existing Conditions 100-Year Profile

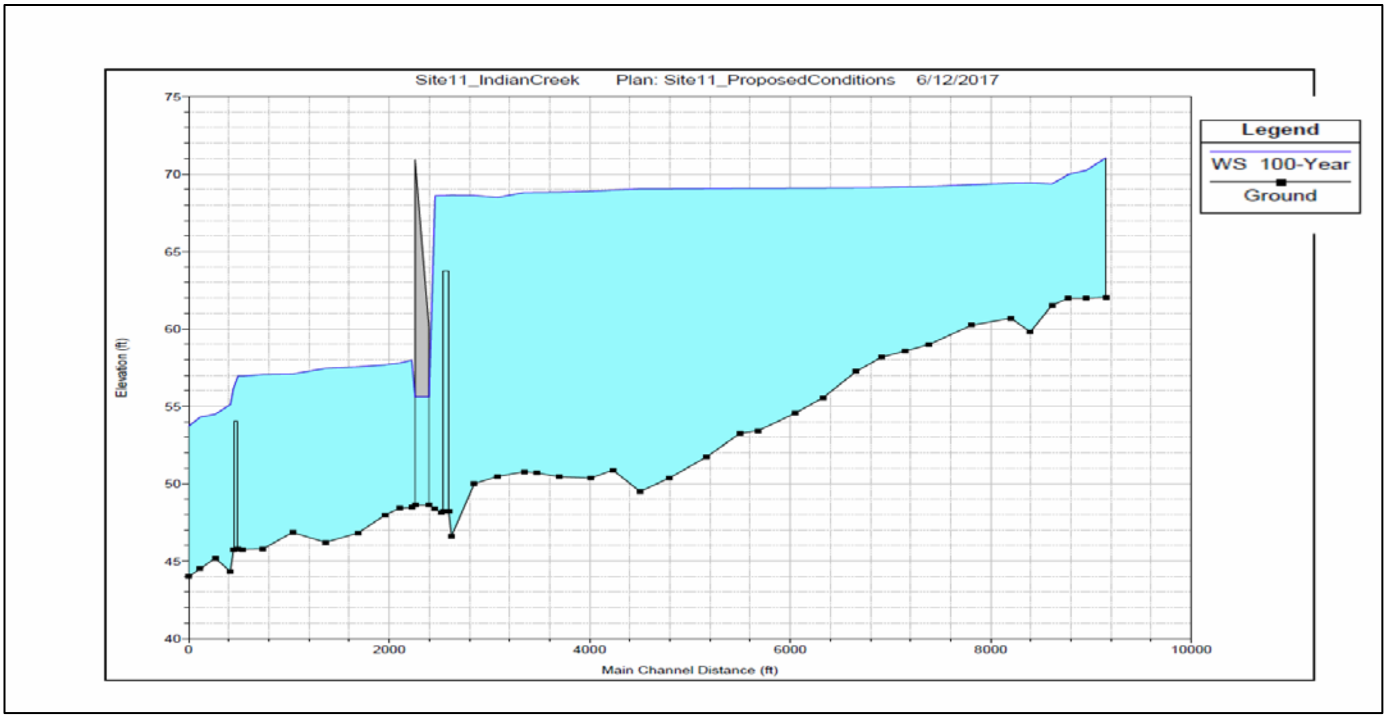

Figure 2: Site 11 Proposed Conditions 100-Year Profile

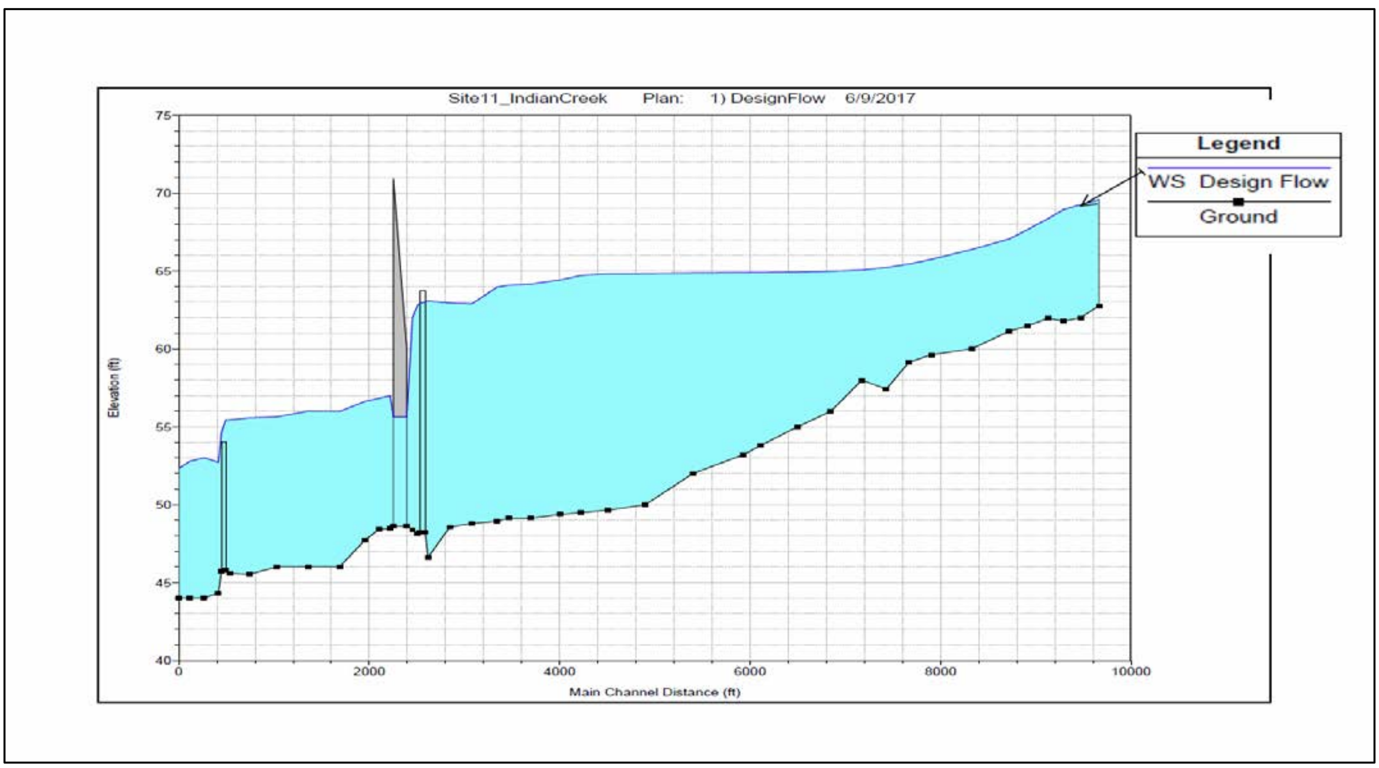

Figure 3: Site 11 Design Flood Profile

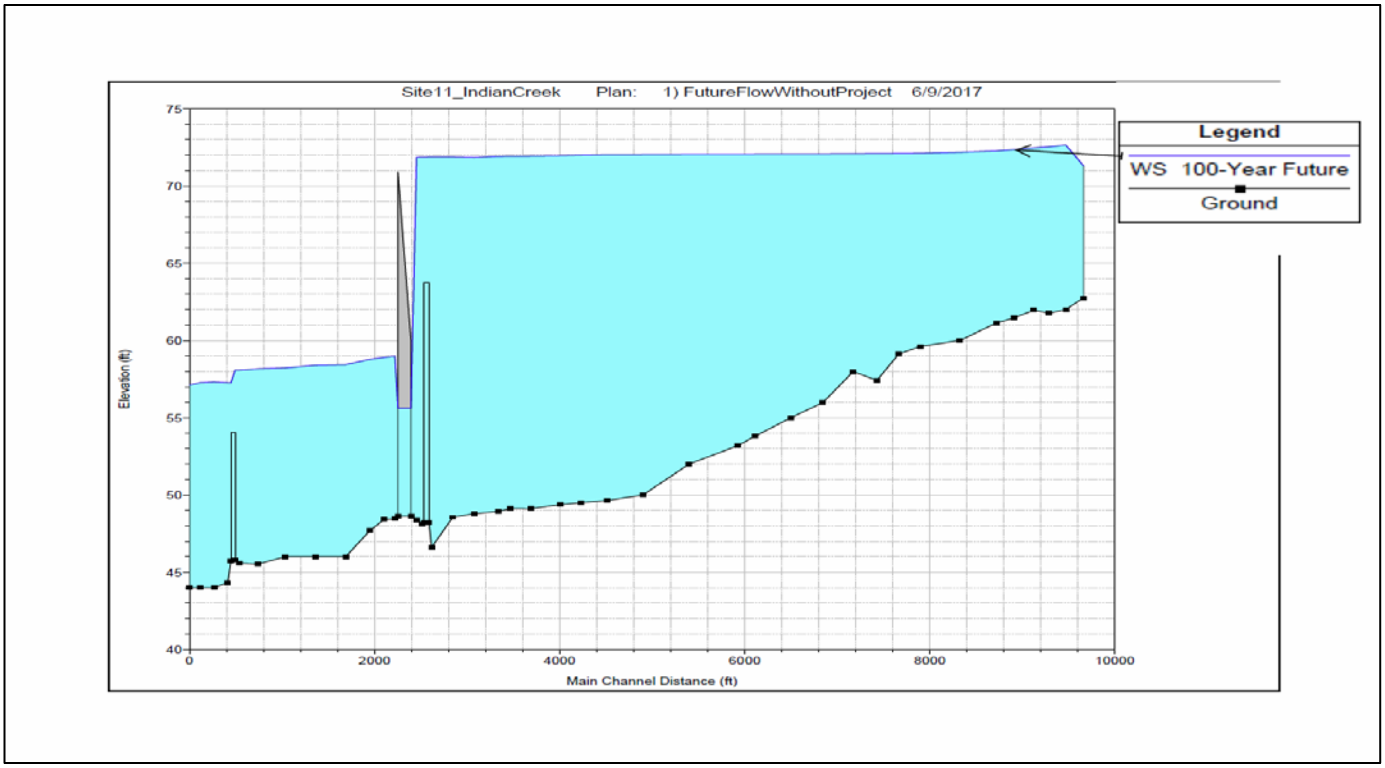

Figure 4: Site 11 Future Flows Without Project Profile

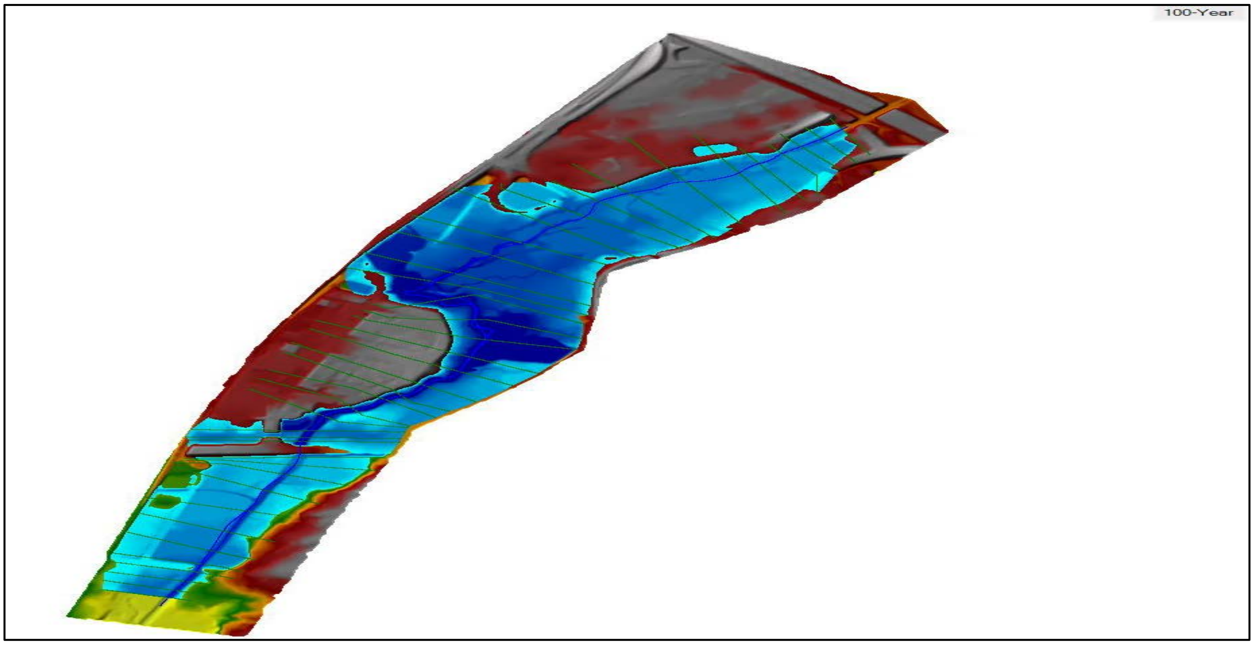

Figure 5: Site 11 Existing Conditions 100-year Flood Map

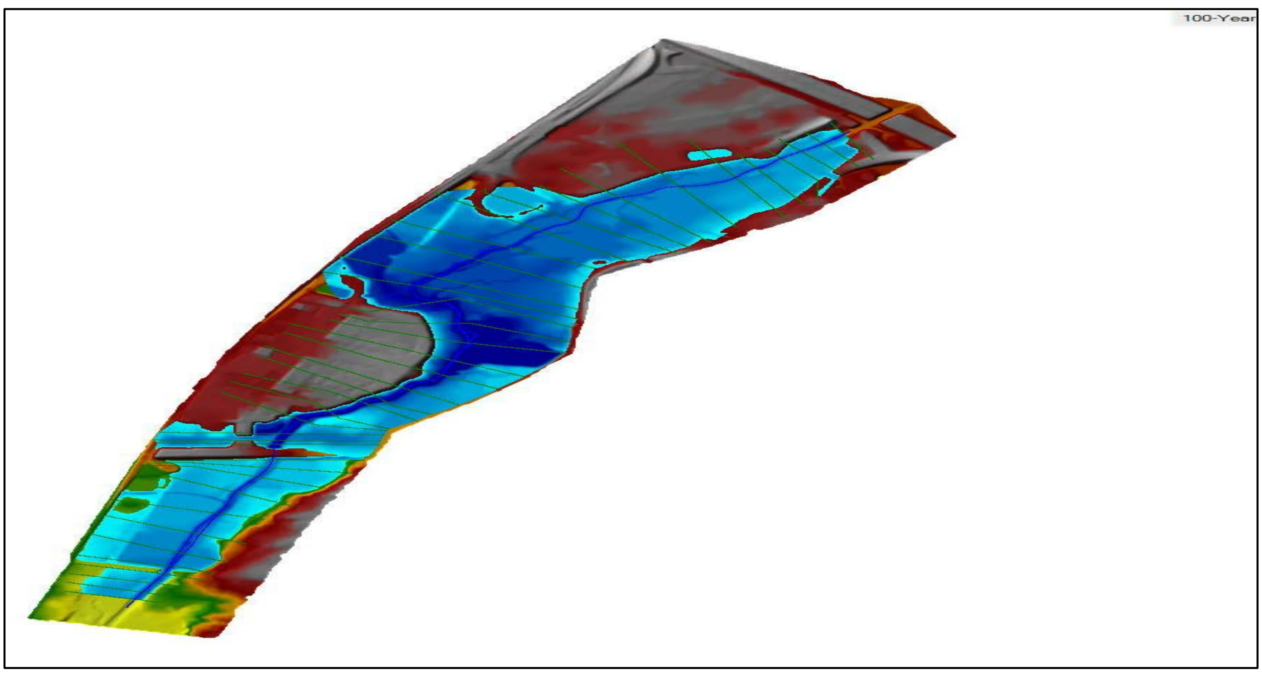

Figure 6: Site 11 Proposed Conditions 100-year Flood Map

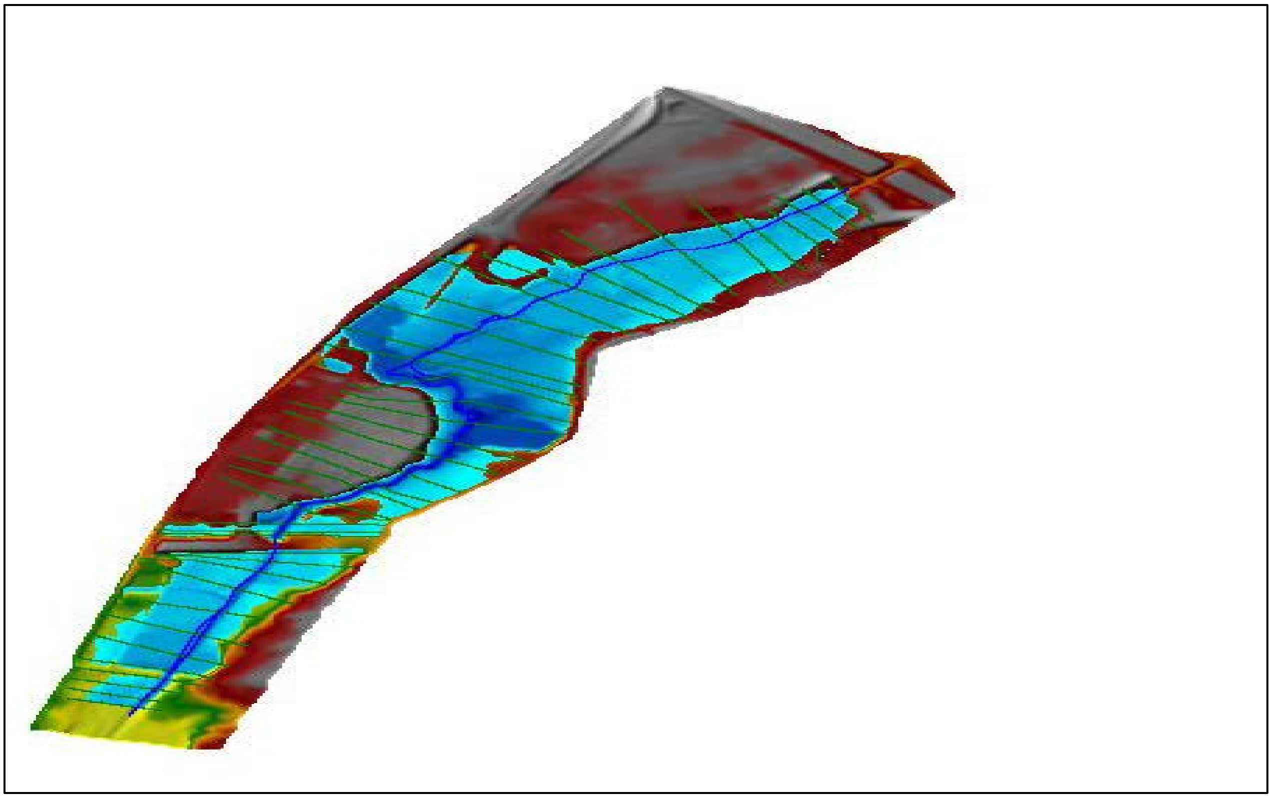

Figure 7: Site 11 Design Flow Flood Map

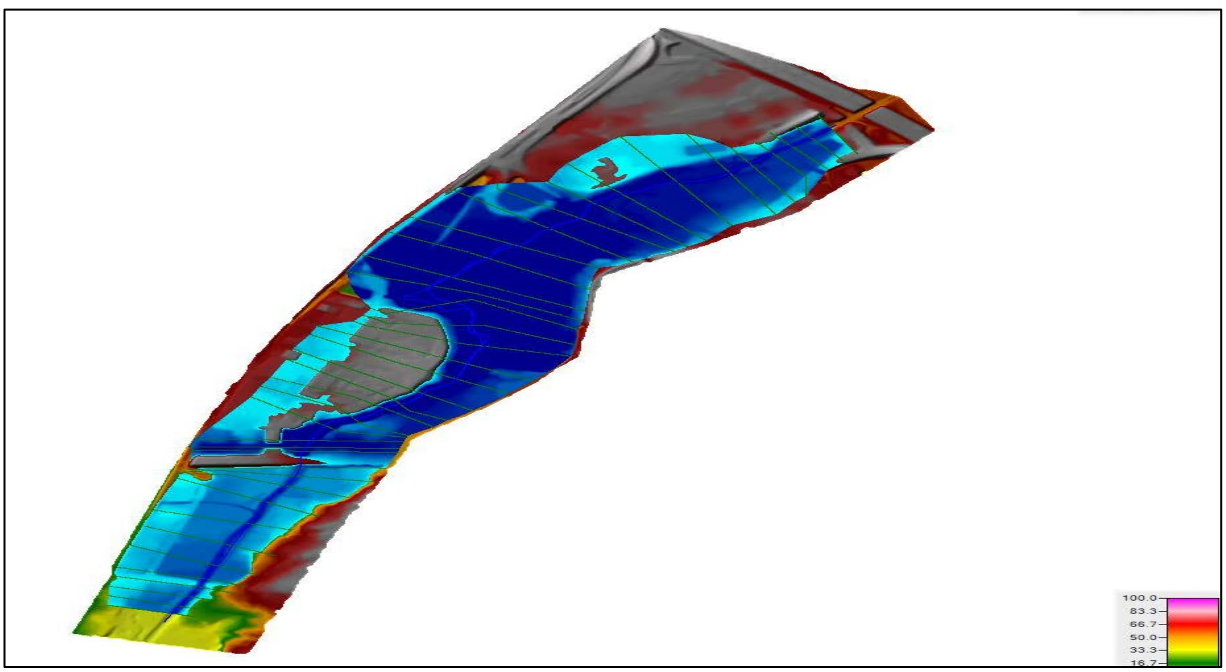

Figure 8: Site 11 Future Flows With Project Conditions 100-Year Flood Map

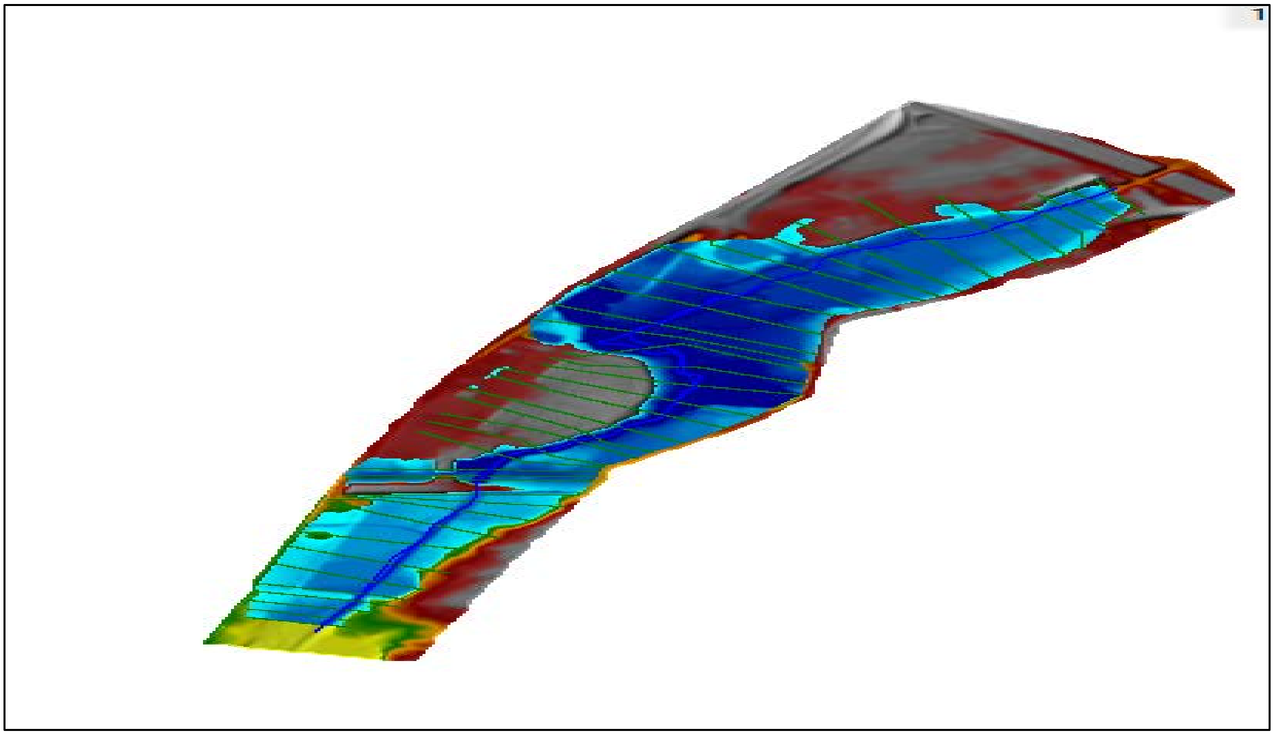

Figure 9: Site 11 Future Flows Without Project Conditions 100-Year Flood Map

SITE 15

Table 1: RAS Results Existing Conditions, Project Proposed Conditions, Design Flood, Future Conditions With Project, and Future Conditions Without Project

		Water Surface Elevation (ft, NAVD88)	100-year Flood Water Surface Elevation (ft, NAVD88)				Difference Existing Conditions HEC RAS vs Proposed Conditions
Site 15 HEC RAS Existing Conditions Model XS	Site 15 HEC-RAS Proposed Conditions Model XS	Site 15 Design Flood	Site 15 HEC-RAS Existing Conditions	Site 15 HEC-RAS Proposed Conditions	Site 15 HEC-RAS Future Flows With Project	Site 15 HEC-RAS Future Flows Without Project	
6619	6619	41.1	42.56	42.4	42.9	42.9	0.14
6345	6345	40.8	42.27	41.93	42.57	42.57	0.34
6186	6186	40.7	42.13	41.68	42.44	42.44	0.45
5925	5925	39.8	41.45	41.39	41.85	41.85	0.06
5776	5776	39.3	41.46	41.22	41.84	41.84	0.24
5588	5588	39.5	41.41	41.24	41.78	41.78	0.17
5463 BR	5463 BR						
5333	5333	38.1	40.28	39.96	40.65	40.65	0.32
5021	5021	37.7	39.97	39.58	40.30	40.30	0.39
4699	4699	37.2	39.60	39.29	39.93	39.93	0.31
4386	4386	35.6	37.71	36.91	38.05	38.05	0.80
4171	4171	35.1	37.50	36.82	37.82	37.82	0.68
3882	3882	34.7	37.17	36.38	37.49	37.49	0.79
3573	3573	34.0	36.22	35.98	36.65	36.65	0.24
3416	3416	33.5	35.97	35.54	36.39	36.39	0.43
3250	3250	33.2	35.77	35.30	36.16	36.16	0.47
2962	2962	33.1	35.42	35.34	35.84	35.84	0.08
2731	2731	32.6	34.85	34.63	35.24	35.24	0.22
2468	2468	31.3	33.70	33.54	34.44	34.44	0.16
2321	2321	31.1	33.32	33.33	33.88	33.88	-0.01
2238 BR	2238 BR						
2167	2167	30.5	32.08	31.69	32.36	32.36	0.39
2021	2021	30.5	31.85	31.75	32.11	32.11	0.10
1877	1877	29.9	30.99	31.00	31.18	31.18	-0.01
1690	1690	29.8	31.08	30.98	31.32	31.32	0.10
1522	1522	29.5	30.99	30.91	31.28	31.28	0.08
1193	1193	29.1	30.65	30.65	30.96	30.96	0.00
877	877	28.3	29.91	29.91	30.23	30.23	0.00
496	496	27.8	29.65	29.65	29.98	29.98	0.00
126	126	27.7	29.38	29.38	29.70	29.70	0.00

* Flood Risk Management Project Location

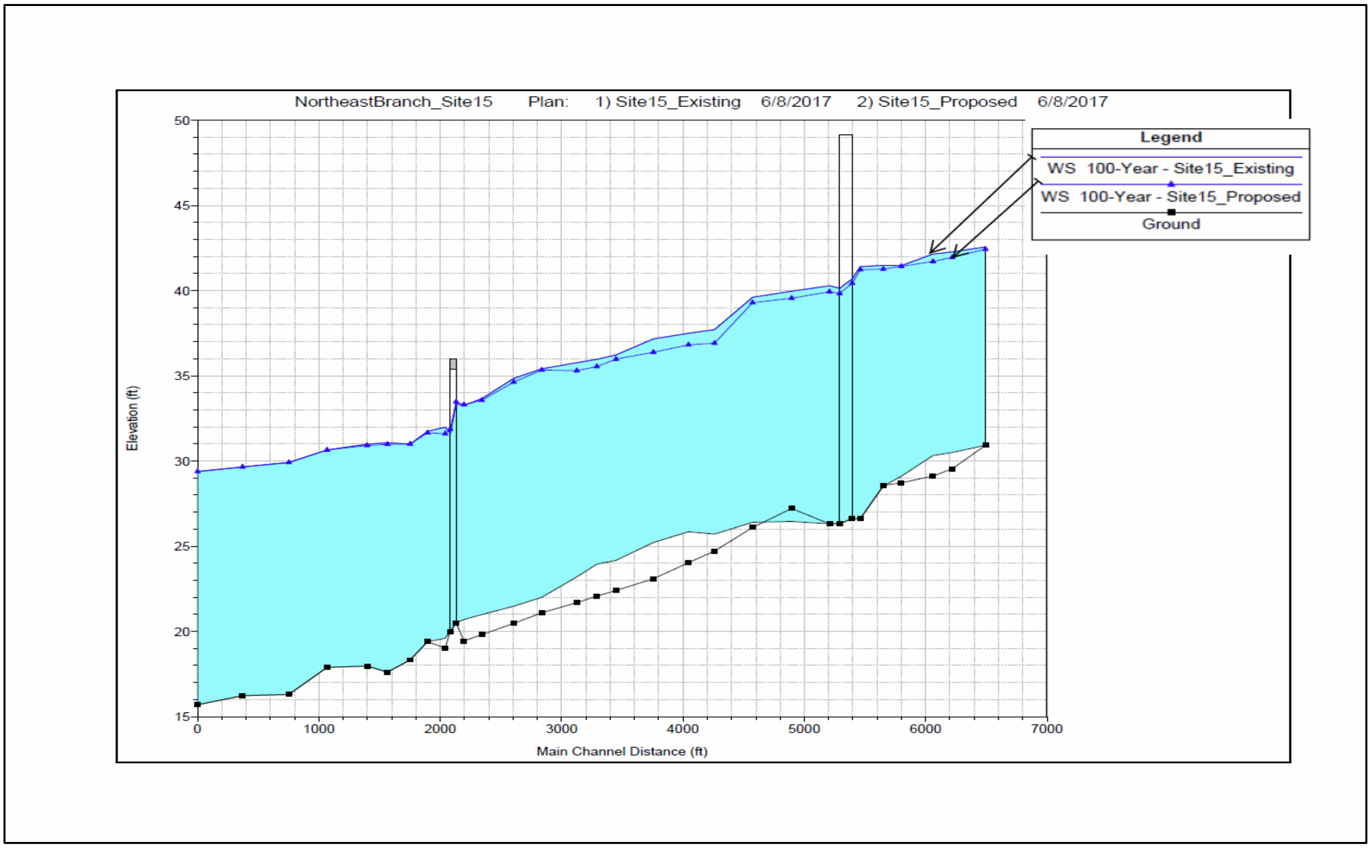

Figure 1: Site 15 Profiles compared - 100-Year Existing and Proposed Project Conditions

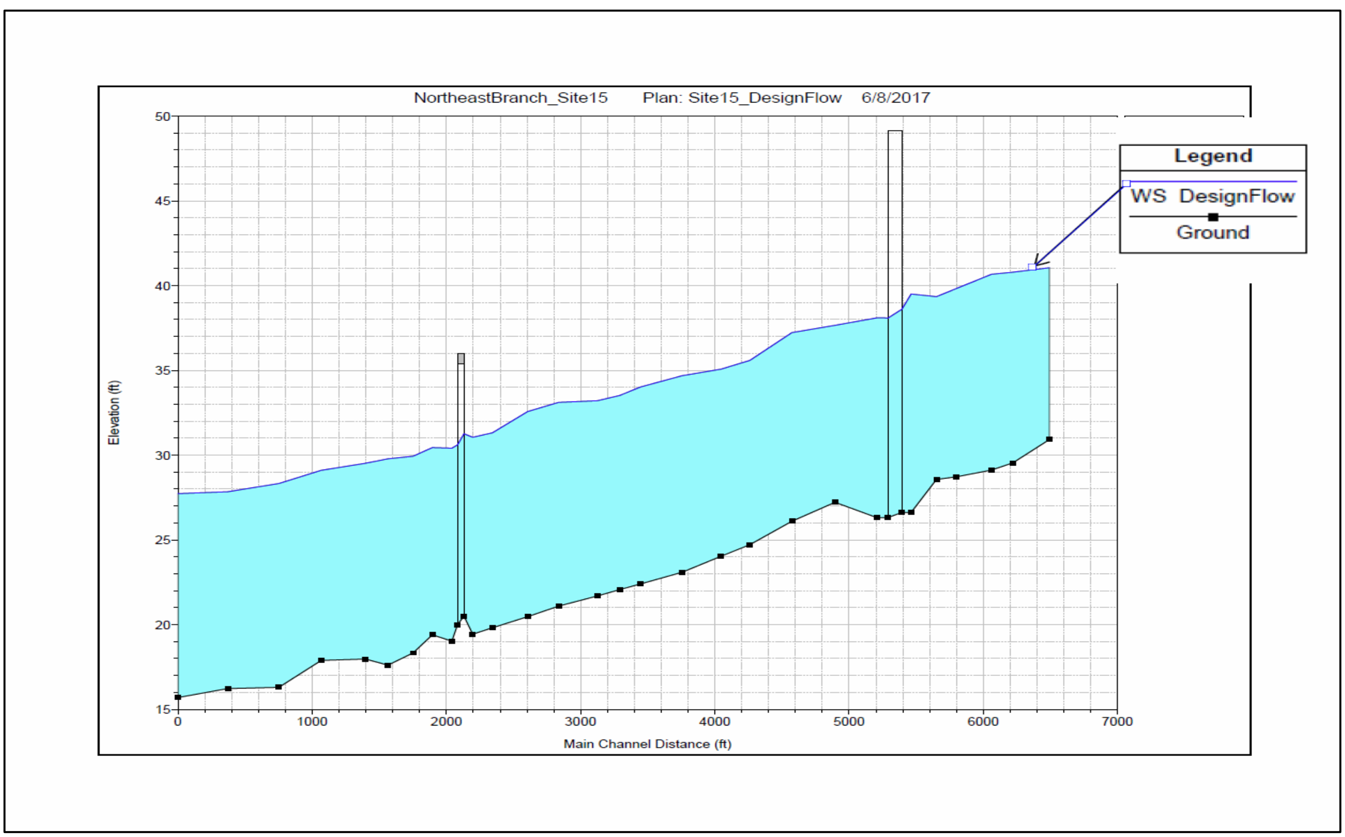

Figure 2: Site 15 Design Flood Profile

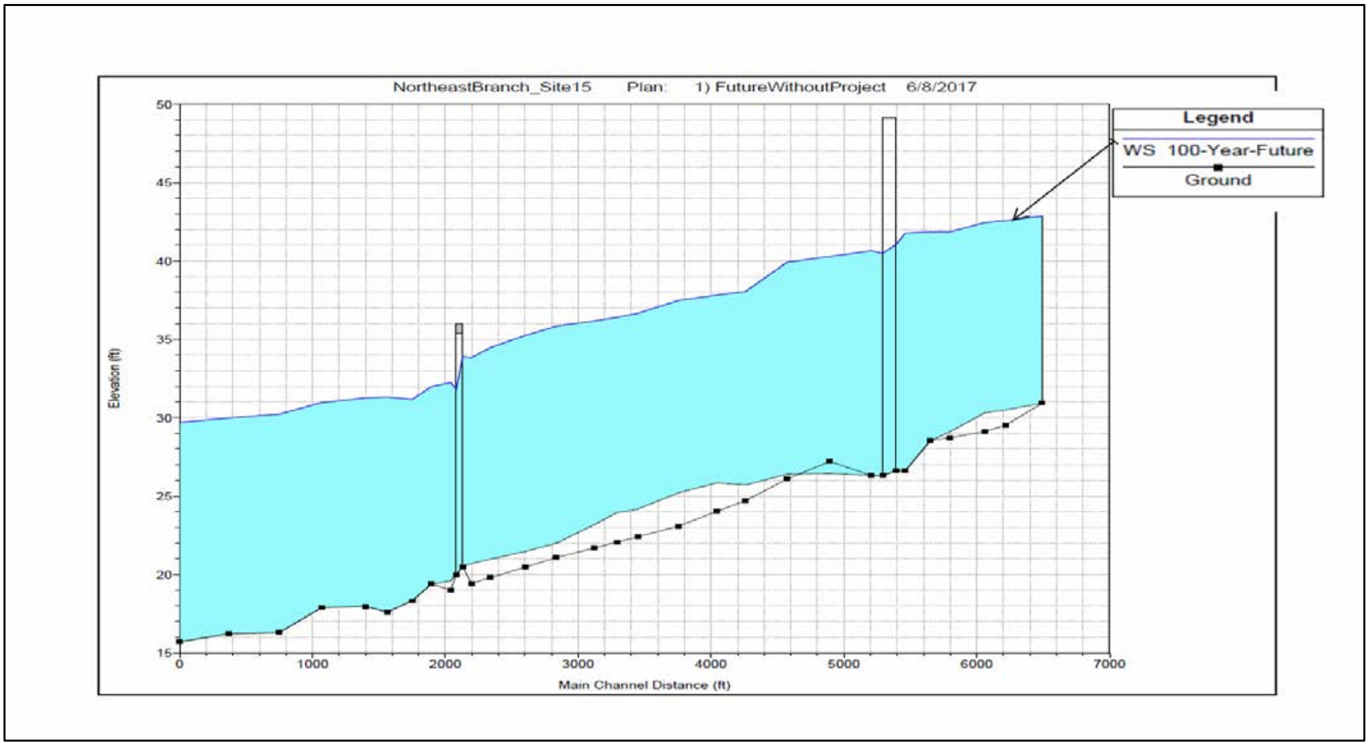

Figure 3: Site 15 Future Flows Without Project Profile

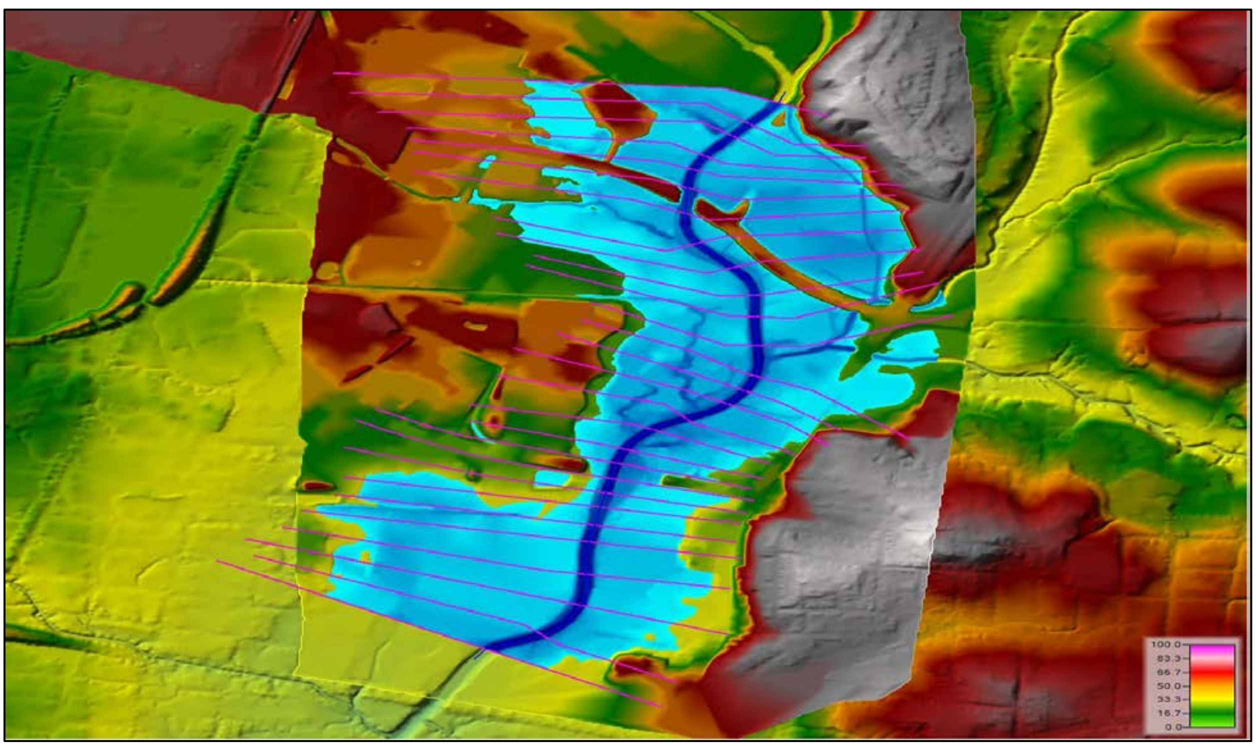

Figure 4: Site 15 Existing Conditions 100-Year Flood Map

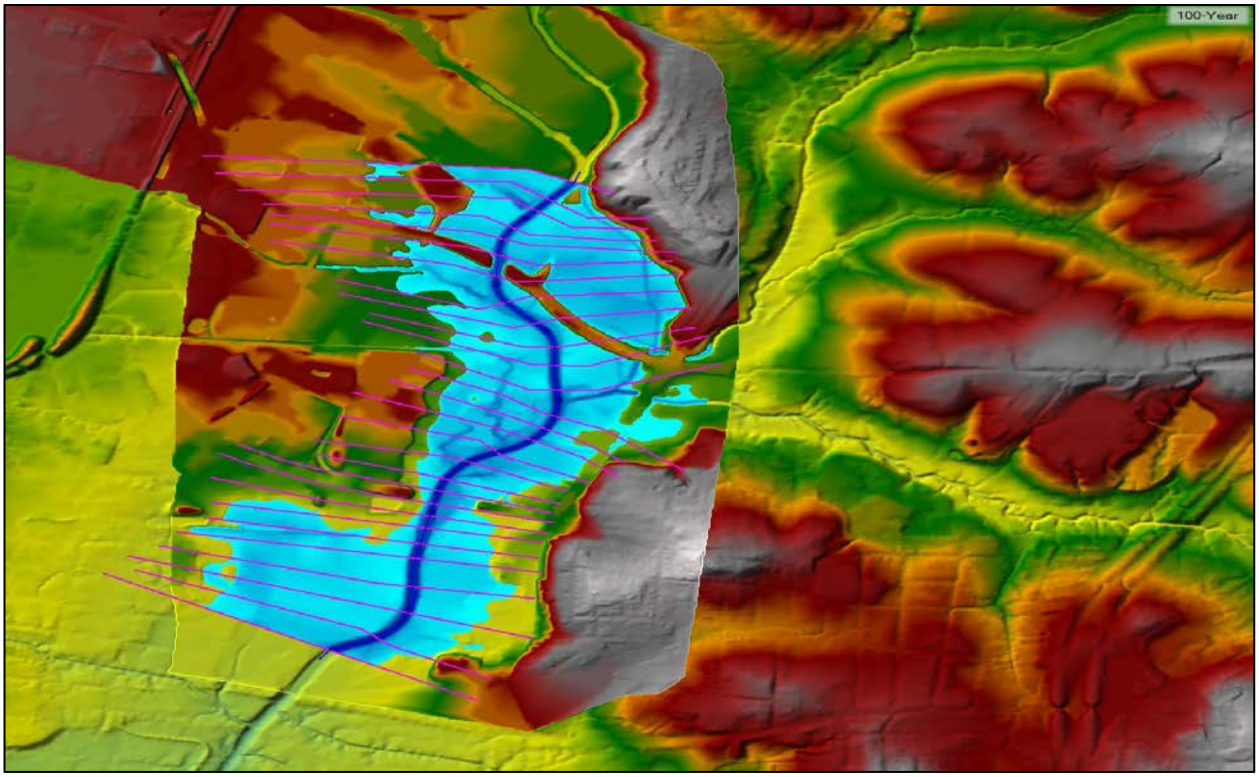

Figure 5: Site 15 Proposed Conditions 100-Year Flood Map

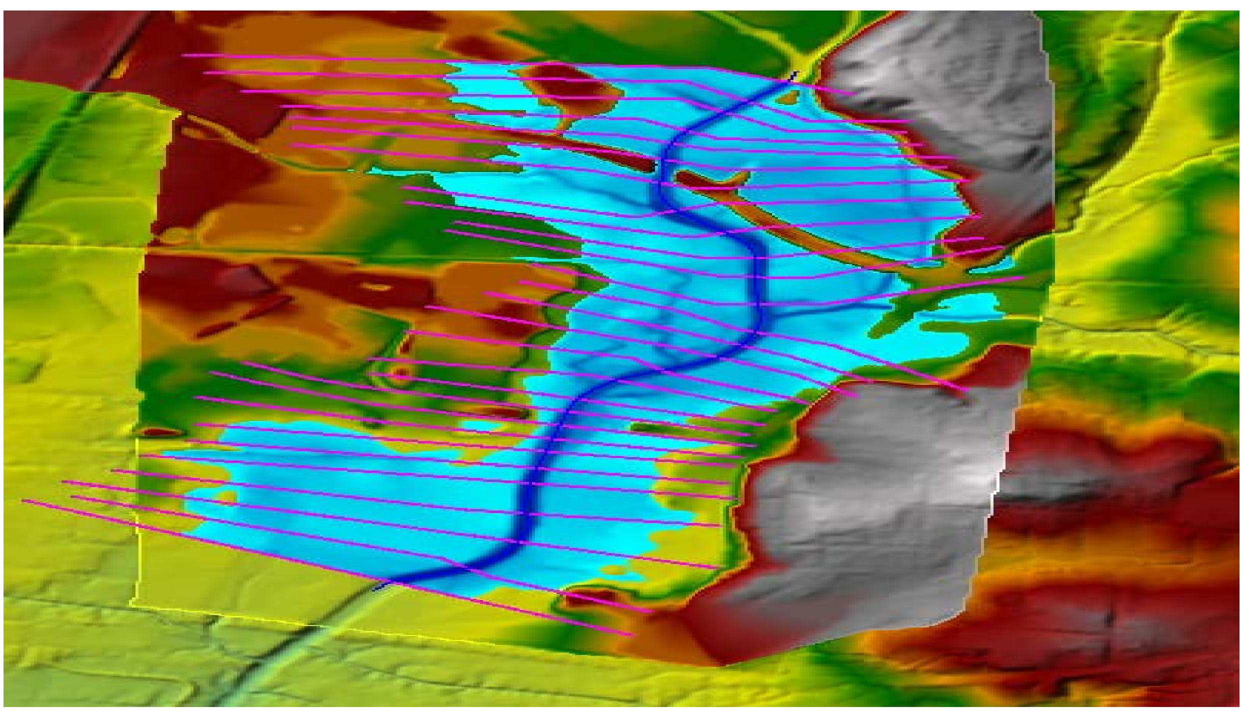

Figure 6: Site 15 Future Flows Without Project Conditions 100-Year Flood Map

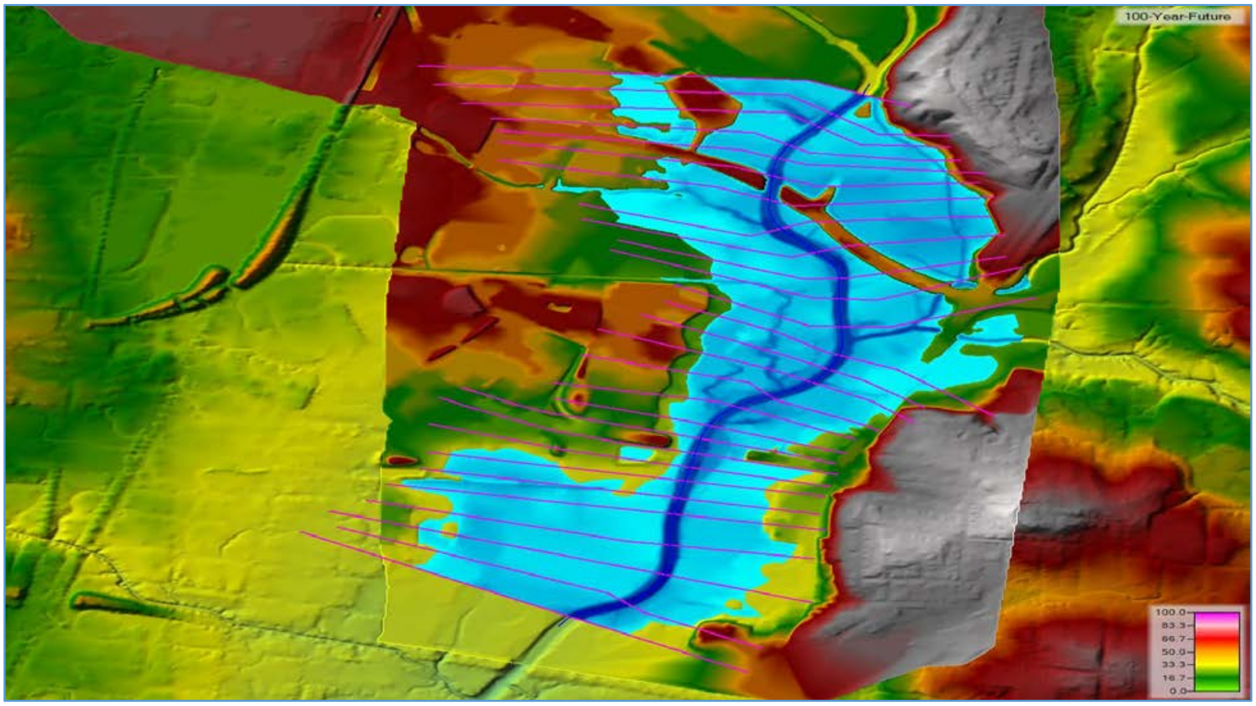

Figure 7: Site 15 Future Flows Without Project Conditions 100-Year Flood Map

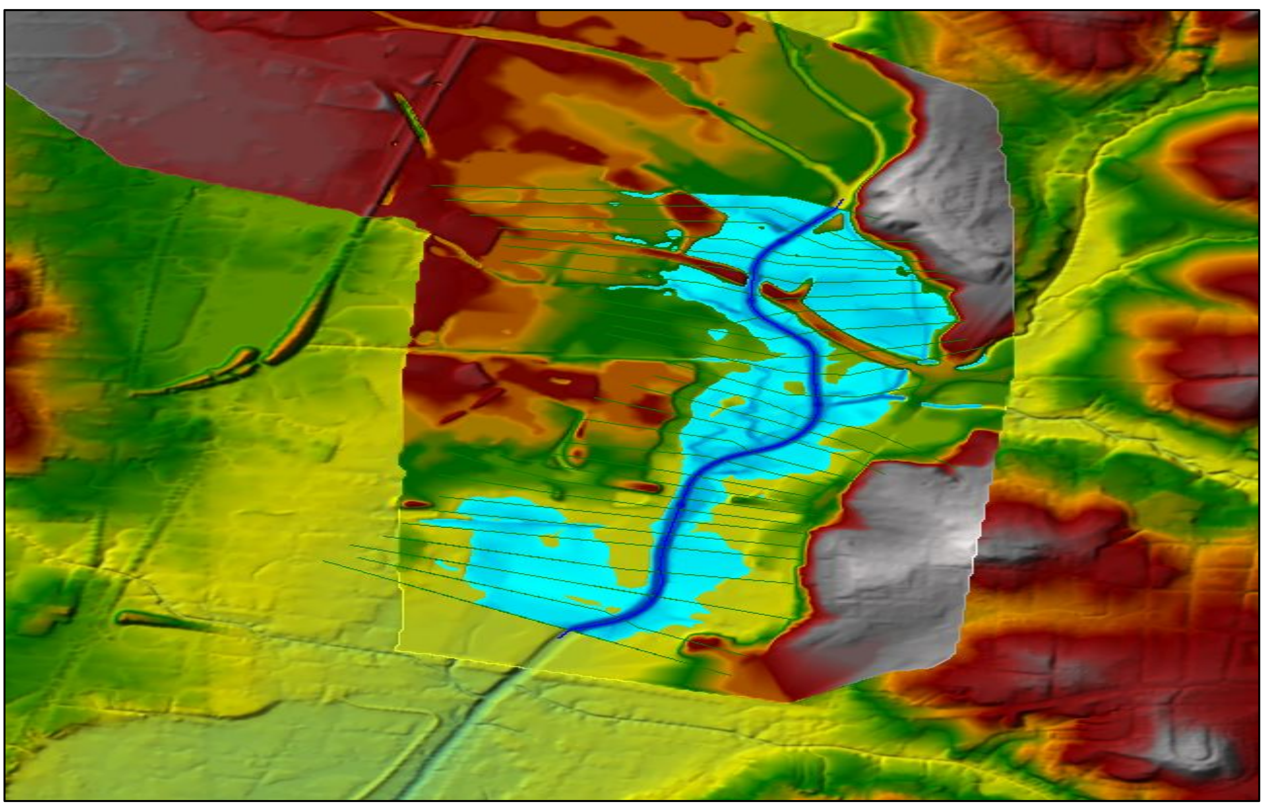

Figure 8: Site 15 Design Flow Flood Map

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E-4: Sediment Impact Assessment Model

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Hydrology and Hydraulic Modeling Report
Sediment Impact Assessment Model
Anacostia Watershed Restoration, Prince George's County, MD

Contents

Introduction

If not evaluated, features implemented to stabilize stream banks and reduce sediment yields to downstream areas can result in unexpected morphologic changes resulting from excessive erosion or aggradation in the channel. The Sediment Impact Assessment Model (SIAM) was used to assess the impact of the proposed restoration features. SIAM, which is incorporated into HEC-RAS, performs reach average sediment transport computations by grain size class, and integrates the computed transport rates with flow duration information to compute an average annual sediment transport capacity in tons per year. This is compared with the average annual inflowing sediment load to evaluate sediment continuity for the reaches in the system.

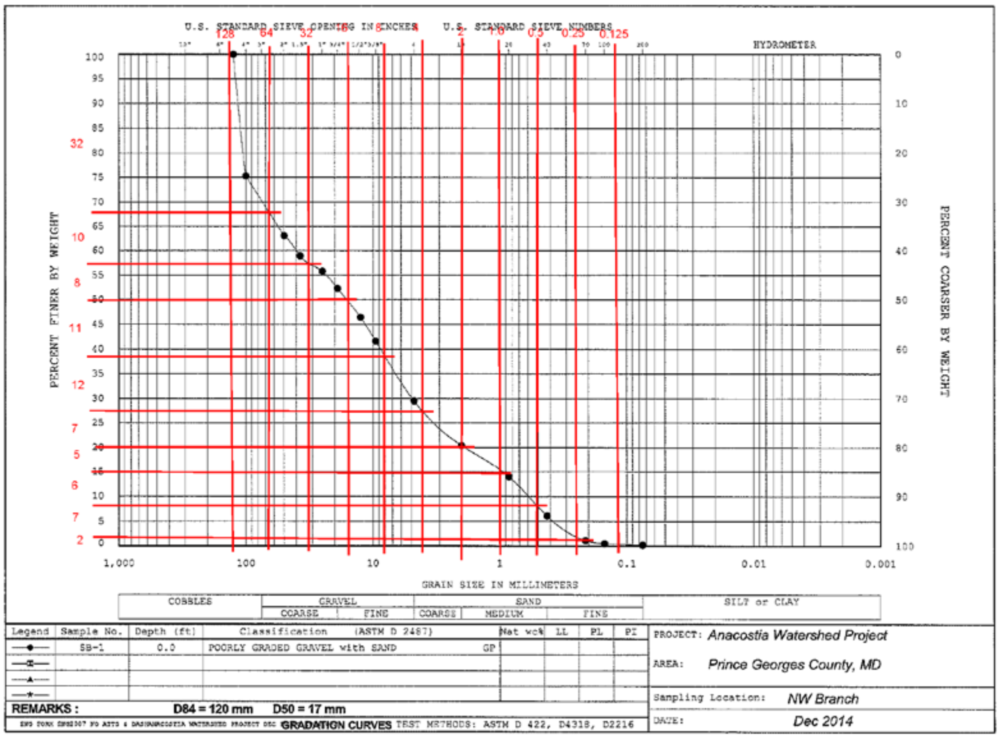
Model parameters required to run SIAM include: Bed Material, Hydrology, Sediment Properties, Sediment Sources and Hydraulics. Given the reaches are fairly short and the proposed improvements are spread evenly through the reach, the SIAM results simplistic. The comparison of the existing conditions run with the proposed conditions indicates a trend however the result does not represent the amount of sediment moved from one cross section to the next. Determining if a system is completely neutral is beyond the scope of SIAM, as it only shows a trend and cannot predict the final channel shape as previously mentioned. To predict the system response, a 2D model is needed and beyond the scope of this study. If it is determined that further analysis is required, a 2D model could be run during the PED phase of the project.

The below sections describe the process, inputs, and outputs for the SIAM analyses for the sites within the recommended plan in the Northwest and Northeast Branches of the Anacostia River. Bed material for the sites come from the gradation curves. Typically the gradation samples are collected for the bed and bank where materials change along the study area. Because the project sites are relatively small and have homogeneous material, one for each site in the bank and bed were collected and accurately represent the study area.

Northwest Branch

Bed Material

<u>SITE 3</u>

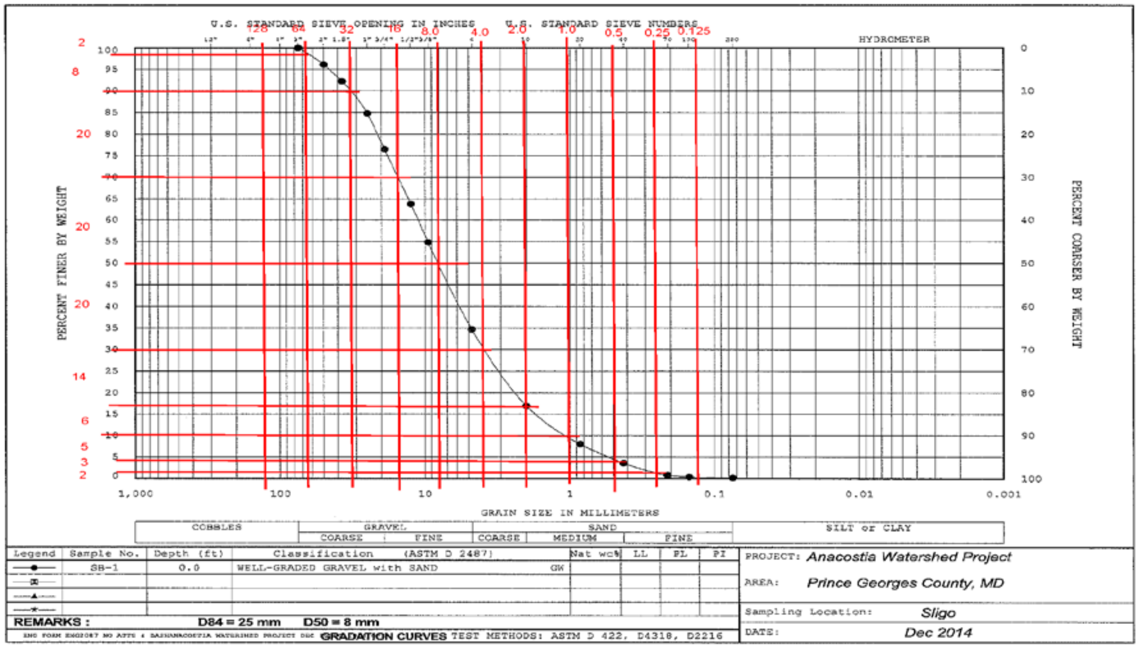


Site 3 Bed Gradation Curve

Site 3 Bed Gradations

Material Class, Dia. (mm)	Site 5, % Finer
CM, 0.0625	
VFS, 0.125	1
FS, 0.25	1
MS, 0.5	7
CS, 1	6
VCS, 2	5
VFG, 4	7
FG, 8	12
MG, 16	11
CG, 32	8
VCG, 64	10
SC, 128	32

<u>SITE 9</u>

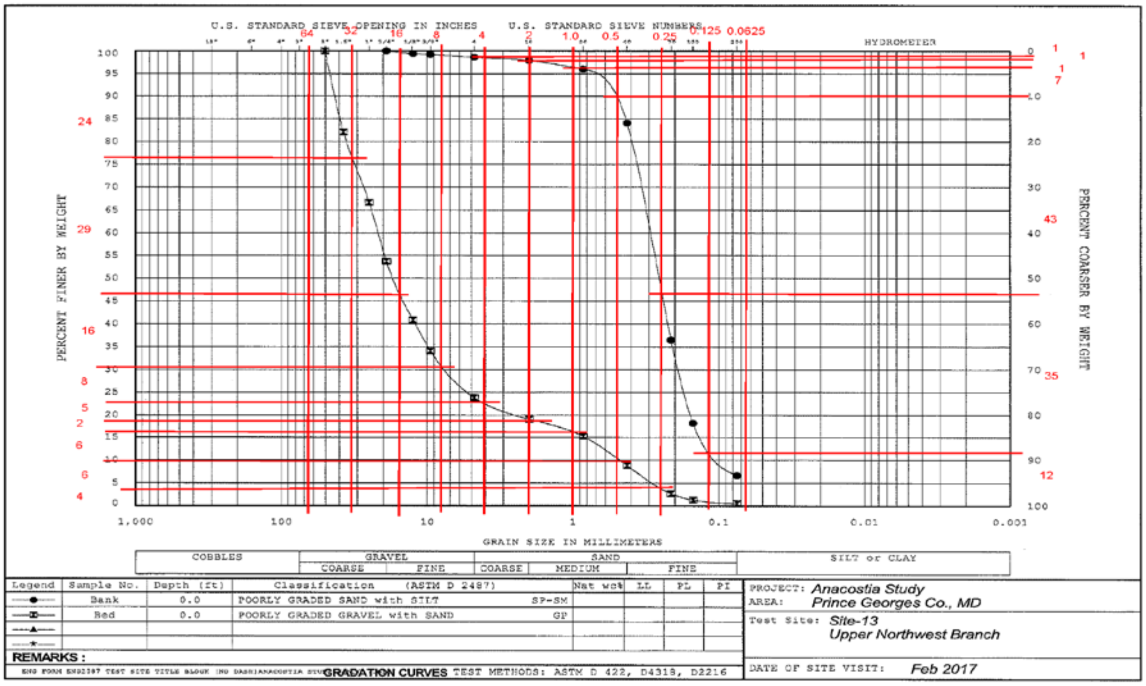


Site 9 Bed Gradation Curve

Site 9, Bed Gradation

Material Class, Dia. (mm)	Site 9, % Finer
MM, 0.032	
CM, 0.0625	
VFS, 0.125	1
FS, 0.25	1
MS, 0.5	3
CS, 1	5
VCS, 2	6
VFG, 4	14
FG, 8	20
MG, 16	20
CG, 32	20
VCG, 64	8
SC, 128	2

SITE 13



Site 13 Bed and Bank Gradation Curve

Site 13, Bed Gradation

Material Class, Dia. (mm)	Site 13, % Finer
FM, 0.016	
MM, 0.032	
CM, 0.0625	1
VFS, 0.125	3
FS, 0.25	6
MS, 0.5	6
CS, 1	2
VCS, 2	5
VFG, 4	8
FG, 8	16
MG, 16	29
CG, 32	24
VCG, 64	
SC, 128	

Hydrology

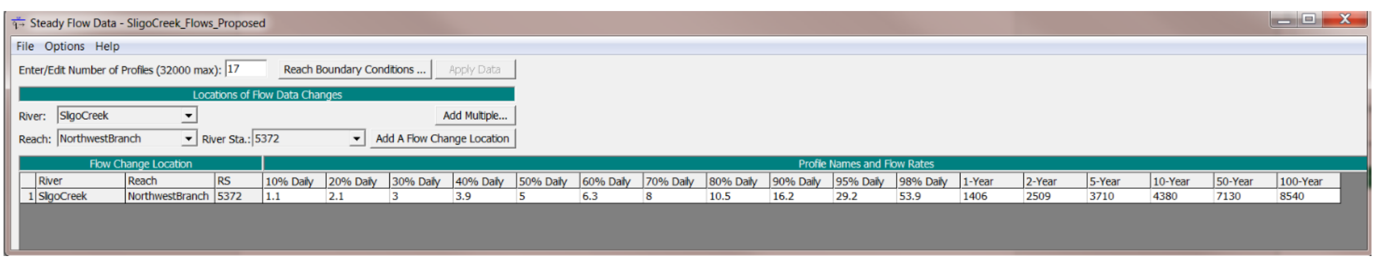
The Hydrology parameter was computed by downloading stream gage information on a daily basis and then calculating the percent daily flows for the 10% Daily flow up to the 100 year event. A total of 17 flow regimes were modeled to capture the full range of flows. The stream gage used for this analysis was the USGS 01651000, Northwest Branch Anacostia River near Hyattsville, MD. The daily information was available from 1938 to 2017 for a total of 28,842 daily flow records. This information was used to determine each of the daily 10% flow brackets, from the 10% thru 90% as well as the 95% and 98% of daily flows. Then the flows are adjusted based on a ratio of the total drainage area of the gage to the area of the site. For the less frequent events, 1-100-yr, SSP and FEMA flows from the stream modeling portion was used to complete the flow regime requirements. Flows are shown below.

<u>SITE 3</u>

	River	Reach	RS	10% Daily	20% Daily	30% Daily	40% Daily	50% Daily	60% Daily	70% Daily	80% Daily	90% Daily	95% Daily	98% Daily	1-yr*Est	2-yr	5-yr*Est	10-yr	50-yr	100-yr
1	NorthwestBr	Anacostia	7551	3.4	6.3	9.1	12	15.4	19.3	24.4	32.2	49.7	90	165	1803	3138	5082	7025	9332	12941
2	NorthwestBr	Anacostia	2785	4.6	8.4	12.1	16	20.5	25.8	32.6	42.9	66.3	119	220	2894	5164	7635	10106	12437	18931

Site 3 Steady Flow Data

<u>SITE 9</u>



	River	Reach	RS	10% Daily	20% Daily	30% Daily	40% Daily	50% Daily	60% Daily	70% Daily	80% Daily	90% Daily	95% Daily	98% Daily	1-Year	2-Year	5-Year	10-Year	50-Year	100-Year
1	SligoCreek	NorthwestBranch	5372	1.1	2.1	3	3.9	5	6.3	8	10.5	16.2	29.2	53.9	1406	2509	3710	4380	7130	8540

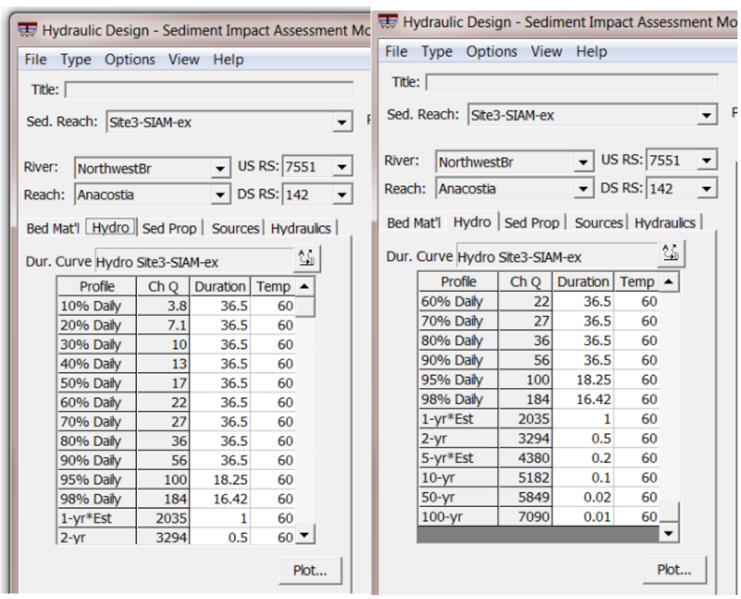
Site 9 Steady Flow Data

<u>SITE 13</u>

Site 13 Steady Flow Data

The flow data were analyzed to determine on how many days the flow will occur in a given year. This information is input into the SIAM Hyro Tab as shown below. Note that a standard temperature of 60 degrees is used, which is typical for studies without specific measurements. The sum of the durations will equate to 365 days of a year.

<u>SITE 3</u>

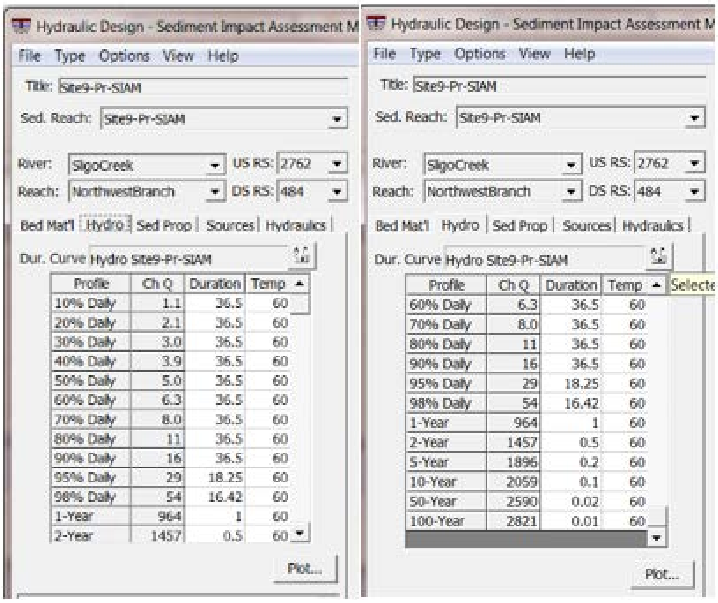


Profile	Ch Q	Duration	Temp
10% Daily	3.8	36.5	60
20% Daily	7.1	36.5	60
30% Daily	10	36.5	60
40% Daily	13	36.5	60
50% Daily	17	36.5	60
60% Daily	22	36.5	60
70% Daily	27	36.5	60
80% Daily	36	36.5	60
90% Daily	56	36.5	60
95% Daily	100	18.25	60
98% Daily	184	16.42	60
1-yr*Est	2035	1	60
2-yr	3294	0.5	60

Profile	Ch Q	Duration	Temp
60% Daily	22	36.5	60
70% Daily	27	36.5	60
80% Daily	36	36.5	60
90% Daily	56	36.5	60
95% Daily	100	18.25	60
98% Daily	184	16.42	60
1-yr*Est	2035	1	60
2-yr	3294	0.5	60
5-yr*Est	4380	0.2	60
10-yr	5182	0.1	60
50-yr	5849	0.02	60
100-yr	7090	0.01	60

Site 3 Number days per year for different durations

<u>SITE 9</u>



Hydraulic Design - Sediment Impact Assessment M
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Sed. Reach: Site9-Pr-SIAM
River: SligoCreek US RS: 2762
Reach: NorthwestBranch DS RS: 484
Bed Mat'l | Hydro | Sed Prop | Sources | Hydraulics
Dur. Curve Hydro Site9-Pr-SIAM

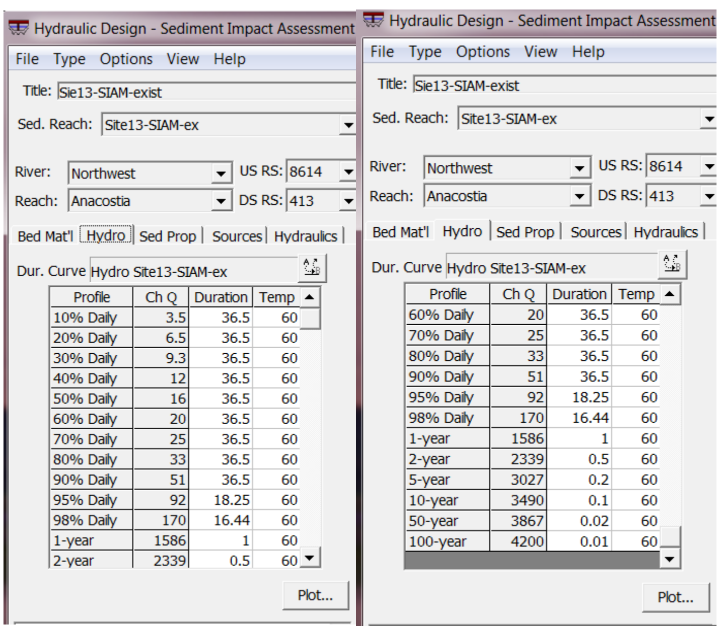
Profile	Ch Q	Duration	Temp
10% Daily	1.1	36.5	60
20% Daily	2.1	36.5	60
30% Daily	3.0	36.5	60
40% Daily	3.9	36.5	60
50% Daily	5.0	36.5	60
60% Daily	6.3	36.5	60
70% Daily	8.0	36.5	60
80% Daily	11	36.5	60
90% Daily	16	36.5	60
95% Daily	29	18.25	60
98% Daily	54	16.42	60
1-Year	964	1	60
2-Year	1457	0.5	60

Plot...

Profile	Ch Q	Duration	Temp
60% Daily	6.3	36.5	60
70% Daily	8.0	36.5	60
80% Daily	11	36.5	60
90% Daily	16	36.5	60
95% Daily	29	18.25	60
98% Daily	54	16.42	60
1-Year	964	1	60
2-Year	1457	0.5	60
5-Year	1896	0.2	60
10-Year	2059	0.1	60
50-Year	2590	0.02	60
100-Year	2821	0.01	60

Site 9 Number days per year for different durations

<u>SITE 13</u>



Hydraulic Design - Sediment Impact Assessment
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Sed. Reach: Site13-SIAM-ex
River: Northwest US RS: 8614
Reach: Anacostia DS RS: 413
Bed Mat'l | Hydro | Sed Prop | Sources | Hydraulics
Dur. Curve Hydro Site13-SIAM-ex

Profile	Ch Q	Duration	Temp
10% Daily	3.5	36.5	60
20% Daily	6.5	36.5	60
30% Daily	9.3	36.5	60
40% Daily	12	36.5	60
50% Daily	16	36.5	60
60% Daily	20	36.5	60
70% Daily	25	36.5	60
80% Daily	33	36.5	60
90% Daily	51	36.5	60
95% Daily	92	18.25	60
98% Daily	170	16.44	60
1-year	1586	1	60
2-year	2339	0.5	60

Plot...

Profile	Ch Q	Duration	Temp
60% Daily	20	36.5	60
70% Daily	25	36.5	60
80% Daily	33	36.5	60
90% Daily	51	36.5	60
95% Daily	92	18.25	60
98% Daily	170	16.44	60
1-year	1586	1	60
2-year	2339	0.5	60
5-year	3027	0.2	60
10-year	3490	0.1	60
50-year	3867	0.02	60
100-year	4200	0.01	60

Site 13 Number of days per year for different durations

Sediment Properties

In this section the method(s) for the analysis were selected based on conversations with Dr. Gibson at HEC Davis, CA. The recommended methods were the Ackers-White and Yang transport methods because they were developed using similar sized particles and more appropriate flows.

Sediment Sources

The next section is Sediment Sources, where the upstream gradations samples are incorporated into the input parameters. There are two source areas: banks and the upstream area. The field gathered gradations are multiplied by the upstream drainage area to determine how much sediment of each size classification is available for transport. To determine the loadings for bank samples, Google Earth Pro was used to estimate the channel width from 2017 imagery and a historic image was used to estimate the prior channel width.

SITE 3

For Site 3, an image from the winter of 1988 was used. The channel width was measured for each cross from each image and an average depth of channel was assumed (7-feet in the case of Site 3 based on field observation) to determine the end average area. The differences were tallied to determine the net change. See the following Table for Site 3.

Site 3 Comparing current and historic stream widths

River Sta		Estimated width (ft) Google Earth 2016		Estimated Width (ft) Google Earth 1988		Difference (S.F.) w/Bank Height 7’
7551		65		45		
7333		50		50		0.0
7196		60		55		36.0
6767		45		48		-67.6
6607		40		42		-16.8
6362		55		55		0.0
6129		50		48		24.5
5643		80		72		204.1
5524		62		68		-37.5
5422		40		42		-10.7
5356		35		40		-17.3
5232		70		55		97.7
5082		53		50		23.6
4854		52		45		83.8
4714		52		45		51.5
4561		62		50		96.4
4382		60		64		-37.6
4209		32		45		-118.1
4050		36		35		8.3
3908		40		40		0.0
3683		33		38		-59.1
3446		50		42		99.5
3284		60		56		34.0

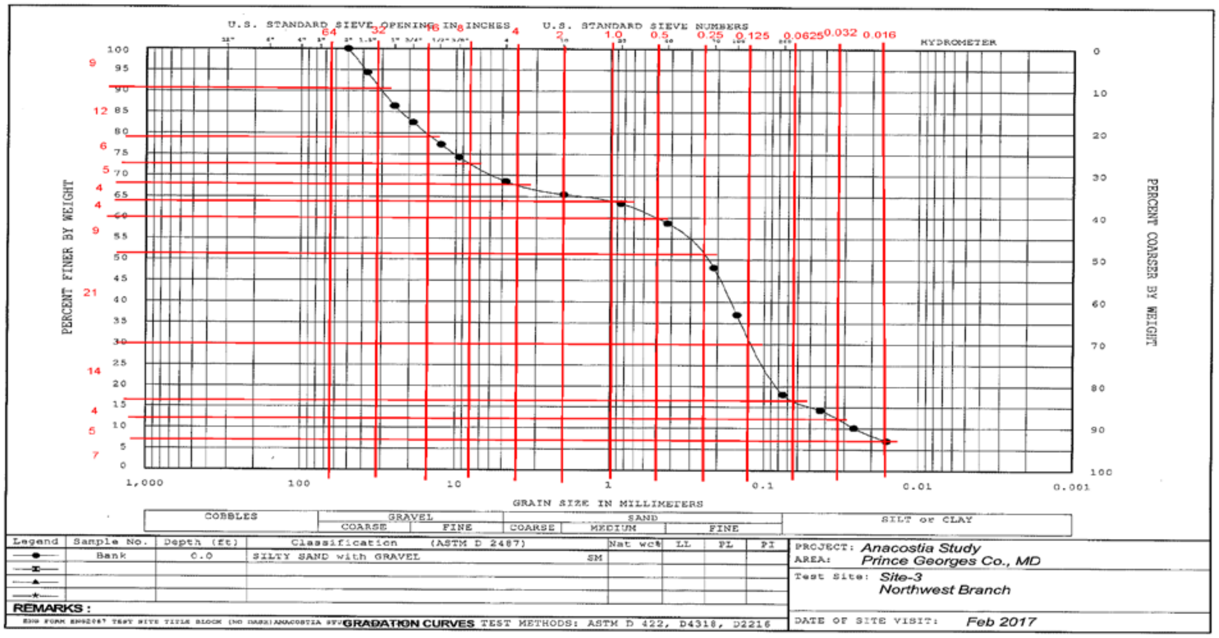
River Sta		Estimated width (ft) Google Earth 2016		Estimated Width (ft) Google Earth 1988		Difference (S.F.) w/Bank Height 7’
3041		48		48		0.0
2785		62		58		53.8
2251		85		70		420.5
2065		80		90		-97.7
1911		70		72		-16.2
1403		70		88		-480.1
1242		70		83		-109.9
958		64		72		-119.3
756		62		72		-106.1
537		70		72		-23.0
377		65		70		-42.0
142		60		63		-37.0

Using an average weight of sediments of 105 lbs/cf, the total tons over all cross sections is 1,135 tons, which equates to 40.5 tons/yr (2017-1988), used as the total for the bank load for the site. This site has armoring along the banks and explains why the sediment from the banks is so low. Most of the load for this site will originate in the upstream areas. To estimate the total load from the upstream area, Dr. Gibson recommended combining 80% bank sample with 20% bed sample to determine a new gradation. To estimate the amount of sediments delivered from the upstream areas, a report developed by the USGS, Water Quality in the Upper Anacostia River, Maryland: Continuous and Discrete Monitoring with Simulations to Estimate Concentrations and Yield, 2003-2005, Scientific Investigations Report 2007-5142, Table 6 was used. Based on this report, an estimated 176,000 kg/yr/km^2 was the amount of expected sediment. Converting this into tons per square mile yielded 74.75 tons/yr/mi^2 of upstream contributing area. The total contributing upstream area to Site 3 is 35 square miles. In addition, a sensitivity analysis was conducted on the the proposed 80%/20% ratio Dr. Gibson recommended and is included at the end of this Appendix.

Site 3 Bank and Upstream Loadings

Material Class Dia (mm)	Site 3, Bank, Tons/yr	Site 3 Upstream 80%Bank, 20% Bed
MM, 0.032	2.8	146
CM, 0.0625	2	105
VFS, 0.125	1.6	94
FS, 0.25	5.7	329
MS, 0.5	8.5	470
CS, 1	3.6	214
VCS, 2	1.6	120
VFG, 4	1.6	146
FG, 8	2	162

MG, 16	2.4	167
CG, 32	4.9	303
VCG, 64	3.6	355
SC, 128		



Site 3 Bank Gradation Curve

<u>SITE 9</u>

For Site 9, the older imagery did not yield sufficiently clear images until 2002. While not ideal, this was the best available. The channel width was measured for each cross from each image, and an average depth of channel was assumed (7-feet in the case of Site 9 based on field observation), which was used to determine the end average area. The differences were then tallied to determine the net change shown in table for Site 9.

Site 9 Comparing current and historic stream widths

HEC-RAS River Station	Estimated width (ft) Google Earth 2016	Estimated width (ft) Google Earth 2002	Difference (S.F.) w/Bank Height 7’
5372	80	75	

4932	82	68	323.4
4663	71	57	197.7
4435	61	84	-275.3
4167	80	77	42.2
3944	75	70	58.5
3738	67	68	-10.8
3359	76	53	457.6
3057	71	66	79.3
2762	82	74	123.9
2484	74	75	-14.6
2017	80	86	-147.1
1816	79	83	-42.2
1682	57	52	35.2
1535	54	54	0.0
1314	45	49	-46.4
1230	58	47	48.5
1132	50	44	30.9
1047	60	57	13.4
931	45	66	-127.9
852	52	59	-29.0
757	47	70	-114.7
671	50	47	13.5
552	43	37	37.5
484	57	28	103.5

Using an average weight of sediments of 105 lbs/cf, the total tons over all cross sections is 5,300 tons, which equates to 353 tons/yr (2017-2002), which was used as the total for the bank load for the site. To estimate the total load from the upstream area, Dr. Gibson recommended combining 80% bank sample with 20% bed sample to determine a new gradation. To estimate the amount of sediments delivered from the upstream areas, a report developed by the USGS, Water Quality in the Upper Anacostia River, Maryland: Continuous and Discrete Monitoring with Simulations to Estimate Concentrations and Yield, 2003-2005, Scientific Investigations Report 2007-5142, Table 6 was used. Based on this report, an estimated 176,000 kg/yr/km^2 was the amount of expected sediment. Converting this into tons per square mile yielded 74.75 tons/yr/mi^2 of upstream contributing area. The total contributing upstream area to Site 9 is 11.4 square miles.

Site 9 Bank and Upstream Loadings

Material Class Dia (mm)	**Site 9, Bank, Tons/yr**	**Site 9 Upstream 80%Bank, 20% Bed**

Material Class Dia (mm)	**Site 9, Bank, Tons/yr**	**Site 9 Upstream 80%Bank, 20% Bed**
FM, 0.016	17.7	34
MM, 0.032	10.6	20
CM, 0.0625	7.1	14
VFS, 0.125	53	104
FS, 0.25	159	309
MS, 0.5	99	196
CS, 1	7.1	22
VCS, 2		10
VFG, 4		24
FG, 8		34
MG, 16		34
CG, 32		34
VCG, 64		13.6
SC, 128		3.4

SITE 13

For Site 13, an image from the winter of 2002 was used. The channel width was measured for each cross from each image and an average depth of channel was assumed (7-feet in the case of Site 13 based on field observation) and used to determine the end average area. The differences in the two were tallied to determine the net change which can be seen in table for Site 13.

Site 13 Comparing current and historic stream widths

HEC-RAS River Sta.	Estimated width (ft) Google Earth 2015	Estimated width (ft) Google Earth 2002	Difference (S.F.) w/Bank Height 7'
9801	77	83	
9647	73	65	64.7
9509	85	69	115.9
9219	81	87	-91.4
8949	77	55	311.9
8772	195	98	901.4
8614	70	165	-788.0
8130	56	101	-1143.5
7971	56	47	75.1
7660	71	49	359.2

HEC-RAS River Sta.	Estimated width (ft) Google Earth 2015	Estimated width (ft) Google Earth 2002	Difference (S.F.) w/Bank Height 7’
7337	94	53	695.3
7256	106	92	59.5
6918	78	53	443.6
6529	57	76	-388.0
6455	61	65	-15.5
6327	71	72	-6.7
6226	52	107	-291.6
6124	54	92	-203.5
5984	42	112	-514.5
5818	76	78	-17.4
5709	58	73	-85.8
5534	82	76	55.1
5321	73	81	-89.5
5030	53	94	-626.4
4792	56	63	-87.5
4616	49	71	-203.3
4582	57	53	7.1
4545	58	58	0.0
4489	50	56	-17.6
4320	45	62	-150.8
4059	40	53	-178.1
3740	42	55	-217.7
3658	50	67	-73.2
3558	66	66	0.0
2941	80	81	-32.4
2503	71	84	-298.9
1956	66	83	-488.2
1644	58	56	32.8
1337	62	63	-16.1
984	59	68	-166.8
684	67	61	94.5
413	77	62	213.4

Using an average weight of sediments of 105 lbs/cf, the total tons over all cross sections is 20,030 tons, which equates to 1540 tons/yr (2015-2002), which was used as the total for the bank load for the site. This site has armoring along the banks and explains why the sediment from the banks is so low. Most of the load for this site will originate in the upstream areas. To estimate the total load from the upstream area, Dr. Gibson recommended combining 80% bank sample with 20% bed sample to determine a new gradation. To estimate the amount of sediments delivered from the upstream areas, a report developed by the USGS, Water Quality in the Upper Anacostia River, Maryland: Continuous and Discrete Monitoring with Simulations to Estimate Concentrations and Yield, 2003-2005, Scientific Investigations Report 2007-5142, Table 6 was used. Based on this report, an estimated 176,000 kg/yr/km^2 was the amount of expected sediment. Converting this into tons per square mile yielded 74.75 tons/yr/mi^2 of upstream contributing area. The total contributing upstream area to Site 13 is 35.3 square miles.

Site 13 Bank and Upstream Loadings

Material Class Dia (mm)	Site 13, Bank, Tons/yr	Site 13 Upstream 80%Bank, 20% Bed
MM, 0.032		
CM, 0.0625		21.1
VFS, 0.125	42.4	285
FS, 0.25	124	771
MS, 0.5	152	918
CS, 1	24.7	174
VCS, 2	3.5	63.3
VFG, 4	3.5	105
FG, 8	3.5	174
MG, 16		127
CG, 32		

Hydraulics

The final section is the Hydraulics section. All of the required information for this section was obtained from the HEC-RAS computer run (See HEC-RAS Modeling Appendix and Attachment).

Results

Overall, the trend for the NW Branch that include Sites 3, 9 and 13 all show an improved condition or a system close to equilibrium under the proposed condition when considering the SIAM results. For each system with the exception of Site 13, the results showed in at least one method of a reduction in the amount of aggradation or degradation bringing the system closer to a neutral system. Summary of the SIAM results for Northwest Branch are shown in the table below.

For the two methods analyzed for Site 3, Ackers-White results showed a small improvement and the Yang method showed a decrease in stream degradation, coming closer to an equilibrium state. It can be concluded the proposed stream improvements will do no harm when considering the Ackers-White method, and improve the condition when considering the Yang method by reducing the amount of degradation. It can be concluded that the proposed stream restoration of Site 3 should improve the stability and the overall health of the stream system.

For Site 9, the reach is very short, only about 0.4 miles proposed for project improvements. For the two methods analyzed for Site 9, Ackers-White results showed a slight change around the point of equilibrium, going from a slight aggrading to a slight degrading system. Given that the improvements are on a very small portion of the stream, it is believed that the model cannot accurately predict what the end state will be. The Yang method showed a decrease in stream degradation, coming closer to an equilibrium state. Based on this and field based experience it has been concluded that the proposed stream improvements will improve the overall health of the stream system and yield the desired results, though the Ackers-White method does not give clear results.

For the two methods analyzed for Site 13, Ackers-White results showed a system with negligible change and the Yang method showed a system close to equilibrium. The only way to refine this result would be to run a 2D model, which is beyond the scope of the planning study. It can be concluded that the proposed stream improvements will do no harm when considering the Ackers-White method and improve the condition when considering the Yang method by reducing the amount of degradation.

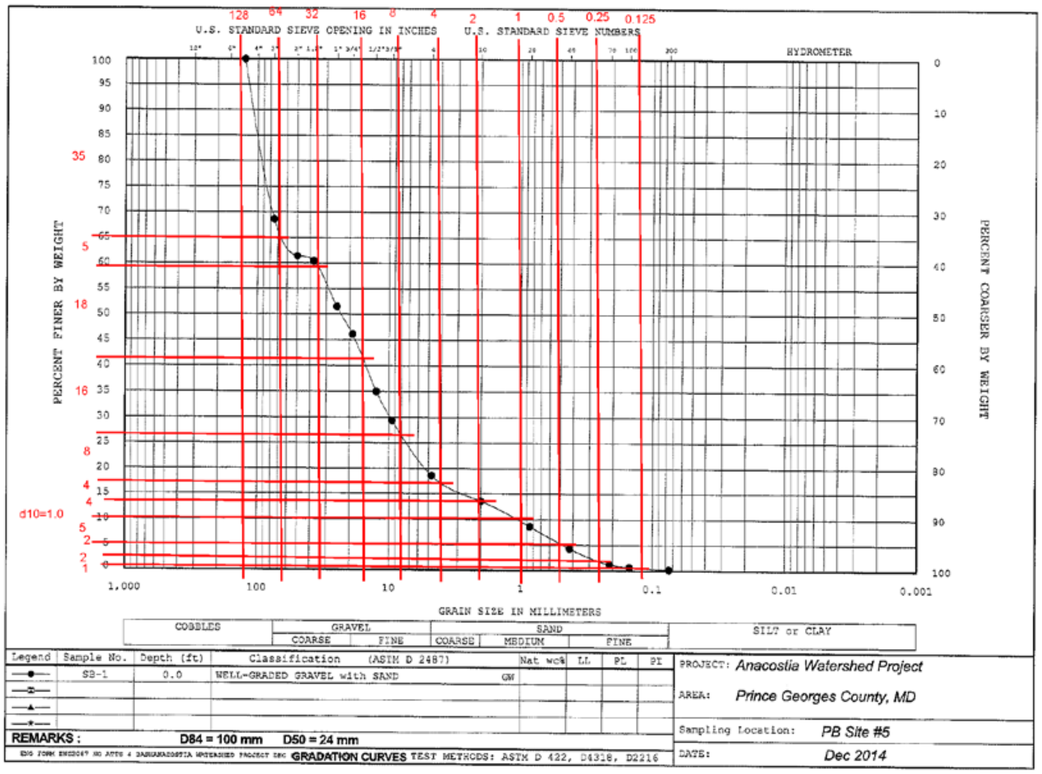
Summary of SIAM outputs for Northwest Branch

Method	**Existing Conditions**	**Proposed Conditions**	**Result**
Site 3			
Ackers-White	1460	2376	Improved Condition
Yang	-15900	-4635	Improved Condition
Site 9			
Ackers-White	426	-192	Negligible change, Close to Equilibrium
Yang	-3101	-1969	Improved Condition
Site 13			
Ackers-White	1054	1076	Negligible Change
Yang	741	697	Close to Equilibrium

Northeast Branch

Bed Material

SITE 5

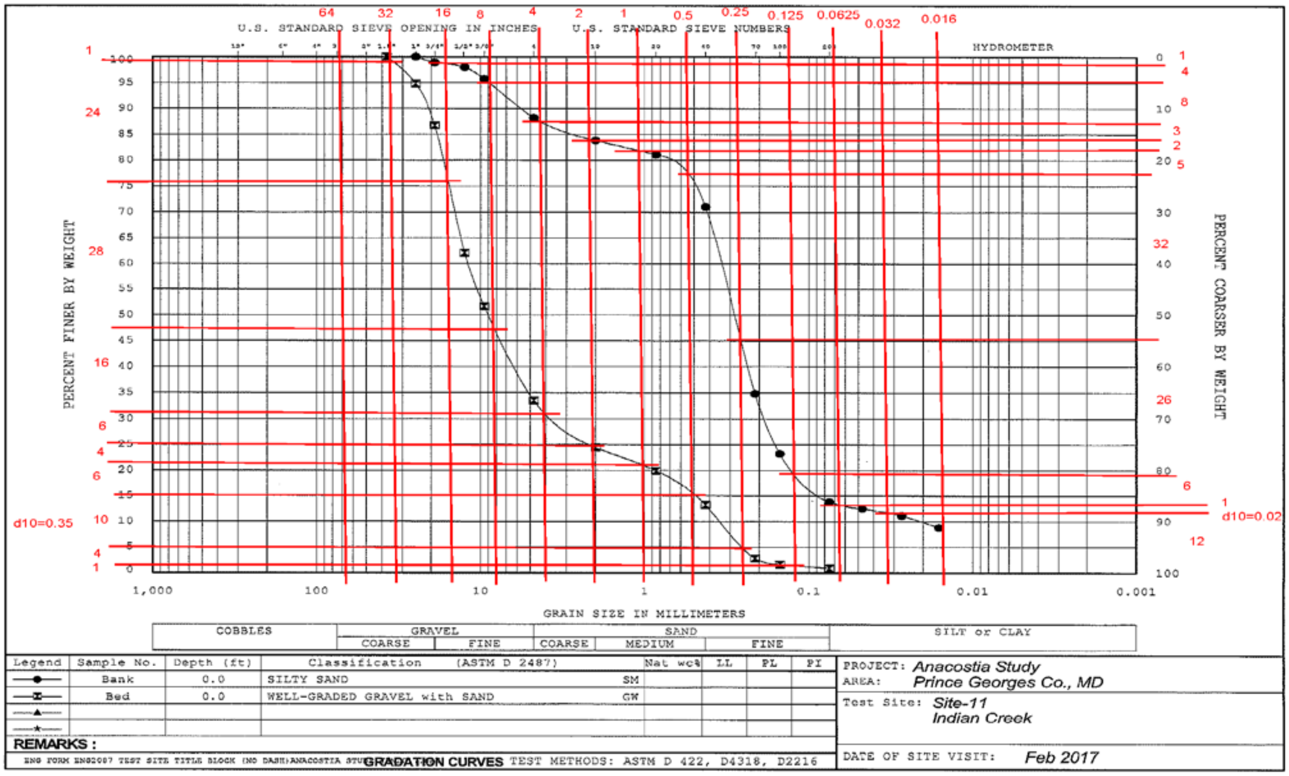


Site 5 Bed Gradation Curve

Site 5 Bed Gradations

Material Class, Dia. (mm)	Site 5, % Finer
CM, 0.0625	
VFS, 0.125	1
FS, 0.25	2
MS, 0.5	2
CS, 1	5
VCS, 2	4
VFG, 4	4
FG, 8	8
MG, 16	16
CG, 32	18
VCG, 64	5
SC, 128	32

SITE 11

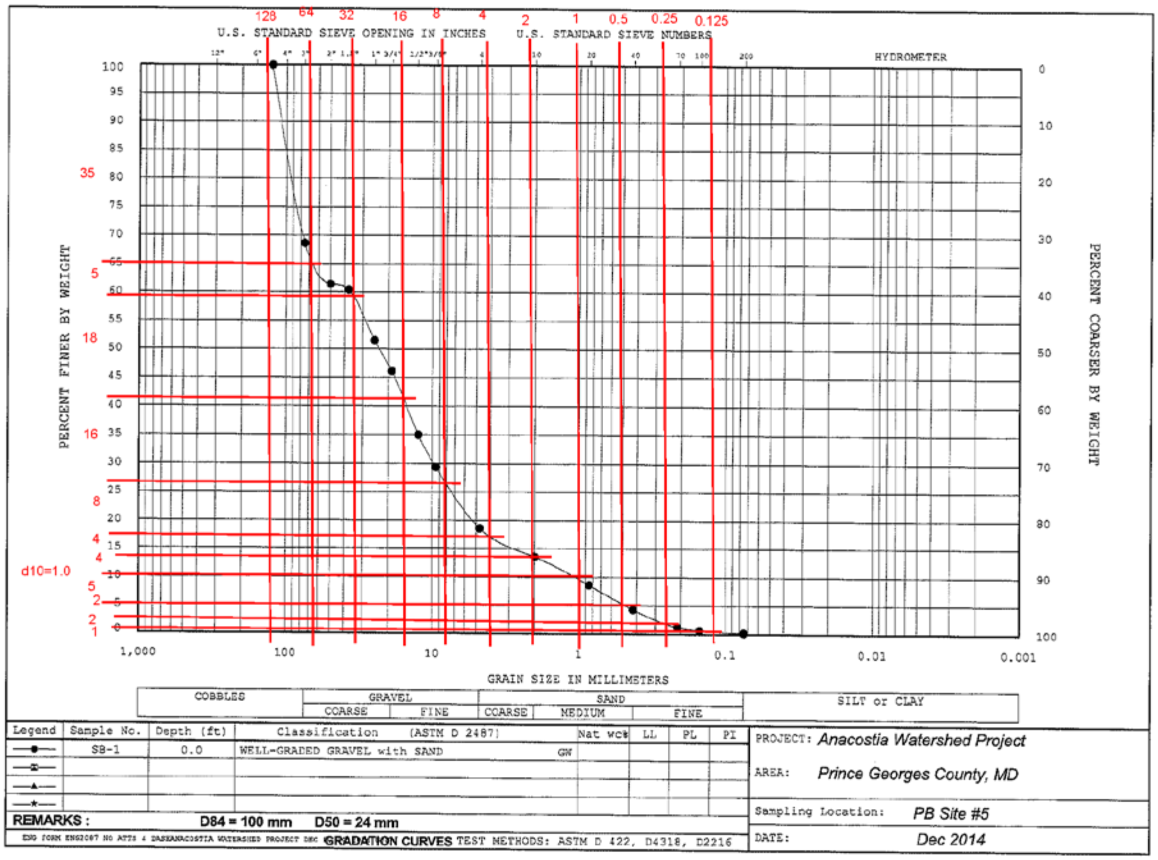


Site 11, Bed and Bank Gradation Curve

Site 11, Bed Gradation

Material Class, Dia. (mm)	Site 11, % Finer
FM, 0.016	12
MM, 0.032	1
CM, 0.0625	6
VFS, 0.125	26
FS, 0.25	32
MS, 0.5	5
CS, 1	2
VCS, 2	3
VFG, 4	8
FG, 8	4
MG, 16	1
CG, 32	
VCG, 64	
SC, 128	

SITE 15



Site 5 Bed Gradation Curve

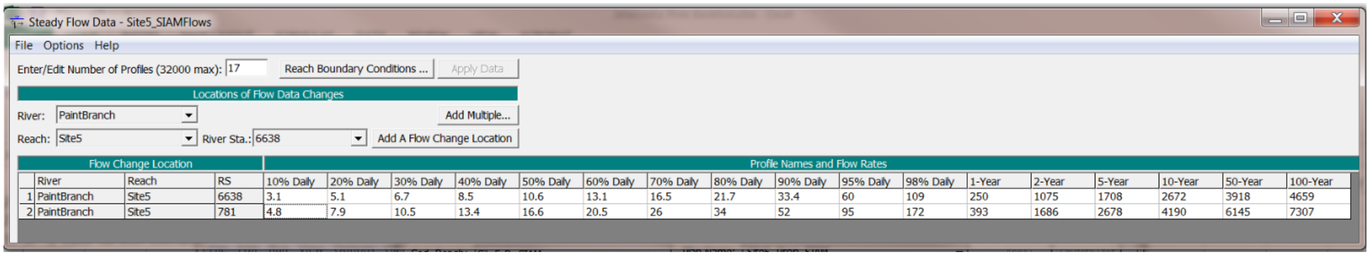
Site 5 Bed Gradations

Material Class, Dia. (mm)	Site 5, % Finer
CM, 0.0625	
VFS, 0.125	1
FS, 0.25	2
MS, 0.5	2
CS, 1	5
VCS, 2	4
VFG, 4	4
FG, 8	8
MG, 16	16
CG, 32	18
VCG, 64	5
SC, 128	32

Hydrology

The Hydrology parameter was computed by downloading daily stream gage information and calculating the percent daily flows for the 10% Daily flow up to the 100 year event. There are a total of 17 flow regimes modeled to capture the full range of flows. The stream gage used for this analysis was the USGS 01649500, Northeast Branch Anacostia River at Riverdale, MD. The daily information was available from 1938 to 2017 for a total of 27,793 daily flow records. This information was used to determine each of the daily 10% flow brackets, from the 10% thru 90% as well as the 95% and 98% of daily flows. The flows are adjusted based on a ratio of the total drainage area of the gage to the area of the site. For the less frequent events, 1-100-yr, SSP and FEMA flows from the stream modeling portion was used to complete the flow regime requirements.

<u>SITE 5</u>



Steady Flow Data - Site5_SIAMFlows

File Options Help

Enter/Edit Number of Profiles (32000 max): 17 | Reach Boundary Conditions ... | Apply Data

Locations of Flow Data Changes

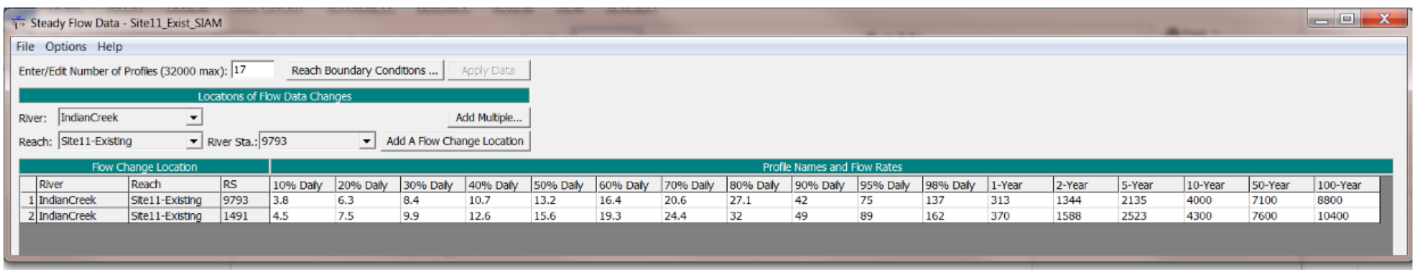
River: PaintBranch | Add Multiple...

Reach: Site5 | River Sta.: 6638 | Add A Flow Change Location

	Flow Change Location			Profile Names and Flow Rates																
	River	Reach	RS	10% Daily	20% Daily	30% Daily	40% Daily	50% Daily	60% Daily	70% Daily	80% Daily	90% Daily	95% Daily	98% Daily	1-Year	2-Year	5-Year	10-Year	50-Year	100-Year
1	PaintBranch	Site5	6638	3.1	5.1	6.7	8.5	10.6	13.1	16.5	21.7	33.4	60	109	250	1075	1708	2672	3918	4659
2	PaintBranch	Site5	781	4.8	7.9	10.5	13.4	16.6	20.5	26	34	52	95	172	393	1686	2678	4190	6145	7307

Site 5 Steady Flow Data

<u>SITE 11</u>



Steady Flow Data - Site11_Exist_SIAM

File Options Help

Enter/Edit Number of Profiles (32000 max): 17 | Reach Boundary Conditions ... | Apply Data

Locations of Flow Data Changes

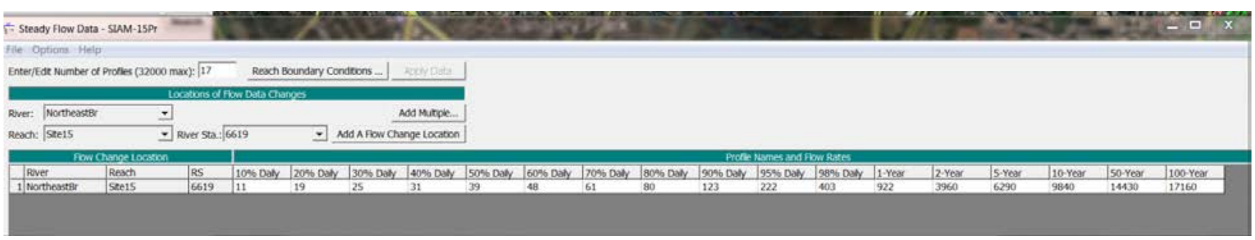
River: IndianCreek | Add Multiple...

Reach: Site11-Existing | River Sta.: 9793 | Add A Flow Change Location

	Flow Change Location			Profile Names and Flow Rates																
	River	Reach	RS	10% Daily	20% Daily	30% Daily	40% Daily	50% Daily	60% Daily	70% Daily	80% Daily	90% Daily	95% Daily	98% Daily	1-Year	2-Year	5-Year	10-Year	50-Year	100-Year
1	IndianCreek	Site11-Existing	9793	3.8	6.3	8.4	10.7	13.2	16.4	20.6	27.1	42	75	137	313	1344	2135	4000	7100	8800
2	IndianCreek	Site11-Existing	1491	4.5	7.5	9.9	12.6	15.6	19.3	24.4	32	49	89	162	370	1588	2523	4300	7600	10400

Site 11 Steady Flow Data

<u>SITE 15</u>



Steady Flow Data - SIAM-15Pr

File Options Help

Enter/Edit Number of Profiles (32000 max): 17 | Reach Boundary Conditions ... | Apply Data

Locations of Flow Data Changes

River: NortheastBr | Add Multiple...

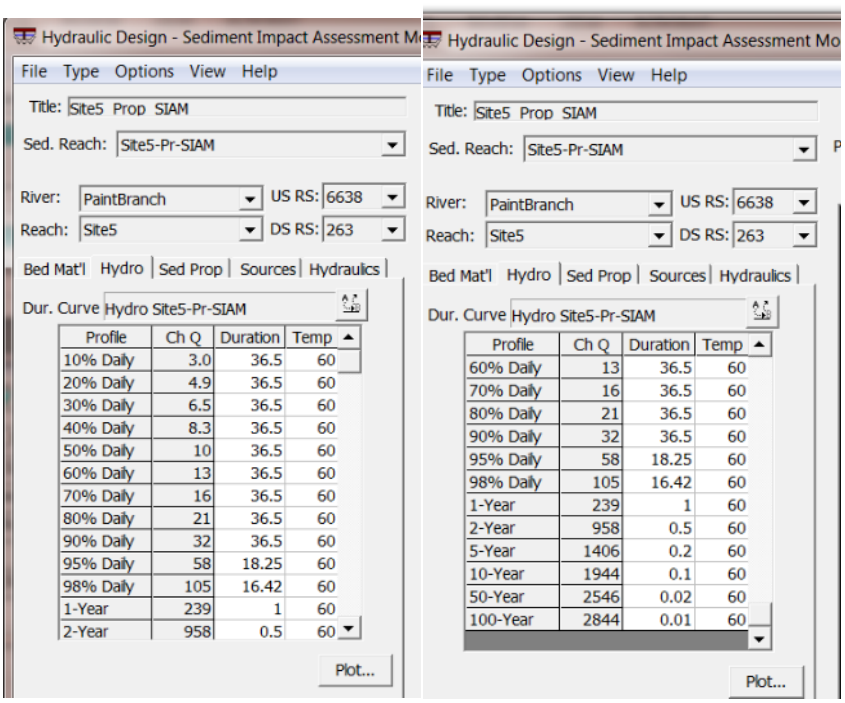
Reach: Site15 | River Sta.: 6619 | Add A Flow Change Location

	Flow Change Location			Profile Names and Flow Rates																
	River	Reach	RS	10% Daily	20% Daily	30% Daily	40% Daily	50% Daily	60% Daily	70% Daily	80% Daily	90% Daily	95% Daily	98% Daily	1-Year	2-Year	5-Year	10-Year	50-Year	100-Year
1	NortheastBr	Site15	6619	11	19	25	31	39	48	61	80	123	222	403	922	3960	6290	9840	14430	17160

Site 15 Steady Flow Data

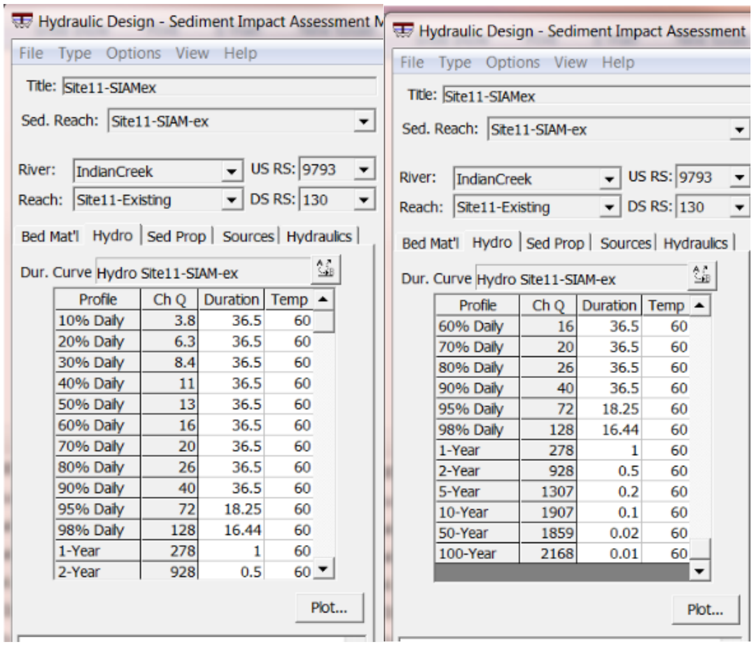
This information was analyzed to determine how many days the flow will occur in a given year. This information was input into the SIAM Hyro Tab. A standard temperature of 60 degrees was used, which this is typical for studies without specific measurements. The sum of all of the durations equates to 365 days of a year.

SITE 5



Site 5 Number days per year for different durations

SITE 11

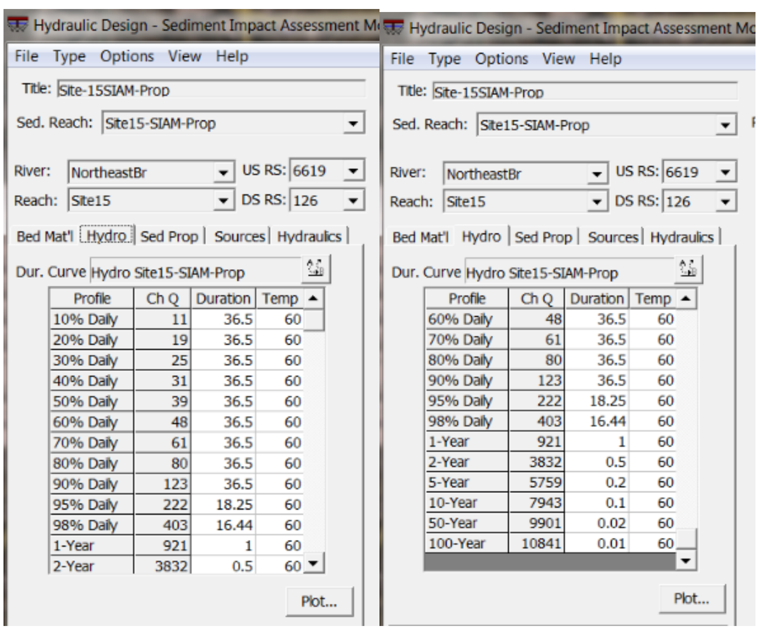


Profile	Ch Q	Duration	Temp
10% Daily	3.8	36.5	60
20% Daily	6.3	36.5	60
30% Daily	8.4	36.5	60
40% Daily	11	36.5	60
50% Daily	13	36.5	60
60% Daily	16	36.5	60
70% Daily	20	36.5	60
80% Daily	26	36.5	60
90% Daily	40	36.5	60
95% Daily	72	18.25	60
98% Daily	128	16.44	60
1-Year	278	1	60
2-Year	928	0.5	60

Profile	Ch Q	Duration	Temp
60% Daily	16	36.5	60
70% Daily	20	36.5	60
80% Daily	26	36.5	60
90% Daily	40	36.5	60
95% Daily	72	18.25	60
98% Daily	128	16.44	60
1-Year	278	1	60
2-Year	928	0.5	60
5-Year	1307	0.2	60
10-Year	1907	0.1	60
50-Year	1859	0.02	60
100-Year	2168	0.01	60

Site 11 Number of days per year for different durations

SITE 15



Profile	Ch Q	Duration	Temp
10% Daily	11	36.5	60
20% Daily	19	36.5	60
30% Daily	25	36.5	60
40% Daily	31	36.5	60
50% Daily	39	36.5	60
60% Daily	48	36.5	60
70% Daily	61	36.5	60
80% Daily	80	36.5	60
90% Daily	123	36.5	60
95% Daily	222	18.25	60
98% Daily	403	16.44	60
1-Year	921	1	60
2-Year	3832	0.5	60

Profile	Ch Q	Duration	Temp
60% Daily	48	36.5	60
70% Daily	61	36.5	60
80% Daily	80	36.5	60
90% Daily	123	36.5	60
95% Daily	222	18.25	60
98% Daily	403	16.44	60
1-Year	921	1	60
2-Year	3832	0.5	60
5-Year	5759	0.2	60
10-Year	7943	0.1	60
50-Year	9901	0.02	60
100-Year	10841	0.01	60

Site 15 Number of days per year for different durations

Sediment Properties

In this section the method(s) for the analysis were selected based on conversations with Dr. Gibson at HEC Davis, CA. The methods he recommended were the Ackers-White and Yang transport methods. These methods were selected because they were developed using similar sized particles and more appropriate flows.

Sediment Sources

The next section is Sediment Sources, where the upstream gradations samples are incorporated into the input parameters. There are two source areas: banks and the upstream area. The field gathered gradations are multiplied by the upstream drainage area to determine how much sediment of each size classification is available for transport. To determine the loadings for bank samples, Google Earth Pro was used to estimate the channel width from 2017 imagery and a historic image was used to estimate the prior channel width.

<u>SITE 5</u>

For Site 5, an image from the winter of 1989 was used. The channel width was measured for each cross from each image and an average depth of channel was assumed (5-feet in the case of Site 5 based on field observation), which was used to determine the end average area. The differences in the two were tallied to determine the net change shown in the table for Site 5.

Table 1 Site 5 Comparing current and historic stream widths

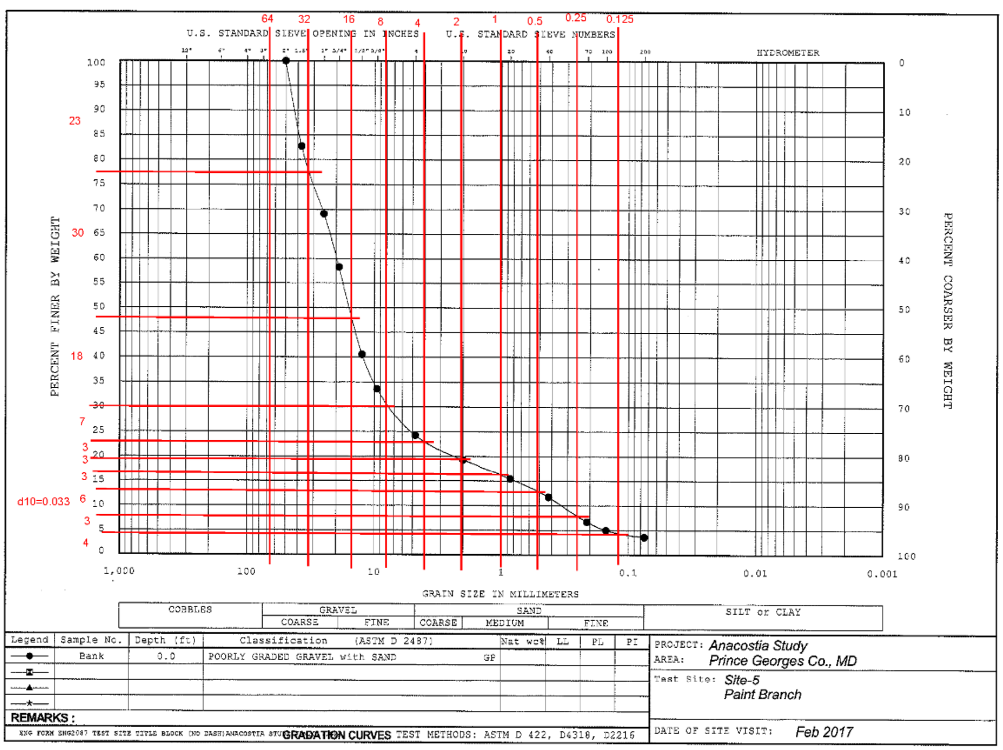
River Sta		Estimated width (ft) Google Earth 2016		Estimated Width (ft) Google Earth 1989		Difference (S.F.) w/Bank Height 5'
6638		50		58		
6556		52		60		-34.4
6405		57		61		-31.7
6233		65		63		18.1
6071		62		84		-187.1
5970		105		88		90.1
5855		135		90		271.7
5776		60		82		-91.2
5560		53		64		-124.7
5402		54		54		0.0
5287		55		55		0.0
5124		66		80		-119.8
5044		70		70		0.0
4917		58		58		0.0
4811		57		52		27.8

River Sta		Estimated width (ft) Google Earth 2016		Estimated Width (ft) Google Earth 1989		Difference (S.F.) w/Bank Height 5’
4588		56		52		46.8
4331		68		67		13.5
4091		120		120		0.0
3907		125		125		0.0
3728		113		113		0.0
3518		112		108		44.1
3225		87		78		138.4
2953		70		80		-142.8
2806		66		83		-131.2
2655		56		72		-126.8
2535		70		96		-163.8
2337		190		158		332.6
2167		114		100		125.0
1957		112		75		407.9
1862		108		63		224.4
1723		72		46		189.7
1678		54		48		14.2
1625		58		48		27.8
1400		57		40		200.8
1200		52		48		42.0
1090		48		48		0.0
960		45		45		0.0
781		65		49		150.4
569		50		45		55.7
263		60		60		0.0

Using an average weight of sediments of 105 lbs/cf, the total tons over all cross sections is 6,337 tons, equating to 234.7 tons/yr (2017-1989), which was used as the total for the bank load for the site. To estimate the total load from the upstream area, Dr. Gibson recommended combining the 80% bank sample with 20% bed sample to determine a new gradation. To estimate the amount of sediments delivered from the upstream areas, a report developed by the USGS, Water Quality in the Upper Anacostia River, Maryland: Continuous and Discrete Monitoring with Simulations to Estimate Concentrations and Yield, 2003-2005, Scientific Investigations Report 2007-5142, Table 6 was used. Based on this report, an estimated 176,000 kg/yr/km^2 was the amount of expected sediment. Converting this into tons per square mile yielded 74.75 tons/yr/mi^2 of upstream contributing area. The total contributing upstream area to Site 5 is 31 square miles.

Site 5 Bank and Upstream Loadings

Material Class Dia (mm)	Site 5, Bank, Tons/yr	Site 5 Upstream 80%Bank, 20% Bed
CM, 0.0625		
VFS, 0.125	9.4	78.8
FS, 0.25	7.0	64.9
MS, 0.5	14.1	120.5
CS, 1	7	78.8
VCS, 2	7	74.4
VFG, 4	7	74.4
FG, 8	16.4	166.8
MG, 16	42.2	407.8
CG, 32	70.4	639.6
VCG, 64	54.0	449.5
SC, 128		162.2



Site 5 Bank Gradation Curve

SITE 11

For Site 11, the historic imagery did not yield sufficiently clear images until 2007. While not ideal, this was the best available. The channel width was measured for each cross section from each image and an average depth of channel was assumed (7-feet in the case of Site 11 based on field observation), which was used to determine the end average area. The differences were tallied to determine the net change which can be seen in the following table for Site 11.

Site 11 Comparing current and historic stream widths

HEC-RAS River Sta.	Estimated width (ft) Google Earth 2016	Estimated width (ft) Google Earth 2007	Difference (S.F.) w/Bank Height 7'
9793	54	54	
9600	65	65	0.0
9420	50	50	0.0
9257	50	40	85.6
9041	45	45	0.0
8848	36	36	0.0
8456	35	22	267.5
8032	40	40	0.0
7795	46	46	0.0
7559	32	28	49.6
7302	48	70	-296.8
6975	36	25	188.8
6628	30	30	0.0
6236	40	48	-164.6
6058	30	35	-46.7
5528	62	55	194.8
5028	48	52	-105.0
4638	32	32	0.0
4356	40	40	0.0
4135	40	40	0.0
3819	40	40	0.0
3595	62	64	-23.5
3468	48	48	0.0
3207	41	41	0.0
2974	48	42	73.4
2745	48	48	0.0
2640	46	46	0.0
2583	74	74	0.0
2350	68	60	97.9

HEC-RAS River Sta.	Estimated width (ft) Google Earth 2016	Estimated width (ft) Google Earth 2007	Difference (S.F.) w/Bank Height 7’
2234	44	44	0.0
2082	44	44	0.0
1817	46	42	55.7
1491	42	48	-102.7
1162	40	40	0.0
866	45	45	0.0
664	53	53	0.0
545	44	44	0.0
393	38	37	8.0
244	33	35	-15.6
130	35	37	-12.0

Using an average weight of sediments of 105 lbs/cf, the total tons over all cross sections is 1,779 Tons, equating to 197.7 tons/yr (2017-2007), which was used as the total for the bank load for the site. To estimate the total load from the upstream area, Dr. Gibson recommended combining 80% bank sample with 20% bed sample to determine a new gradation. To estimate the amount of sediment delivered from the upstream areas, a report developed by the USGS, Water Quality in the Upper Anacostia River, Maryland: Continuous and Discrete Monitoring with Simulations to Estimate Concentrations and Yield, 2003-2005, Scientific Investigations Report 2007-5142, Table 6 was used. Based on this report, an estimated 176,000 kg/yr/km^2 was the amount of expected sediment. Converting this into tons per square mile yielded 74.75 tons/yr/mi^2 of upstream contributing area. The total contributing upstream area to Site 5 is 29.2 square miles.

Site 11 Bank and Upstream Loadings

Material Class Dia (mm)	**Site 11, Bank, Tons/yr**	**Site 11 Upstream 80%Bank, 20% Bed**
FM, 0.016	23.7	209.5
MM, 0.032	2	17.5
CM, 0.0625	11.9	104.8
VFS, 0.125	51.4	458.4
FS, 0.25	63.3	576.2
MS, 0.5	9.9	131
CS, 1	4	61.1
VCS, 2	5.9	69.8
VFG, 4	15.8	165.9
FG, 8	7.9	139.7

Material Class Dia (mm)	Site 11, Bank, Tons/yr	Site 11 Upstream 80%Bank, 20% Bed
MG, 16	2	139.7
CG, 32		104.8
VCG, 64		4.4
SC, 128		

SITE 15

For Site 15, an image from the winter of 1989 was used. The channel width was measured for each cross from each image and an average depth of channel was assumed (7-feet in the case of Site 15 based on field observation), which was used to determine the end average area. The differences were tallied to determine the net change shown in the table for Site 15.

Site 15 Comparing current and historic stream widths

HEC-RAS River Sta.	Estimated width (ft) Google Earth 2016	Estimated width (ft) Google Earth 1989	Difference (S.F.) w/Bank Height 7’
6619	57	57	
6345	62	66	-57.5
6186	65	65	0.0
5925	68	68	0.0
5776	61	61	0.0
5588	75	85	-98.7
5333	75	75	0.0
5021	115	115	0.0
4699	80	84	-67.6
4386	64	83	-312.2
4171	88	77	124.2
3882	70	67	45.5
3573	62	62	0.0
3416	50	50	0.0
3250	50	50	0.0
2962	52	50	30.2
2731	56	62	-72.8
2468	56	56	0.0
2321	57	57	0.0
2167	70	70	0.0

HEC-RAS River Sta.	Estimated width (ft) Google Earth 2016	Estimated width (ft) Google Earth 1989	Difference (S.F.) w/Bank Height 7’
2021	80	82	-15.3
1877	78	78	0.0
1522	82	82	0.0
1193	70	70	0.0
877	60	52	132.7
496	68	51	340.0
126	78	78	0.0

Using an average weight of sediments of 105 lbs/cf, the total tons over all cross sections is only 339.6 tons, equating to 12.6 tons/yr (2017-2007), which was used as the total for the bank load for the site. This site has a lot of armoring along the banks, which explains why the sediment from the banks is so low. Most of the load for this site will originate in the upstream areas. To estimate the total load from the upstream area, Dr. Gibson recommended combining the 80% bank sample with 20% bed sample to determine a new gradation. To estimate the amount of sediments delivered from the upstream areas, a report developed by the USGS, Water Quality in the Upper Anacostia River, Maryland: Continuous and Discrete Monitoring with Simulations to Estimate Concentrations and Yield, 2003-2005, Scientific Investigations Report 2007-5142, Table 6 was used. Based on this report, an estimated 176,000 $kg/yr/km^2$ was the amount of expected sediment. Converting this into tons per square mile yielded 74.75 $tons/yr/mi^2$ of upstream contributing area. The total contributing upstream area to Site 15 is 72.8 square miles.

Site 15 Bank and Upstream Loadings

Material Class Dia (mm)	**Site 15, Bank, Tons/yr**	**Site 5 & 11 Combined for Upstream 80%Bank, 20% Bed**
FM, 0.016	1.13	210
MM, 0.032	0.38	17
CM, 0.0625	0.25	105
VFS, 0.125	0.75	537
FS, 0.25	1.26	641
MS, 0.5	1.89	252
CS, 1	0.75	140
VCS, 2	0.38	144
VFG, 4	0.63	240
FG, 8	0.88	307

Material Class Dia (mm)	Site 15, Bank, Tons/yr	Site 5 & 11 Combined for Upstream 80%Bank, 20% Bed
MG, 16	1.63	548
CG, 32	2.01	744
VCG, 64	0.63	454
SC, 128		162

Hydraulics

The final section is the Hydraulics section. All of the required information for this section is obtained from the HEC-RAS computer run (See HEC-RAS Modeling Appendix and Attachment).

Results

Overall, the trend for the Northeast Branch, including Sites 5, 11 and 15, all show improvements under the proposed condition when considering the SIAM results. For each system, the results showed in at least one method a reduction in the amount of aggradation or degradation bringing the system closer to a neutral system (Table 16).

For the two methods analyzed for Site 5, Ackers-White results showed a negligible change and the Yang method showed a decrease in stream degradation, coming closer to an equilibrium state. It can be concluded that the proposed stream improvements will do no harm when considering the Ackers-White method and improve the condition when considering the Yang method by reducing the amount of degradation.

For the two methods analyzed for Site 11, Ackers-White results showed a negligible change and the Yang method showed a decrease in stream degradation, coming closer to an equilibrium state. It can be concluded that the proposed stream improvements will do no harm when considering the Ackers-White method and improve the condition when considering the Yang method by reducing the amount of degradation.

For the two methods analyzed for Site 15, Ackers-White results showed a slightly improved condition with less aggradation and the Yang method showed a decrease in stream degradation. It is interesting that one method shows aggradation and the other method degradation. The only way to confirm is to run a 2D model which is beyond the scope of the planning study. Based on this it can be concluded that the proposed stream improvements will do no harm when considering the Ackers-White method and improve the condition when considering the Yang method by reducing the amount of degradation.

Summary of SIAM outputs for Northeast Branch

Method	**Existing Conditions**	**Proposed Conditions**	**Result**
Site 5			
Ackers-White	2300	2376	Negligible change
Yang	-12100	-5607	Improved Condition
Site 11			
Ackers-White	785	536	Negligible change
Yang	-385,000	-299,000	Improved Condition
Site 15			
Ackers-White	4102	3946	Improved Condition
Yang	-11,800	-9631	Improved Condition

Sensitivity Analysis

A sensitivity analysis was conducted to determine if the 80%/20% bank/bed sediment ratio used in the model runs for sediment inflows (as recommended by Dr. Gibson) are sensitive to changes in bank/bed ratio.

Two alternatives were considered for the sensitivity analysis, a ratio of 70%/30% bank/bed and a 60%/40% bank/bed. Based on existing site conditions, it was ascertained that a revised ratio of 70%/30% would have a higher potential of occurrence; whereas, the 60%/40% would be highly unlikely due to the number of existing grade control structures that protect the numerous utility crossings throughout the sites. This ratio will be even less likely under proposed conditions due to the addition of stream stabilizing structures. SIAM runs with the revised 70%/30% loadings were conducted for sites 3, 9, 13 and Site 15 (which uses a combination of Site 5 & 11 since it is downstream of both).

Results of the sensitivity analysis show the results to be mixed with variability occurring within each of the two methods used (Ackers-White vs. Yang). For instance, For the Yang method, there was negligible changes for Sites 3, 9 and 15, but showed an increase in aggradation for Site 13. When considering the Ackers-White Method, Sites 13 and 15 showed negligible change while Sites 3 & 9 showed no change in existing conditions and an increase in aggradation in the proposed condition as shown below in the accompanying table.

Method		**Existing Conditions**	**Proposed Conditions**	**Result**
Site 3				
80%/20%	Ackers-White	1460	1393	Original Run
80%/20%	Yang	-15,900	-4635	Original Run
70%/30%	Ackers-White	1492	2185	Reversed Trend
70%/30%	Yang	-15,900	-4597	Same Trend

Site 9				
80%/20%	Ackers-White	426	-192	Original Run
80%/20%	Yang	-3101	-1969	Original Run
70%/30%	Ackers-White	485	930	Reversed Trend
70%/30%	Yang	-3,043	-1,949	Same Trend
Site 13				
80%/20%	Ackers-White	1,054	1,076	Original Run
80%/20%	Yang	741	697	Original Run
70%/30%	Ackers-White	872	827	Same Trend
70%/30%	Yang	1,542	2,008	Reversed Trend
Site 15				
80%/20%	Ackers-White	4102	3946	Original Run
80%/20%	Yang	-11,800	-9631	Original Run
70%/30%	Ackers-White	4080	4021	Same Trend
70%/30%	Yang	-11,700	-9608	Same Trend

In addition, a sensitivity analysis was also performed by modifying the period of record flow data. While the watershed has changed over the years, most areas around stream gages in the U.S., especially those gages along the east and west coasts where development has been more intense and have a long period of record, have changed similarly. That stated, the use of the full record is a typical practice and a longer record typically reduces the uncertainty.

To address concerns about changes in the watershed over time, we evaluated USGS gage 01651000, which has 78 years of annual average flow records. Available information suggests that much of the development within the beltway area peaked in the mid-1970s to late 1970s with heavier population expansion occurring outside the beltway after this time. Therefore, dividing the average daily discharge for the record from 1938-1977 (estimated when development changed), results in an average of 44 cfs. Similarly, an average daily discharge of 56 cfs was computed between the years of 1977-2016. While this does show an increase in average flows, both of these are still significantly lower than the channel forming flows of the 1.5-2 year events which are estimated for the differing draining areas with the higher flows entering the floodplain with reduced stress on the stream itself. To further test this, Site 13 was looked at by changing the daily flows and once again the results were mixed, with the Yang method showing an increase in sediment transported while the Ackers-White method showed negligible change. As previously stated, many utilities have been installed under the streams over the years creating grade control which have arrested the vast majority of the channel down cutting. The proposed stream restoration has been designed to account for the added stresses on the channel banks where there is no grade control. As part of this project, we are providing in-stream structures to create grade control to protect the stream's bed and bank; therefore, bank erosion becomes much more limited, reducing the sediment supply within the restored reaches.

It is unknown to what extent the future flows will change and to attempt to quantify that, based on available information from the climate change models and policy, a 10% flow increase was utilized. Considering that the stream restoration stabilizes the channel and banks, any increased flows would in all likelihood cause the system to jump the banks sooner and enter the floodplain where velocities would start to decrease and any additional sediments would start to drop out.

In addition to this, current and future development within the region will be adhering to very strict local stormwater regulations that enforce mitigation of any additional impervious area for new and redeveloped sites. The majority of the Prince George County and adjacent counties are also actively instituting bio-retention, rain gardens and other storm water management practices to reduce incoming runoff.

The results show mixed results and a clear picture cannot be ascertained. This is not to say that the results are incorrect, but that for this level of analysis, some uncertainty remains. It should be noted that SIAM is a limited static model that cannot predict what the channel shape will be in the future. Given the results show some sensitivity for some of the sites under certain conditions, it is warranted that this uncertainty be captured within the risk register/matrix. While results provided here are sufficient for the study and more advanced modeling is not warranted at this time, more detailed modeling could be considered during the PED phase of the project.

E-5: Feasibility Level Design Drawings

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ANACOSTIA WATERSHED RESTORATION

PRINCE GEORGES COUNTY, MD

FEASIBILITY STUDY

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G-100	SHEET INDEX
G-101	PLAN SHEET LAYOUT
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C-110 THRU C-111	SITE 9 SLIGO CREEK – PLANS
C-120 THRU C-124	SITE 5 PAINT BRANCH – PLANS
C-130 THRU C-134	SITE 15 N.E. BRANCH – PLANS
C-141 THRU C-147	SITE 13 N.W. BRANCH – PLANS
C-150 THRU C-157	SITE 11 INDIAN CREEK – PLANS
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C-501	DETAILS

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SHEET INDEX

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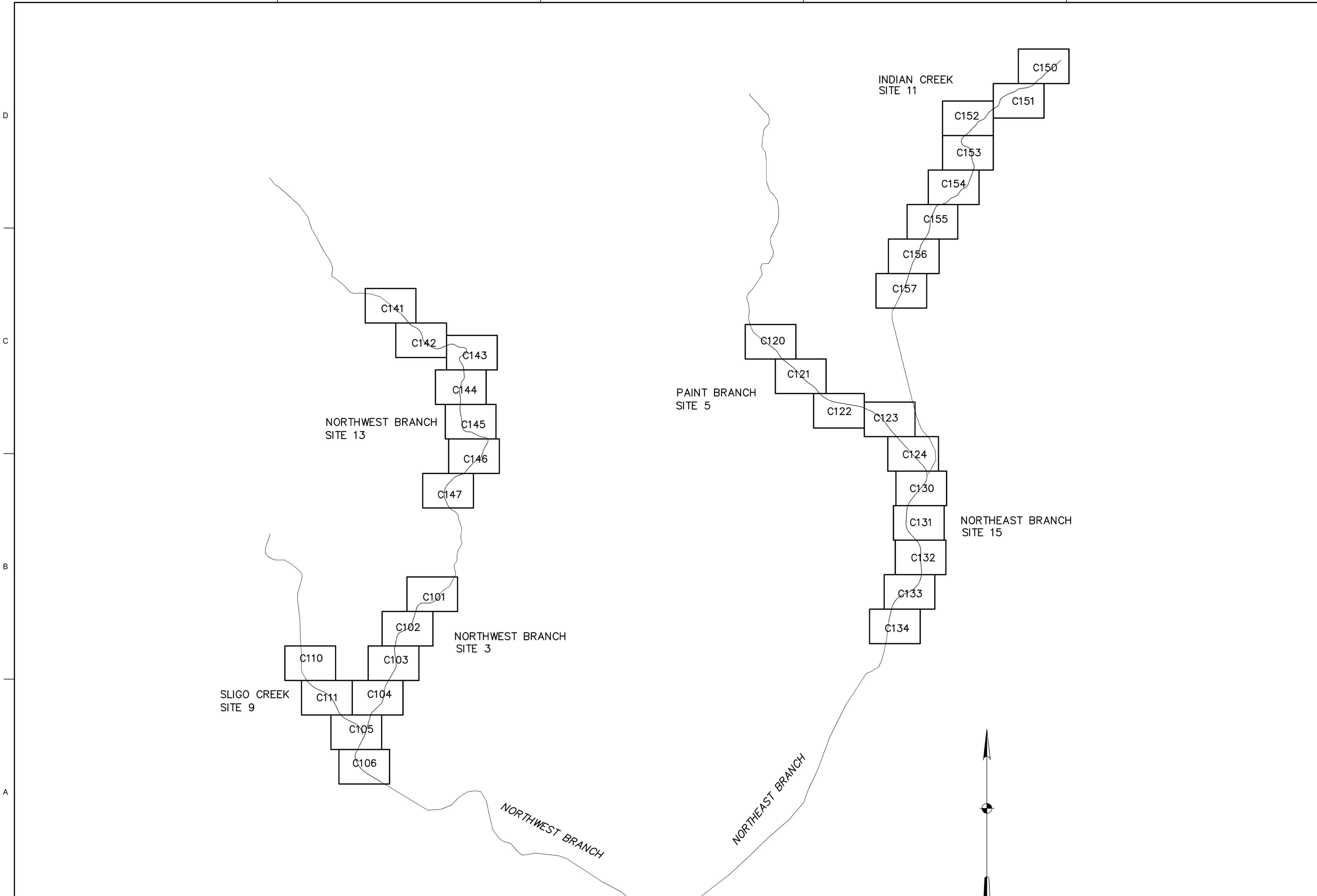

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PLAN SHEET LAYOUT

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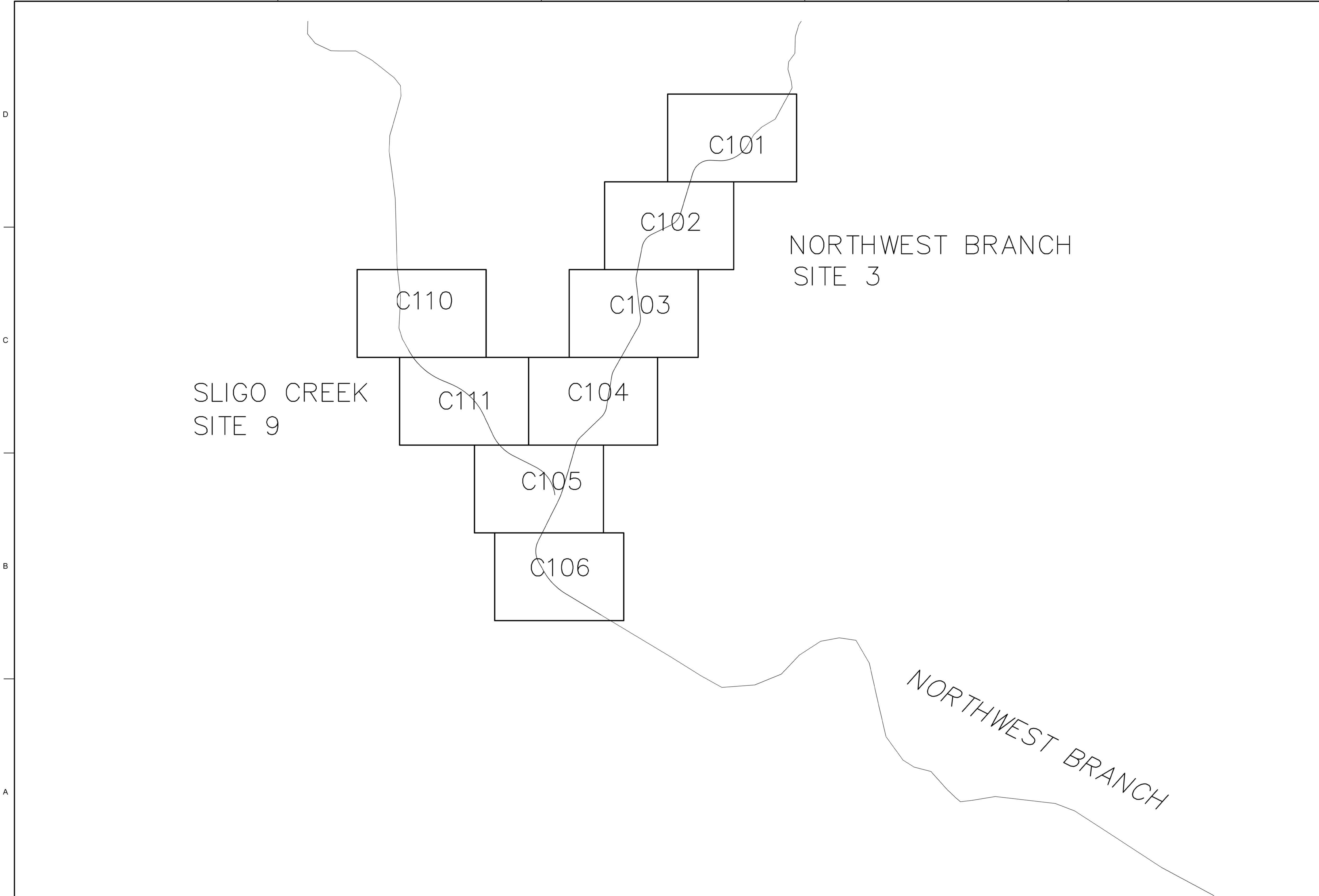
G-101



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SITE 3 NORTHWEST BRANCH - PLAN

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SITE 3 NORTHWEST BRANCH - PLAN

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SITE 3 NORTHWEST BRANCH - PLAN

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SITE 3 NORTHWEST BRANCH - PLAN

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C-105

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SITE 3 NORTHWEST BRANCH - PLAN

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ANACOSTIA WATERSHED RESTORATION
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SITE 9 SLIGO CREEK - PLAN

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FEASIBILITY STUDY

SITE 9 SLIGO CREEK - PLAN

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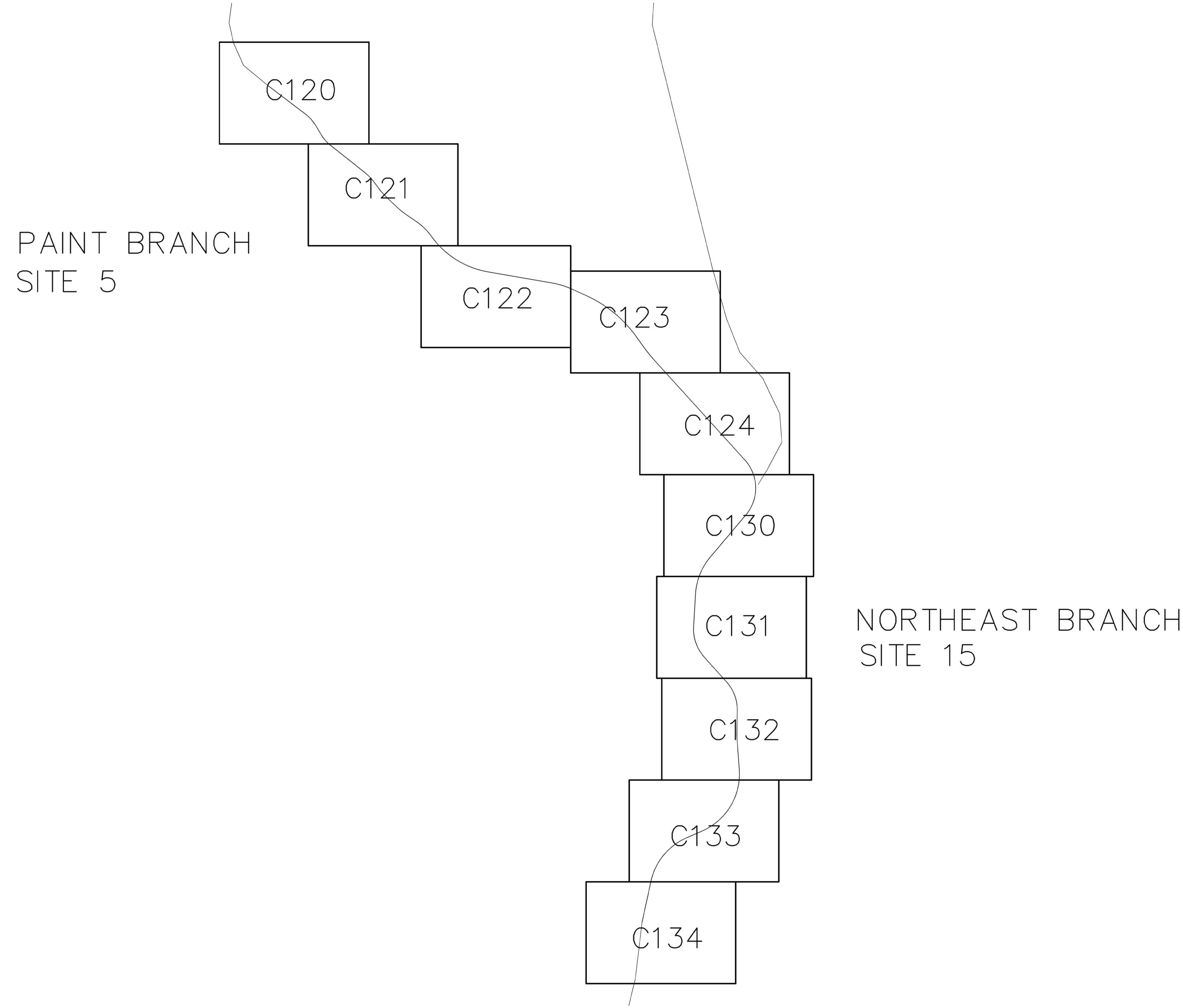

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PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 5 PAINT BRANCH - PLAN

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C-120

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PRINCE GEORGES COUNTY, MD
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SITE 5 PAINT BRANCH - PLAN

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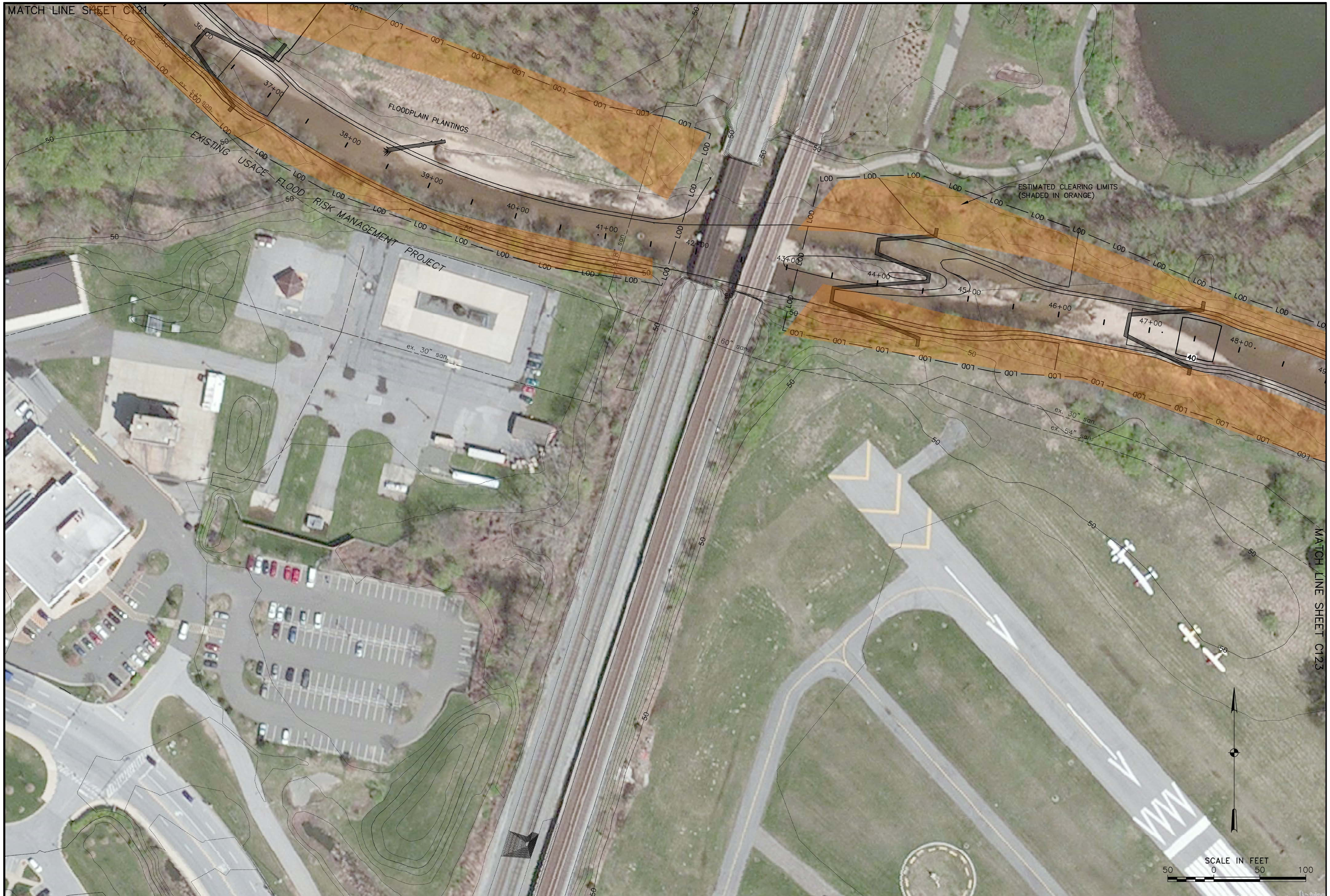

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SITE 5 PAINT BRANCH - PLAN

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FEASIBILITY STUDY

SITE 5 PAINT BRANCH - PLAN

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ANACOSTIA WATERSHED RESTORATION
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FEASIBILITY STUDY

SITE 5 PAINT BRANCH - PLAN

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ANACOSTIA WATERSHED RESTORATION
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FEASIBILITY STUDY

SITE 15 NORTHEAST BRANCH - PLAN

SHEET IDENTIFICATION
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ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 15 NORTHEAST BRANCH - PLAN

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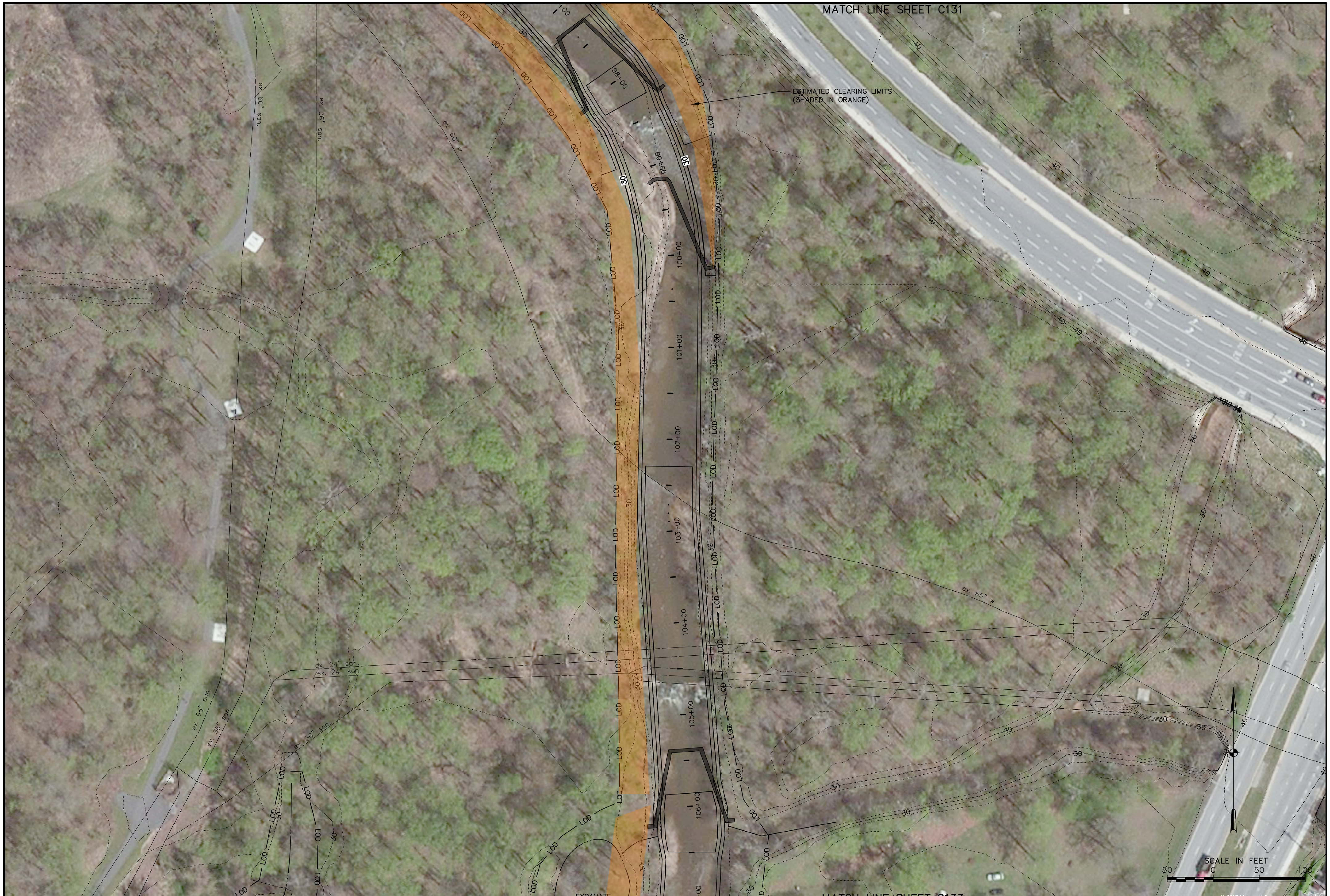

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PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 15 NORTHEAST BRANCH - PLAN

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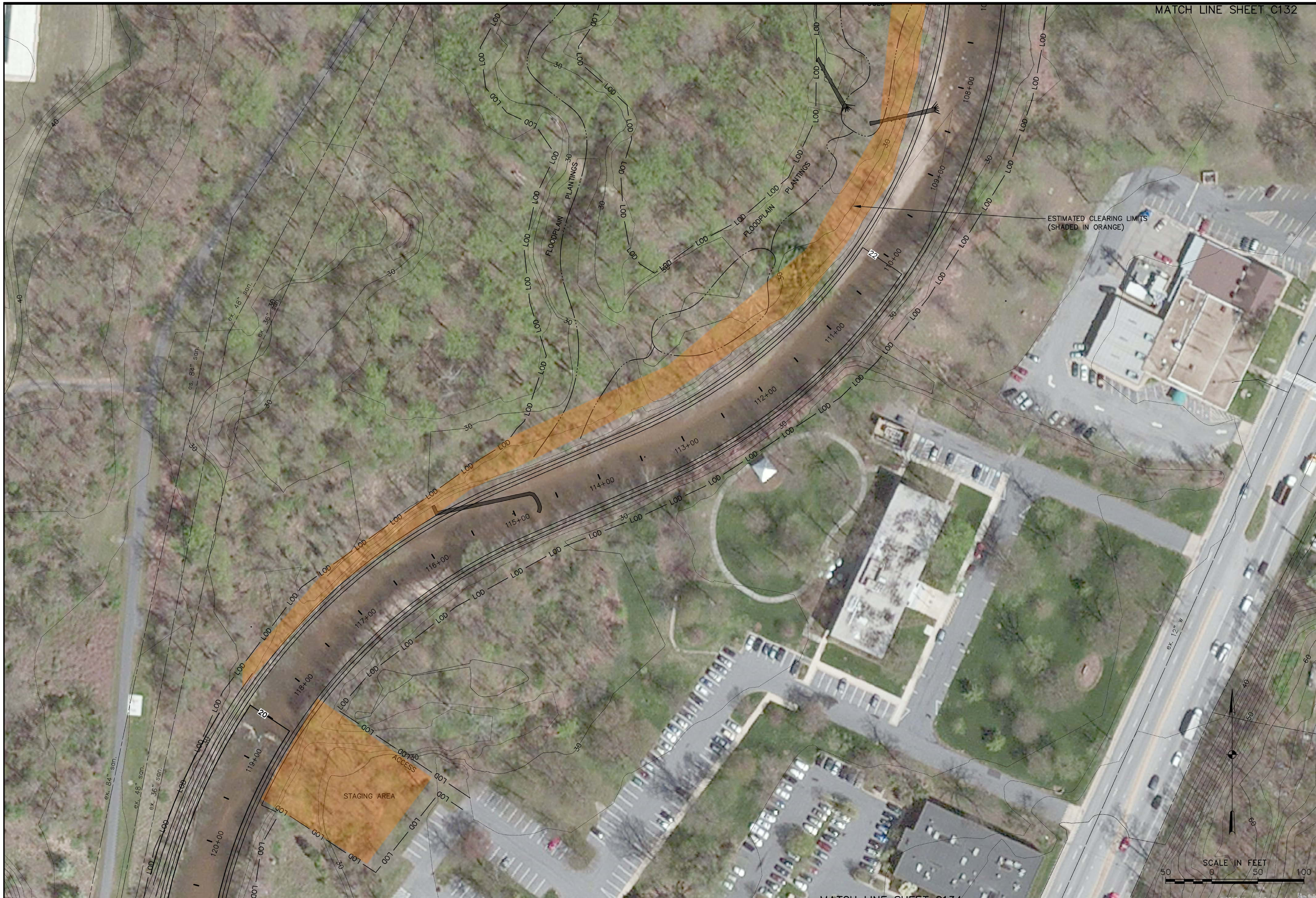

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ANACOSTIA WATERSHED RESTORATION
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FEASIBILITY STUDY

SITE 15 NORTHEAST BRANCH - PLAN

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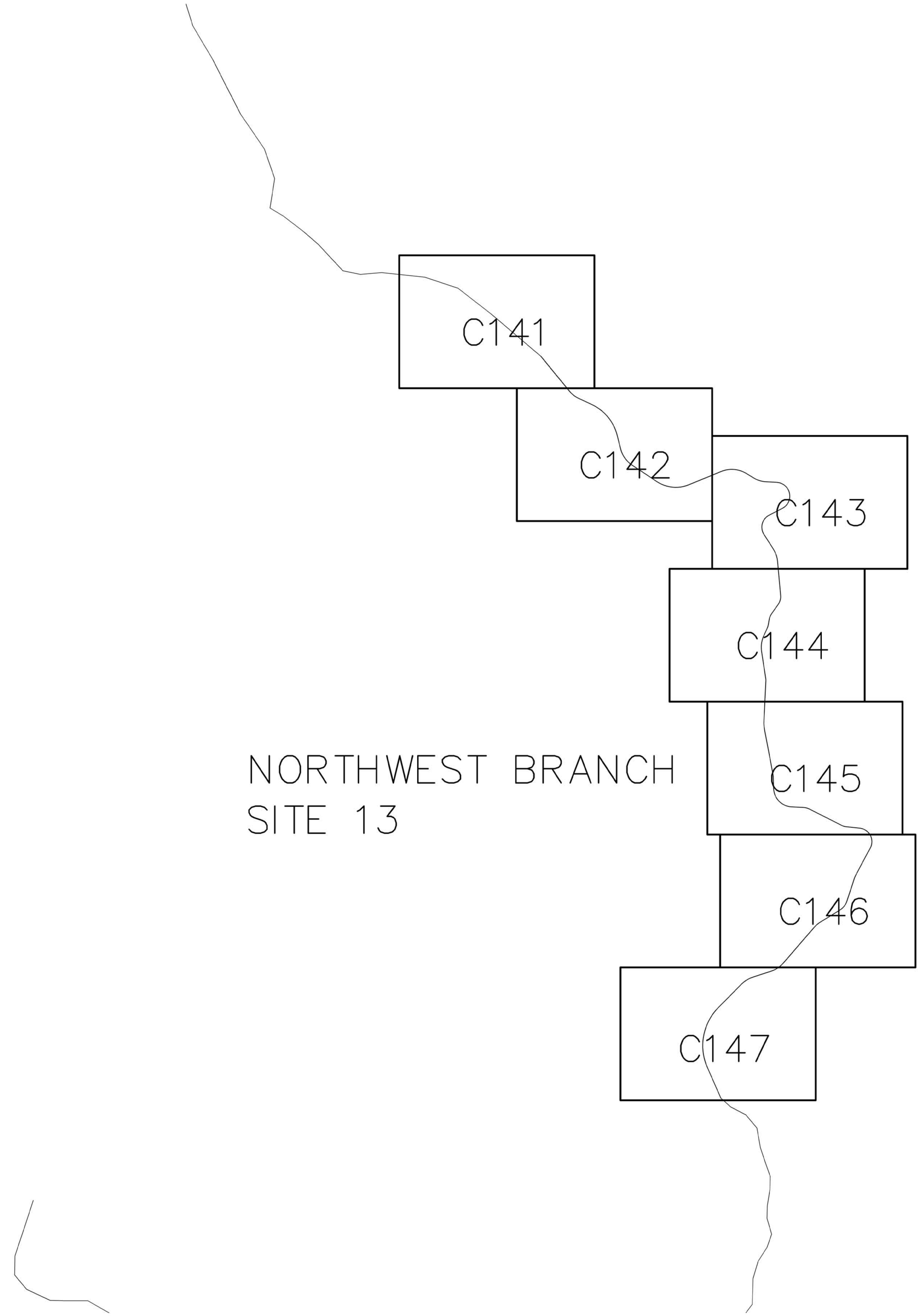

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ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

PLAN SHEET LAYOUT

SHEET IDENTIFICATION

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ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NORTHWEST BRANCH - PLAN

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SIZE: ANSI D
FILE NAME: C-142.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00/000

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NORTHWEST BRANCH - PLAN

SHEET IDENTIFICATION
C-142

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR.

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"= 1'
PLOT DATE:
SIZE: ANSI D
FILE NAME: C-143.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00/000

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NORTHWEST BRANCH - PLAN

SHEET IDENTIFICATION
C-143

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000
SIZE: ANSI D	FILE NAME: C-144.DWG	

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NORTHWEST BRANCH - PLAN

SHEET IDENTIFICATION
C-144

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000
SIZE: ANSI D	FILE NAME: C-145.DWG	

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NORTHWEST BRANCH - PLAN

SHEET IDENTIFICATION
C-145

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000
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ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NORTHWEST BRANCH - PLAN

SHEET IDENTIFICATION
C-146

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

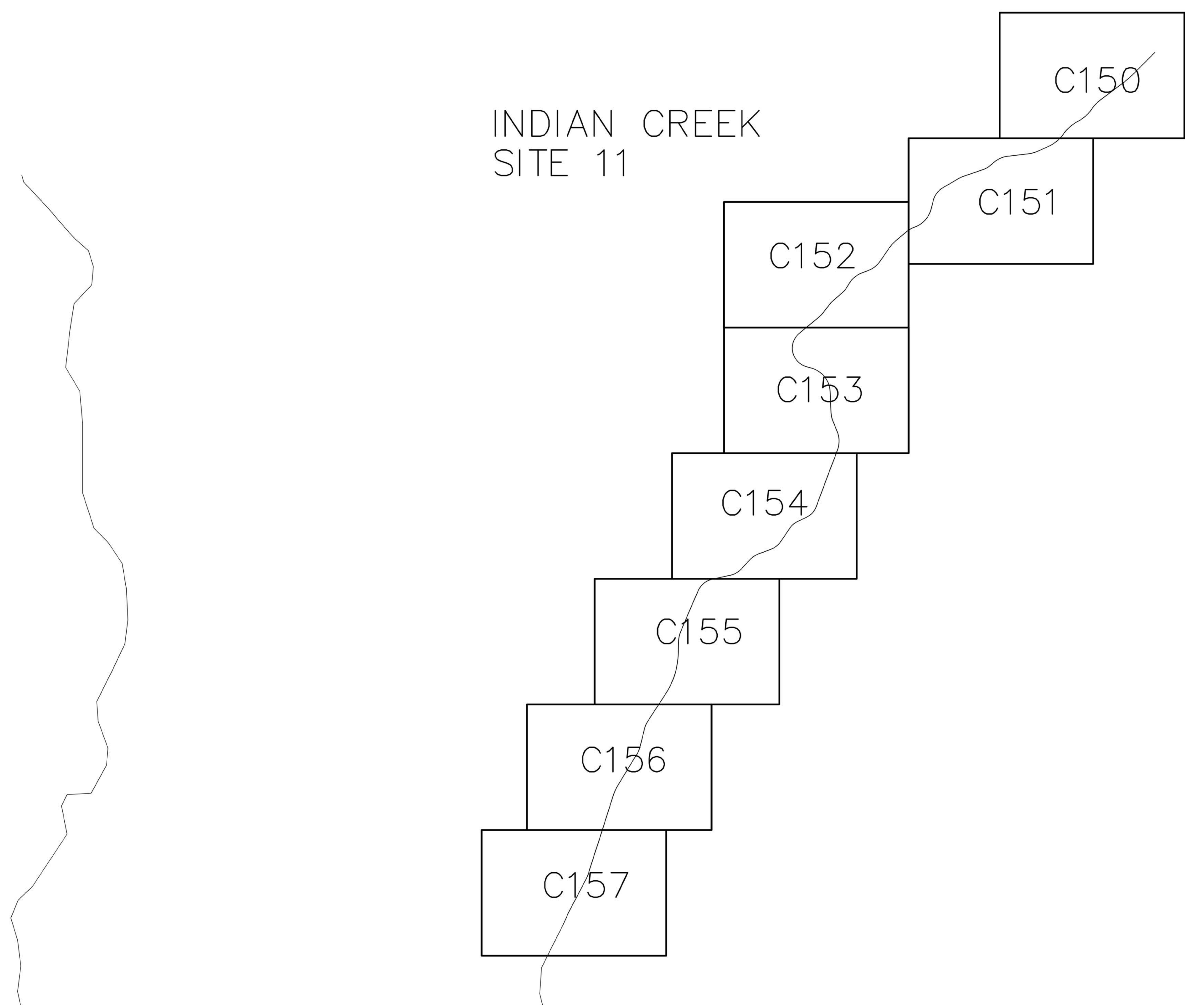
MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS BALTIMORE DISTRICT BALTIMORE, MARYLAND	DESIGNED BY:	DATE: 0000-00-00
	DWN BY: / CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
	SUBMITTED BY:	CONTRACT NO.: W000AA-00-A-0000
	PLOT SCALE: 1"= 1' / PLOT DATE:	FILE NUMBER: AA-A-00/000
	SIZE: ANSI D / FILE NAME: C-147.DWG	

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NORTHWEST BRANCH - PLAN

SHEET IDENTIFICATION
C-147



US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:			DATE: 0000-00-00
DWN BY:	CKD BY:		SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:			CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:		FILE NUMBER: AA-A-00/000
SIZE: ANSI D	FILE NAME: C-149.DWG		

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

PLAN SHEET LAYOUT

SHEET IDENTIFICATION

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000
SIZE: ANSI D	FILE NAME: C-150.DWG	

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK - PLAN

SHEET IDENTIFICATION
C-150

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"= 1'
PLOT DATE:
SIZE: ANSI D
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DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00/000

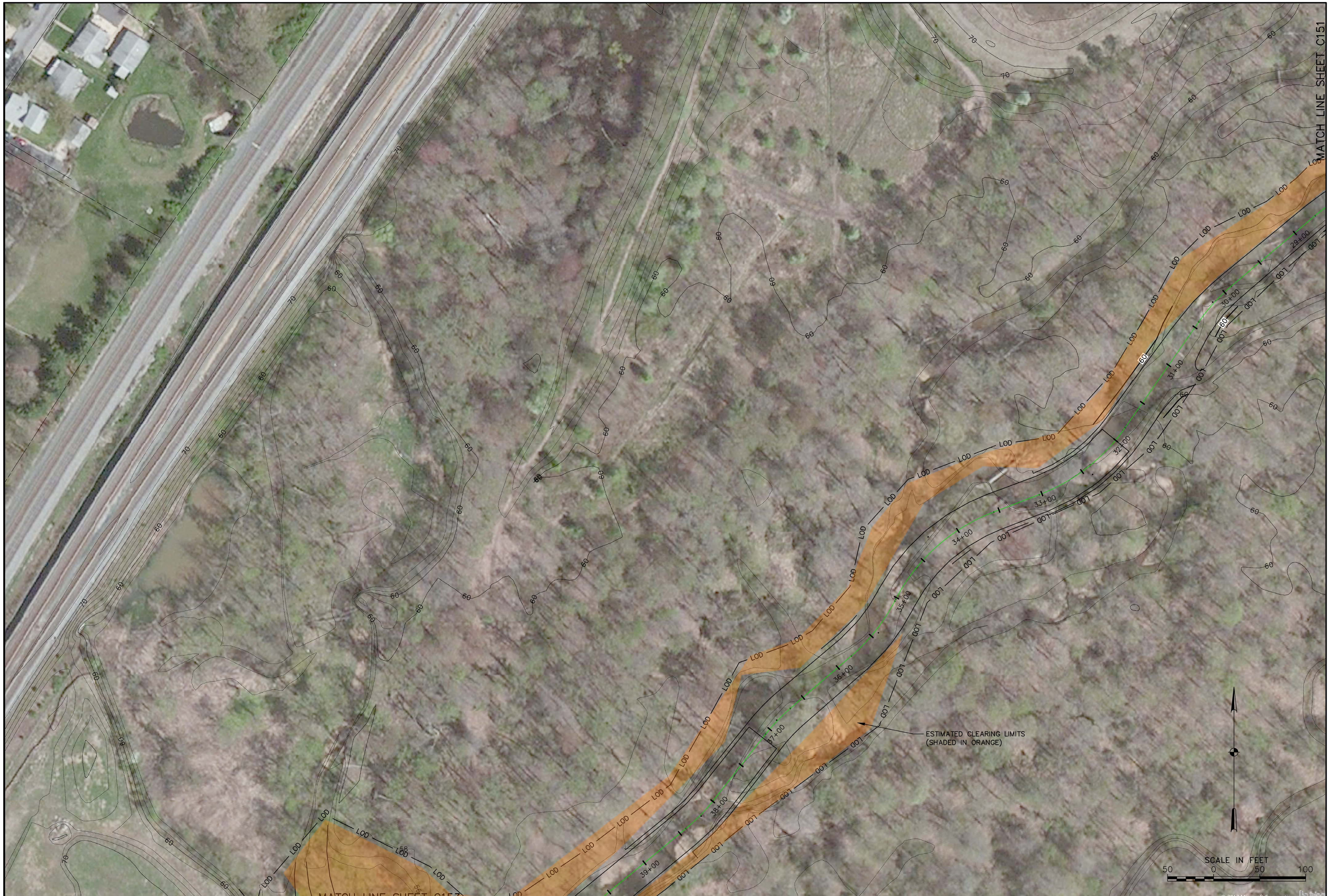
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK - PLAN

SHEET IDENTIFICATION
C-151

1 2 3 4 5

D C B A



US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR.

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE:
PLOT DATE:
SIZE:
FILE NAME:
FILE NUMBER:
CONTRACT NO.:
SOLICITATION NO.:
DATE:

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK - PLAN

SHEET IDENTIFICATION
C-152

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000
SIZE: ANSI D	FILE NAME: C-153.DWG	

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK - PLAN

SHEET IDENTIFICATION
C-153

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000
SIZE: ANSI D	FILE NAME: C-154.DWG	

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK - PLAN

SHEET IDENTIFICATION
C-154

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"= 1'
PLOT DATE:
SIZE: ANSI D
FILE NAME: C-155.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00/000

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK - PLAN

SHEET IDENTIFICATION
C-155

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR.

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000
SIZE: ANSI D	FILE NAME: C-156.DWG	

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK - PLAN

SHEET IDENTIFICATION
C-156

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000
SIZE: ANSI D	FILE NAME: C-157.DWG	

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK - PLAN

SHEET IDENTIFICATION
C-157

SITE 3 NORTHWEST BRANCH CROSS–SECTIONS

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

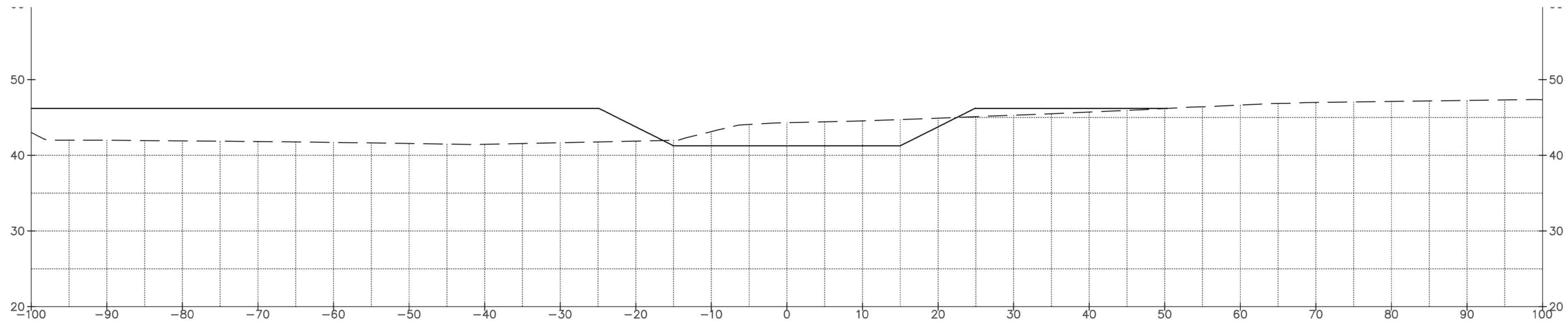
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY: | DATE: 0000-00-00
DWN BY: | CKD BY: | SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY: | CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1' | PLOT DATE: | FILE NUMBER: AA-A-00/000
SIZE: ANSI D | FILE NAME: C-300.DWG

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 3 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION



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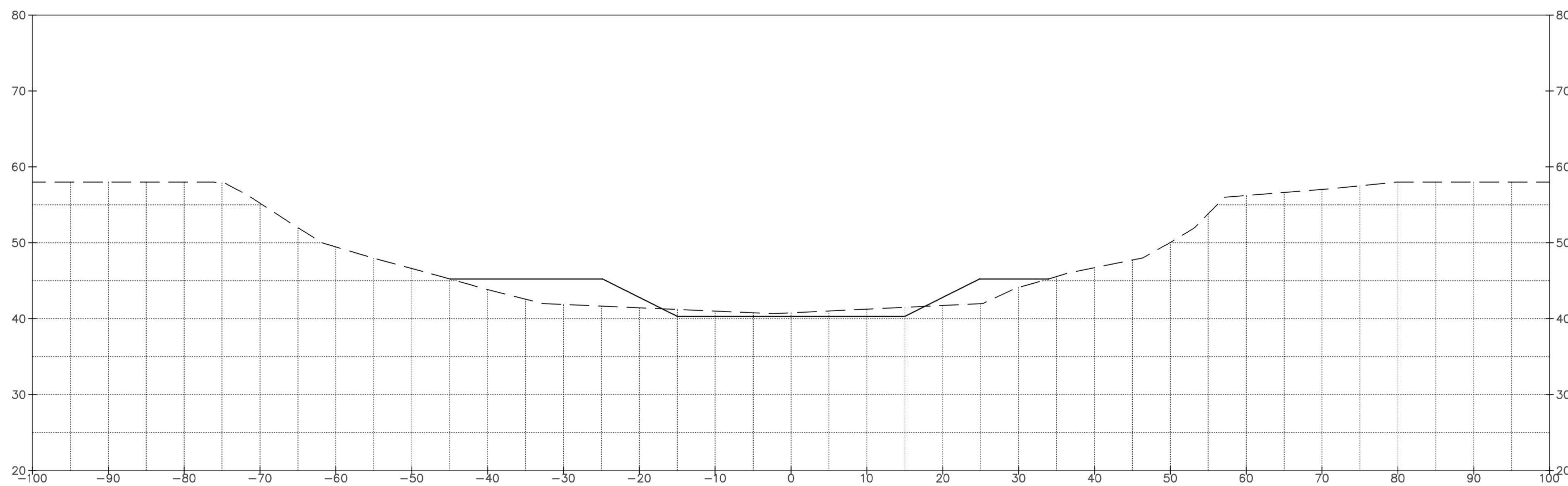

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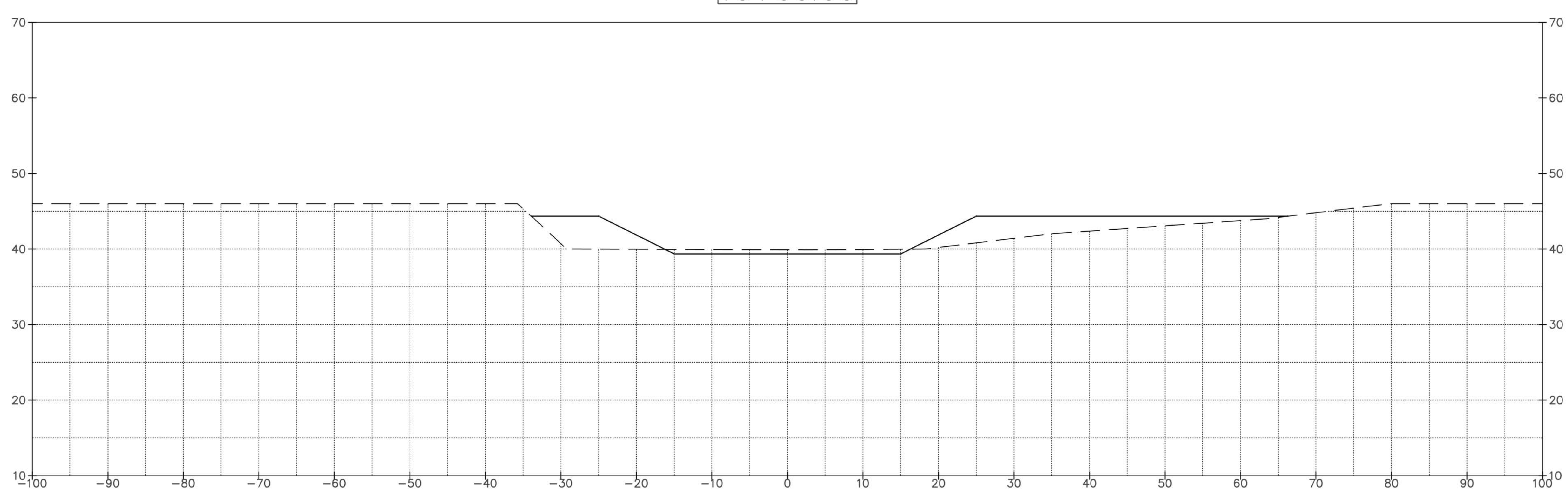


15+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

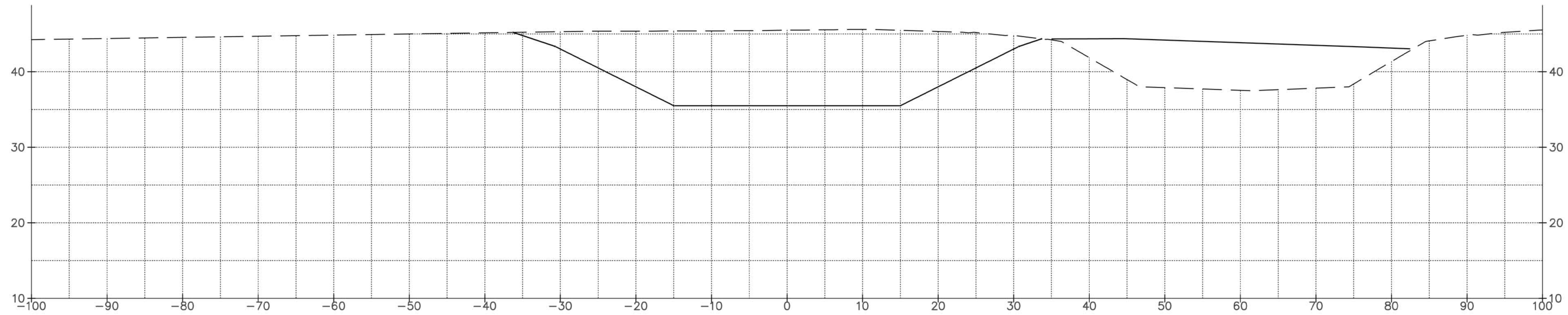
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"=1'
SIZE: ANSI D
PLOT DATE:
FILE NAME: C-301.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 3 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-301



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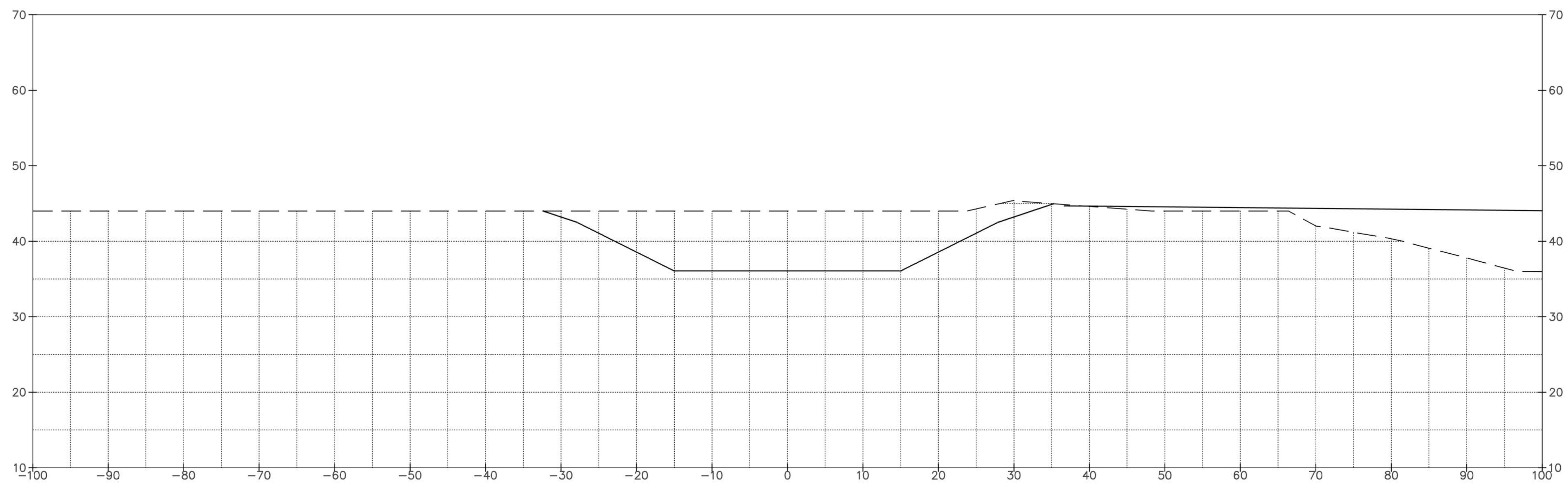

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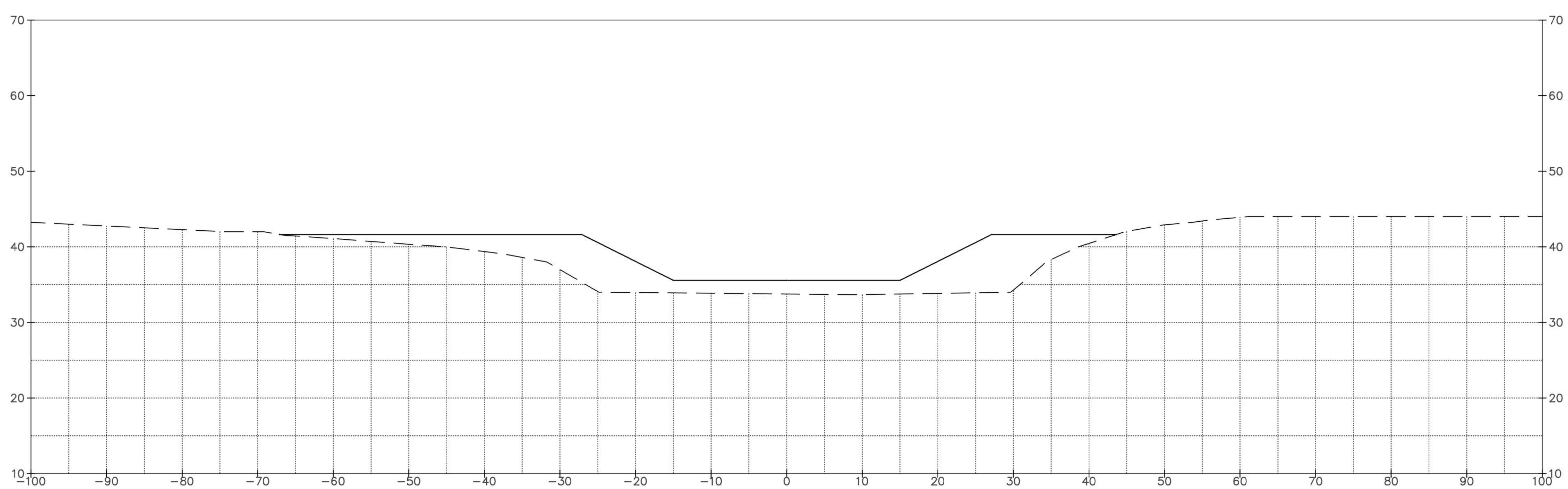

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

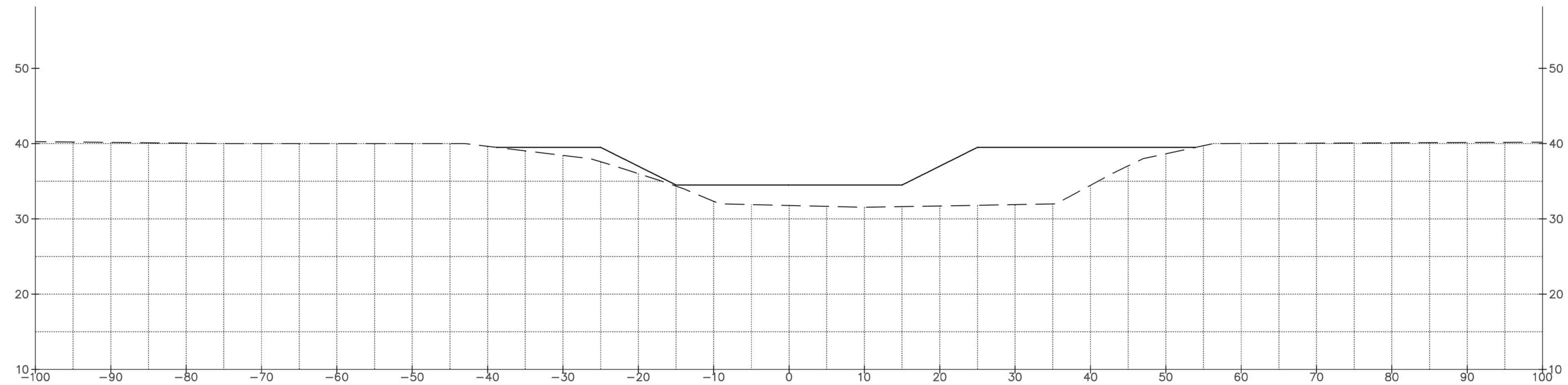
DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"= 1'
PLOT DATE:
SIZE: ANSI D
FILE NAME: C-302.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00/000

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 3 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-302



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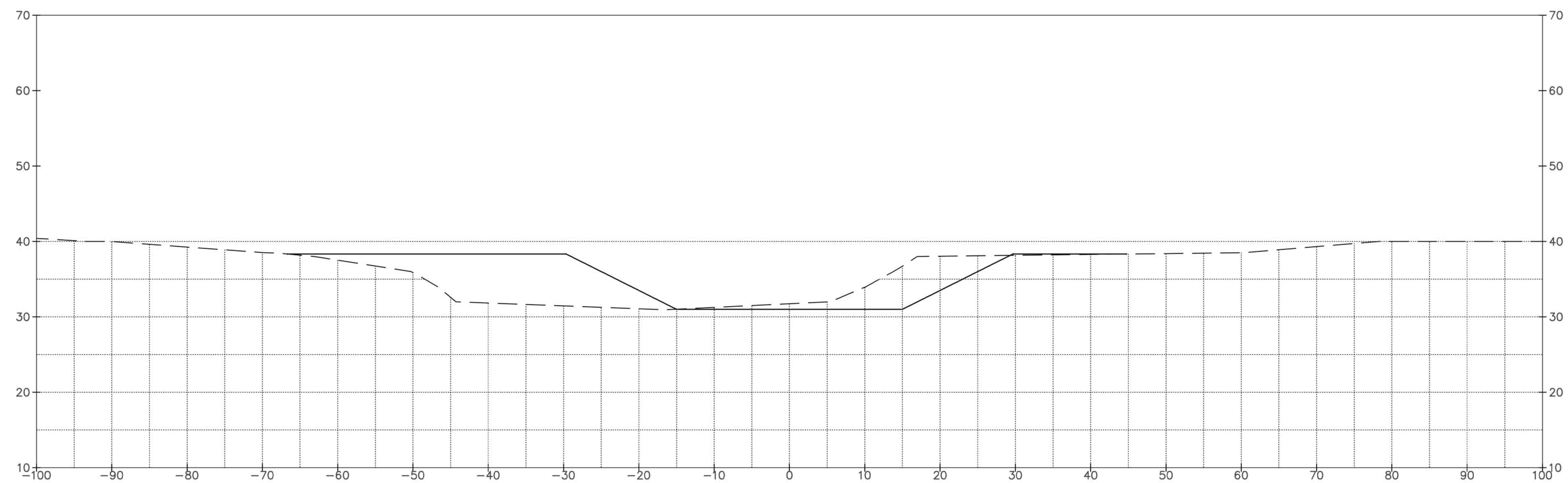

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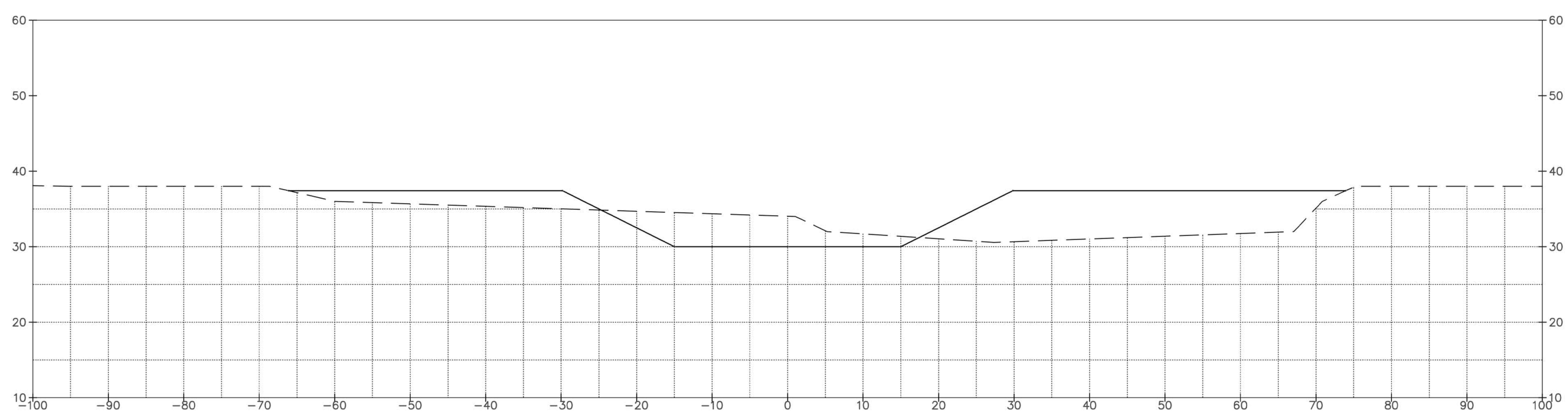

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

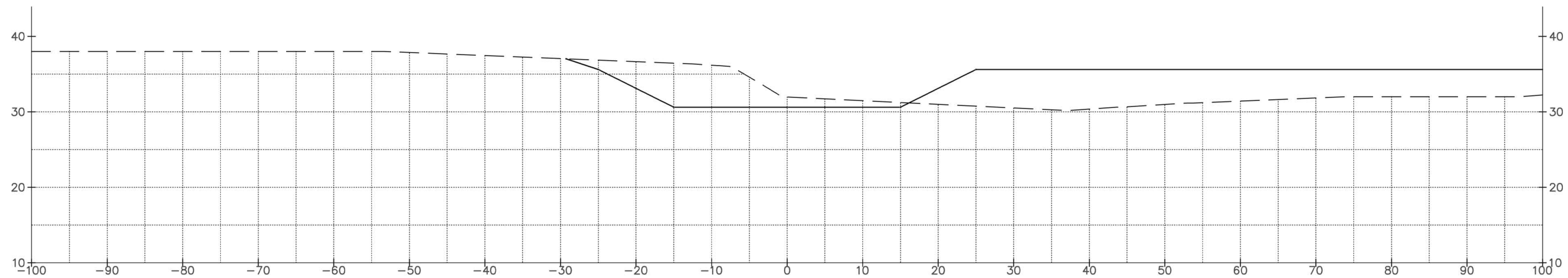
DESIGNED BY: | DATE: 0000-00-00
DWN BY: | CKD BY: | SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY: | CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1' | PLOT DATE: | FILE NUMBER: AA-A-00000
SIZE: ANSI D | FILE NAME: C-303.DWG

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 3 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-303



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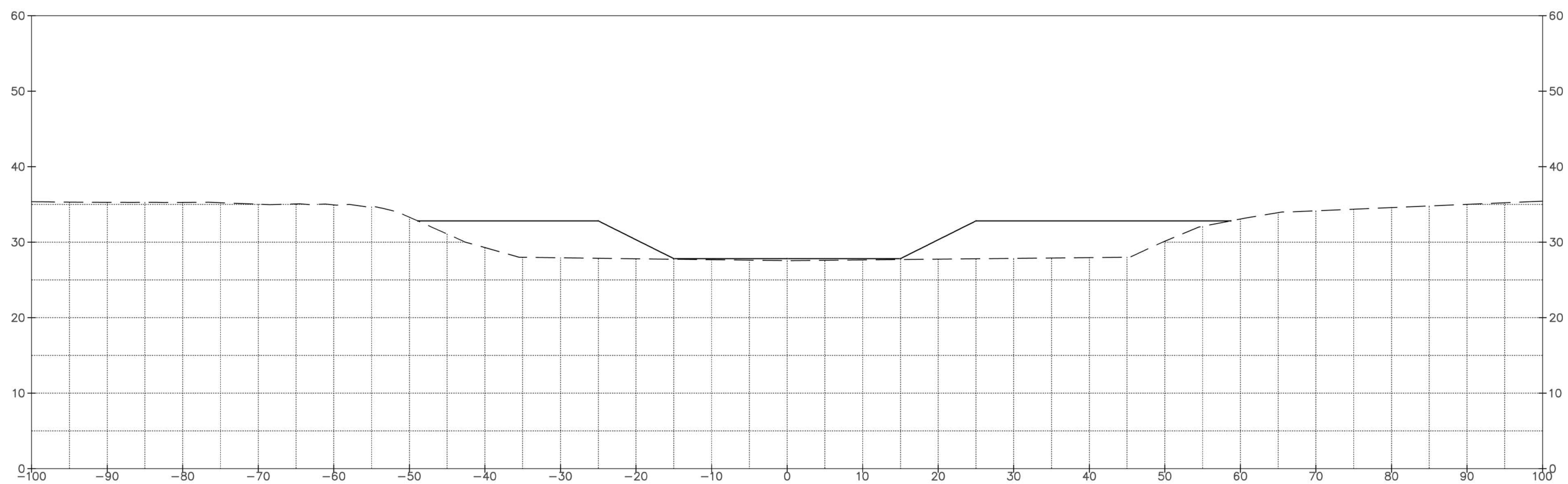

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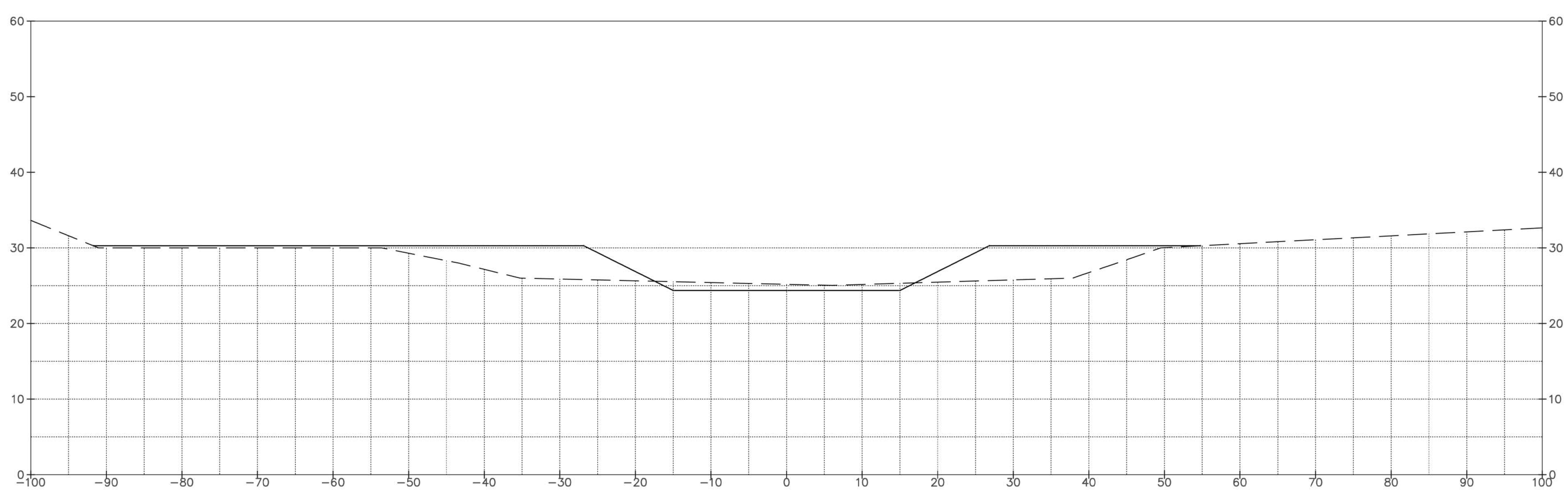

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

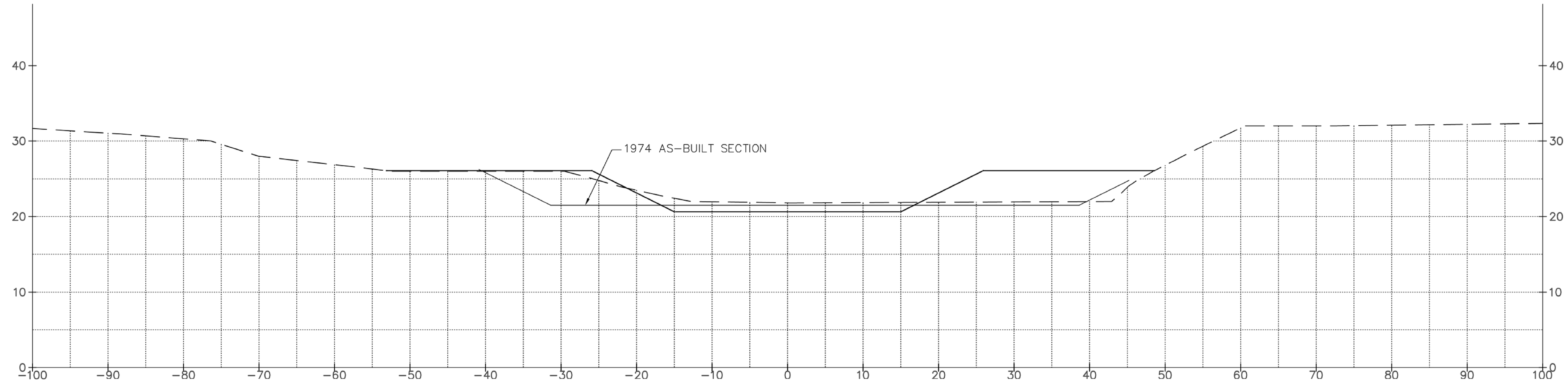
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY: | DATE: 0000-00-00
DWN BY: | CKD BY: | SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY: | CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1' | PLOT DATE: | FILE NUMBER: AA-A-00/000
SIZE: ANSI D | FILE NAME: C-304.DWG

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 3 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-304



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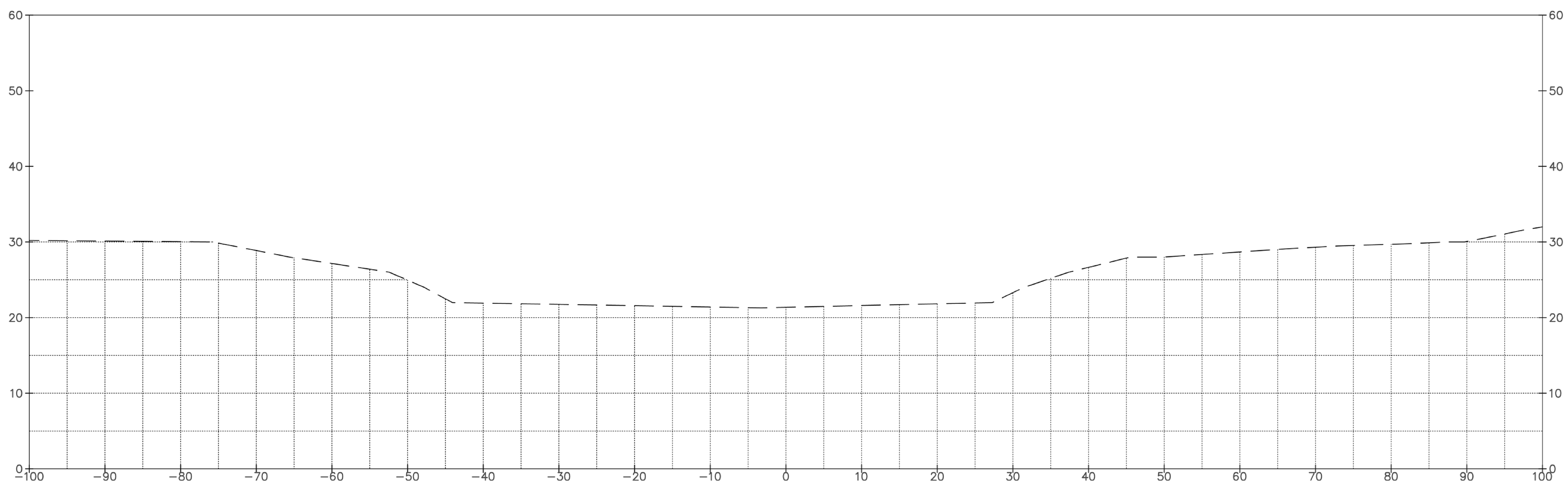

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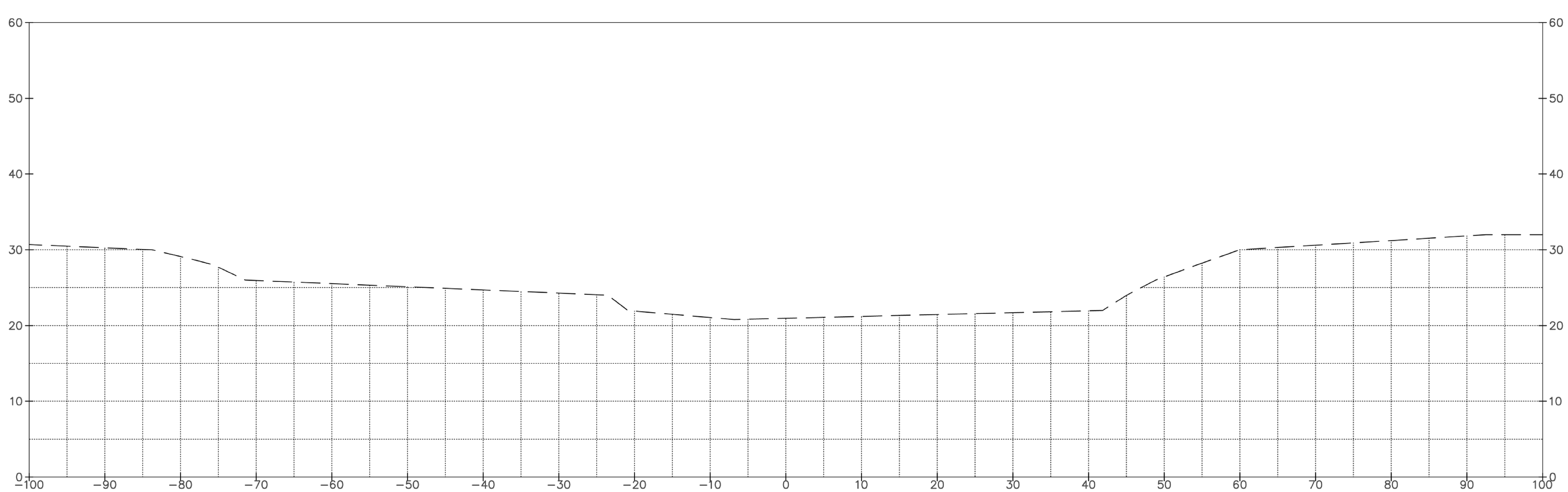

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"= 1'
PLOT DATE:
SIZE: ANSI D
FILE NAME: C-305.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00/000

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 3 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-305

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SITE 9 SLIGO CREEK CROSS-SECTIONS

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

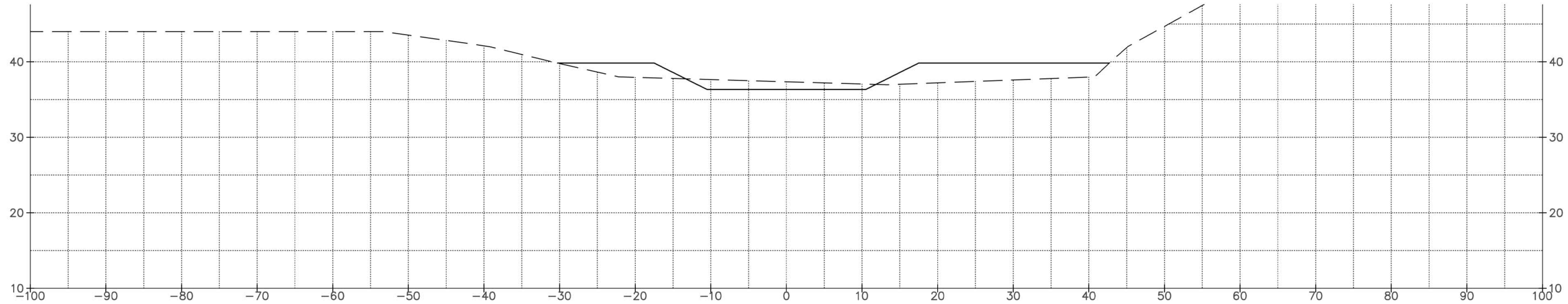
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

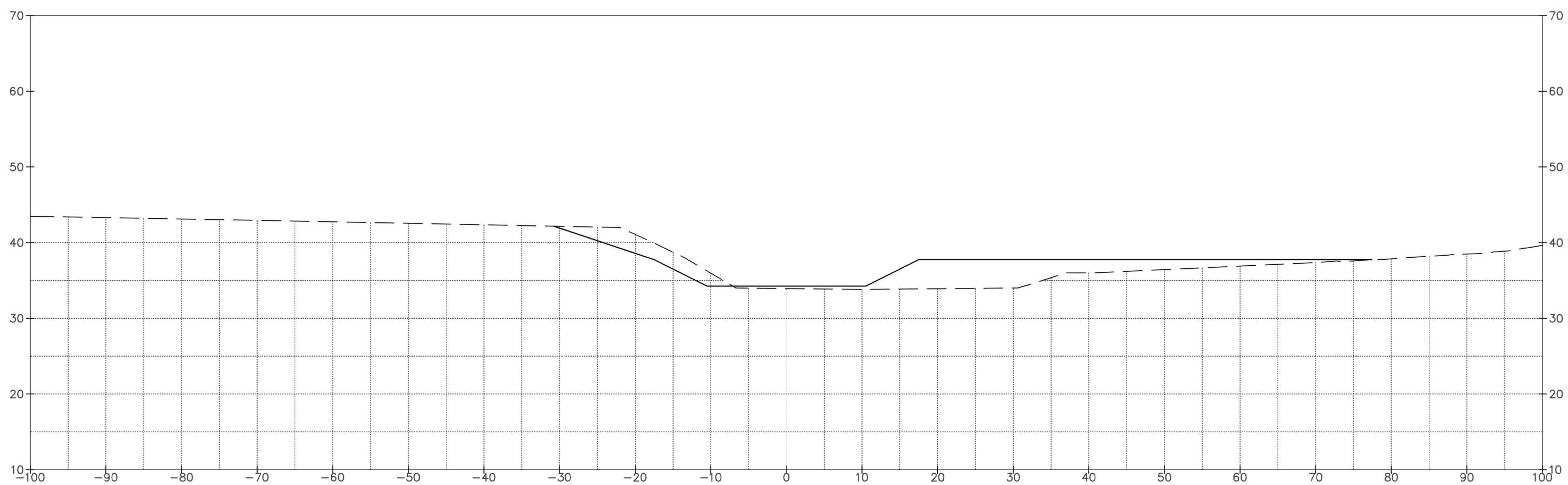
DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"= 1'
PLOT DATE:
SIZE: ANSI D
FILE NAME: C-309.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

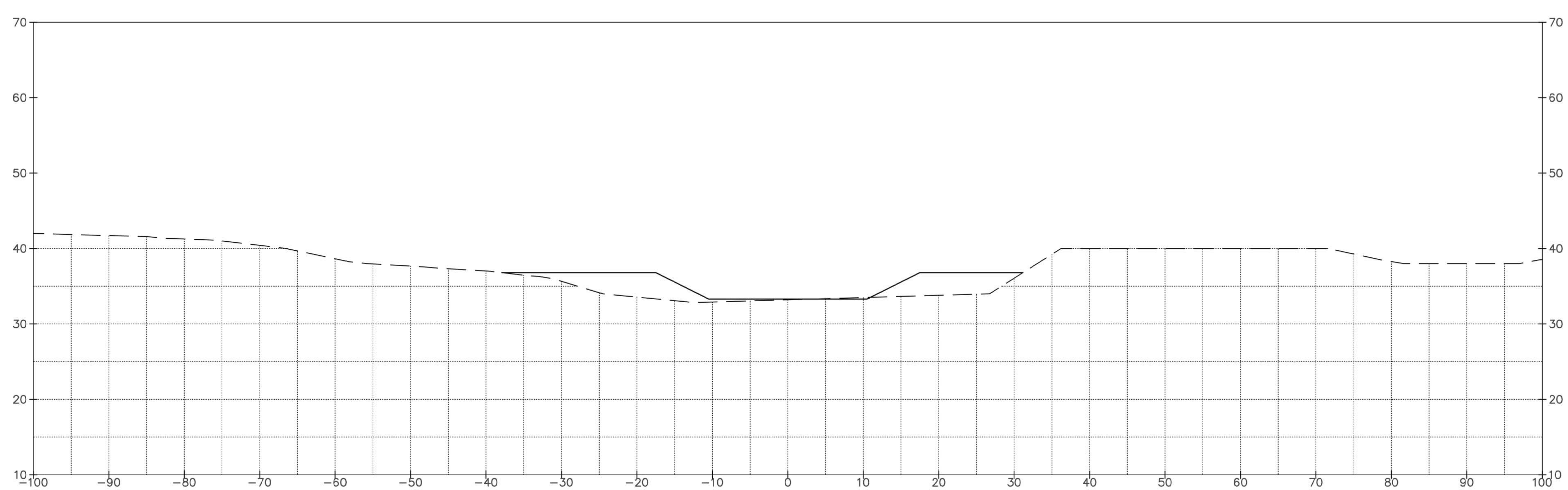
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 9 SLIGO CREEK -CROSS-SECTIONS

SHEET
IDENTIFICATION







US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS BALTIMORE DISTRICT BALTIMORE, MARYLAND	DESIGNED BY:		DATE: 0000-00-00
	DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
	SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
	PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000
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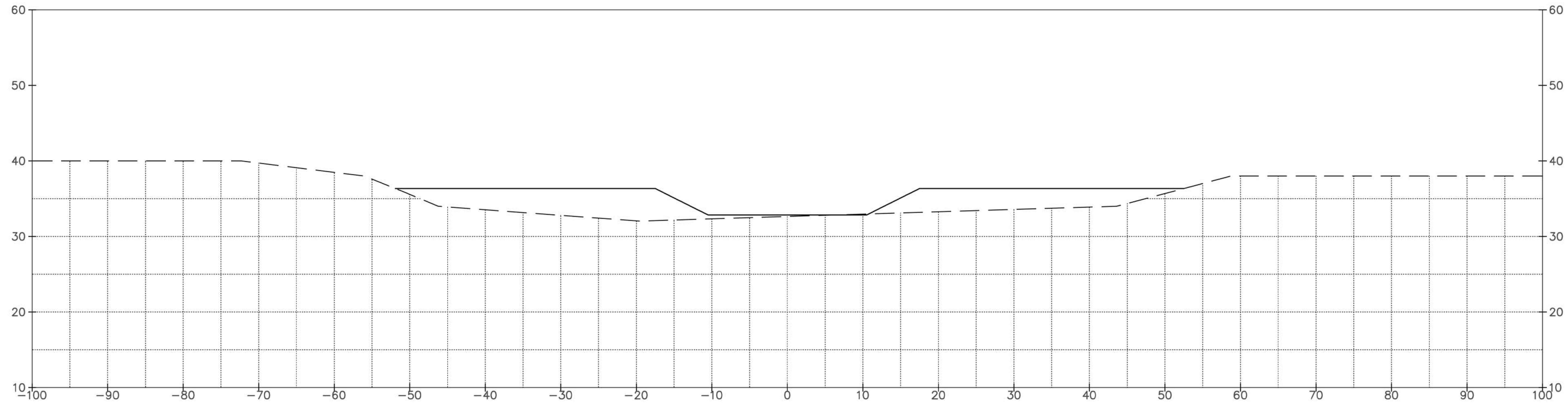
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 9 SLIGO CREEK -CROSS-SECTIONS

SHEET IDENTIFICATION
C-310

20+00.00



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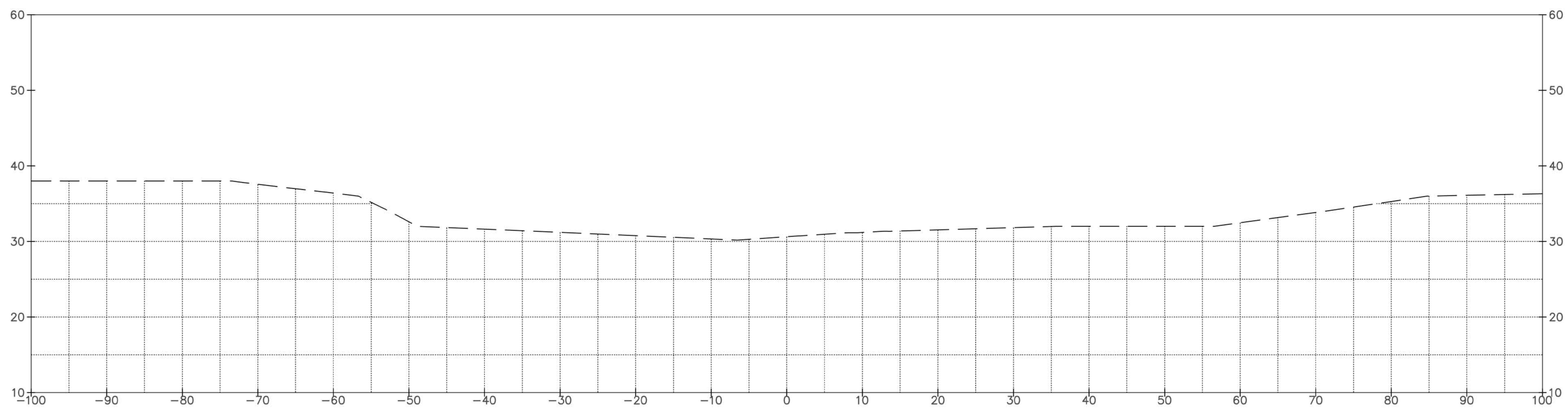

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

DESIGNED BY: | DATE: 0000-00-00
DWN BY: | CKD BY: | SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY: | CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1' | PLOT DATE: | FILE NUMBER: AA-A-00000
SIZE: ANSI D | FILE NAME: C-311.DWG

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 9 SLIGO CREEK -CROSS-SECTIONS

SHEET IDENTIFICATION
C-311

SITE 5 PAINT BRANCH CROSS-SECTIONS

US Army Corps of Engineers ®
Baltimore District

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY: DATE: 0000-00-00
DWN BY: CKD BY: SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY: CONTRACT NO.: W000AA-00-A-0000
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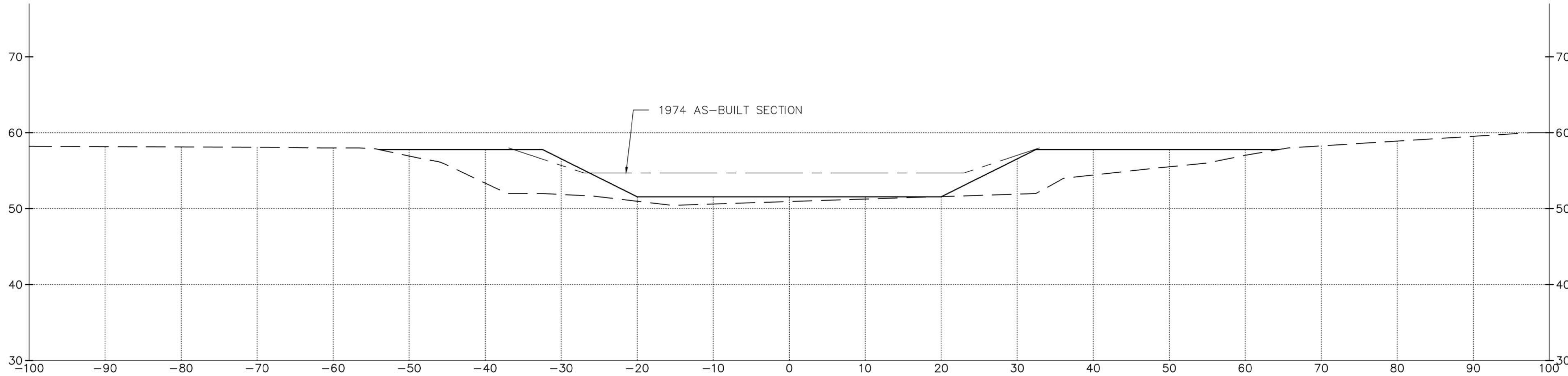
SIZE: ANSI D FILE NAME: C-319.DWG

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 5 PAINT BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION



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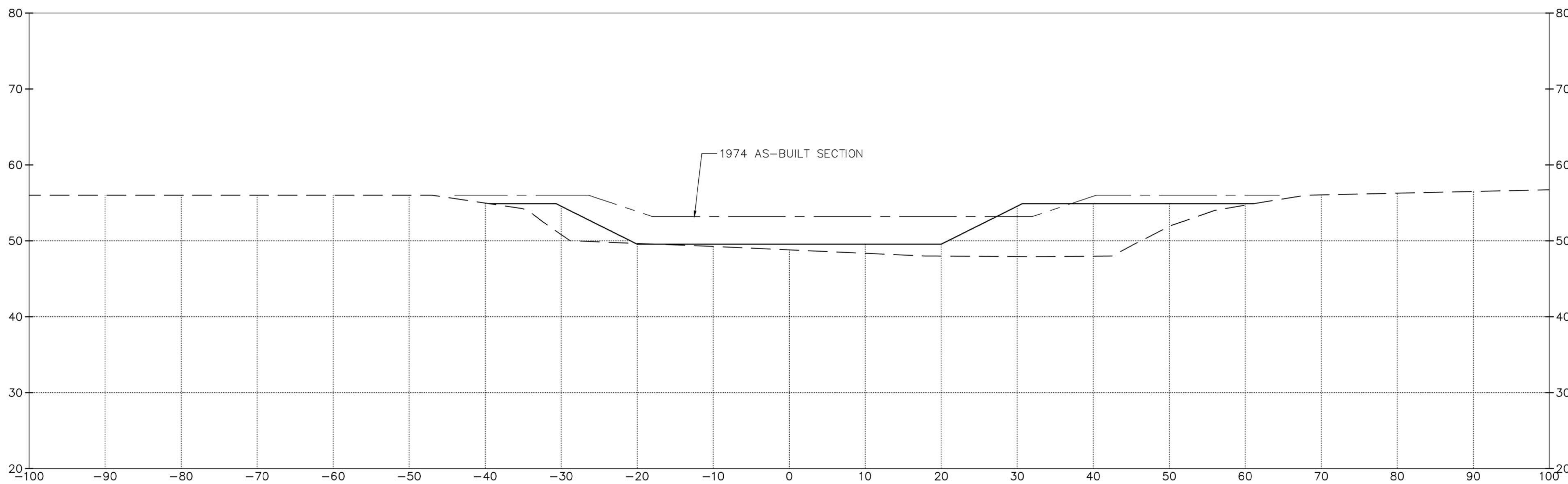

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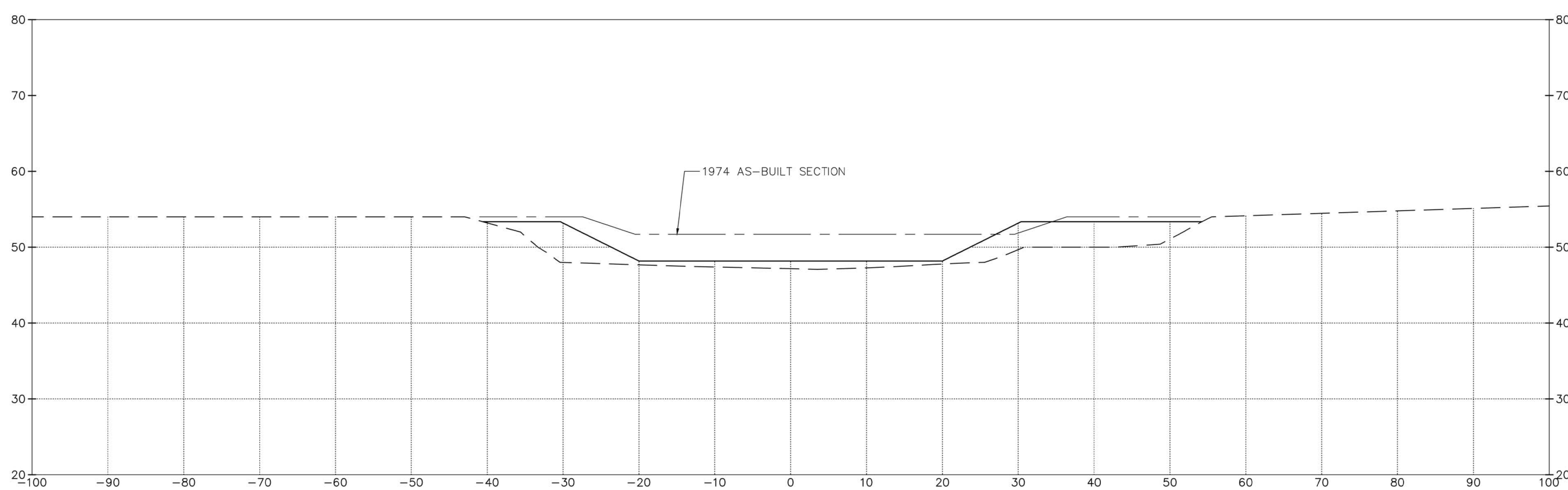


25+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

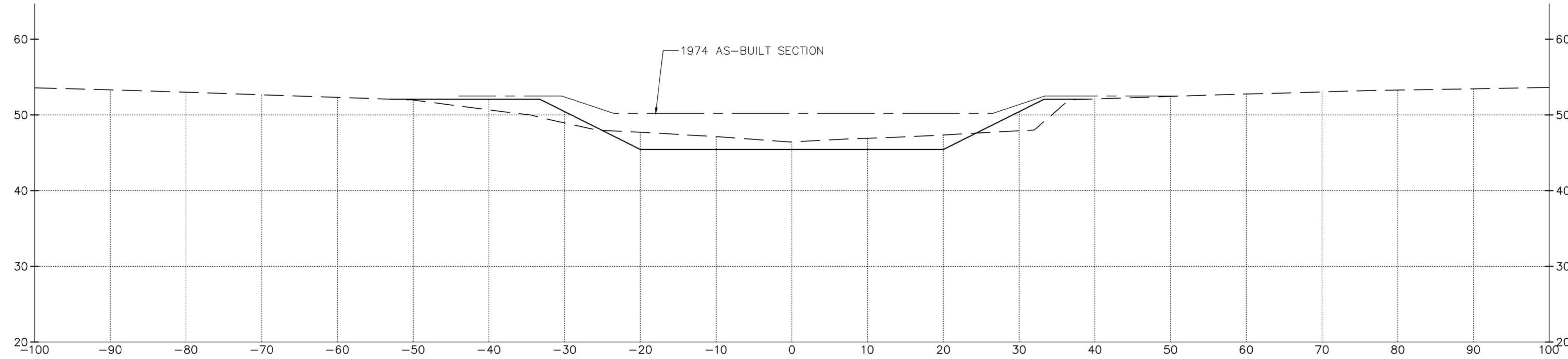
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"=1'
SIZE: ANSI D
PLOT DATE:
FILE NAME: C-320.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 5 PAINT BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-320



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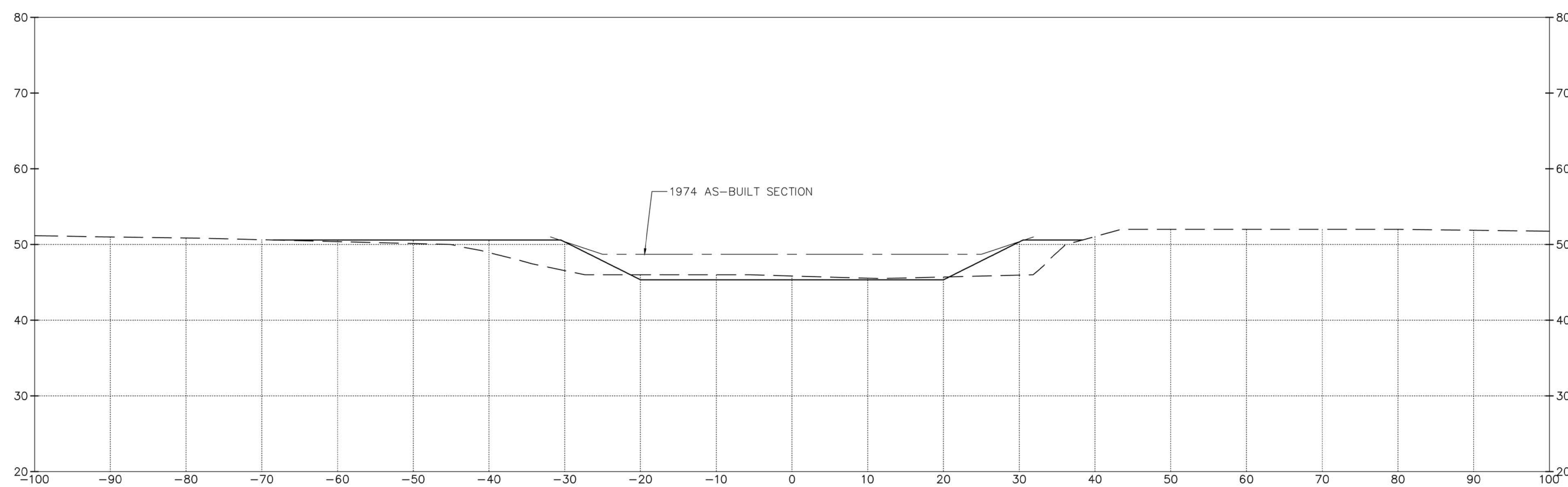

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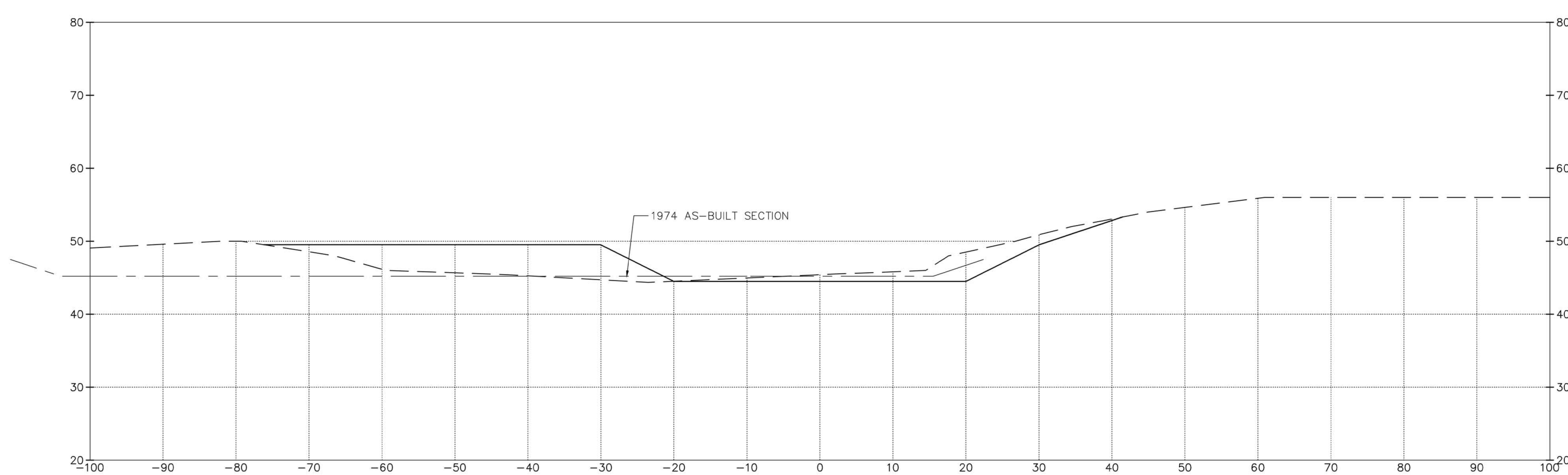

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US Army Corps of Engineers ®
Baltimore District

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MARK	DESCRIPTION	DATE	APPR

DESIGNED BY:
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SUBMITTED BY:
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SIZE: ANSI D
FILE NAME: C-321.DWG
DATE: 0000-00-00
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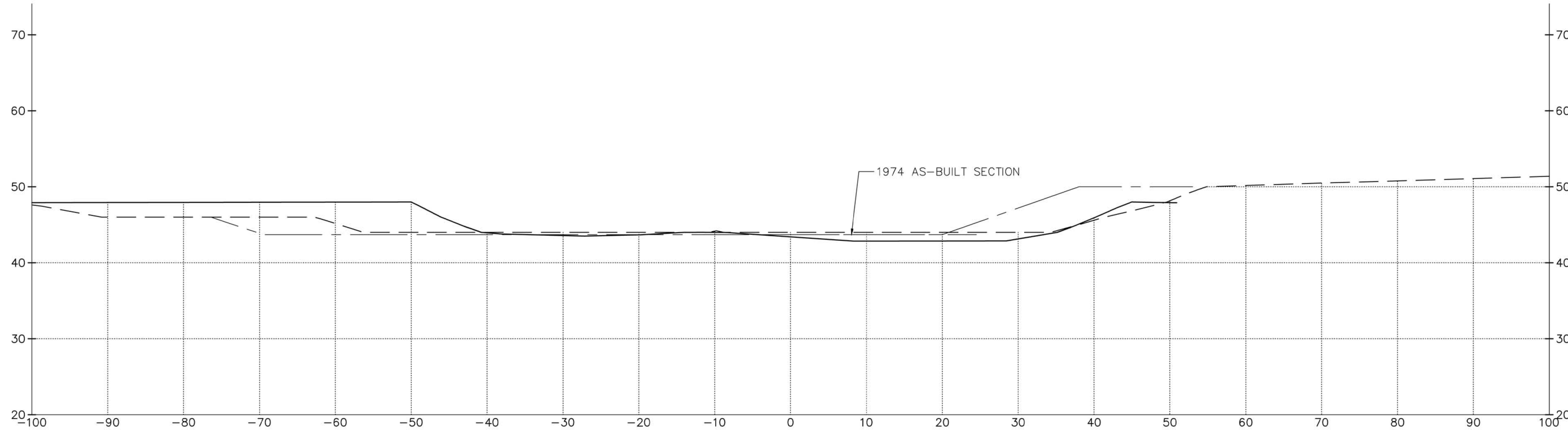
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 5 PAINT BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-321



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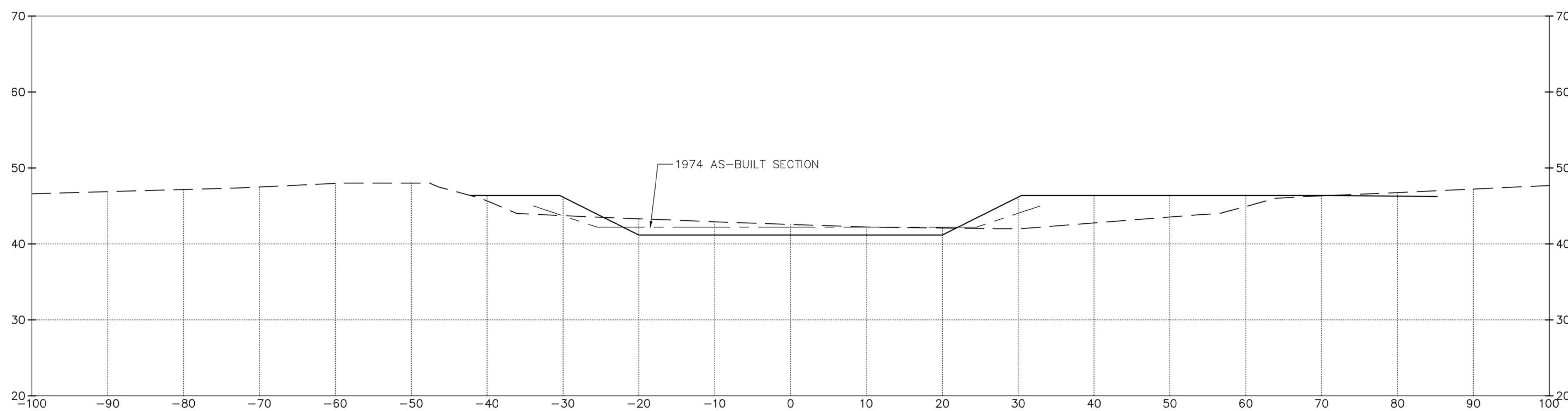

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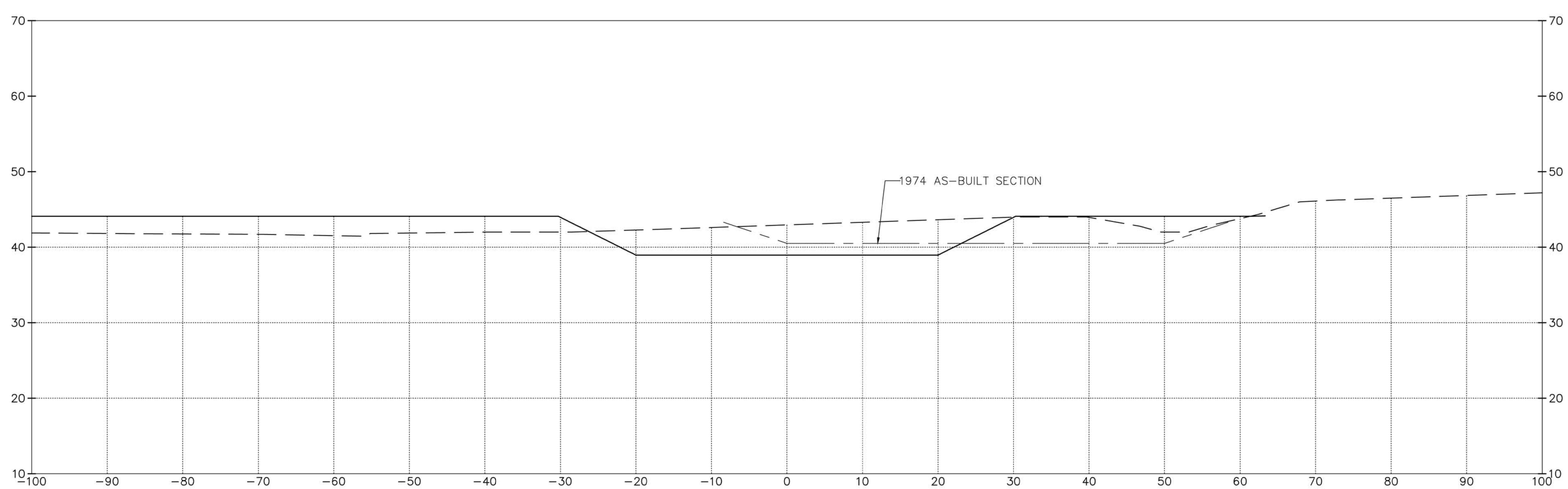

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

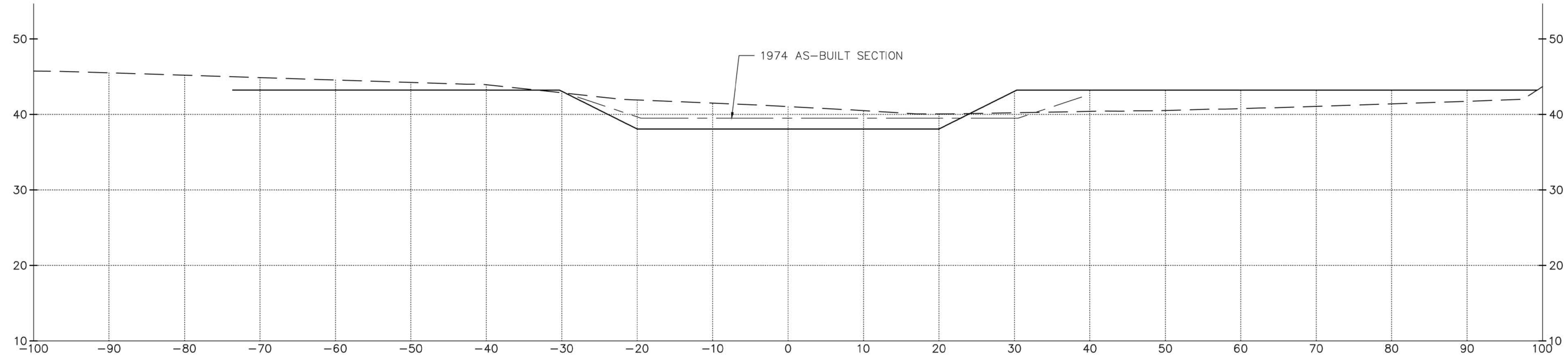
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"= 1'
PLOT DATE:
SIZE: ANSI D
FILE NAME: C-322.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 5 PAINT BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-322



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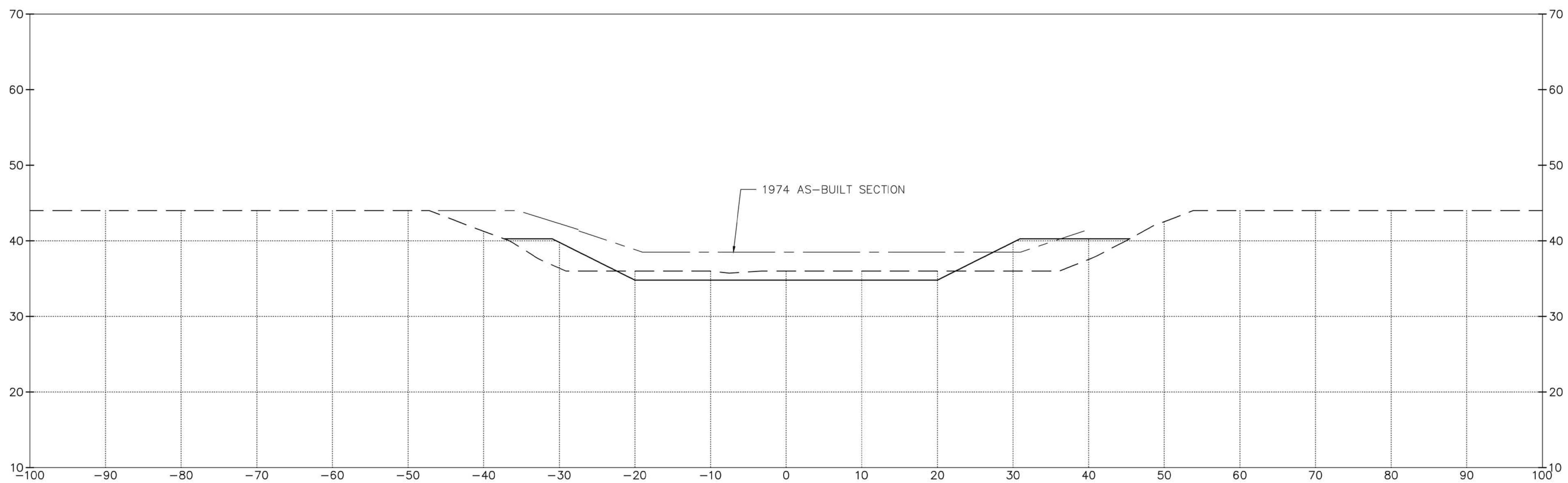

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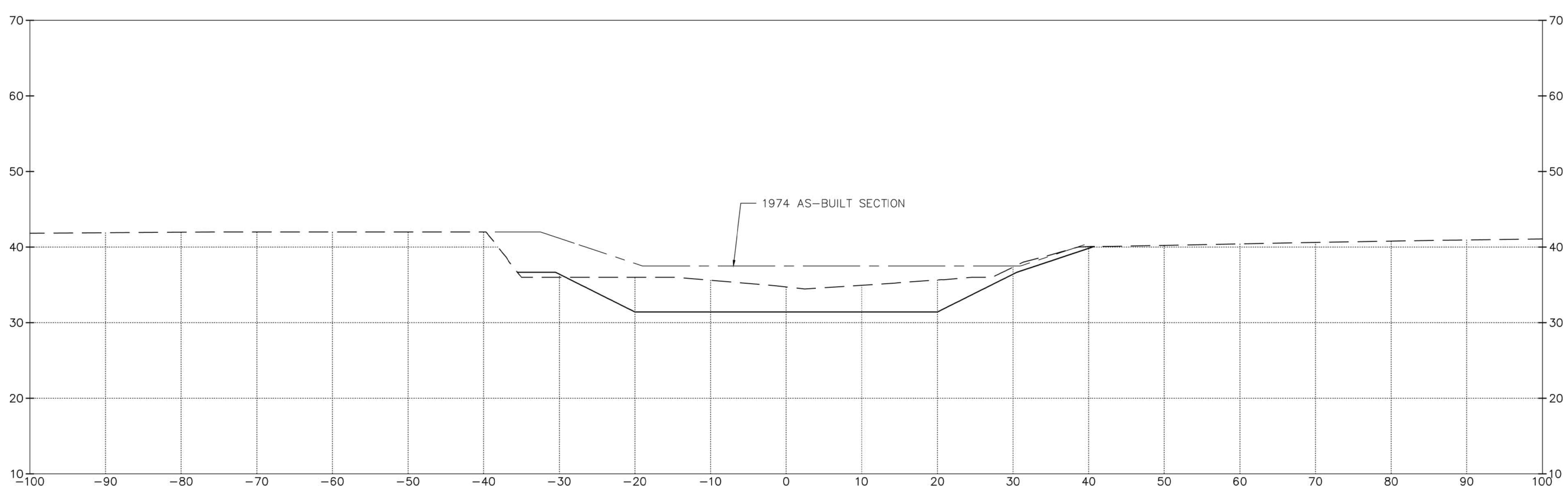

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:	DWN BY:	CKD BY:	DATE: 0000-00-00
SUBMITTED BY:		SOLICITATION NO.: W000AA-00-A-0000	CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00000	
SIZE: ANSI D	FILE NAME: C-323.DWG		

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 5 PAINT BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-323

SITE 15 NORTHEAST BRANCH CROSS-SECTIONS

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

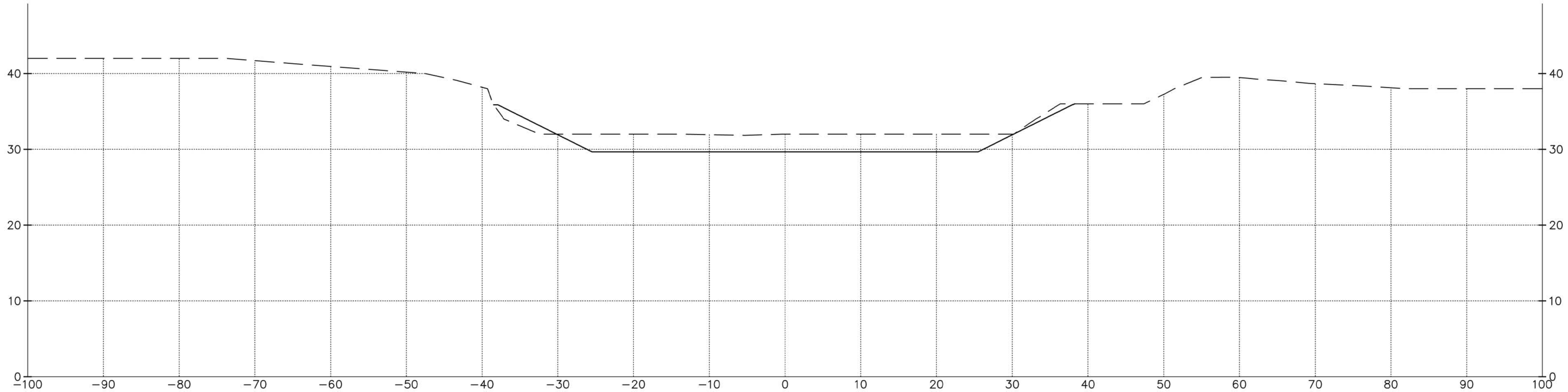
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"= 1'
PLOT DATE:
SIZE: ANSI D
FILE NAME: C-329.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 15 NE BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION



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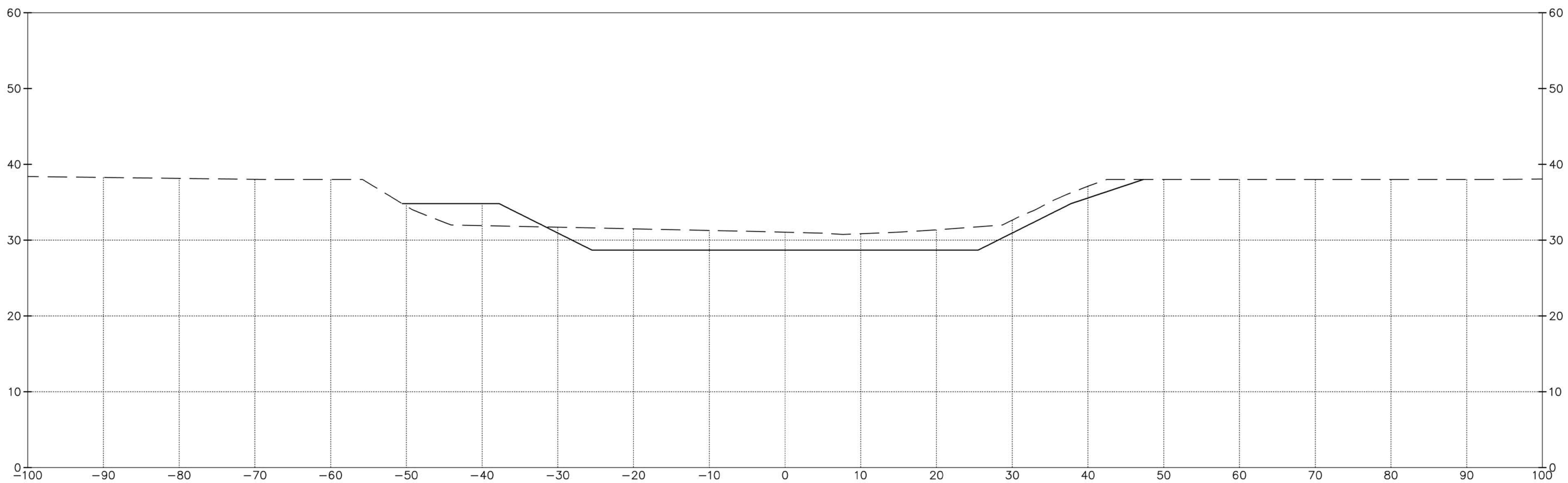

85+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"= 1'
SIZE: ANSI D
PLOT DATE:
FILE NAME: C-330.DWG
DATE: 0000-00-00
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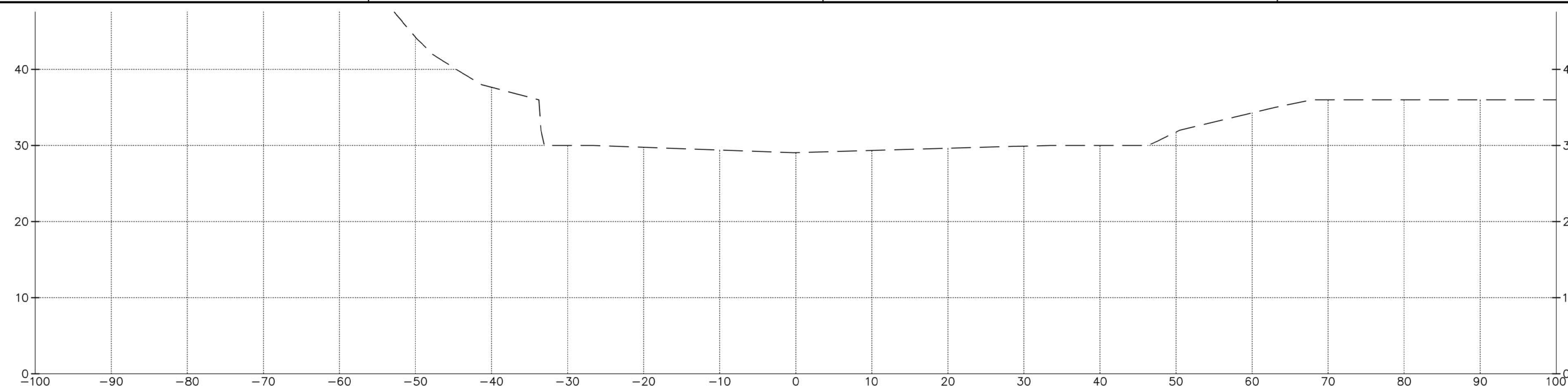
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 15 NE BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-330



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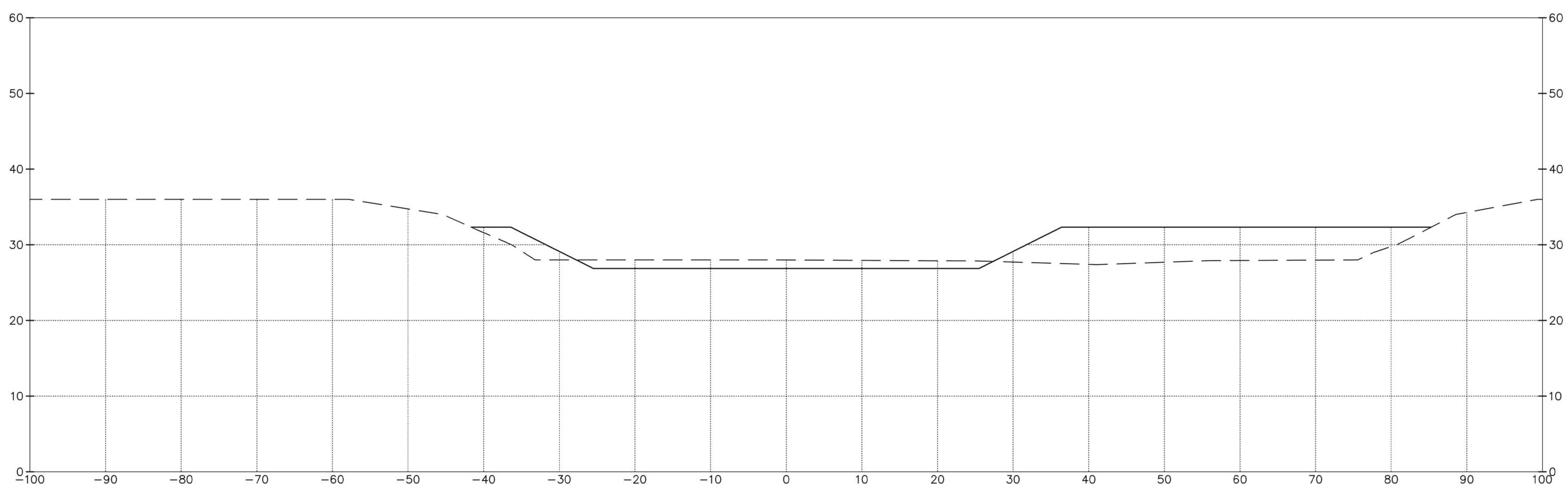

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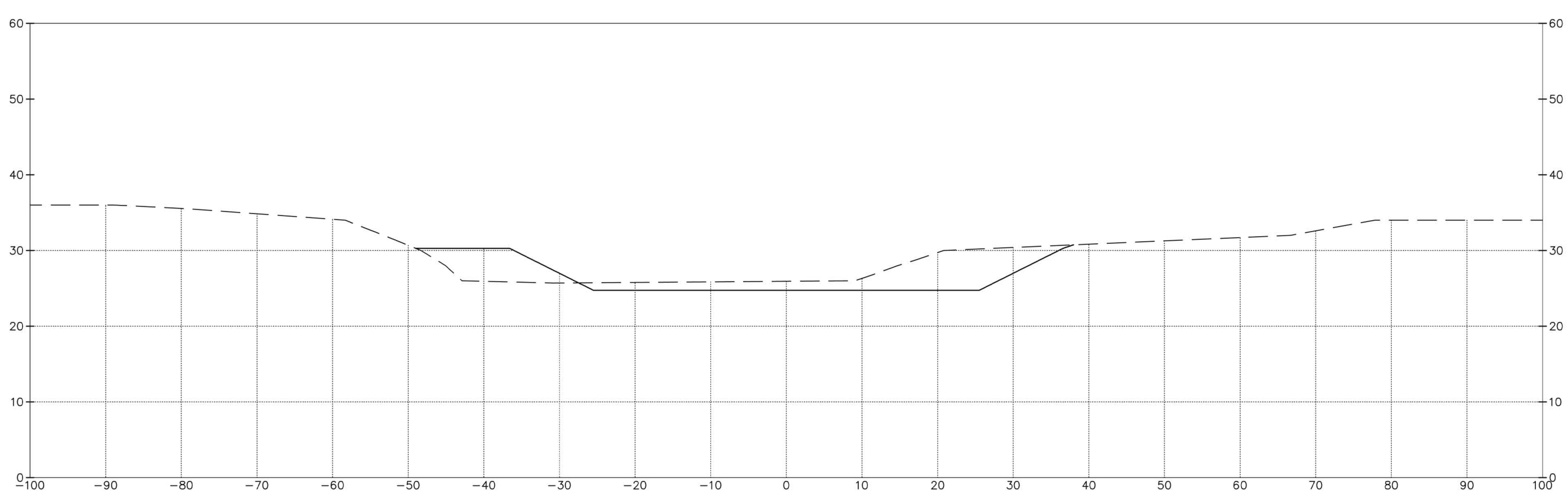


100+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

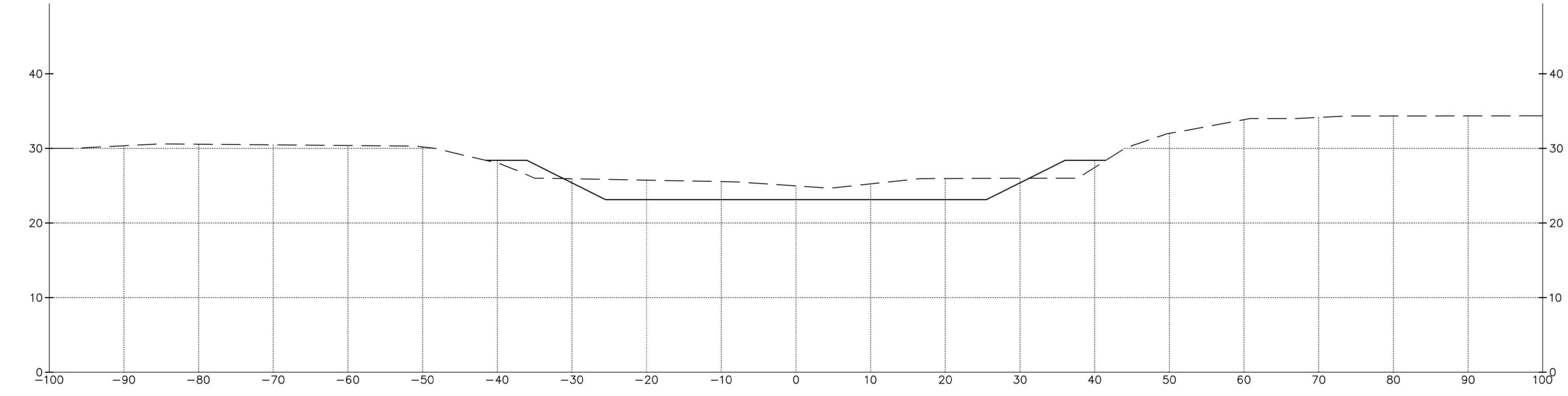
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

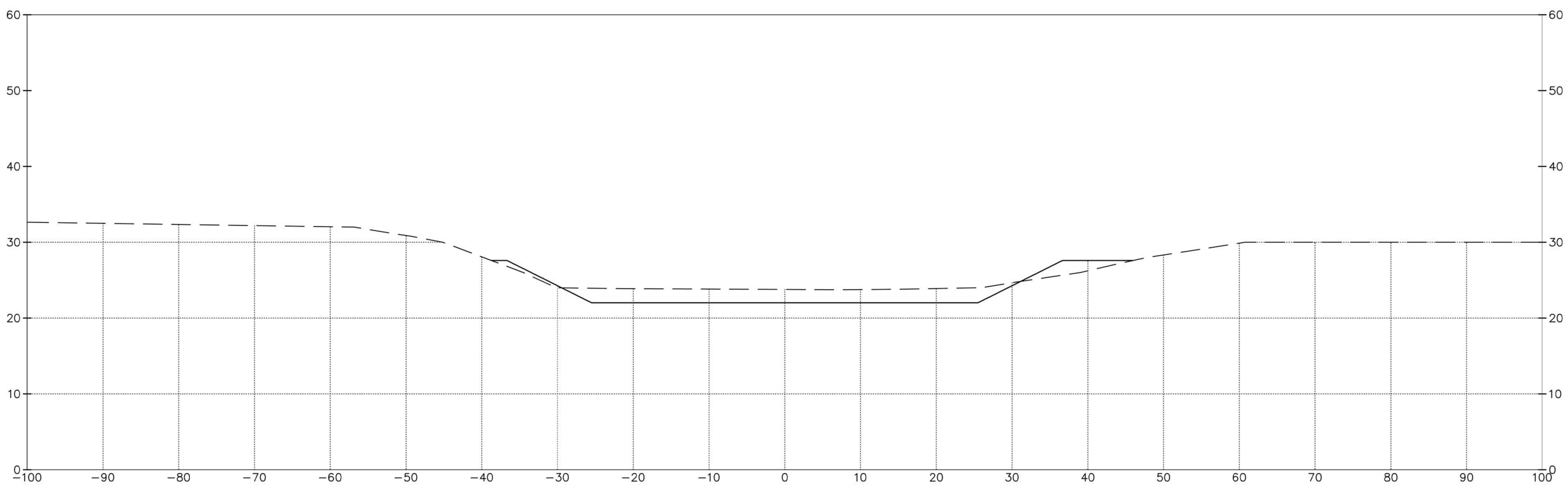
DESIGNED BY: | DATE: 0000-00-00
DWN BY: | CKD BY: | SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY: | CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1' | PLOT DATE: | FILE NUMBER: AA-A-00000
SIZE: ANSI D | FILE NAME: C-331.DWG

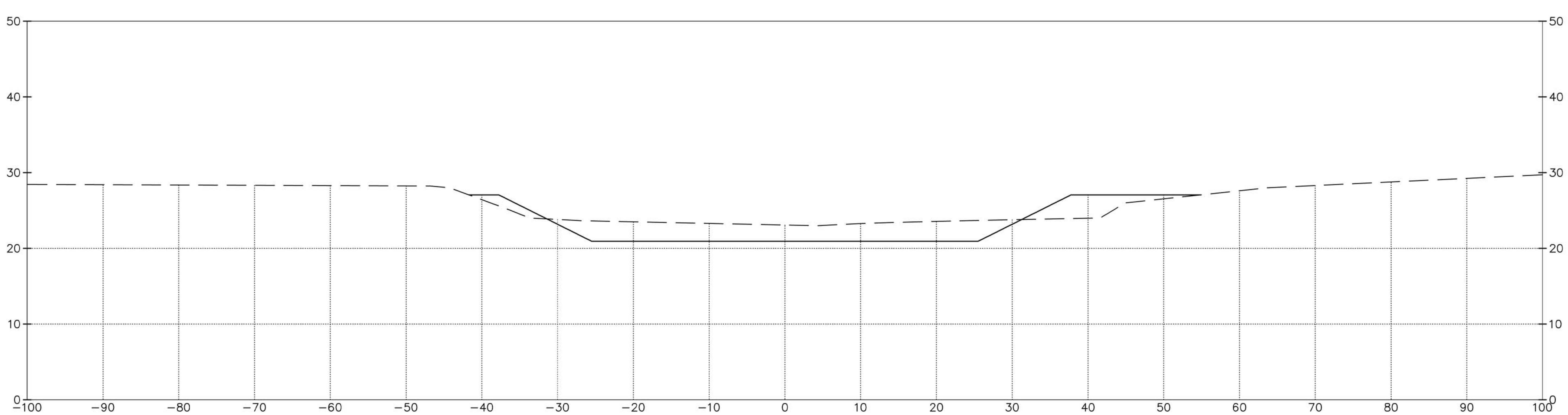
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 15 NE BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-331







US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

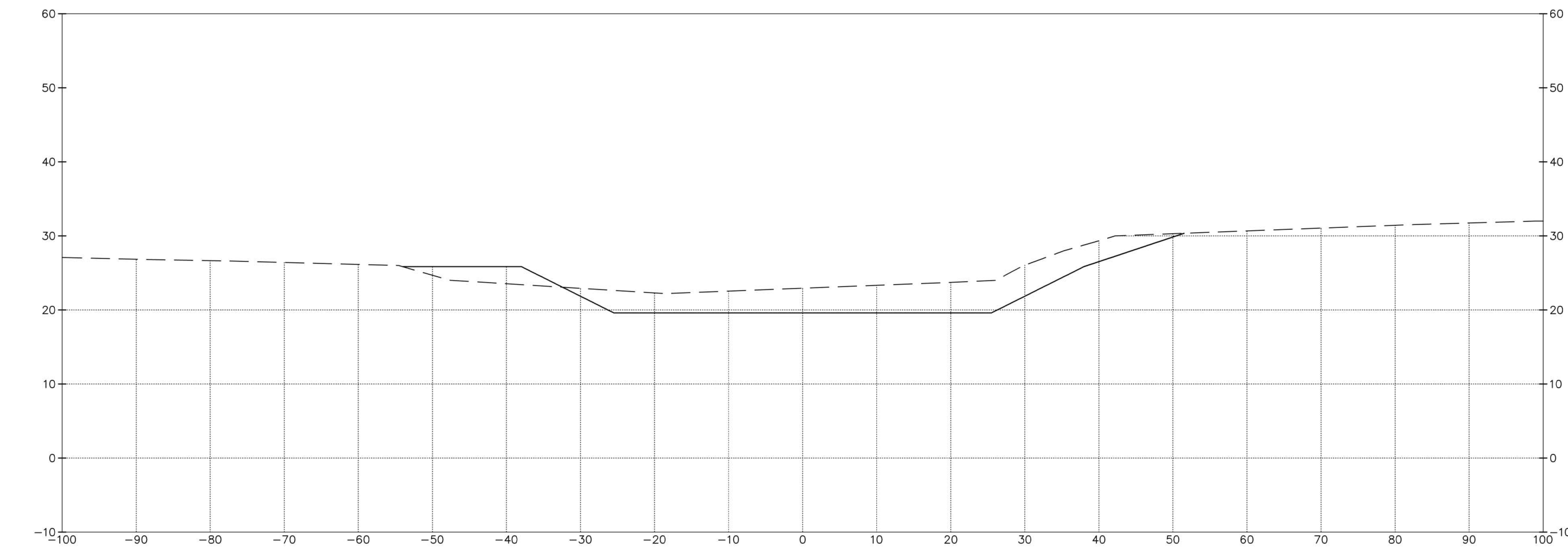
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000
SIZE: ANSI D	FILE NAME: C-332.DWG	

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 15 NE BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-332



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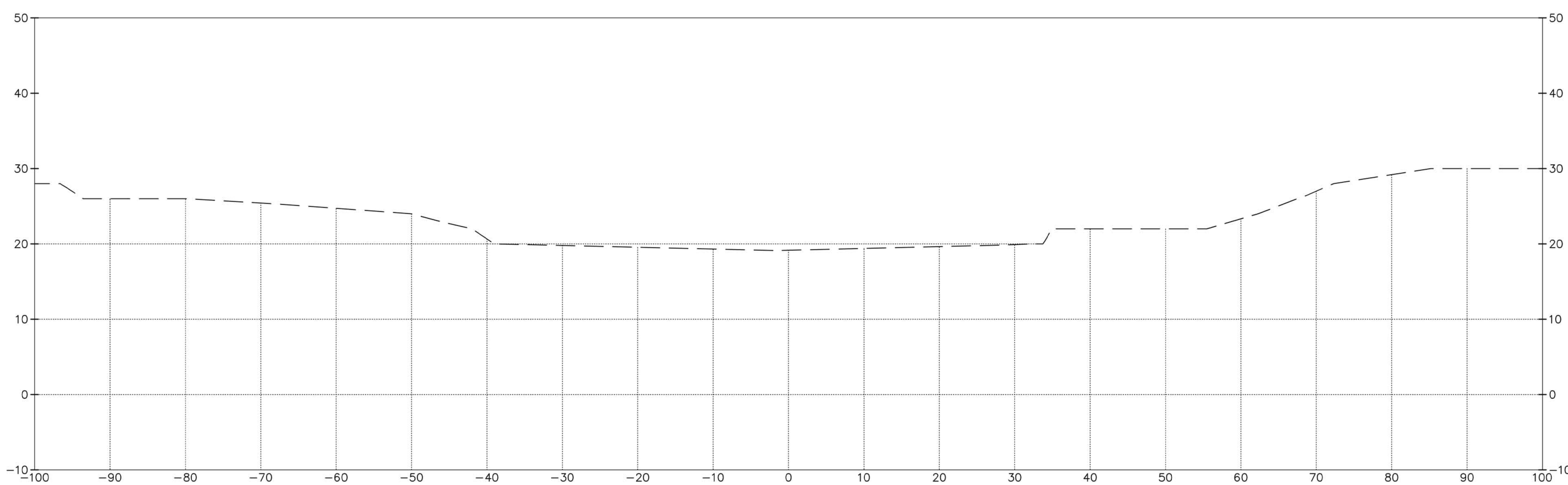


125+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY: | DATE: 0000-00-00
DWN BY: | CKD BY: | SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY: | CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1' | PLOT DATE: | FILE NUMBER: AA-A-00000
SIZE: ANSI D | FILE NAME: C-333.DWG

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 15 NE BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-333

SITE 13 NORTHWEST BRANCH CROSS-SECTIONS

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

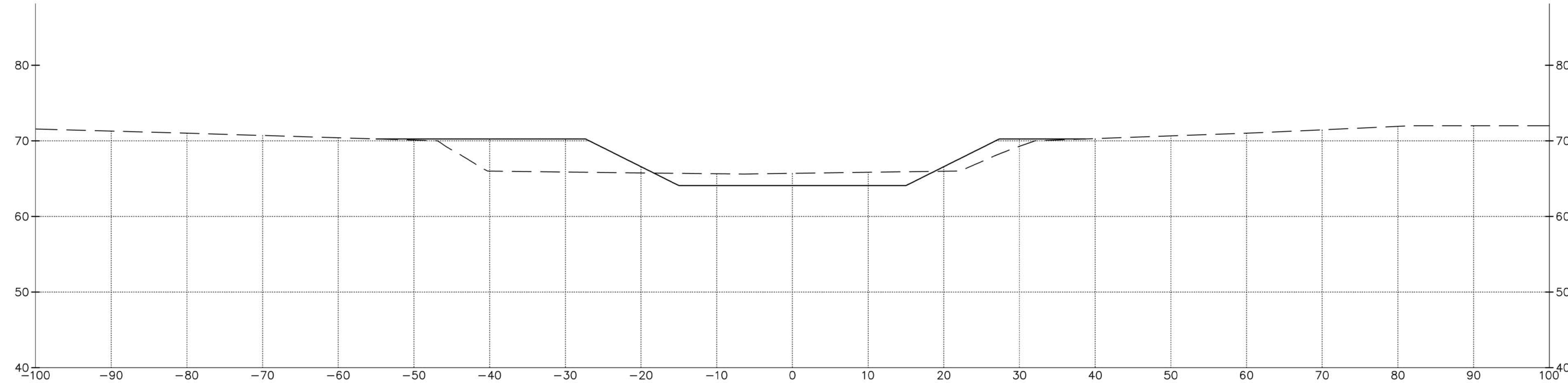
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"= 1'
SIZE: ANSI D
PLOT DATE:
FILE NAME: C-340.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION



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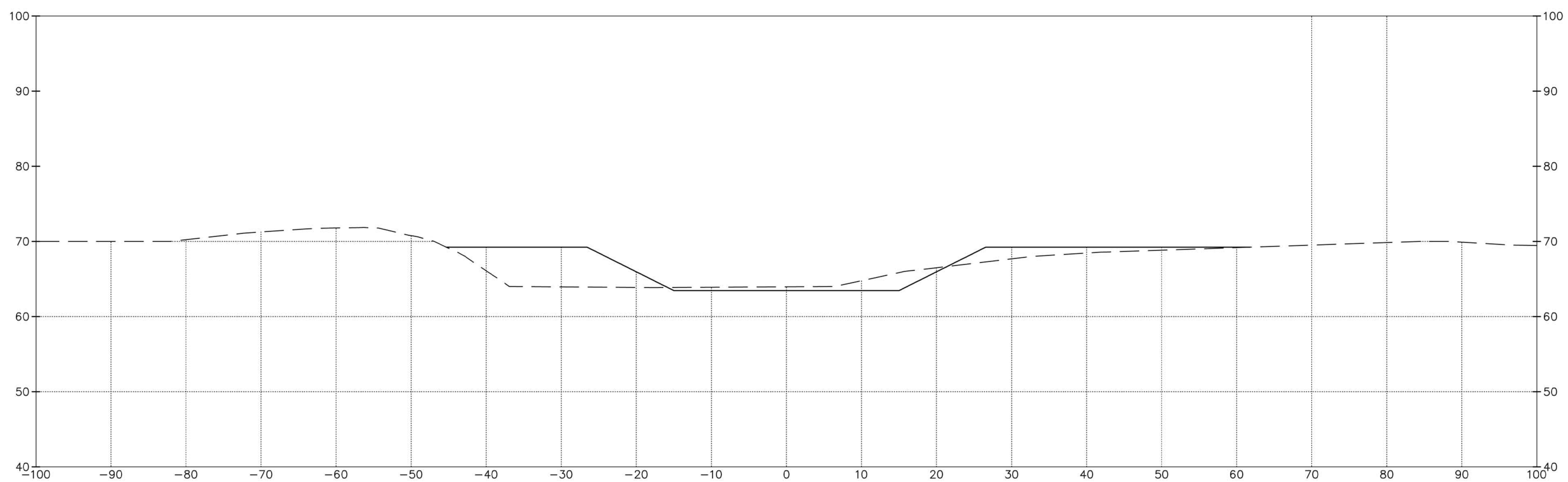

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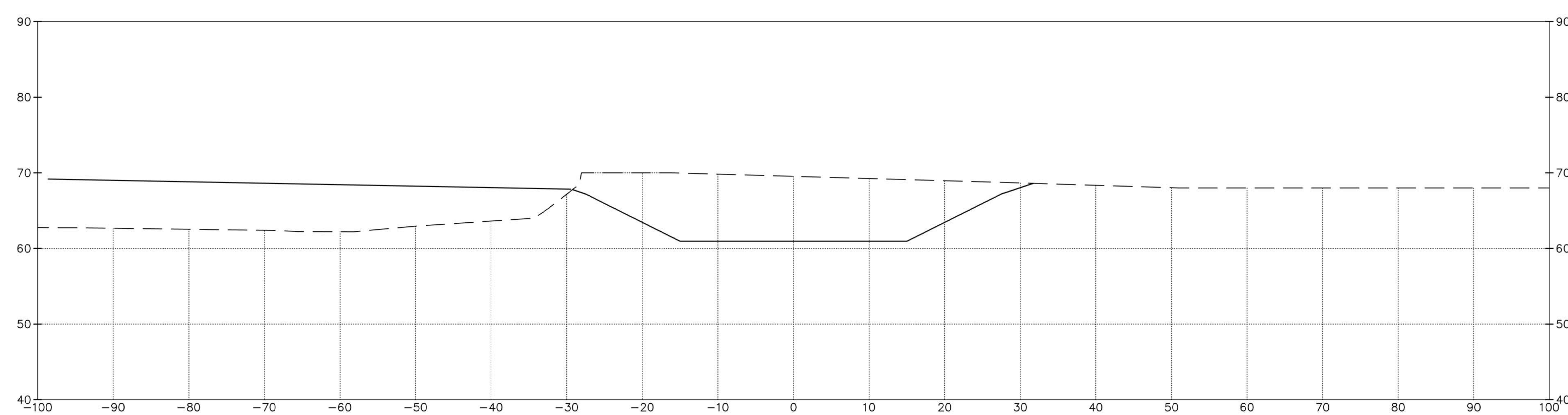

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY: | DATE: 0000-00-00
DWN BY: | CKD BY: | SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY: | CONTRACT NO.: W000AA-00-A-0000
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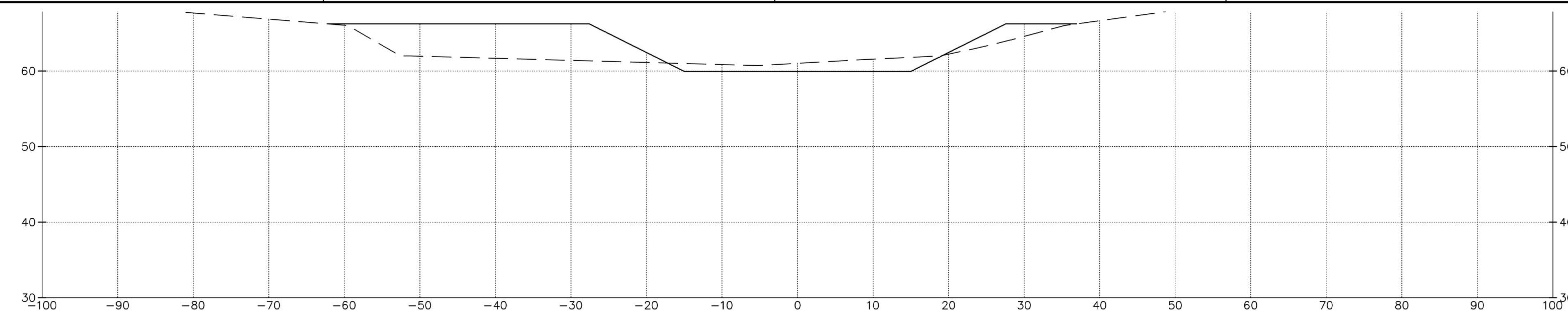
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-341



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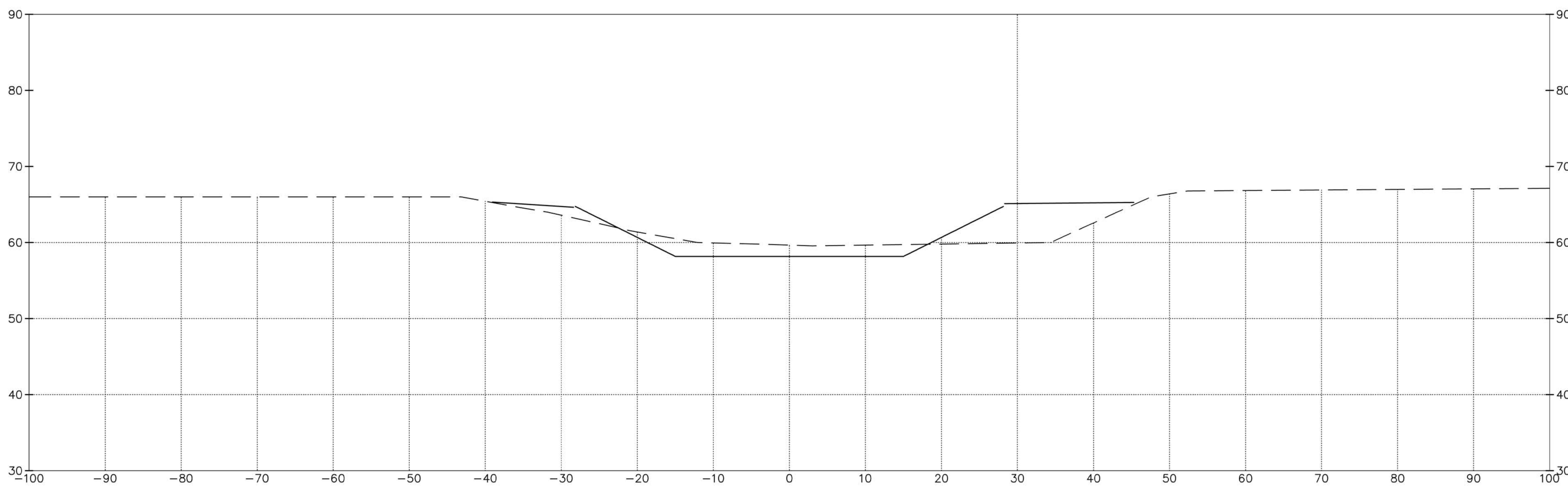

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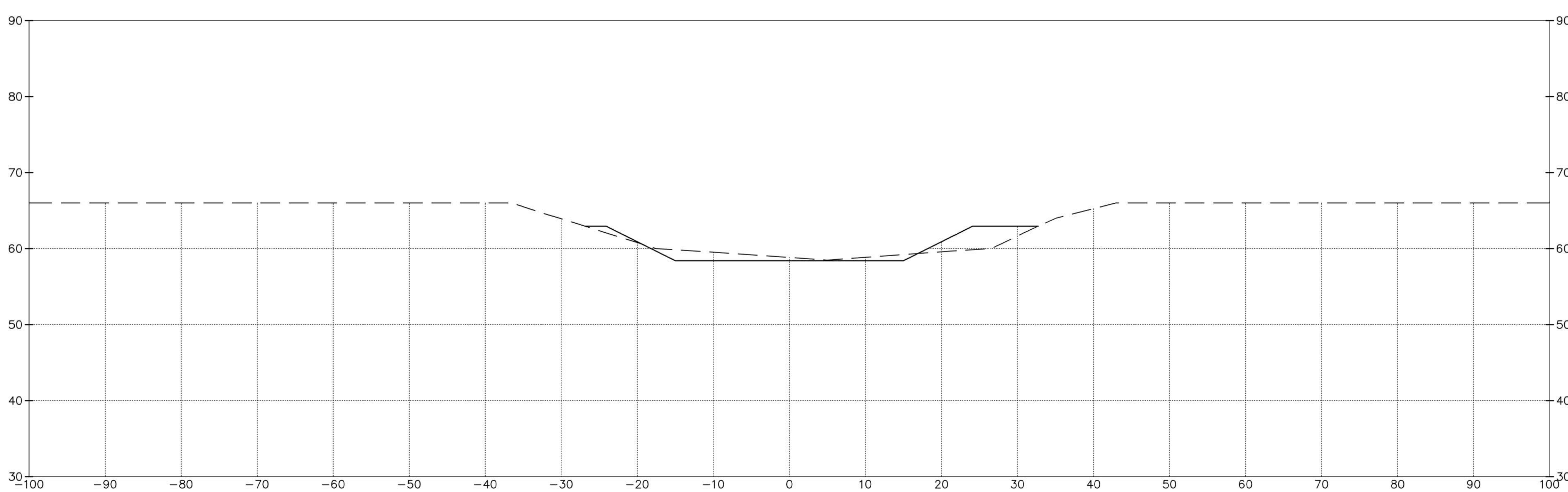

35+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

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CKD BY:
SOLICITATION NO.: W000AA-00-A-0000
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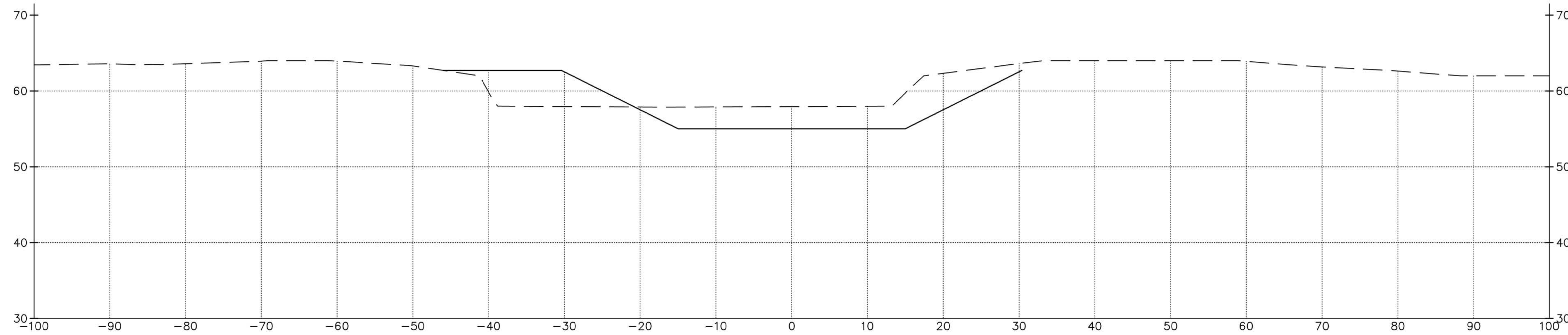
SIZE: ANSI D
FILE NAME: C-342.DWG

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-342



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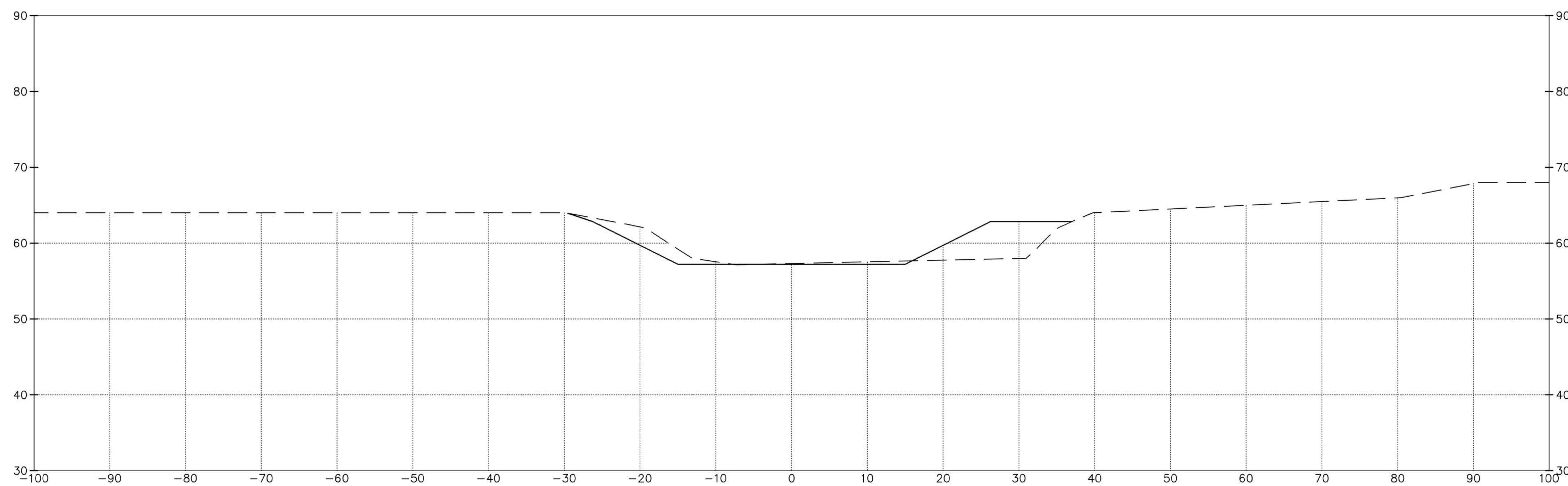

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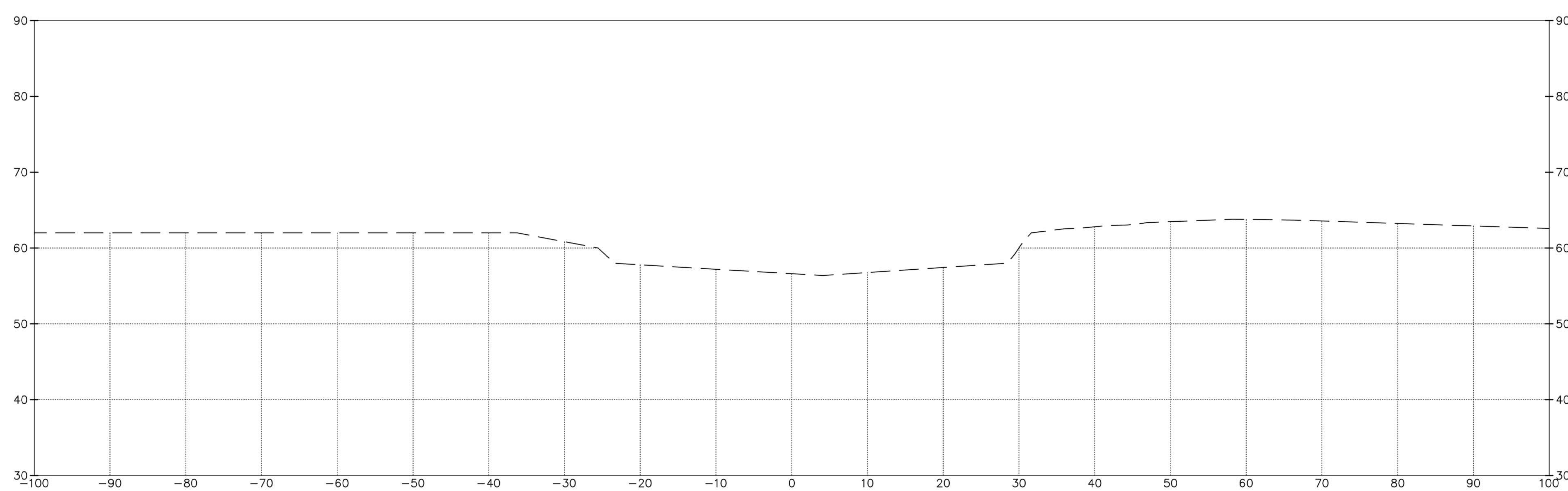

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

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CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"=1'
PLOT DATE:
SIZE: ANSI D
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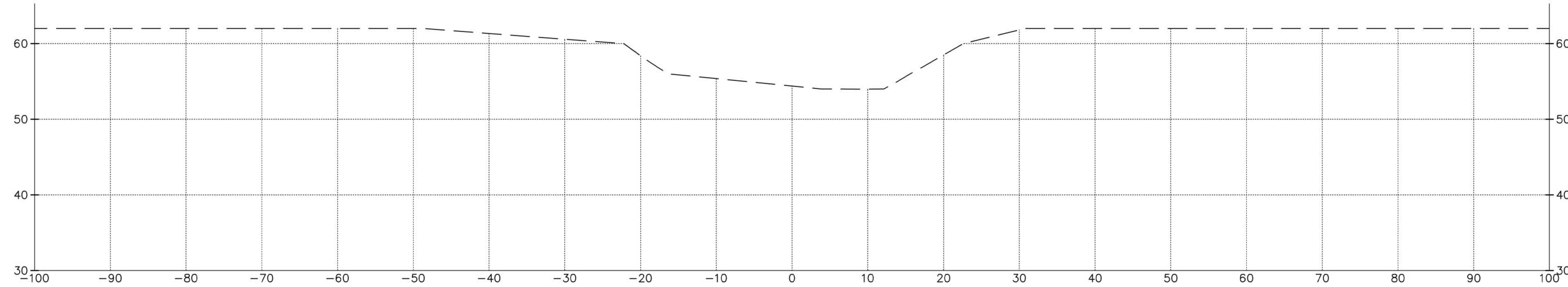
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-343



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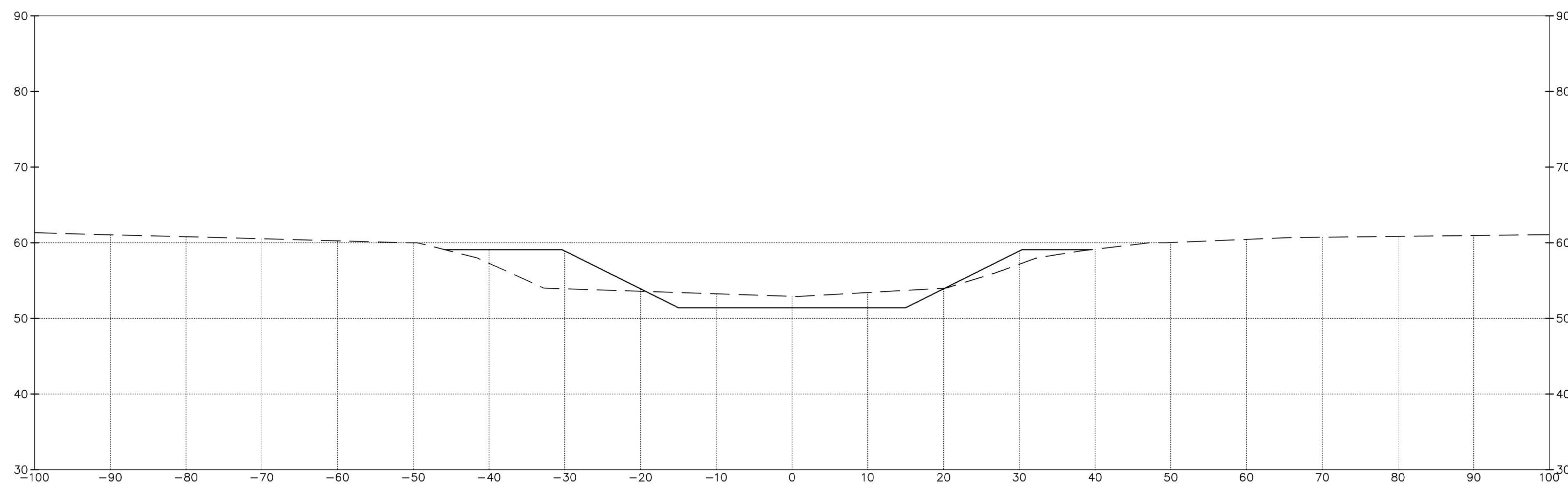

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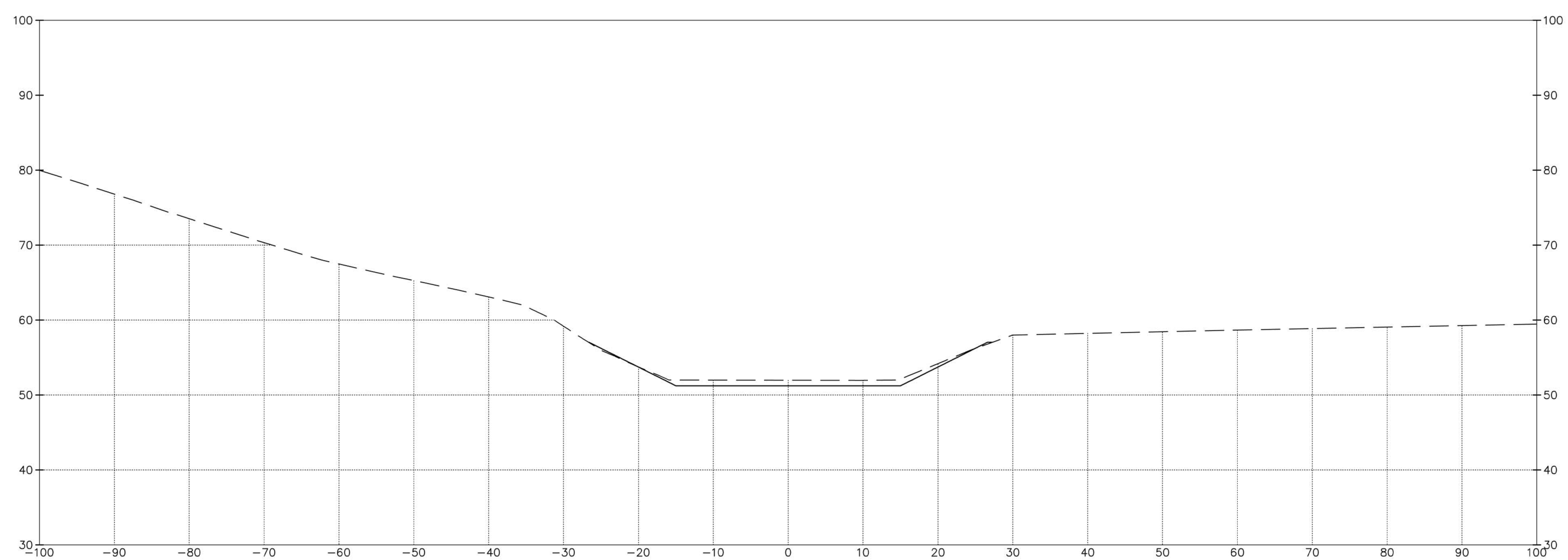

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:
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SUBMITTED BY:
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CONTRACT NO.: W000AA-00-A-0000
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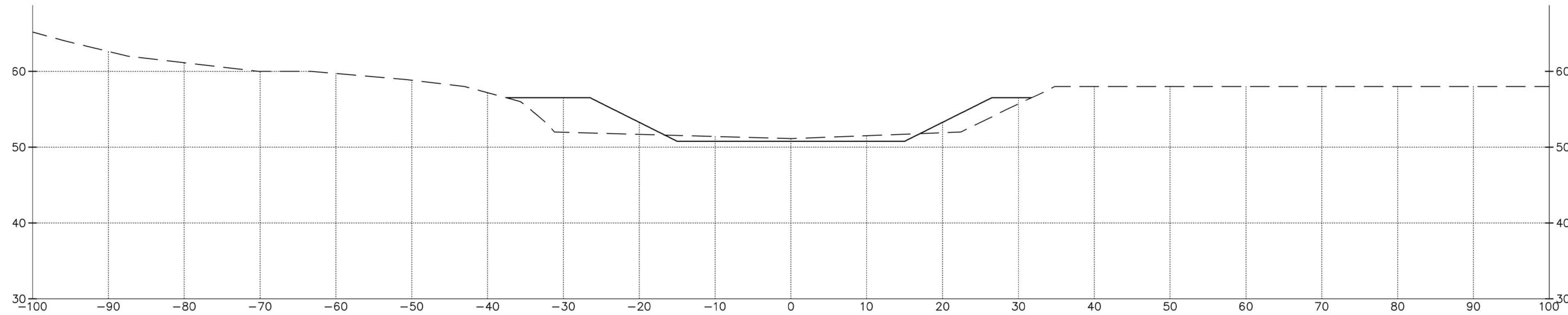
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-344



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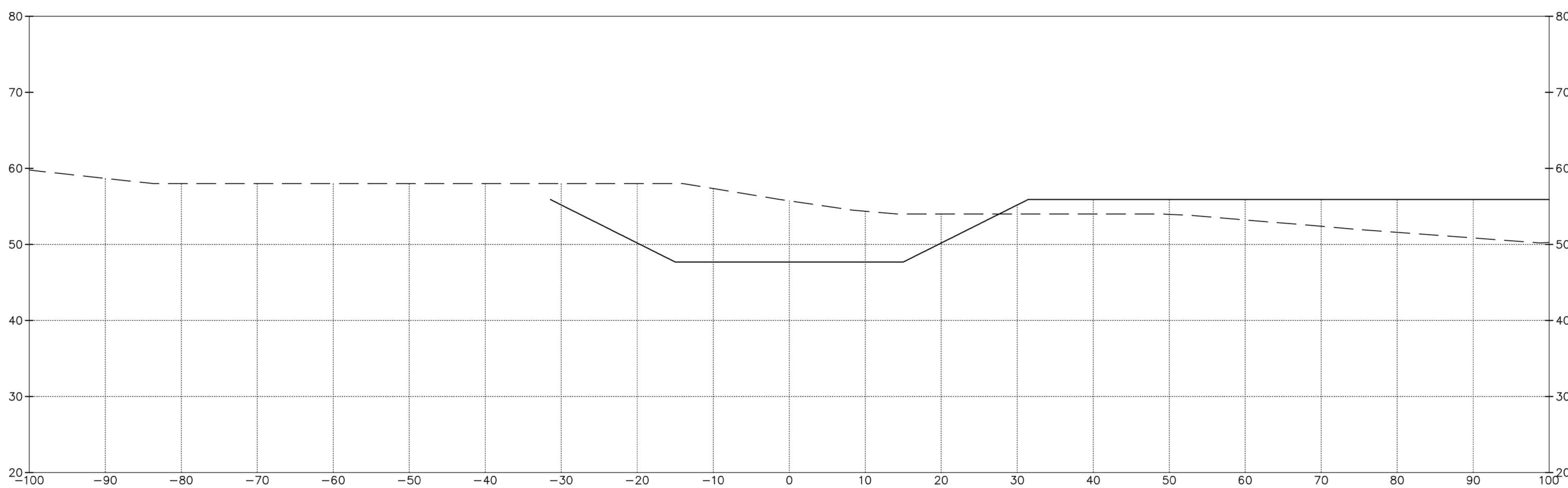

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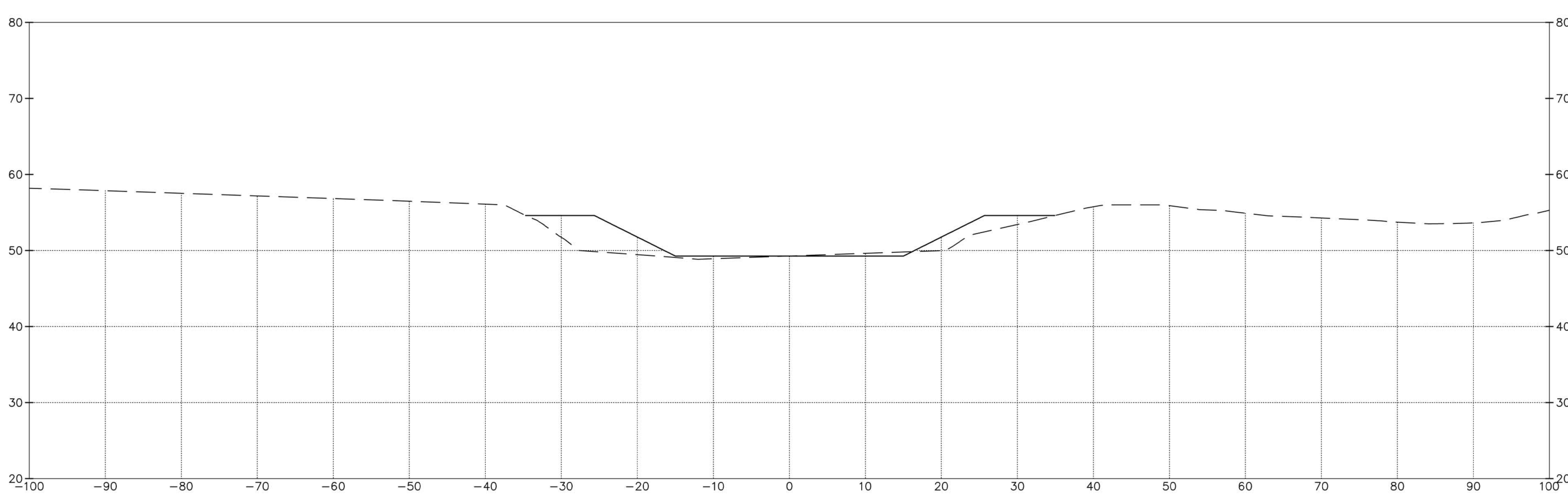

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US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

DESIGNED BY: | DATE: 0000-00-00
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SUBMITTED BY: | CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1' | PLOT DATE: | FILE NUMBER: AA-A-00000
SIZE: ANSI D | FILE NAME: C-345.DWG

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 13 NW BRANCH -CROSS-SECTIONS

SHEET IDENTIFICATION
C-345

SITE 11 INDIAN CREEK CROSS-SECTIONS

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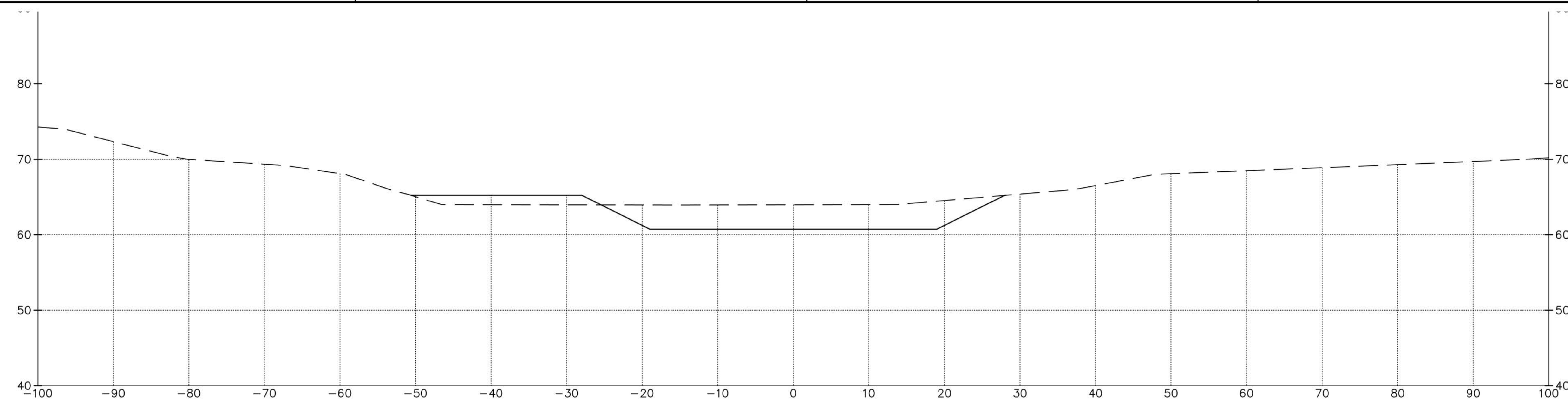
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK -CROSS-SECTIONS

SHEET IDENTIFICATION



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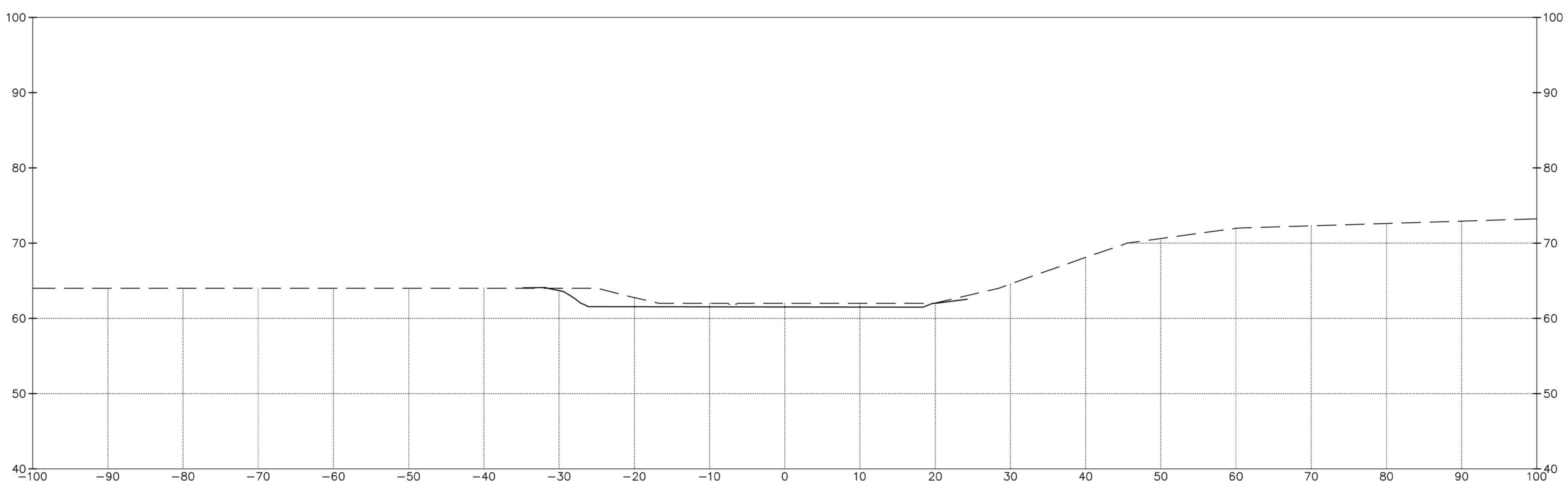

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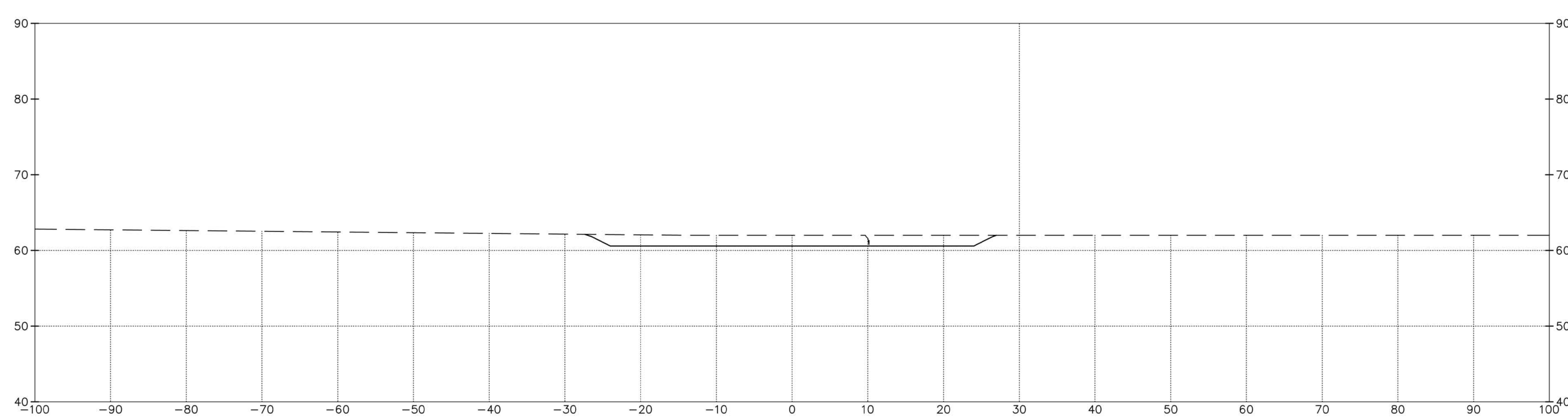


15+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

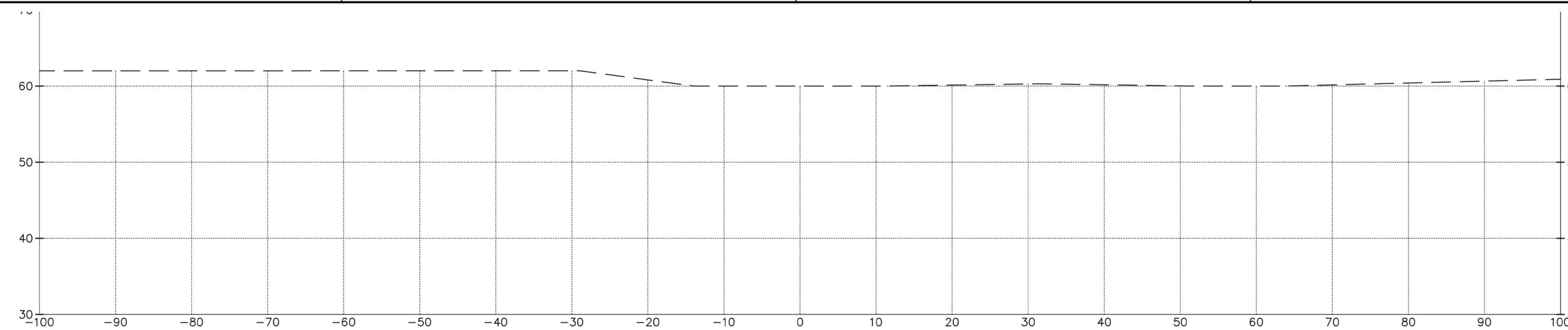
DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000
PLOT SCALE: 1"= 1'
PLOT DATE:
SIZE: ANSI D
FILE NAME: C-350.DWG

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK -CROSS-SECTIONS

SHEET IDENTIFICATION
C-350



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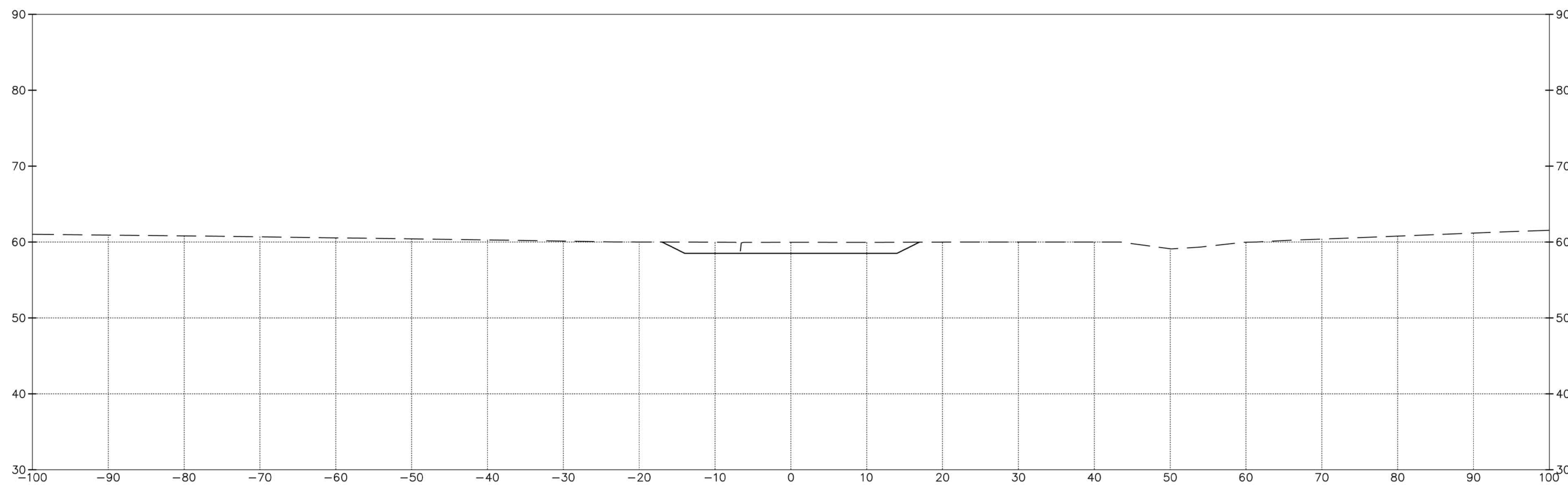

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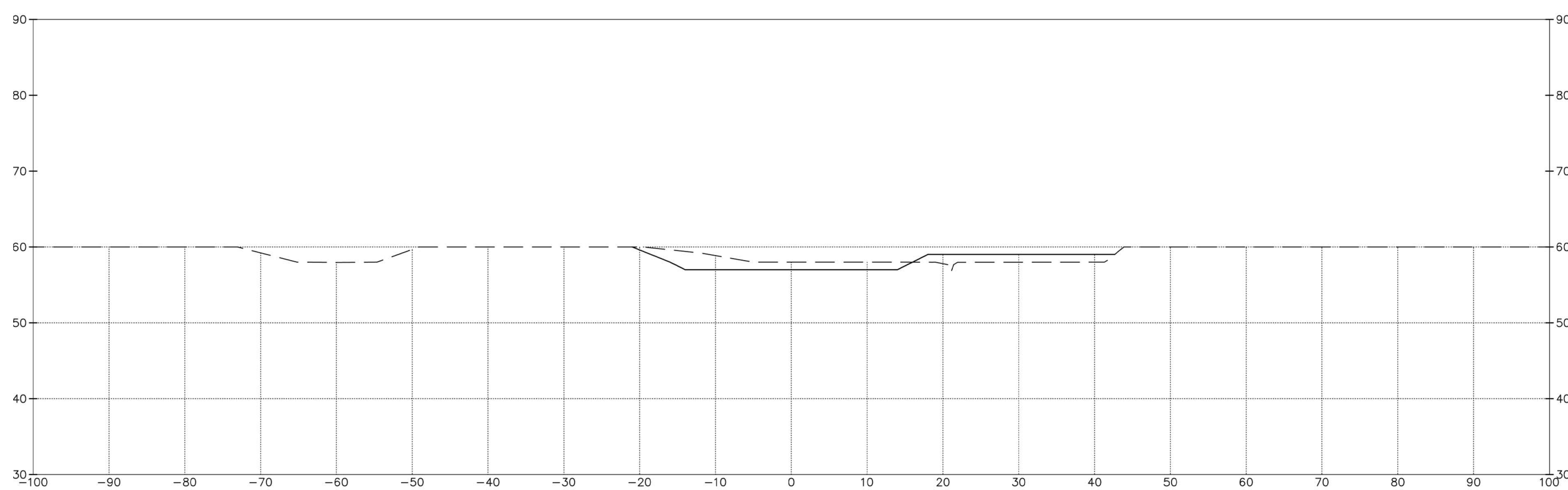

30+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

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DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1"=1'
SIZE: ANSI D
PLOT DATE:
FILE NAME: C-351.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

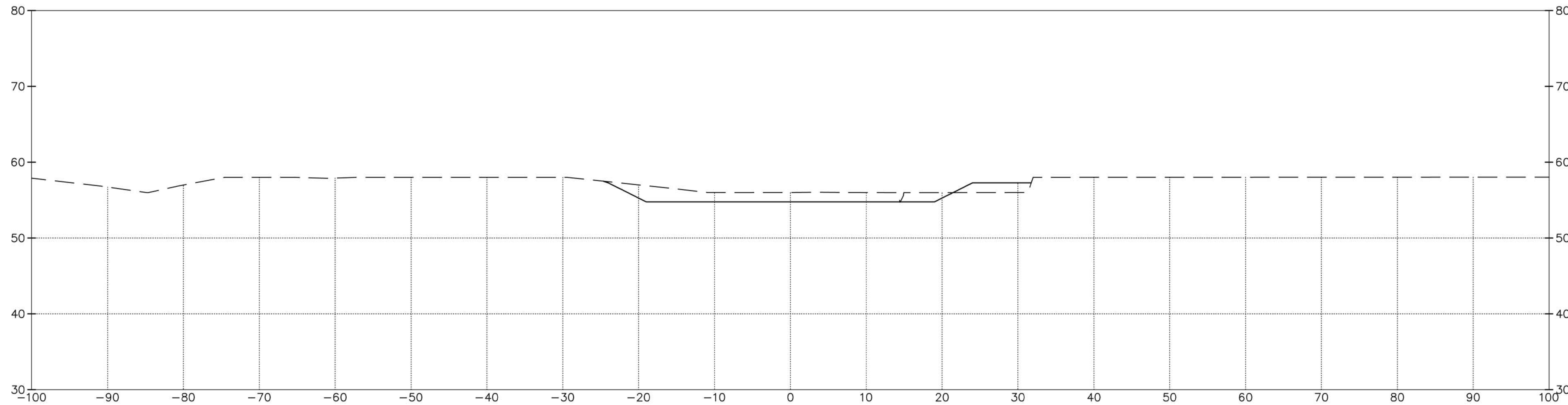
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK -CROSS-SECTIONS

SHEET IDENTIFICATION
C-351

1 2 3 4 5

D C B A



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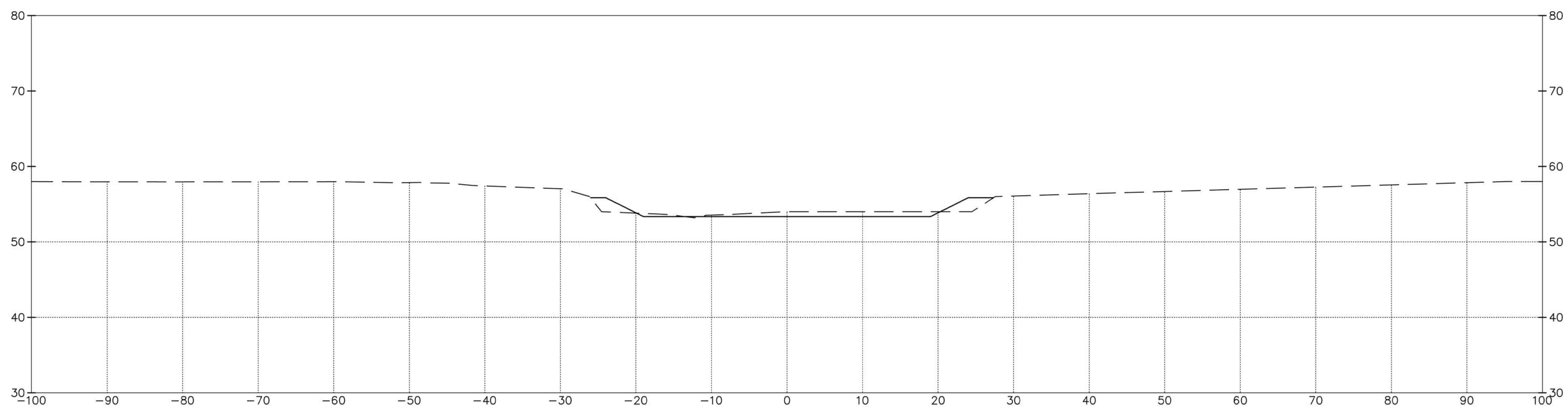

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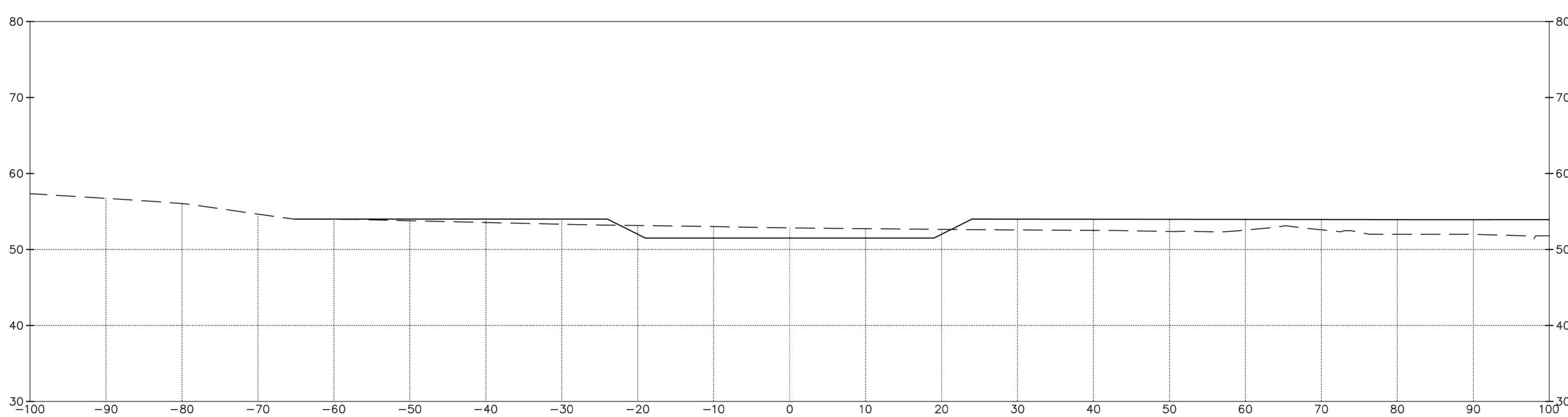

45+00.00

US Army Corps of Engineers ®
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MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

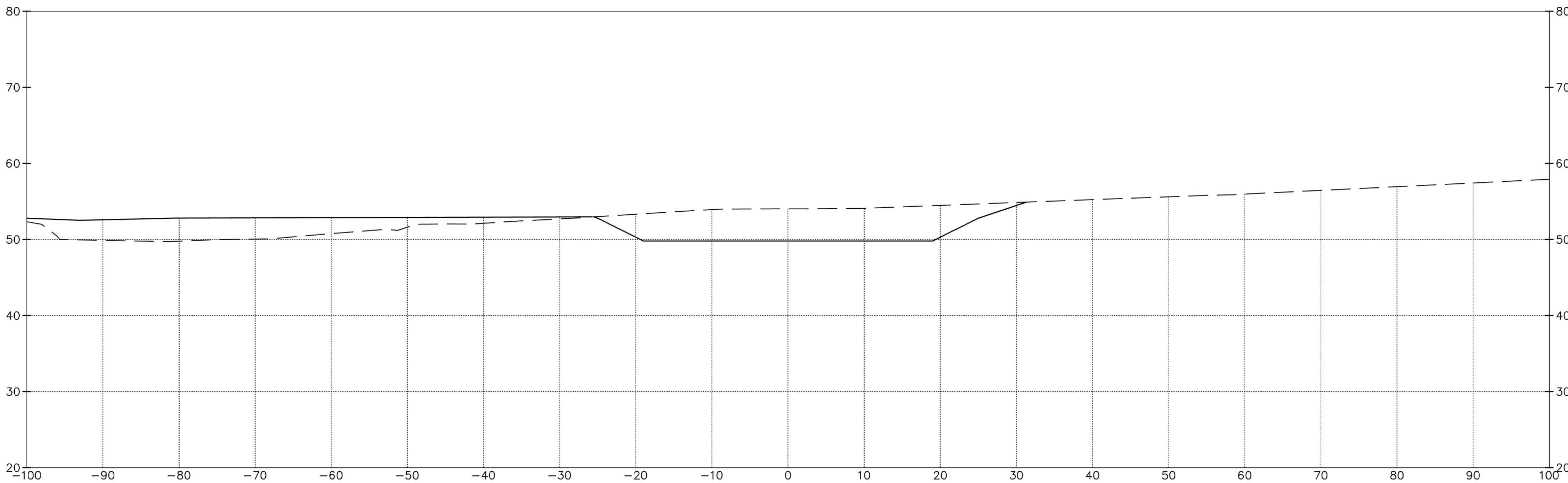
DESIGNED BY: | DATE: 0000-00-00
DWN BY: | CKD BY: | SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY: | CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1' | PLOT DATE: | FILE NUMBER: AA-A-00000
SIZE: ANSI D | FILE NAME: C-352.DWG

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK -CROSS-SECTIONS

SHEET IDENTIFICATION
C-352



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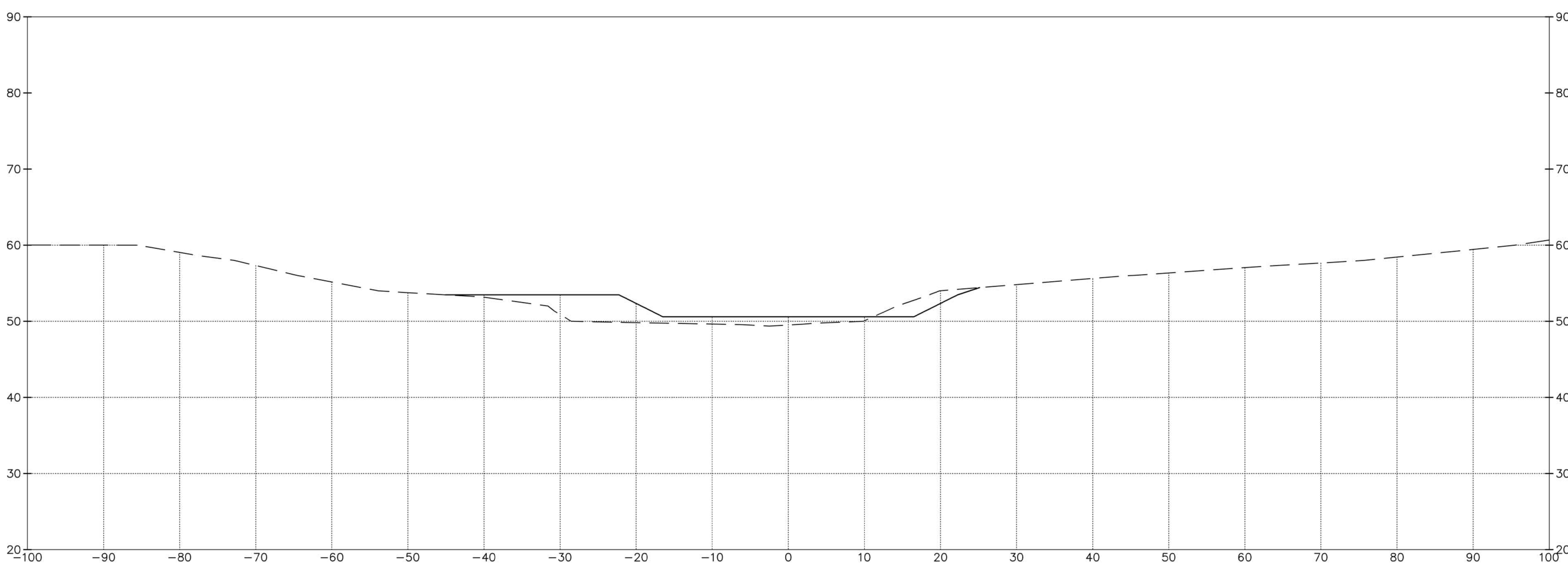


55+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

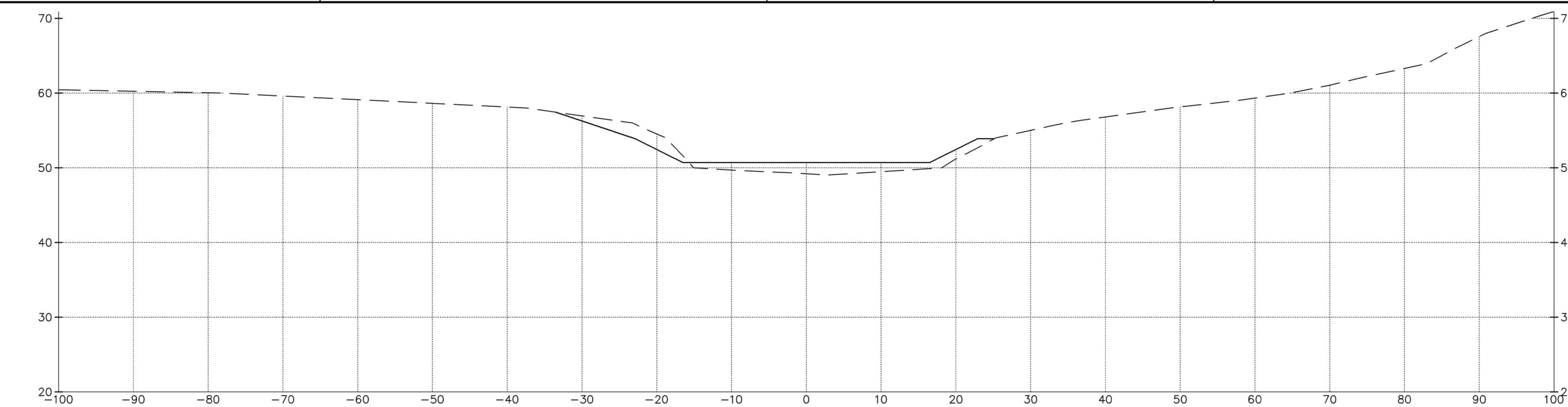
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00	
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000	
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000	
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00/000	
SIZE: ANSI D	FILE NAME: C-353.DWG		

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK -CROSS-SECTIONS

SHEET IDENTIFICATION
C-353



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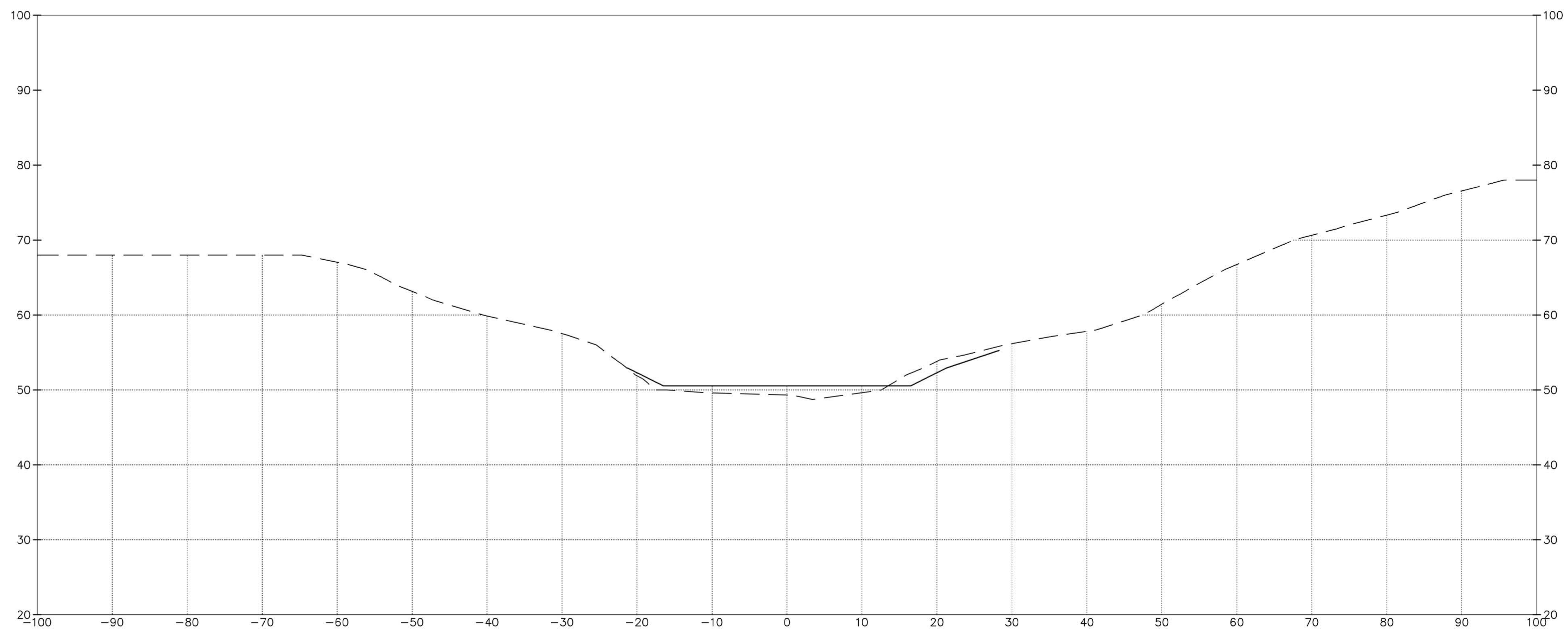


65+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

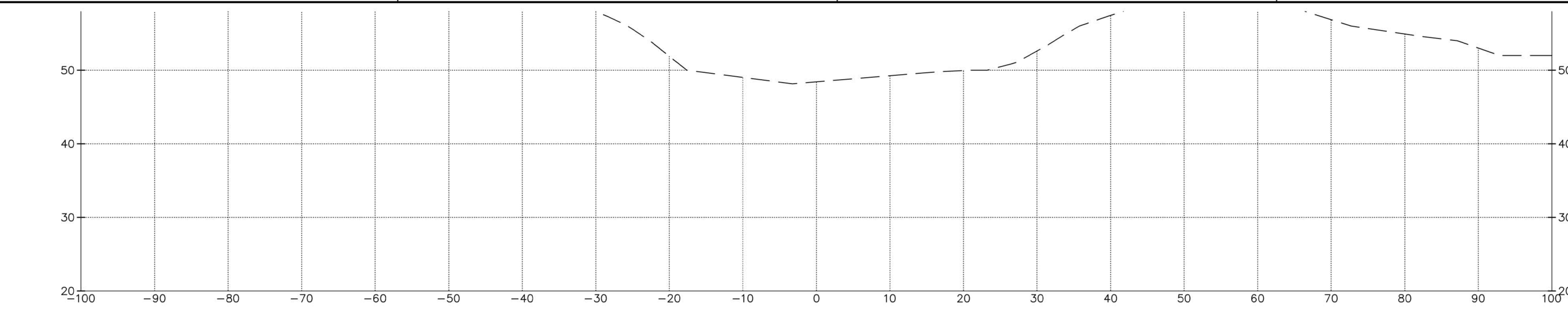
DESIGNED BY:	DATE: 0000-00-00	
DWN BY:	CKD BY:	SOLICITATION NO.: W000AA-00-A-0000
SUBMITTED BY:		CONTRACT NO.: W000AA-00-A-0000
PLOT SCALE: 1"= 1'	PLOT DATE:	FILE NUMBER: AA-A-00000
SIZE: ANSI D	FILE NAME: C-354.DWG	

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK -CROSS-SECTIONS

SHEET IDENTIFICATION
C-354



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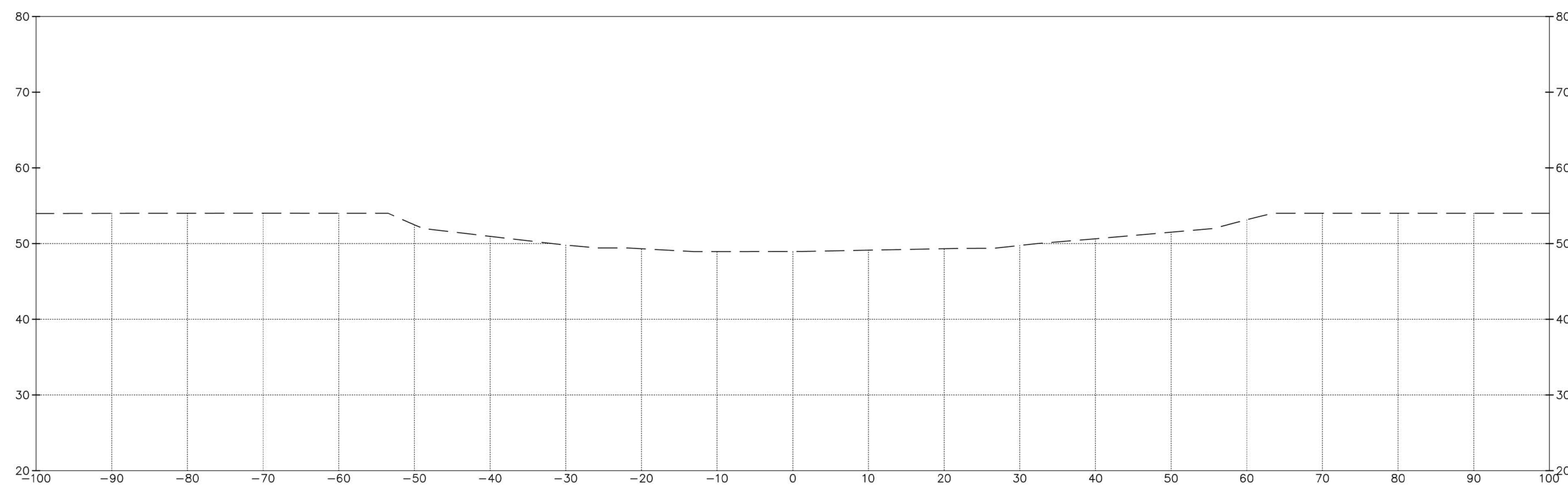

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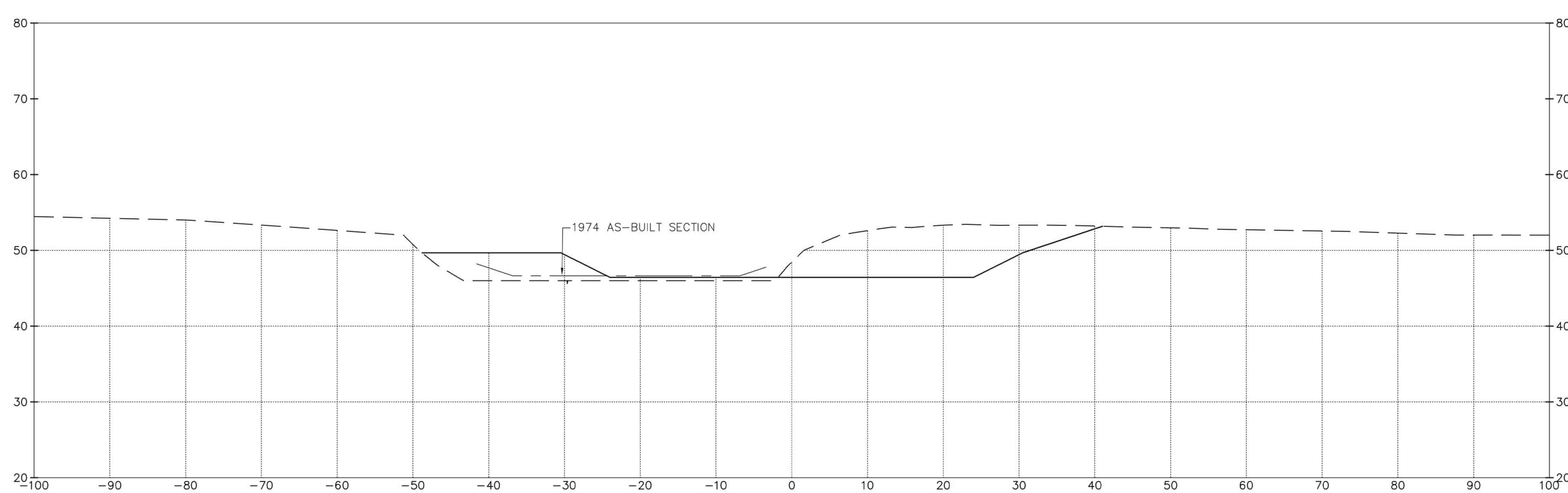


80+00.00

US Army Corps of Engineers ®
Baltimore District

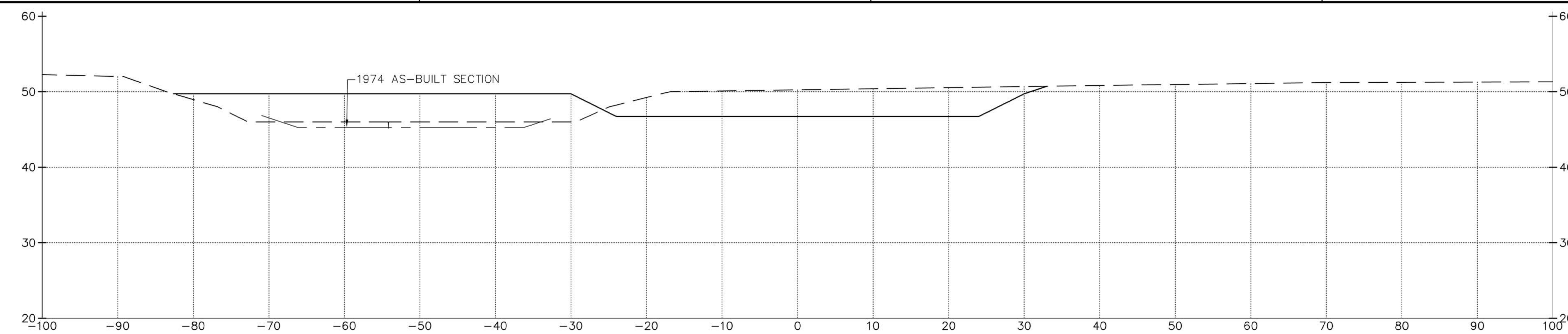
DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
PLOT SCALE 1"= 1'
PLOT DATE:
SIZE: ANSI D
FILE NAME: C-355.DWG
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

SITE 11 INDIAN CREEK -CROSS-SECTIONS

SHEET IDENTIFICATION
C-355



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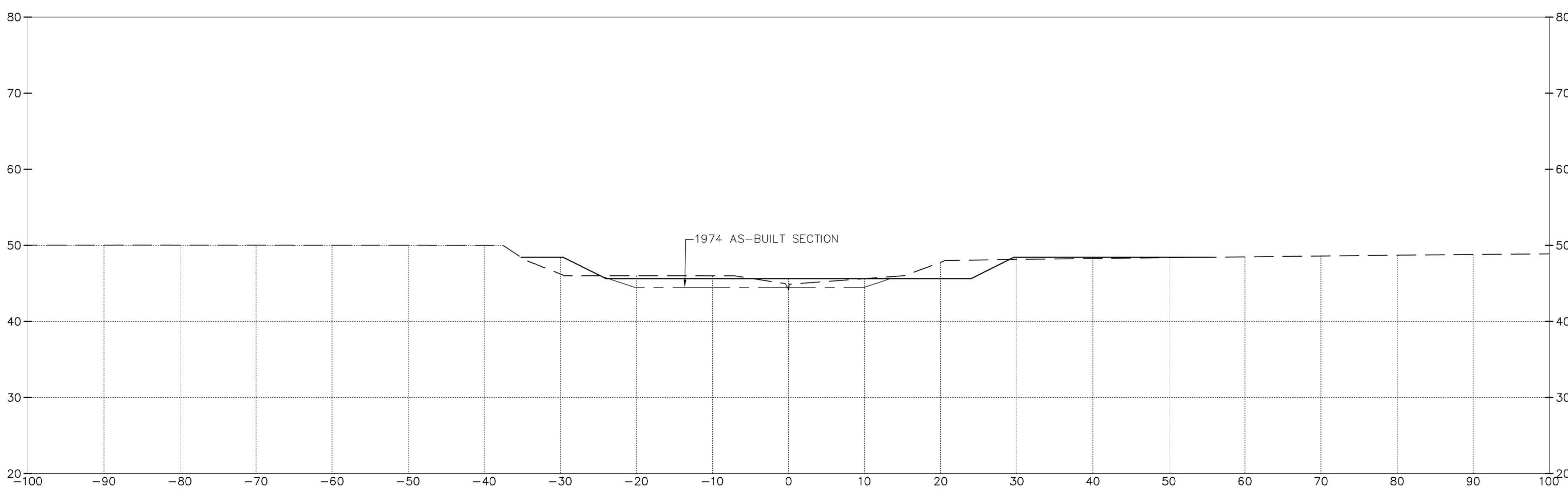

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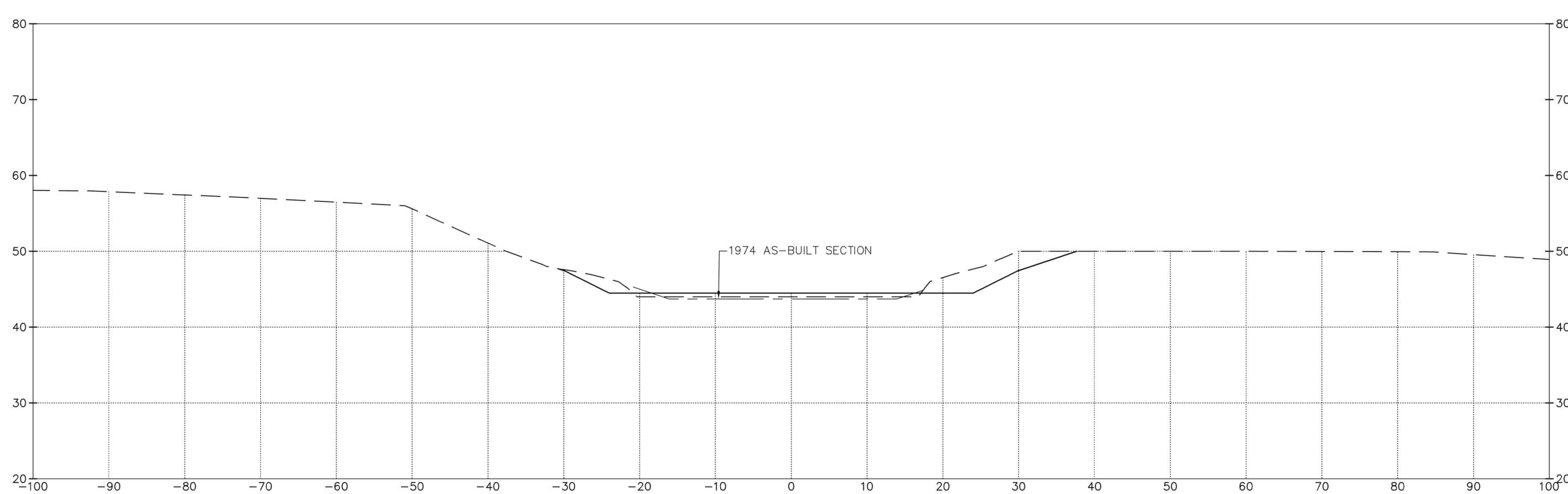


95+00.00

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
DATE: 0000-00-00
SOLICITATION NO.: W000AA-00-A-0000
CONTRACT NO.: W000AA-00-A-0000
FILE NUMBER: AA-A-00000
PLOT SCALE: 1"= 1'
PLOT DATE:
SIZE: ANSI D
FILE NAME: C-356.DWG

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

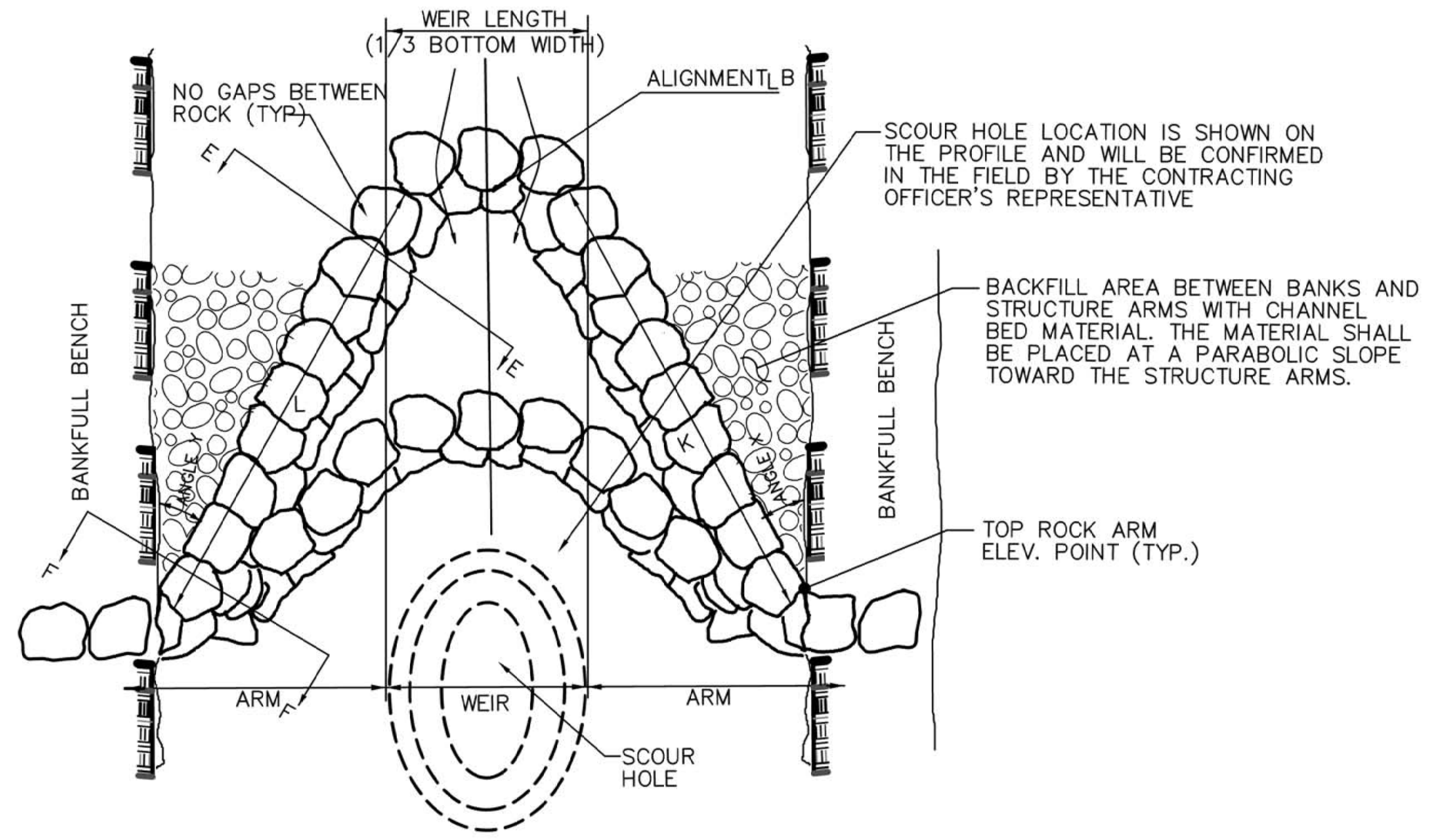
SITE 11 INDIAN CREEK -CROSS-SECTIONS

SHEET IDENTIFICATION
C-356

1 2 3 4 5

NESTED CROSS VANE STRUCTURE

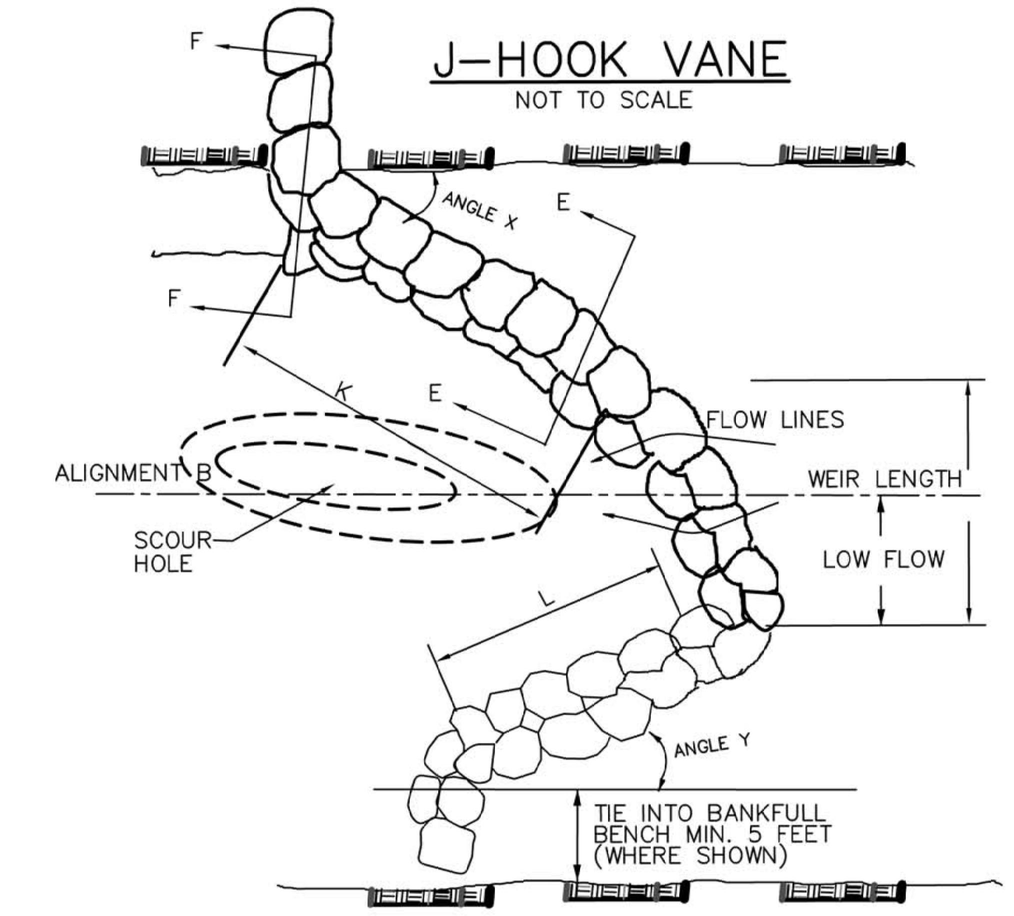
NOT TO SCALE



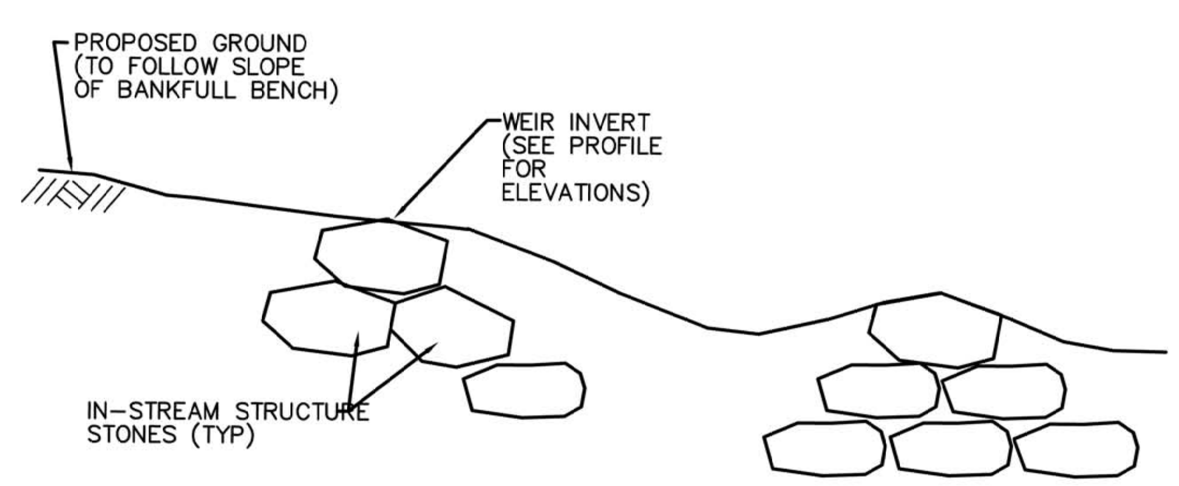
PLAN VIEW

J-HOOK VANE

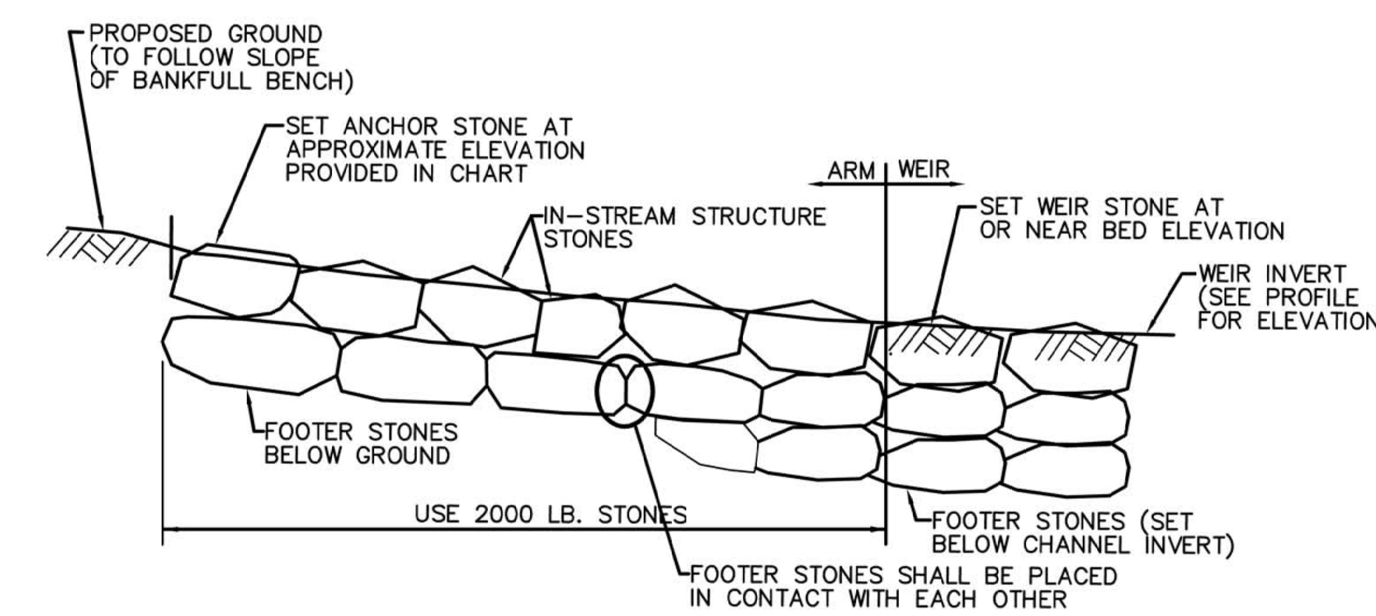
NOT TO SCALE



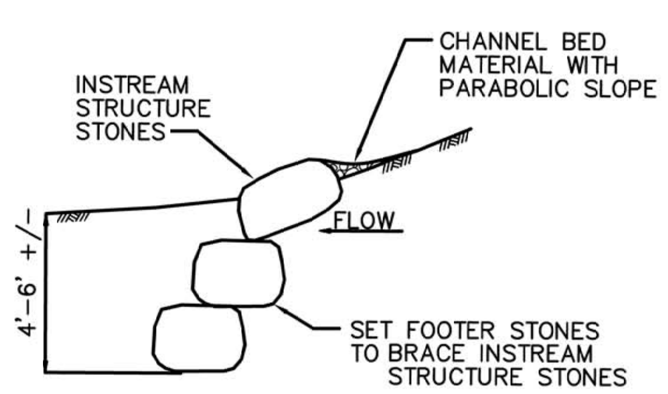
PLAN VIEW



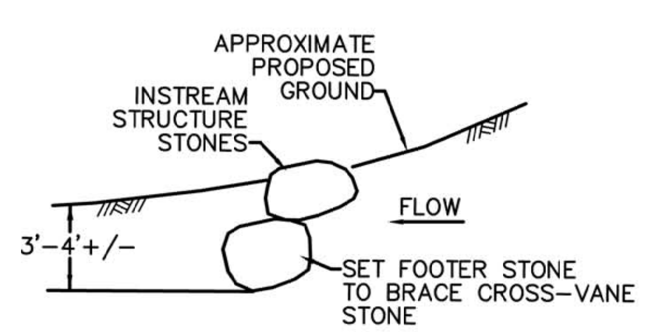
NESTED CROSS VANE PROFILE
(ALONG CENTERLINE OF STRUCTURE)



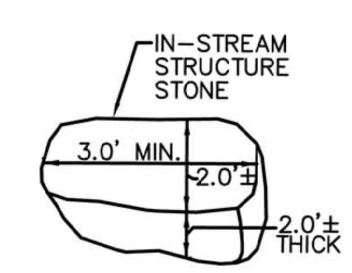
J-HOOK PROFILE
(ALONG CENTERLINE OF STRUCTURE)



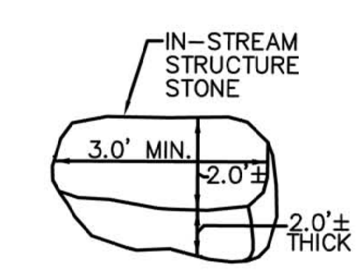
SECTION E-E



SECTION F-F



NOTE: FOR TYPICAL SIZE OF WEIR, FOOTER AND ARM STONES USE 2000 LB. STONES



NOTE: FOR TYPICAL SIZE OF WEIR, FOOTER AND ARM STONES USE 2000 LB. STONES

US Army Corps of Engineers ®
Baltimore District

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
BALTIMORE, MARYLAND

DESIGNED BY:		DATE: 0000-00-00	SOLICITATION NO.: W000AA-00-A-0000
DWN BY:	CKD BY:	CONTRACT NO.: W000AA-00-A-0000	
SUBMITTED BY:		FILE NUMBER: AA-A-00000	
PLOT SCALE: 1"= 1'	PLOT DATE:		
SIZE: ANSI D	FILE NAME: C-501.DWG		

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGES COUNTY, MD
FEASIBILITY STUDY

DETAILS

SHEET IDENTIFICATION
C-501

E-6: Concept Level Design Drawings

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ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD

Concept Level Design

Indian Creek (Site 1)

Alternative 1

GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD

Concept Level Design

Indian Creek (Site 1)

Alternative 2

Legend

- Proposed In Stream Structure
- Proposed Contour Changes
- Proposed Stream CL
- Proposed Edge of Channel
- Proposed Wetland
- Proposed Pond
- Proposed Riffle Grade Control
- SSWR_MHOL
- Existing Utilities - Sewer
- Existing Utilities - Water
- Existing Pedestrian Bridge
- Existing 2' Contours

0 300 600 900 Feet

GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.


US Army Corps of Engineers
Baltimore District
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD
Concept Level Design
Northwest Branch (Site 3-9-10)
Alternative 1
Legend
Proposed In Stream Structure
Proposed Contour Changes
Proposed Stream CL
Proposed Edge of Channel
Proposed Wetland
Proposed Pond
Proposed Riffle Grade Control
SSWR_MHOL
Existing Utilities - Sewer
Existing Utilities - Water
Existing Pedestrian Bridge
Existing 2' Contours
N
0 300 600 900 Feet
GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.


US Army Corps of Engineers
Baltimore District
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD
Concept Level Design
Northwest Branch (Site 3-9-10)
Alternative 2
Legend
Proposed In Stream Structure
Proposed Contour Changes
Proposed Stream CL
Proposed Edge of Channel
Proposed Wetland
Proposed Pond
Proposed Riffle Grade Control
SSWR_MHOL
Existing Utilities - Sewer
Existing Utilities - Water
Existing Pedestrian Bridge
Existing 2' Contours
N
0
600
1,200
1,800
Feet
GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.


US Army Corps of Engineers ®
Baltimore District
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD
Concept Level Design
Paint Branch (Site 5)
Alternative 1
Legend
Proposed In Stream Structure
Proposed Contour Changes
Proposed Stream CL
Proposed Edge of Channel
Proposed Wetland
Proposed Pond
Proposed Riffle Grade Control
SSWR_MHOL
Existing Utilities - Sewer
Existing Utilities - Water
Existing Pedestrian Bridge
Existing 2' Contours
N
0 200 400 600 Feet
SITE 5
SITE 15
BALTIMORE
CAMPUS
PAINT BRANCH
LAKELAND
PIERCE
NAVAHOE
BERWYN HOUSE
MELBOURNE
ROSSBOROUGH
FRATERNITY
NORWICH
RANDOLPH MACON
COLLEGE
LEHIGH
LITTON
CPL FRANK SCOTT
CALVERT
KNOX
RIVERSIDE
GIS shapefiles of existing and water and sanitary sewer
lines and manholes were provided by Prince George's County in 2014
and 2015. Other utilities may be present.

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD

Concept Level Design

Paint Branch (Site 5)

Alternative 2

GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.

GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD

Concept Level Design

Paint Branch (Site 7)

Alternative 2

Legend

- Proposed In Stream Structure
- Proposed Contour Changes
- Proposed Stream CL
- Proposed Edge of Channel
- Proposed Wetland
- Proposed Pond
- Proposed Riffle Grade Control
- SSWR_MHOL
- Existing Utilities - Sewer
- Existing Utilities - Water
- Existing Pedestrian Bridge
- Existing 2' Contours

N

0 200 400 600 Feet

GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.


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Baltimore District
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD
Concept Level Design
Indian Creek (Site 11 DS)
Alternative 1
Legend
Proposed In Stream Structure
Proposed Contour Changes
Proposed Stream CL
Proposed Edge of Channel
Proposed Wetland
Proposed Pond
Proposed Riffle Grade Control
SSWR_MHOL
Existing Utilities - Sewer
Existing Utilities - Water
Existing Pedestrian Bridge
Existing 2' Contours
N
0 100 200 300
Feet
GREENBELT
BALLEW
ROANOKE
51ST
BERWYN
POTOMAC
55TH
56TH
SEMINOLE
RUATAN
QUEBEC
57TH
PONTIAC
CUNNINGHAM
GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.


US Army Corps of Engineers ®
Baltimore District
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD
Concept Level Design
Indian Creek (Site 11 DS)
Alternative 2
Legend
Proposed In Stream Structure
Proposed Contour Changes
Proposed Stream CL
Proposed Edge of Channel
Proposed Wetland
Proposed Pond
Proposed Riffle Grade Control
SSWR_MHOL
Existing Utilities - Sewer
Existing Utilities - Water
Existing Pedestrian Bridge
Existing 2' Contours
N
0 100 200 300
Feet
GREENBELT
TECUMSEH
50TH
51ST
ROANOKE
BERWYN
POTOMAC
QUEBEC
BALLEW
55TH
56TH
57TH
SEMINOLE
RUATAN
PONTIAC
CUNNINGHAM
GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD

Concept Level Design

Indian Creek (Site 11)

Alternative 1

US Army Corps of Engineers
Baltimore District

Legend

- Proposed In Stream Structure
- Proposed Contour Changes
- Proposed Stream CL
- Proposed Edge of Channel
- Proposed Wetland
- Proposed Pond
- Proposed Riffle Grade Control
- SSWR_MHOL
- Existing Utilities - Sewer
- Existing Utilities - Water
- Existing Pedestrian Bridge
- Existing 2' Contours

N

0 300 600 900 Feet

GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.

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Baltimore District

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD

Concept Level Design

Indian Creek (Site 11)
Alternative 2

Legend

- Proposed In Stream Structure
- Proposed Contour Changes
- Proposed Stream CL
- Proposed Edge of Channel
- Proposed Wetland
- Proposed Pond
- Proposed Riffle Grade Control
- SSWR_MHOL
- Existing Utilities - Sewer
- Existing Utilities - Water
- Existing Pedestrian Bridge
- Existing 2' Contours

0 300 600 900
Feet

N

GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.


US Army Corps of Engineers
Baltimore District
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD
Concept Level Design
Little Paint Branch (Site 12)
Alternative 1
Legend
Proposed In Stream Structure
Proposed Contour Changes
Proposed Stream CL
Proposed Edge of Channel
Proposed Wetland
Proposed Pond
Proposed Riffle Grade Control
SSWR_MHOL
Existing Utilities - Sewer
Existing Utilities - Water
Existing Pedestrian Bridge
Existing 2' Contours
N
0
300
600
900
Feet
GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.

GIS shapefiles of existing and water and sanitary sewer
lines and manholes were provided by Prince George's County in 2014
and 2015. Other utilities may be present.

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD

Concept Level Design

Northwest Branch (Site 13)

Alternative 1

GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.

ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD

Concept Level Design

Little Paint Branch (Site 13)

Alternative 2

GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.


US Army Corps of Engineers ®
Baltimore District
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD
Concept Level Design
Northeast Branch (Site 15)
Alternative 1
Legend
Proposed In Stream Structure
Proposed Contour Changes
Proposed Stream CL
Proposed Edge of Channel
Proposed Wetland
Proposed Pond
Proposed Riffle Grade Control
SSWR_MHOL
Existing Utilities - Sewer
Existing Utilities - Water
Existing Pedestrian Bridge
Existing 2' Contours
N
0 150 300 450
Feet
SITE 5
SITE 15
EDMONSTON
KENILWORTH
BAYLOR
RADCLIFFE
OLD CALVERT
GOOD LUCK
PAINT BRANCH
RIVERSIDE
TENNYSON
57TH
CPL FRANK SCOTT
RIVER
UNIVERSITY RESEARCH
HAIG
52ND
GIS shapefiles of existing and water and sanitary sewer lines and manholes were provided by Prince George's County in 2014 and 2015. Other utilities may be present.


US Army Corps of Engineers
Baltimore District
ANACOSTIA WATERSHED RESTORATION
PRINCE GEORGE'S COUNTY, MD
Concept Level Design
Northeast Branch (Site 15)
Alternative 2
Legend
Proposed In Stream Structure
Proposed Contour Changes
Proposed Stream CL
Proposed Edge of Channel
Proposed Wetland
Proposed Pond
Proposed Riffle Grade Control
SSWR_MHOL
Existing Utilities - Sewer
Existing Utilities - Water
Existing Pedestrian Bridge
Existing 2' Contours
N
0 170 340 510 Feet
SITE 5
SITE 15
EDMONSTON
KENILWORTH
BAYLOR
RADCLIFFE
OLD CALVERT
GOOD LUCK
PAINT BRANCH
RIVERSIDE
TENNYSON
57TH
CPL FRANK SCOTT
52ND
RIVER
UNIVERSITY RESEARCH
HAIG
GIS shapefiles of existing and water and sanitary sewer
lines and manholes were provided by Prince George's County in 2014
and 2015. Other utilities may be present.

E-7: Cost Engineering Products

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WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

For Project No. 331281

NAB – Anacostia Watershed Restoration
Prince George's County, MD

The Anacostia Watershed Restoration feasibility study, as presented by Baltimore District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of September 24, 2018, the Cost MCX certifies the estimated total project cost:

FY19 Project First Cost:	$34,106,000
Fully Funded Amount:	$38,395,000

It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management through the period of Federal Participation.

®

JACOBS.MICHAEL.PIERRE.1160569537

Digitally signed by JACOBS.MICHAEL.PIERRE.1160569537
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=JACOBS.MICHAEL.PIERRE.1160569537
Date: 2018.09.24 14:47:41 -07'00'

Michael P. Jacobs, PE, CCE
Chief, Cost Engineering MCX
Walla Walla District

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **Anacostia Watershed Restoration, Prince George's County - All Selected Sites**
PROJECT NO: 331281
LOCATION: PG County, MD

DISTRICT: Baltimore District **PREPARED: 11/14/2017**
POC: CHIEF, Estimating and Specs Section, Parris J. McGhee-Bey

This Estimate reflects the scope and schedule in report; Draft Feasibility Study Report Dated Aug 2017

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2019; Effective Price Level Date: 1 OCT 18									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-17** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	RELOCATIONS	$642	$215	33.5%	$858	4.6%	$672	$225	$897	$0	$897	11.6%	$751	$251	$1,002
16	BANK STABILIZATION	$19,146	$6,095	31.8%	$25,242	3.8%	$19,872	$6,326	$26,198	$0	$26,198	12.5%	$22,359	$7,113	$29,471
16	BANK STABILIZATION - Adaptive Management	$328	$104	31.8%	$433	3.8%	$341	$108	$449	$0	$449	12.2%	$382	$122	$504
	CONSTRUCTION ESTIMATE TOTALS:	$20,117	$6,415		$26,532	3.8%	$20,885	$6,660	$27,545	$0	$27,545	12.5%	$23,491	$7,485	$30,976
01	LANDS AND DAMAGES	$286	$57	20.0%	$344	4.7%	$300	$60	$360	$0	$360	4.8%	$314	$63	$377
30	PLANNING, ENGINEERING & DESIGN	$3,235	$413	12.8%	$3,649	6.1%	$3,432	$438	$3,870	$0	$3,870	11.7%	$3,832	$490	$4,322
31	CONSTRUCTION MANAGEMENT	$2,012	$187	9.3%	$2,198	6.1%	$2,134	$198	$2,332	$0	$2,332	16.6%	$2,489	$231	$2,719
	PROJECT COST TOTALS:	$25,650	$7,072	27.6%	$32,723		$26,750	$7,356	**$34,106**	$0	**$34,106**	12.6%	$30,126	$8,268	$38,395

______________________ **CHIEF, Estimating and Specs Section, Parris J. McGhee-Bey**

ESTIMATED TOTAL PROJECT COST: $38,395

______________________ **PROJECT MANAGER, Gayle Mccowin**

______________________ **CHIEF, REAL ESTATE, Susan K. Lewis**

______________________ **CHIEF, PLANNING, Amy M. Guise**

______________________ **CHIEF, ENGINEERING, Ronald J. Maj**

______________________ **CHIEF, OPERATIONS, Patrick G. Findlay**

______________________ **CHIEF, CONSTRUCTION, Jeff J. Werner**

______________________ **CHIEF, CONTRACTING, Paula M. Beck**

______________________ **CHIEF, PP-C, Christopher M. Nolta**

______________________ **CHIEF, DPM, David B. Morrow**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Anacostia Watershed Restoration, Prince George's County - All Selected Sites
LOCATION: PG County, MD
This Estimate reflects the scope and schedule in report; Draft Feasibility Study Report Dated Aug 2017

DISTRICT: Baltimore District
POC: CHIEF, Estimating and Specs Section, Parris J. McGhee-Bey
PREPARED: 11/14/2017

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 16-Oct-17 Effective Price Level: 1-Oct-16				Program Year (Budget EC): 2019 Effective Price Level Date: 1 OCT 18								
				RISK BASED										
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	Site 13													
02	RELOCATIONS	$357	$127	35.4%	$484	4.6%	$374	$132	$506	2022Q1	8.7%	$407	$144	$551
16	BANK STABILIZATION	$3,247	$1,150	35.4%	$4,397	3.8%	$3,370	$1,193	$4,563	2022Q1	8.7%	$3,665	$1,298	$4,962
16	BANK STABILIZATION - Adaptive Management	$56	$20	35.4%	$76	3.8%	$58	$21	$79	2022Q1	8.7%	$63	$22	$86
	CONSTRUCTION ESTIMATE TOTALS:	$3,661	$1,296	35.4%	**$4,957**		$3,802	$1,346	$5,149			$4,135	$1,464	$5,599
01	LANDS AND DAMAGES	$53	$11	20.0%	$63	4.7%	$55	$11	$66	2020Q4	4.8%	$58	$12	$70
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$18	$2	12.8%	$21	6.1%	$19	$2	$22	2020Q4	6.8%	$21	$3	$23
0.3%	Planning & Environmental Compliance	$9	$1	12.8%	$10	6.1%	$10	$1	$11	2020Q4	6.8%	$10	$1	$12
10.0%	Engineering & Design	$366	$47	12.8%	$413	6.1%	$388	$50	$438	2020Q4	6.8%	$415	$53	$468
0.5%	Reviews, ATRs, IEPRs, VE	$18.30	$2	12.8%	$21	6.1%	$19	$2	$22	2020Q4	6.8%	$21	$3	$23
0.5%	Life Cycle Updates (cost, schedule, risks)	$18	$2	12.8%	$21	6.1%	$19	$2	$22	2020Q4	6.8%	$21	$3	$23
0.3%	Contracting & Reprographics	$9	$1	12.8%	$10	6.1%	$10	$1	$11	2020Q4	6.8%	$10	$1	$12
1.0%	Engineering During Construction	$37	$5	12.8%	$41	6.1%	$39	$5	$44	2022Q1	11.8%	$43	$6	$49
0.3%	Planning During Construction	$9	$1	12.8%	$10	6.1%	$10	$1	$11	2022Q1	11.8%	$11	$1	$12
	Monitoring (estimated)	$95	$12	12.8%	$107	6.1%	$101	$13	$114	2025Q1	24.8%	$126	$16	$142
0.0%	Project Operations	$0	$0	12.8%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
9.0%	Construction Management	$329	$31	9.3%	$360	6.1%	$349	$33	$382	2022Q1	11.8%	$391	$36	$427
0.0%	Project Operation:	$0	$0	9.3%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Project Management	$37	$3	9.3%	$40	6.1%	$39	$4	$42	2022Q1	11.8%	$43	$4	$47
	CONTRACT COST TOTALS:	$4,660	$1,415		$6,075		$4,861	$1,472	$6,334			$5,305	$1,603	$6,908

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Anacostia Watershed Restoration, Prince George's County - All Selected Sites
LOCATION: PG County, MD
This Estimate reflects the scope and schedule in report; Draft Feasibility Study Report Dated Aug 2017

DISTRICT: Baltimore District
POC: CHIEF, Estimating and Specs Section, Parris J. McGhee-Bey
PREPARED: 11/14/2017

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**				
		Estimate Prepared:			**16-Oct-17**	Program Year (Budget EC):			2019					
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 18					
				RISK BASED										
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***	***P***	***L***	***M***	***N***	***O***
	Site 3 and 9													
02	RELOCATIONS	$285	$89	31.1%	$374	4.6%	$298	$93	$391	2024Q1	15.4%	$344	$107	$451
16	BANK STABILIZATION	$6,307	$1,963	31.1%	$8,270	3.8%	$6,546	$2,037	$8,583	2024Q1	15.4%	$7,552	$2,350	$9,902
16	BANK STABILIZATION - Adaptive Management	$98	$30	31.1%	$128	3.8%	$102	$32	$133	2024Q1	15.4%	$117	$37	$154
	CONSTRUCTION ESTIMATE TOTALS:	$6,690	$2,082	31.1%	**$8,772**		$6,946	$2,162	$9,108			$8,013	$2,494	$10,507
01	LANDS AND DAMAGES	$33	$7	20.0%	$40	4.7%	$35	$7	$41	2020Q4	4.8%	$36	$7	$43
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$33	$4	12.7%	$38	6.1%	$35	$5	$40	2020Q4	6.8%	$38	$5	$43
0.3%	Planning & Environmental Compliance	$17	$2	12.7%	$19	6.1%	$18	$2	$20	2020Q4	6.8%	$19	$2	$21
10.0%	Engineering & Design	$669	$85	12.7%	$754	6.1%	$710	$90	$800	2020Q4	6.8%	$758	$96	$854
0.5%	Reviews, ATRs, IEPRs, VE	$33.45	$4	12.7%	$38	6.1%	$35	$5	$40	2020Q4	6.8%	$38	$5	$43
0.5%	Life Cycle Updates (cost, schedule, risks)	$33	$4	12.7%	$38	6.1%	$35	$5	$40	2020Q4	6.8%	$38	$5	$43
0.3%	Contracting & Reprographics	$17	$2	12.7%	$19	6.1%	$18	$2	$20	2020Q4	6.8%	$19	$2	$21
1.0%	Engineering During Construction	$67	$9	12.7%	$75	6.1%	$71	$9	$80	2024Q1	20.4%	$85	$11	$96
0.3%	Planning During Construction	$17	$2	12.7%	$19	6.1%	$18	$2	$20	2024Q1	20.4%	$21	$3	$24
	Monitoring (estimated)	$190	$24	12.7%	$214	6.1%	$202	$26	$227	2027Q2	35.7%	$273	$35	$308
0.0%	Project Operations	$0	$0	12.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
9.0%	Construction Management	$602	$56	9.2%	$658	6.1%	$639	$59	$697	2024Q1	20.4%	$769	$71	$840
0.0%	Project Operation:	$0	$0	9.2%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Project Management	$67	$6	9.2%	$73	6.1%	$71	$7	$77	2024Q1	20.4%	$85	$8	$93
	CONTRACT COST TOTALS:	$8,468	$2,287		$10,756		$8,832	$2,379	$11,211			$10,193	$2,744	$12,937

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Anacostia Watershed Restoration, Prince George's County - All Selected Sites
LOCATION: PG County, MD
This Estimate reflects the scope and schedule in report; Draft Feasibility Study Report Dated Aug 2017

DISTRICT: Baltimore District
POC: CHIEF, Estimating and Specs Section, Parris J. McGhee-Bey
PREPARED: 11/14/2017

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 16-Oct-17 Effective Price Level: 1-Oct-16				Program Year (Budget EC): 2019 Effective Price Level Date: 1 OCT 18								
WBS NUMBER *A*	Civil Works Feature & Sub-Feature Description *B*	COST ($K) *C*	CNTG ($K) *D*	RISK BASED CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	TOTAL ($K) *J*	Mid-Point Date *P*	INFLATED (%) *L*	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*
	Site 5 and 15													
16	BANK STABILIZATION	$6,221	$1,935	31.1%	$8,155	3.8%	$6,457	$2,008	$8,464	2022Q2	9.6%	$7,074	$2,200	$9,274
16	BANK STABILIZATION - Adaptive Management	$124	$38	31.1%	$162	3.8%	$128	$40	$168	2022Q2	9.6%	$141	$44	$184
	CONSTRUCTION ESTIMATE TOTALS:	$6,344	$1,973	31.1%	**$8,317**		$6,585	$2,048	$8,633			$7,215	$2,244	$9,459
01	LANDS AND DAMAGES	$115	$23	20.0%	$138	4.7%	$120	$24	$144	2020Q4	4.8%	$126	$25	$151
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$32	$4	12.8%	$36	6.1%	$34	$4	$38	2020Q4	6.8%	$36	$5	$41
0.3%	Planning & Environmental Compliance	$16	$2	12.8%	$18	6.1%	$17	$2	$19	2020Q4	6.8%	$18	$2	$20
10.0%	Engineering & Design	$634	$81	12.8%	$715	6.1%	$673	$86	$759	2020Q4	6.8%	$719	$92	$811
0.5%	Reviews, ATRs, IEPRs, VE	$31.72	$4	12.8%	$36	6.1%	$34	$4	$38	2020Q4	6.8%	$36	$5	$41
0.5%	Life Cycle Updates (cost, schedule, risks)	$32	$4	12.8%	$36	6.1%	$34	$4	$38	2020Q4	6.8%	$36	$5	$41
0.3%	Contracting & Reprographics	$16	$2	12.8%	$18	6.1%	$17	$2	$19	2020Q4	6.8%	$18	$2	$20
1.0%	Engineering During Construction	$63	$8	12.8%	$72	6.1%	$67	$9	$76	2022Q2	12.8%	$76	$10	$86
0.3%	Planning During Construction	$16	$2	12.8%	$18	6.1%	$17	$2	$19	2022Q2	12.8%	$19	$2	$21
	Monitoring (estimated)	$190	$24	12.8%	$214	6.1%	$202	$26	$227	2025Q3	27.2%	$256	$33	$289
0.0%	Project Operations	$0	$0	12.8%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
9.0%	Construction Management	$571	$53	9.3%	$624	6.1%	$606	$56	$662	2022Q2	12.8%	$683	$64	$747
0.0%	Project Operation:	$0	$0	9.3%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Project Management	$63	$6	9.3%	$69	6.1%	$67	$6	$74	2022Q2	12.8%	$76	$7	$83
	CONTRACT COST TOTALS:	$8,124	$2,187		$10,311		$8,471	$2,274	$10,745			$9,314	$2,495	$11,809

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

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Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 16-Oct-17				Program Year (Budget EC): 2019								
		Effective Price Level: 1-Oct-16				Effective Price Level Date: 1 OCT 18								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	Site 11													
16	BANK STABILIZATION	$3,371	$1,048	31.1%	$4,420	3.8%	$3,499	$1,088	$4,587	2024Q2	16.2%	$4,067	$1,265	$5,332
16	BANK STABILIZATION - Adaptive Management	$50	$16	31.1%	$66	3.8%	$52	$16	$69	2024Q2	16.2%	$61	$19	$80
	CONSTRUCTION ESTIMATE TOTALS:	$3,422	$1,064	31.1%	**$4,486**		$3,551	$1,104	$4,656			$4,128	$1,284	$5,412
01	LANDS AND DAMAGES	$86	$17	20.0%	$103	4.7%	$90	$18	$108	2020Q4	4.8%	$94	$19	$113
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$17	$2	12.9%	$19	6.1%	$18	$2	$20	2020Q4	6.8%	$19	$2	$22
0.3%	Planning & Environmental Compliance	$9	$1	12.9%	$10	6.1%	$9	$1	$10	2020Q4	6.8%	$10	$1	$11
10.0%	Engineering & Design	$342	$44	12.9%	$386	6.1%	$363	$47	$410	2020Q4	6.8%	$388	$50	$438
0.5%	Reviews, ATRs, IEPRs, VE	$17.11	$2	12.9%	$19	6.1%	$18	$2	$20	2020Q4	6.8%	$19	$2	$22
0.5%	Life Cycle Updates (cost, schedule, risks)	$17	$2	12.9%	$19	6.1%	$18	$2	$20	2020Q4	6.8%	$19	$2	$22
0.3%	Contracting & Reprographics	$9	$1	12.9%	$10	6.1%	$9	$1	$10	2020Q4	6.8%	$10	$1	$11
1.0%	Engineering During Construction	$34	$4	12.9%	$39	6.1%	$36	$5	$41	2024Q2	21.5%	$44	$6	$50
0.3%	Planning During Construction	$9	$1	12.9%	$10	6.1%	$9	$1	$10	2024Q2	21.5%	$11	$1	$12
	Monitoring (estimated)	$95	$12	12.9%	$107	6.1%	$101	$13	$114	2026Q1	29.5%	$131	$17	$147
0.0%	Project Operations	$0	$0	12.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
9.0%	Construction Management	$308	$29	9.3%	$336	6.1%	$327	$30	$357	2024Q2	21.5%	$397	$37	$433
0.0%	Project Operation:	$0	$0	9.3%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Project Management	$34	$3	9.3%	$37	6.1%	$36	$3	$40	2024Q2	21.5%	$44	$4	$48
	CONTRACT COST TOTALS:	$4,398	$1,183		$5,581		$4,586	$1,231	$5,816			$5,314	$1,427	$6,741

Costs for accounts 30 and 31 are accounted for in the TPCS.

Estimated by CENAB-EN-DT
Designed by CENAB-EN
Prepared by Luan Ngo
Preparation Date 10/16/2017
Effective Date of Pricing 10/1/2016
Estimated Construction Time 1,695 Days

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Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
Project Cost			**20,973,036.68**	**0.00**	**20,973,036.68**
1 Site 13	**EA**	**1.0000**	*3,808,436.4285* **3,808,436.43**	**0.00**	*3,808,436.4285* **3,808,436.43**
1.1 Lands and Damages	**EA**	**1.0000**	*52,800.0000* **52,800.00**	**0.00**	*52,800.0000* **52,800.00**
1.2 Relocations	**EA**	**1.0000**	*357,320.7554* **357,320.76**	**0.00**	*357,320.7554* **357,320.76**
1.2.1 Roads, Construction Activities	**EA**	**1.0000**	*357,320.7554* **357,320.76**	**0.00**	*357,320.7554* **357,320.76**
1.2.1.1 Bridges. Foundations	**EA**	**1.0000**	*90,602.0665* **90,602.07**	**0.00**	*90,602.0665* **90,602.07**
1.2.1.1.1 Concrete	**EA**	**1.0000**	*90,602.0665* **90,602.07**	**0.00**	*90,602.0665* **90,602.07**
1.2.1.1.1.1 Concrete, in Place:	**CY**	**130.0000**	*696.9390* **90,602.07**	**0.00**	*696.9390* **90,602.07**
1.2.1.2 Bridges, Superstructure and Deck	**EA**	**1.0000**	*266,718.6888* **266,718.69**	**0.00**	*266,718.6888* **266,718.69**
1.2.1.2.1 Metals	**EA**	**1.0000**	*266,718.6888* **266,718.69**	**0.00**	*266,718.6888* **266,718.69**
1.2.1.2.1.1 Steel Trusses, Girders and B	**EA**	**1.0000**	*116,171.4509* **116,171.45**	**0.00**	*116,171.4509* **116,171.45**
1.2.1.2.1.2 Bearing Pads	**EA**	**1.0000**	*13,766.8382* **13,766.84**	**0.00**	*13,766.8382* **13,766.84**
1.2.1.2.1.3 Miscellaneous Steel (all type	**EA**	**1.0000**	*136,780.3997* **136,780.40**	**0.00**	*136,780.3997* **136,780.40**
1.2.1.2.1.3.1 Bridge Stiffeners	**EA**	**1.0000**	*136,780.3997* **136,780.40**	**0.00**	*136,780.3997* **136,780.40**
1.3 Bank Stabilization	**EA**	**1.0000**	*3,303,315.6931* **3,303,315.69**	**0.00**	*3,303,315.6931* **3,303,315.69**
1.3.1 Bank Stabilization	**EA**	**1.0000**	*3,247,230.9504* **3,247,230.95**	**0.00**	*3,247,230.9504* **3,247,230.95**
1.3.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	*63,373.1437* **63,373.14**	**0.00**	*63,373.1437* **63,373.14**
1.3.1.2 Earthwork	**EA**	**1.0000**	*383,165.0333* **383,165.03**	**0.00**	*383,165.0333* **383,165.03**
1.3.1.2.1 Site Work	**EA**	**1.0000**	*383,165.0333* **383,165.03**	**0.00**	*383,165.0333* **383,165.03**
1.3.1.2.1.1 Clearing and Grubbing	**ACR**	**4.5200**	*10,686.1298* **48,301.31**	**0.00**	*10,686.1298* **48,301.31**

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
			3.8332		*3.8332*
1.3.1.2.1.2 Excavation, Common	**CY**	**20,500.0000**	**78,581.51**	**0.00**	**78,581.51**
			11.0466		*11.0466*
1.3.1.2.1.3 Fill	**CY**	**23,200.0000**	**256,282.21**	**0.00**	**256,282.21**
			2,800,692.7734		*2,800,692.7734*
1.3.1.3 Associated General Items	**EA**	**1.0000**	**2,800,692.77**	**0.00**	**2,800,692.77**
			145.3231		*145.3231*
1.3.1.3.1 Vane	**TON**	**2,805.0000**	**407,631.33**	**0.00**	**407,631.33**
			145.3231		*145.3231*
1.3.1.3.2 J-Hook, Upper Reach	**TON**	**990.0000**	**143,869.88**	**0.00**	**143,869.88**
			178,280.9199		*178,280.9199*
1.3.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**178,280.92**	**0.00**	**178,280.92**
			145.3231		*145.3231*
1.3.1.3.4 Misc. Rock	**TON**	**330.0000**	**47,956.63**	**0.00**	**47,956.63**
			57.1929		*57.1929*
1.3.1.3.5 Replace Damaged Path	**SY**	**334.0000**	**19,102.43**	**0.00**	**19,102.43**
			272,131.7565		*272,131.7565*
1.3.1.3.6 Seed and Mulch	**EA**	**1.0000**	**272,131.76**	**0.00**	**272,131.76**
			503,619.7335		*503,619.7335*
1.3.1.3.7 Planting	**EA**	**1.0000**	**503,619.73**	**0.00**	**503,619.73**
			75.4647		*75.4647*
1.3.1.3.8 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	**169,795.63**	**0.00**	**169,795.63**
			33.5967		*33.5967*
1.3.1.3.9 Stabilized Construction Entrance	**TON**	**55.0000**	**1,847.82**	**0.00**	**1,847.82**
			244,553.8135		*244,553.8135*
1.3.1.3.10 Mulch Access Road	**EA**	**1.0000**	**244,553.81**	**0.00**	**244,553.81**
			272,021.8325		*272,021.8325*
1.3.1.3.11 Temporary Seed and Mulch	**EA**	**1.0000**	**272,021.83**	**0.00**	**272,021.83**
			4.0532		*4.0532*
1.3.1.3.12 Orange Construction Fence	**LF**	**3,570.0000**	**14,469.82**	**0.00**	**14,469.82**
			3,059.1534		*3,059.1534*
1.3.1.3.13 Silt Fence	**EA**	**1.0000**	**3,059.15**	**0.00**	**3,059.15**
			41.9860		*41.9860*
1.3.1.3.14 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	**12,595.80**	**0.00**	**12,595.80**
			261,305.5867		*261,305.5867*
1.3.1.3.15 Upstream Diversion	**EA**	**1.0000**	**261,305.59**	**0.00**	**261,305.59**
			1,306.9320		*1,306.9320*
1.3.1.3.15.1 Pumping	**DAY**	**180.0000**	**235,247.77**	**0.00**	**235,247.77**
			14.4766		*14.4766*

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
1.3.1.3.15.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**26,057.82**	**0.00**	**26,057.82**
			248,450.6371		*248,450.6371*
1.3.1.3.16 Downstream Diversion	**EA**	**1.0000**	**248,450.64**	**0.00**	**248,450.64**
			1,306.9320		*1,306.9320*
1.3.1.3.16.1 Pumping	**DAY**	**180.0000**	**235,247.77**	**0.00**	**235,247.77**
			14.6699		*14.6699*
1.3.1.3.16.2 Sandbags to Be Set Up	**EA**	**900.0000**	**13,202.87**	**0.00**	**13,202.87**
			56,084.7427		*56,084.7427*
1.3.2 Adaptive Management Minor Repair *	**EA**	**1.0000**	**56,084.74**	**0.00**	**56,084.74**
			145.3231		*145.3231*
1.3.2.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**14,532.31**	**0.00**	**14,532.31**
			75.4647		*75.4647*
1.3.2.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**37,732.36**	**0.00**	**37,732.36**
			1,338.0722		*1,338.0722*
1.3.2.3 Silt Fence	**EA**	**1.0000**	**1,338.07**	**0.00**	**1,338.07**
			4.9640		*4.9640*
1.3.2.4 Orange Construction Fence	**LF**	**500.0000**	**2,482.00**	**0.00**	**2,482.00**
			94,999.9800		*94,999.9800*
1.4 PED - Monitoring only	**EA**	**1.0000**	**94,999.98**	**0.00**	**94,999.98**
			6,912,863.1032		*6,912,863.1032*
2 Site 3 and 9	**EA**	**1.0000**	**6,912,863.10**	**0.00**	**6,912,863.10**
			33,000.0000		*33,000.0000*
2.1 Lands and Damages	**EA**	**1.0000**	**33,000.00**	**0.00**	**33,000.00**
			284,935.3639		*284,935.3639*
2.2 Relocations	**EA**	**1.0000**	**284,935.36**	**0.00**	**284,935.36**
			284,935.3639		*284,935.3639*
2.2.1 Roads, Construction Activities for Site 3	**EA**	**1.0000**	**284,935.36**	**0.00**	**284,935.36**
			68,393.5381		*68,393.5381*
2.2.1.1 Bridges. Foundations	**EA**	**1.0000**	**68,393.54**	**0.00**	**68,393.54**
			68,393.5381		*68,393.5381*
2.2.1.1.1 Concrete	**EA**	**1.0000**	**68,393.54**	**0.00**	**68,393.54**
			68,393.5381		*68,393.5381*
2.2.1.1.1.1 Concrete, in Place:	**EA**	**1.0000**	**68,393.54**	**0.00**	**68,393.54**
			216,541.8258		*216,541.8258*
2.2.1.2 Bridges, Superstructure and Deck	**EA**	**1.0000**	**216,541.83**	**0.00**	**216,541.83**
			216,541.8258		*216,541.8258*
2.2.1.2.1 Metals	**EA**	**1.0000**	**216,541.83**	**0.00**	**216,541.83**
			105,215.8101		*105,215.8101*
2.2.1.2.1.1 Steel Trusses, Girders and B	**EA**	**1.0000**	**105,215.81**	**0.00**	**105,215.81**

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
			10,198.0221		*10,198.0221*
2.2.1.2.1.2 Bearing Pads	**EA**	**1.0000**	**10,198.02**	**0.00**	**10,198.02**
			101,127.9936		*101,127.9936*
2.2.1.2.1.3 Miscellaneous Steel (all type	**EA**	**1.0000**	**101,127.99**	**0.00**	**101,127.99**
			101,127.9936		*101,127.9936*
2.2.1.2.1.3.1 Bridge Stiffeners	**EA**	**1.0000**	**101,127.99**	**0.00**	**101,127.99**
			6,404,927.7793		*6,404,927.7793*
2.3 Bank Stabilization	**EA**	**1.0000**	**6,404,927.78**	**0.00**	**6,404,927.78**
			4,636,777.2905		*4,636,777.2905*
2.3.1 Bank Stabilization for Site 3	**EA**	**1.0000**	**4,636,777.29**	**0.00**	**4,636,777.29**
			64,819.2495		*64,819.2495*
2.3.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**64,819.25**	**0.00**	**64,819.25**
			1,331,497.3741		*1,331,497.3741*
2.3.1.2 Earthwork	**EA**	**1.0000**	**1,331,497.37**	**0.00**	**1,331,497.37**
			1,331,497.3741		*1,331,497.3741*
2.3.1.2.1 Site Work	**EA**	**1.0000**	**1,331,497.37**	**0.00**	**1,331,497.37**
			10,963.8484		*10,963.8484*
2.3.1.2.1.1 Clearing and Grubbing	**ACR**	**5.1800**	**56,792.73**	**0.00**	**56,792.73**
			3.1941		*3.1941*
2.3.1.2.1.2 Excavation, Common	**CY**	**21,500.0000**	**68,673.90**	**0.00**	**68,673.90**
			31.9056		*31.9056*
2.3.1.2.1.3 Fill	**CY**	**37,800.0000**	**1,206,030.74**	**0.00**	**1,206,030.74**
			3,191,435.1841		*3,191,435.1841*
2.3.1.3 Associated General Items	**EA**	**1.0000**	**3,191,435.18**	**0.00**	**3,191,435.18**
			131.3621		*131.3621*
2.3.1.3.1 Vane	**TON**	**2,475.0000**	**325,121.09**	**0.00**	**325,121.09**
			131.3621		*131.3621*
2.3.1.3.2 J-Hook, Upper Reach	**TON**	**495.0000**	**65,024.22**	**0.00**	**65,024.22**
			318,944.3792		*318,944.3792*
2.3.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**318,944.38**	**0.00**	**318,944.38**
			131.2151		*131.2151*
2.3.1.3.4 Misc. Rock	**TON**	**50.0000**	**6,560.76**	**0.00**	**6,560.76**
			52.0710		*52.0710*
2.3.1.3.5 Replace Damaged Path	**SY**	**56.0000**	**2,915.98**	**0.00**	**2,915.98**
			447,424.4717		*447,424.4717*
2.3.1.3.6 Seed and Mulch	**EA**	**1.0000**	**447,424.47**	**0.00**	**447,424.47**
			640,916.9825		*640,916.9825*
2.3.1.3.7 Planting	**EA**	**1.0000**	**640,916.98**	**0.00**	**640,916.98**
			65.0015		*65.0015*

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
2.3.1.3.8 Wooden logs for stabilization and in stream structures	**LF**	**3,000.0000**	**195,004.52**	**0.00**	**195,004.52**
2.3.1.3.9 Stabilized Construction Entrance	**TON**	**92.0000**	*30.7747* **2,831.27**	**0.00**	*30.7747* **2,831.27**
2.3.1.3.10 Mulch Access Road	**EA**	**1.0000**	*235,657.6753* **235,657.68**	**0.00**	*235,657.6753* **235,657.68**
2.3.1.3.11 Temporary Seed and Mulch	**EA**	**1.0000**	*447,424.4717* **447,424.47**	**0.00**	*447,424.4717* **447,424.47**
2.3.1.3.12 Orange Construction Fence	**LF**	**5,450.0000**	*3.5850* **19,538.27**	**0.00**	*3.5850* **19,538.27**
2.3.1.3.13 Silt Fence	**EA**	**1.0000**	*2,922.8258* **2,922.83**	**0.00**	*2,922.8258* **2,922.83**
2.3.1.3.14 Upstream Diversion	**EA**	**1.0000**	*245,992.5562* **245,992.56**	**0.00**	*245,992.5562* **245,992.56**
2.3.1.3.14.1 Pumping	**DAY**	**180.0000**	*1,244.6053* **224,028.96**	**0.00**	*1,244.6053* **224,028.96**
2.3.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	*12.2020* **21,963.60**	**0.00**	*12.2020* **21,963.60**
2.3.1.3.15 Downstream Diversion	**EA**	**1.0000**	*235,155.7121* **235,155.71**	**0.00**	*235,155.7121* **235,155.71**
2.3.1.3.15.1 Pumping	**DAY**	**180.0000**	*1,244.6053* **224,028.96**	**0.00**	*1,244.6053* **224,028.96**
2.3.1.3.15.2 Sandbags to Be Set Up	**EA**	**900.0000**	*12.3631* **11,126.76**	**0.00**	*12.3631* **11,126.76**
2.3.1.4 Adaptive Management Minor Repair *	**EA**	**1.0000**	*49,025.4829* **49,025.48**	**0.00**	*49,025.4829* **49,025.48**
2.3.1.4.1 Vane, J-Hook Repairs	**TON**	**100.0000**	*131.3621* **13,136.21**	**0.00**	*131.3621* **13,136.21**
2.3.1.4.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	*65.0015* **32,500.75**	**0.00**	*65.0015* **32,500.75**
2.3.1.4.3 Silt Fence	**EA**	**1.0000**	*1,193.2133* **1,193.21**	**0.00**	*1,193.2133* **1,193.21**
2.3.1.4.4 Orange Construction Fence	**LF**	**500.0000**	*4.3906* **2,195.31**	**0.00**	*4.3906* **2,195.31**
2.3.2 Bank Stabilization for Site 9	**EA**	**1.0000**	*1,768,150.4887* **1,768,150.49**	**0.00**	*1,768,150.4887* **1,768,150.49**
2.3.2.1 Earthwork	**EA**	**1.0000**	*435,778.1270* **435,778.13**	**0.00**	*435,778.1270* **435,778.13**
2.3.2.1.1 Site Work	**EA**	**1.0000**	*435,778.1270* **435,778.13**	**0.00**	*435,778.1270* **435,778.13**

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
			11,110.3542		*11,110.3542*
2.3.2.1.1.1 Clearing and Grubbing	**ACR**	**3.0000**	**33,331.06**	**0.00**	**33,331.06**
			3.1941		*3.1941*
2.3.2.1.1.2 Excavation, Common	**CY**	**1,380.0000**	**4,407.91**	**0.00**	**4,407.91**
			10.5301		*10.5301*
2.3.2.1.1.3 Fill	**CY**	**37,800.0000**	**398,039.16**	**0.00**	**398,039.16**
			1,283,346.8789		*1,283,346.8789*
2.3.2.2 Associated General Items	**EA**	**1.0000**	**1,283,346.88**	**0.00**	**1,283,346.88**
			131.3621		*131.3621*
2.3.2.2.1 Vane	**TON**	**660.0000**	**86,698.96**	**0.00**	**86,698.96**
			131.3621		*131.3621*
2.3.2.2.2 J-Hook, Upper Reach	**TON**	**116.0000**	**15,238.00**	**0.00**	**15,238.00**
			112,459.6470		*112,459.6470*
2.3.2.2.3 Topsoil 4 in depth	**EA**	**1.0000**	**112,459.65**	**0.00**	**112,459.65**
			131.3443		*131.3443*
2.3.2.2.4 Misc. Rock	**TON**	**41.3000**	**5,424.52**	**0.00**	**5,424.52**
			52.0710		*52.0710*
2.3.2.2.5 Replace Damaged Path	**SY**	**34.0000**	**1,770.41**	**0.00**	**1,770.41**
			157,720.3218		*157,720.3218*
2.3.2.2.6 Seed and Mulch	**EA**	**1.0000**	**157,720.32**	**0.00**	**157,720.32**
			282,311.1549		*282,311.1549*
2.3.2.2.7 Planting	**EA**	**1.0000**	**282,311.15**	**0.00**	**282,311.15**
			65.0015		*65.0015*
2.3.2.2.8 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	**146,253.39**	**0.00**	**146,253.39**
			31.2177		*31.2177*
2.3.2.2.9 Stabilized Construction Entrance	**TON**	**18.0000**	**561.92**	**0.00**	**561.92**
			77,521.1292		*77,521.1292*
2.3.2.2.10 Mulch Access Road	**EA**	**1.0000**	**77,521.13**	**0.00**	**77,521.13**
			157,720.3218		*157,720.3218*
2.3.2.2.11 Temporary Seed and Mulch	**EA**	**1.0000**	**157,720.32**	**0.00**	**157,720.32**
			3.5850		*3.5850*
2.3.2.2.12 Orange Construction Fence	**LF**	**1,340.0000**	**4,803.91**	**0.00**	**4,803.91**
			584.5652		*584.5652*
2.3.2.2.13 Silt Fence	**EA**	**1.0000**	**584.57**	**0.00**	**584.57**
			234,278.6356		*234,278.6356*
2.3.2.2.14 Upstream Diversion	**EA**	**1.0000**	**234,278.64**	**0.00**	**234,278.64**
			4,480.5791		*4,480.5791*
2.3.2.2.14.1 Pumping	**DAY**	**50.0000**	**224,028.96**	**0.00**	**224,028.96**
			12.2020		*12.2020*

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
2.3.2.2.14.2 Sandbags to Be Set Up	**EA**	**840.0000**	**10,249.68**	**0.00**	**10,249.68**
			49,025.4829		*49,025.4829*
2.3.2.3 Adaptive Management Minor Repair *	**EA**	**1.0000**	**49,025.48**	**0.00**	**49,025.48**
			131.3621		*131.3621*
2.3.2.3.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**13,136.21**	**0.00**	**13,136.21**
			65.0015		*65.0015*
2.3.2.3.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**32,500.75**	**0.00**	**32,500.75**
			1,193.2133		*1,193.2133*
2.3.2.3.3 Silt Fence	**EA**	**1.0000**	**1,193.21**	**0.00**	**1,193.21**
			4.3906		*4.3906*
2.3.2.3.4 Orange Construction Fence	**LF**	**500.0000**	**2,195.31**	**0.00**	**2,195.31**
			189,999.9600		*189,999.9600*
2.4 PED - Monitoring Only	**EA**	**1.0000**	**189,999.96**	**0.00**	**189,999.96**
			94,999.9800		*94,999.9800*
2.4.1 PED - Monitoring only for site 3	**EA**	**1.0000**	**94,999.98**	**0.00**	**94,999.98**
			94,999.9800		*94,999.9800*
2.4.2 PED - Monitoring only for site 9	**EA**	**1.0000**	**94,999.98**	**0.00**	**94,999.98**
			6,649,262.7672		*6,649,262.7672*
3 Site 5 and 15	**EA**	**1.0000**	**6,649,262.77**	**0.00**	**6,649,262.77**
			114,770.0000		*114,770.0000*
3.1 Lands and Damages	**EA**	**1.0000**	**114,770.00**	**0.00**	**114,770.00**
			6,344,492.8072		*6,344,492.8072*
3.2 Bank Stabilization	**EA**	**1.0000**	**6,344,492.81**	**0.00**	**6,344,492.81**
			4,046,695.4544		*4,046,695.4544*
3.2.1 Bank Stabilization - Site 5	**EA**	**1.0000**	**4,046,695.45**	**0.00**	**4,046,695.45**
			65,588.5384		*65,588.5384*
3.2.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**65,588.54**	**0.00**	**65,588.54**
			1,131,878.8713		*1,131,878.8713*
3.2.1.2 Earthwork	**EA**	**1.0000**	**1,131,878.87**	**0.00**	**1,131,878.87**
			1,131,878.8713		*1,131,878.8713*
3.2.1.2.1 Site Work	**EA**	**1.0000**	**1,131,878.87**	**0.00**	**1,131,878.87**
			14,713.6713		*14,713.6713*
3.2.1.2.1.1 Clearing and Grubbing	**ACR**	**7.1600**	**105,349.89**	**0.00**	**105,349.89**
			4.3094		*4.3094*
3.2.1.2.1.2 Excavation, Common	**CY**	**17,100.0000**	**73,690.59**	**0.00**	**73,690.59**
			27.6988		*27.6988*
3.2.1.2.1.3 Fill	**CY**	**34,400.0000**	**952,838.40**	**0.00**	**952,838.40**
			2,789,268.5266		*2,789,268.5266*
3.2.1.3 Associated General Items	**EA**	**1.0000**	**2,789,268.53**	**0.00**	**2,789,268.53**

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
			149.5207		*149.5207*
3.2.1.3.1 Vane	**TON**	**1,815.0000**	**271,380.13**	**0.00**	**271,380.13**
			149.5207		*149.5207*
3.2.1.3.2 J-Hook	**TON**	**825.0000**	**123,354.60**	**0.00**	**123,354.60**
			232,166.7995		*232,166.7995*
3.2.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**232,166.80**	**0.00**	**232,166.80**
			149.5207		*149.5207*
3.2.1.3.4 Misc. Rock	**TON**	**165.0000**	**24,670.92**	**0.00**	**24,670.92**
			392,312.7896		*392,312.7896*
3.2.1.3.5 Seed and Mulch	**EA**	**1.0000**	**392,312.79**	**0.00**	**392,312.79**
			679,772.7121		*679,772.7121*
3.2.1.3.6 Planting	**EA**	**1.0000**	**679,772.71**	**0.00**	**679,772.71**
			81.9799		*81.9799*
3.2.1.3.7 Wooden logs for stabilization and in stream structures	**LF**	**1,500.0000**	**122,969.82**	**0.00**	**122,969.82**
			34.3307		*34.3307*
3.2.1.3.8 Stabilized Construction Entrance	**TON**	**18.0000**	**617.95**	**0.00**	**617.95**
			238,306.8401		*238,306.8401*
3.2.1.3.9 Mulch Access Road	**EA**	**1.0000**	**238,306.84**	**0.00**	**238,306.84**
			392,312.7896		*392,312.7896*
3.2.1.3.10 Temporary Seed and Mulch	**EA**	**1.0000**	**392,312.79**	**0.00**	**392,312.79**
			4.2765		*4.2765*
3.2.1.3.11 Orange Construction Fence	**LF**	**1,380.0000**	**5,901.62**	**0.00**	**5,901.62**
			685.2491		*685.2491*
3.2.1.3.12 Silt Fence	**EA**	**1.0000**	**685.25**	**0.00**	**685.25**
			163.9057		*163.9057*
3.2.1.3.13 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	**49,171.70**	**0.00**	**49,171.70**
			255,644.6066		*255,644.6066*
3.2.1.3.14 Upstream Diversion	**EA**	**1.0000**	**255,644.61**	**0.00**	**255,644.61**
			1,259.3766		*1,259.3766*
3.2.1.3.14.1 Pumping	**DAY**	**180.0000**	**226,687.78**	**0.00**	**226,687.78**
			16.0871		*16.0871*
3.2.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**28,956.83**	**0.00**	**28,956.83**
			59,959.5180		*59,959.5180*
3.2.1.4 Adaptive Management Minor Repair *	**EA**	**1.0000**	**59,959.52**	**0.00**	**59,959.52**
			149.5207		*149.5207*
3.2.1.4.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**14,952.07**	**0.00**	**14,952.07**
			81.9799		*81.9799*
3.2.1.4.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**40,989.94**	**0.00**	**40,989.94**
			1,398.7289		*1,398.7289*

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
3.2.1.4.3 Silt Fence	**EA**	**1.0000**	**1,398.73**	**0.00**	**1,398.73**
			5.2376		*5.2376*
3.2.1.4.4 Orange Construction Fence	**LF**	**500.0000**	**2,618.78**	**0.00**	**2,618.78**
			2,297,797.3528		*2,297,797.3528*
3.2.2 Bank Stabilization - Site 15	**EA**	**1.0000**	**2,297,797.35**	**0.00**	**2,297,797.35**
			273,978.1253		*273,978.1253*
3.2.2.1 Earthwork	**EA**	**1.0000**	**273,978.13**	**0.00**	**273,978.13**
			273,978.1253		*273,978.1253*
3.2.2.1.1 Site Work	**EA**	**1.0000**	**273,978.13**	**0.00**	**273,978.13**
			16,052.3184		*16,052.3184*
3.2.2.1.1.1 Clearing and Grubbing	**ACR**	**2.7300**	**43,822.83**	**0.00**	**43,822.83**
			4.7012		*4.7012*
3.2.2.1.1.2 Excavation, Common	**CY**	**22,600.0000**	**106,246.08**	**0.00**	**106,246.08**
			8.6589		*8.6589*
3.2.2.1.1.3 Fill	**CY**	**14,310.0000**	**123,909.22**	**0.00**	**123,909.22**
			1,960,095.2767		*1,960,095.2767*
3.2.2.2 Associated General Items	**EA**	**1.0000**	**1,960,095.28**	**0.00**	**1,960,095.28**
			155.5570		*155.5570*
3.2.2.2.1 Vane	**TON**	**1,650.0000**	**256,668.99**	**0.00**	**256,668.99**
			155.5570		*155.5570*
3.2.2.2.2 J-Hook	**TON**	**330.0000**	**51,333.80**	**0.00**	**51,333.80**
			133,281.2515		*133,281.2515*
3.2.2.2.3 Topsoil 4 in depth	**EA**	**1.0000**	**133,281.25**	**0.00**	**133,281.25**
			155.5570		*155.5570*
3.2.2.2.4 Misc. Rock	**TON**	**165.0000**	**25,666.90**	**0.00**	**25,666.90**
			238,867.5878		*238,867.5878*
3.2.2.2.5 Seed and Mulch	**EA**	**1.0000**	**238,867.59**	**0.00**	**238,867.59**
			398,937.0728		*398,937.0728*
3.2.2.2.6 Planting	**EA**	**1.0000**	**398,937.07**	**0.00**	**398,937.07**
			87.8733		*87.8733*
3.2.2.2.7 Wooden logs for stabilization and in stream structures	**LF**	**1,200.0000**	**105,447.97**	**0.00**	**105,447.97**
			42.7513		*42.7513*
3.2.2.2.8 Stabilized Construction Entrance	**TON**	**55.0000**	**2,351.32**	**0.00**	**2,351.32**
			189,515.5804		*189,515.5804*
3.2.2.2.9 Mulch Access Road	**EA**	**1.0000**	**189,515.58**	**0.00**	**189,515.58**
			238,867.5878		*238,867.5878*
3.2.2.2.10 Temporary Seed and Mulch	**EA**	**1.0000**	**238,867.59**	**0.00**	**238,867.59**
			5.5266		*5.5266*
3.2.2.2.11 Orange Construction Fence	**LF**	**3,460.0000**	**19,121.96**	**0.00**	**19,121.96**

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
			2,613.5958		*2,613.5958*
3.2.2.2.12 Silt Fence	**EA**	**1.0000**	**2,613.60**	**0.00**	**2,613.60**
			37,275.3193		*37,275.3193*
3.2.2.2.13 STREAMBANK PLANTING - willow stakes	**EA**	**1.0000**	**37,275.32**	**0.00**	**37,275.32**
			60.3980		*60.3980*
3.2.2.2.14 Replace Damaged Path	**SY**	**34.0000**	**2,053.53**	**0.00**	**2,053.53**
			258,092.8092		*258,092.8092*
3.2.2.2.15 Upstream Diversion	**EA**	**1.0000**	**258,092.81**	**0.00**	**258,092.81**
			1,259.3766		*1,259.3766*
3.2.2.2.15.1 Pumping	**DAY**	**180.0000**	**226,687.78**	**0.00**	**226,687.78**
			17.4472		*17.4472*
3.2.2.2.15.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**31,405.03**	**0.00**	**31,405.03**
			63,723.9508		*63,723.9508*
3.2.2.3 Adaptive Management Minor Repair *	**EA**	**1.0000**	**63,723.95**	**0.00**	**63,723.95**
			155.5570		*155.5570*
3.2.2.3.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**15,555.70**	**0.00**	**15,555.70**
			87.8733		*87.8733*
3.2.2.3.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**43,936.65**	**0.00**	**43,936.65**
			1,468.3122		*1,468.3122*
3.2.2.3.3 Silt Fence	**EA**	**1.0000**	**1,468.31**	**0.00**	**1,468.31**
			5.5266		*5.5266*
3.2.2.3.4 Orange Construction Fence	**LF**	**500.0000**	**2,763.29**	**0.00**	**2,763.29**
			189,999.9600		*189,999.9600*
3.3 PED - Monitoring Only	**EA**	**1.0000**	**189,999.96**	**0.00**	**189,999.96**
			94,999.9800		*94,999.9800*
3.3.1 PED - Monitoring only for site 5	**EA**	**1.0000**	**94,999.98**	**0.00**	**94,999.98**
			94,999.9800		*94,999.9800*
3.3.2 PED - Monitoring only for site 15	**EA**	**1.0000**	**94,999.98**	**0.00**	**94,999.98**
			3,602,474.3849		*3,602,474.3849*
4 Site 11	**EA**	**1.0000**	**3,602,474.38**	**0.00**	**3,602,474.38**
			85,800.0000		*85,800.0000*
4.1 Lands and Damages	**EA**	**1.0000**	**85,800.00**	**0.00**	**85,800.00**
			3,421,674.4049		*3,421,674.4049*
4.2 Bank Stabilization	**EA**	**1.0000**	**3,421,674.40**	**0.00**	**3,421,674.40**
			3,371,329.9656		*3,371,329.9656*
4.2.1 Bank Stabilization	**EA**	**1.0000**	**3,371,329.97**	**0.00**	**3,371,329.97**
			61,974.5704		*61,974.5704*
4.2.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**61,974.57**	**0.00**	**61,974.57**
			318,100.5616		*318,100.5616*

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
4.2.1.2 Earthwork	**EA**	**1.0000**	**318,100.56**	**0.00**	**318,100.56**
			318,100.5616		*318,100.5616*
4.2.1.2.1 Site Work	**EA**	**1.0000**	**318,100.56**	**0.00**	**318,100.56**
			11,198.4938		*11,198.4938*
4.2.1.2.1.1 Clearing and Grubbing	**ACR**	**9.6100**	**107,617.53**	**0.00**	**107,617.53**
			3.2801		*3.2801*
4.2.1.2.1.2 Excavation, Common	**CY**	**20,800.0000**	**68,225.42**	**0.00**	**68,225.42**
			6.7103		*6.7103*
4.2.1.2.1.3 Fill	**CY**	**21,200.0000**	**142,257.62**	**0.00**	**142,257.62**
			2,991,254.8336		*2,991,254.8336*
4.2.1.3 Associated General Items	**EA**	**1.0000**	**2,991,254.83**	**0.00**	**2,991,254.83**
			134.8962		*134.8962*
4.2.1.3.1 Vane	**TON**	**1,815.0000**	**244,836.52**	**0.00**	**244,836.52**
			134.8962		*134.8962*
4.2.1.3.2 J-Hook	**TON**	**495.0000**	**66,773.60**	**0.00**	**66,773.60**
			247,319.4891		*247,319.4891*
4.2.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**247,319.49**	**0.00**	**247,319.49**
			134.8962		*134.8962*
4.2.1.3.4 Misc. Rock	**TON**	**165.0000**	**22,257.87**	**0.00**	**22,257.87**
			346,892.5726		*346,892.5726*
4.2.1.3.5 Seed and Mulch	**EA**	**1.0000**	**346,892.57**	**0.00**	**346,892.57**
			679,044.0100		*679,044.0100*
4.2.1.3.6 Planting	**EA**	**1.0000**	**679,044.01**	**0.00**	**679,044.01**
			66.7503		*66.7503*
4.2.1.3.7 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	**150,188.11**	**0.00**	**150,188.11**
			31.7709		*31.7709*
4.2.1.3.8 Stabilized Construction Entrance	**TON**	**73.0000**	**2,319.28**	**0.00**	**2,319.28**
			301,613.2931		*301,613.2931*
4.2.1.3.9 Mulch Access Road	**EA**	**1.0000**	**301,613.29**	**0.00**	**301,613.29**
			346,892.5726		*346,892.5726*
4.2.1.3.10 Temporary Seed and Mulch	**EA**	**1.0000**	**346,892.57**	**0.00**	**346,892.57**
			3.6815		*3.6815*
4.2.1.3.11 Orange Construction Fence	**LF**	**3,260.0000**	**12,001.54**	**0.00**	**12,001.54**
			1,780.8665		*1,780.8665*
4.2.1.3.12 Silt Fence	**EA**	**1.0000**	**1,780.87**	**0.00**	**1,780.87**
			167.4143		*167.4143*
4.2.1.3.13 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	**50,224.29**	**0.00**	**50,224.29**
			265,119.6095		*265,119.6095*
4.2.1.3.14 Upstream Diversion	**EA**	**1.0000**	**265,119.61**	**0.00**	**265,119.61**

Currency in US dollars

Description	UOM	Quantity	ContractCost	Contingency	ProjectCost
			1,347.5839		*1,347.5839*
4.2.1.3.14.1 Pumping	**DAY**	**180.0000**	**242,565.11**	**0.00**	**242,565.11**
			12.5303		*12.5303*
4.2.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**22,554.50**	**0.00**	**22,554.50**
			253,991.2165		*253,991.2165*
4.2.1.3.15 Downstream Diversion	**EA**	**1.0000**	**253,991.22**	**0.00**	**253,991.22**
			1,347.5839		*1,347.5839*
4.2.1.3.15.1 Pumping	**DAY**	**180.0000**	**242,565.11**	**0.00**	**242,565.11**
			12.6957		*12.6957*
4.2.1.3.15.2 Sandbags to Be Set Up	**EA**	**900.0000**	**11,426.11**	**0.00**	**11,426.11**
			50,344.4393		*50,344.4393*
4.2.2 Adaptive Management Minor Repair *	**EA**	**1.0000**	**50,344.44**	**0.00**	**50,344.44**
			134.8962		*134.8962*
4.2.2.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**13,489.62**	**0.00**	**13,489.62**
			66.7503		*66.7503*
4.2.2.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**33,375.14**	**0.00**	**33,375.14**
			1,225.3149		*1,225.3149*
4.2.2.3 Silt Fence	**EA**	**1.0000**	**1,225.31**	**0.00**	**1,225.31**
			4.5087		*4.5087*
4.2.2.4 Orange Construction Fence	**LF**	**500.0000**	**2,254.37**	**0.00**	**2,254.37**
			94,999.9800		*94,999.9800*
4.3 PED - Monitoring only	**EA**	**1.0000**	**94,999.98**	**0.00**	**94,999.98**

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
Contract Cost			**15,040,294.30**	**5,076,372.50**	**20,973,036.68**
1 Site 13	**EA**	**1.0000**	*2,650,389.6373* **2,650,389.64**	**1,010,246.81**	*3,808,436.4285* **3,808,436.43**
1.1 Lands and Damages	**EA**	**1.0000**	*0.0000* **0.00**	**0.00**	*52,800.0000* **52,800.00**
1.1.1 RE Cost, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	*0.0000* 0.00	0.00	*52,800.0000* 52,800.00
1.2 Relocations	**EA**	**1.0000**	*258,795.8929* **258,795.89**	**98,524.86**	*357,320.7554* **357,320.76**
1.2.1 Roads, Construction Activities	**EA**	**1.0000**	*258,795.8929* **258,795.89**	**98,524.86**	*357,320.7554* **357,320.76**
1.2.1.1 Bridges. Foundations	**EA**	**1.0000**	*65,620.1532* **65,620.15**	**24,981.91**	*90,602.0665* **90,602.07**
1.2.1.1.1 Concrete	**EA**	**1.0000**	*65,620.1532* **65,620.15**	**24,981.91**	*90,602.0665* **90,602.07**
1.2.1.1.1.1 Concrete, in Place:	**CY**	**130.0000**	*504.7704* **65,620.15**	**24,981.91**	*696.9390* **90,602.07**
1.2.1.1.1.1.1 C.I.P. concrete forms, equipment foundations, 1 use, includes erecting, bracing, stripping and cleaning	SFC	1,040.0000	*20.8888* 21,724.40	8,270.58	*28.8413* 29,994.98
1.2.1.1.1.1.2 Structural concrete, in place, foundation mat (3000 psi), over 20 C.Y., includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	CY	130.0000	*337.6597* 43,895.76	16,711.33	*466.2083* 60,607.08
1.2.1.2 Bridges, Superstructure and Deck	**EA**	**1.0000**	*193,175.7397* **193,175.74**	**73,542.95**	*266,718.6888* **266,718.69**
1.2.1.2.1 Metals	**EA**	**1.0000**	*193,175.7397* **193,175.74**	**73,542.95**	*266,718.6888* **266,718.69**
1.2.1.2.1.1 Steel Trusses, Girders and B	**EA**	**1.0000**	*84,139.2332* **84,139.23**	**32,032.22**	*116,171.4509* **116,171.45**
1.2.1.2.1.1.1 Fabricated pedestrian bridges, steel, trussed or arch spans, complete in place, 10' wide, 150' span, includes erection, excludes foundations	SF	1,950.0000	*12.6454* 24,658.46	9,387.60	*17.4595* 34,046.06
1.2.1.2.1.1.2 Mobilization or demobilization, crane, truck-mounted, up to 75 ton, (driver only)	EA	4.0000	*174.4981* 697.99	265.73	*240.9304* 963.72
1.2.1.2.1.1.3 Crane crew, daily use for small jobs, 100-ton truck-mounted hydraulic crane, portal to portal	DAY	14.0000	*4,198.7700* 58,782.78	22,378.89	*5,797.2622* 81,161.67
1.2.1.2.1.2 Bearing Pads	**EA**	**1.0000**	*9,970.8767* **9,970.88**	**3,795.96**	*13,766.8382* **13,766.84**
1.2.1.2.1.2.1 Bearing pad, fabric reinforced neoprene, 5000 psi, 1/2" thick	SF	130.0000	*76.6991* 9,970.88	3,795.96	*105.8988* 13,766.84

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
1.2.1.2.1.3 Miscellaneous Steel (all type	**EA**	**1.0000**	*99,065.6298* **99,065.63**	**37,714.77**	*136,780.3997* **136,780.40**
1.2.1.2.1.3.1 Bridge Stiffeners	**EA**	**1.0000**	*99,065.6298* **99,065.63**	**37,714.77**	*136,780.3997* **136,780.40**
1.2.1.2.1.3.1.1 Channel framing, structural steel, field fabricated, C6x8.2, incl cutting & welding	LF	1,950.0000	*50.8029* 99,065.63	37,714.77	*70.1438* 136,780.40
1.3 Bank Stabilization	**EA**	**1.0000**	*2,391,593.7443* **2,391,593.74**	**911,721.95**	*3,303,315.6931* **3,303,315.69**
1.3.1 Bank Stabilization	**EA**	**1.0000**	*2,350,973.3750* **2,350,973.37**	**896,257.58**	*3,247,230.9504* **3,247,230.95**
1.3.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	*45,899.1230* **45,899.12**	**17,474.02**	*63,373.1437* **63,373.14**
1.3.1.1.1 Mob and Demob	EA	1.0000	*42,258.8903* 42,258.89	16,088.17	*58,347.0565* 58,347.06
1.3.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	*149.4260* 298.85	113.77	*206.3133* 412.63
1.3.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	*89.8343* 1,437.35	547.21	*124.0347* 1,984.56
1.3.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	*3.9667* 1,904.03	724.87	*5.4769* 2,628.91
1.3.1.2 Earthwork	**EA**	**1.0000**	*276,878.0135* **276,878.01**	**106,287.02**	*383,165.0333* **383,165.03**
1.3.1.2.1 Site Work	**EA**	**1.0000**	*276,878.0135* **276,878.01**	**106,287.02**	*383,165.0333* **383,165.03**
1.3.1.2.1.1 Clearing and Grubbing	**ACR**	**4.5200**	*7,598.8987* **34,347.02**	**13,954.28**	*10,686.1298* **48,301.31**
1.3.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	4.5200	*4,788.9672* 21,646.13	8,794.25	*6,734.5977* 30,440.38
1.3.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	4.5200	*2,361.4028* 10,673.54	4,336.38	*3,320.7781* 15,009.92
1.3.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	400.0000	*5.0684* 2,027.35	823.66	*7.1275* 2,851.01
1.3.1.2.1.2 Excavation, Common	**CY**	**20,500.0000**	*2.7763* **56,914.05**	**21,667.46**	*3.8332* **78,581.51**
1.3.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	20,500.0000	*2.7763* 56,914.05	21,667.46	*3.8332* 78,581.51
1.3.1.2.1.3 Fill	**CY**	**23,200.0000**	*8.0007* **185,616.94**	**70,665.28**	*11.0466* **256,282.21**

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
1.3.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	2,700.0000	*23.6340* 63,811.73	24,293.44	*32.6315* 88,105.16
1.3.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	20,500.0000	*3.4396* 70,511.21	26,843.96	*4.7490* 97,355.17
1.3.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	2,700.0000	*6.4895* 17,521.64	6,670.57	*8.9601* 24,192.22
1.3.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	23,200.0000	*1.4557* 33,772.36	12,857.30	*2.0099* 46,629.66
1.3.1.3 Associated General Items	**EA**	**1.0000**	*2,028,196.2384* **2,028,196.24**	**772,496.53**	*2,800,692.7734* **2,800,692.77**
1.3.1.3.1 Vane	**TON**	**2,805.0000**	*105.2528* **295,234.22**	**112,397.11**	*145.3231* **407,631.33**
1.3.1.3.1.1 Armor Stone Placement	TON	2,805.0000	*88.0767* 247,055.19	94,055.12	*121.6080* 341,110.31
1.3.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,700.0000	*21.0743* 35,826.27	13,639.23	*29.0974* 49,465.50
1.3.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	140.2500	*88.0767* 12,352.76	4,702.76	*121.6080* 17,055.52
1.3.1.3.2 J-Hook, Upper Reach	**TON**	**990.0000**	*105.2528* **104,200.31**	**39,669.57**	*145.3231* **143,869.88**
1.3.1.3.2.1 Armor Stone Placement	TON	990.0000	*88.0767* 87,195.95	33,195.92	*121.6080* 120,391.87
1.3.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	600.0000	*21.0743* 12,644.56	4,813.85	*29.0974* 17,458.41
1.3.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	49.5000	*88.0767* 4,359.80	1,659.80	*121.6080* 6,019.59
1.3.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	*129,123.1175* **129,123.12**	**49,157.80**	*178,280.9199* **178,280.92**
1.3.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	3,831.0000	*33.7048* 129,123.12	49,157.80	*46.5364* 178,280.92
1.3.1.3.4 Misc. Rock	**TON**	**330.0000**	*105.2528* **34,733.44**	**13,223.19**	*145.3231* **47,956.63**
1.3.1.3.4.1 Armor Stone Placement	TON	330.0000	*88.0767* 29,065.32	11,065.31	*121.6080* 40,130.62
1.3.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck,	LCY	200.0000	*21.0743* 4,214.85	1,604.62	*29.0974* 5,819.47

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
highway haulers, excludes loading					
1.3.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	16.5000	*88.0767* 1,453.27	553.27	*121.6080* 2,006.53
1.3.1.3.5 Replace Damaged Path	**SY**	**334.0000**	*41.4230* **13,835.27**	**5,267.16**	*57.1929* **19,102.43**
1.3.1.3.5.1 Fine grading, finish grading, small area, to be paved with grader	SY	334.0000	*5.5467* 1,852.60	705.30	*7.6584* 2,557.90
1.3.1.3.5.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	334.0000	*2.1488* 717.71	273.24	*2.9669* 990.95
1.3.1.3.5.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	2,914.9091	*2.6862* 7,829.96	2,980.90	*3.7088* 10,810.86
1.3.1.3.5.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	334.0000	*1.1932* 398.54	151.73	*1.6475* 550.26
1.3.1.3.5.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	30.3636	*10.9761* 333.27	126.88	*15.1547* 460.15
1.3.1.3.5.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	291.4909	*0.6395* 186.41	70.97	*0.8830* 257.38
1.3.1.3.5.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	334.0000	*7.5353* 2,516.78	958.15	*10.4040* 3,474.94
1.3.1.3.6 Seed and Mulch	**EA**	**1.0000**	*197,096.2500* **197,096.25**	**75,035.51**	*272,131.7565* **272,131.76**
1.3.1.3.6.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	34,478.0000	*3.0681* 105,780.86	40,271.29	*4.2361* 146,052.16
1.3.1.3.6.2 Seeding, mechanical seeding, 215 lb./acre	ACR	7.1200	*1,336.0041* 9,512.35	3,621.40	*1,844.6275* 13,133.75
1.3.1.3.6.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	310,302.0000	*0.2636* 81,803.04	31,142.82	*0.3640* 112,945.85
1.3.1.3.7 Planting	**EA**	**1.0000**	*364,755.5219* **364,755.52**	**138,864.21**	*503,619.7335* **503,619.73**
1.3.1.3.7.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	776.0000	*237.5867* 184,367.31	70,189.54	*328.0372* 254,556.85
1.3.1.3.7.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	958.0000	*188.2967* 180,388.21	68,674.67	*259.9821* 249,062.89
1.3.1.3.8 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	*54.6567* **122,977.50**	**46,818.13**	*75.4647* **169,795.63**
1.3.1.3.8.1 Laborers, (Semi-Skilled)	HR	213.3621	*41.8937* 8,938.52	3,402.94	*57.8428* 12,341.46
1.3.1.3.8.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or	VLF	2,250.0000	*26.9321* 60,597.28	23,069.68	*37.1853* 83,666.96

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
demobilization					
1.3.1.3.8.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	213.3621	*120.6753* 25,747.53	9,802.21	*166.6170* 35,549.75
1.3.1.3.8.4 Equip. Operators, Medium	HR	213.3621	*87.9052* 18,755.64	7,140.36	*121.3712* 25,896.00
1.3.1.3.8.5 Laborers, (Semi-Skilled)	HR	213.3621	*41.8937* 8,938.52	3,402.94	*57.8428* 12,341.46
1.3.1.3.9 Stabilized Construction Entrance	**TON**	**55.0000**	*23.8906* **1,313.98**	**533.84**	*33.5967* **1,847.82**
1.3.1.3.9.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	55.0000	*11.7209* 644.65	261.90	*16.4828* 906.56
1.3.1.3.9.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	200.0000	*3.3467* 669.33	271.93	*4.7063* 941.26
1.3.1.3.10 Mulch Access Road	**EA**	**1.0000**	*177,122.4358* **177,122.44**	**67,431.38**	*244,553.8135* **244,553.81**
1.3.1.3.10.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	11,000.0000	*2.6748* 29,422.87	11,201.43	*3.6931* 40,624.31
1.3.1.3.10.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	445.5000	*331.5366* 147,699.56	56,229.95	*457.7542* 203,929.51
1.3.1.3.11 Temporary Seed and Mulch	**EA**	**1.0000**	*197,016.6355* **197,016.64**	**75,005.20**	*272,021.8325* **272,021.83**
1.3.1.3.11.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	34,478.0000	*3.0681* 105,780.86	40,271.29	*4.2361* 146,052.16
1.3.1.3.11.2 Seeding, mechanical seeding, 215 lb./acre	ACR	7.1200	*1,336.0041* 9,512.35	3,621.40	*1,844.6275* 13,133.75
1.3.1.3.11.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	310,000.0000	*0.2636* 81,723.42	31,112.51	*0.3640* 112,835.93
1.3.1.3.12 Orange Construction Fence	**LF**	**3,570.0000**	*2.8822* **10,289.48**	**4,180.34**	*4.0532* **14,469.82**
1.3.1.3.12.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	3,570.0000	*2.8822* 10,289.48	4,180.34	*4.0532* 14,469.82
1.3.1.3.13 Silt Fence	**EA**	**1.0000**	*2,175.3616* **2,175.36**	**883.79**	*3,059.1534* **3,059.15**
1.3.1.3.13.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	1,400.0000	*1.5538* 2,175.36	883.79	*2.1851* 3,059.15
1.3.1.3.14 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	*30.4091* **9,122.73**	**3,473.07**	*41.9860* **12,595.80**
1.3.1.3.14.1 willow stakes @ 4' spacing	EA	1,913.0000	*4.7688* 9,122.73	3,473.07	*6.5843* 12,595.80

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
1.3.1.3.15 Upstream Diversion	**EA**	**1.0000**	*189,255.2045* **189,255.20**	**72,050.38**	*261,305.5867* **261,305.59**
1.3.1.3.15.1 Pumping	**DAY**	**180.0000**	*946.5687* **170,382.37**	**64,865.40**	*1,306.9320* **235,247.77**
1.3.1.3.15.1.1 10" Pump, 2 pumps	DAY	180.0000	*281.2887* 50,631.97	19,275.84	*388.3767* 69,907.80
1.3.1.3.15.1.2 Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	22,794.78	*41.3350* 82,669.98
1.3.1.3.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	22,794.78	*41.3350* 82,669.98
1.3.1.3.15.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	*10.4849* **18,872.84**	**7,184.98**	*14.4766* **26,057.82**
1.3.1.3.15.2.1 Sandbags, 14" x 26"	EA	1,800.0000	*0.8462* 1,523.23	579.90	*1.1684* 2,103.12
1.3.1.3.15.2.2 Laborers, (Semi-Skilled)	HR	360.0000	*41.8937* 15,081.72	5,741.68	*57.8428* 20,823.41
1.3.1.3.15.2.3 Equip. Operators, Medium	HR	18.0000	*87.9052* 1,582.29	602.39	*121.3712* 2,184.68
1.3.1.3.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	*38.0888* 685.60	261.01	*52.5894* 946.61
1.3.1.3.16 Downstream Diversion	**EA**	**1.0000**	*179,944.7793* **179,944.78**	**68,505.86**	*248,450.6371* **248,450.64**
1.3.1.3.16.1 Pumping	**DAY**	**180.0000**	*946.5687* **170,382.37**	**64,865.40**	*1,306.9320* **235,247.77**
1.3.1.3.16.1.1 10" Pump, 2 pumps	DAY	180.0000	*281.2887* 50,631.97	19,275.84	*388.3767* 69,907.80
1.3.1.3.16.1.2 Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	22,794.78	*41.3350* 82,669.98
1.3.1.3.16.1.3 Local Relocate Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	22,794.78	*41.3350* 82,669.98
1.3.1.3.16.2 Sandbags to Be Set Up	**EA**	**900.0000**	*10.6249* **9,562.41**	**3,640.46**	*14.6699* **13,202.87**
1.3.1.3.16.2.1 Sandbags, 14" x 26"	EA	900.0000	*0.8462* 761.61	289.95	*1.1684* 1,051.56
1.3.1.3.16.2.2 Laborers, (Semi-Skilled)	HR	180.0000	*41.8937* 7,540.86	2,870.84	*57.8428* 10,411.70
1.3.1.3.16.2.3 Equip. Operators, Medium	HR	10.0000	*87.9052* 879.05	334.66	*121.3712* 1,213.71

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
1.3.1.3.16.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	10.0000	*38.0888* 380.89	145.01	*52.5894* 525.89
1.3.2 Adaptive Management Minor Repair *	**EA**	**1.0000**	*40,620.3693* **40,620.37**	**15,464.37**	*56,084.7427* **56,084.74**
1.3.2.1 Vane, J-Hook Repairs	**TON**	**100.0000**	*105.2528* **10,525.28**	**4,007.03**	*145.3231* **14,532.31**
1.3.2.1.1 Armor Stone Placement	TON	100.0000	*88.0767* 8,807.67	3,353.12	*121.6080* 12,160.80
1.3.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	*21.0743* 1,277.23	486.25	*29.0974* 1,763.48
1.3.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	*88.0767* 440.38	167.66	*121.6080* 608.04
1.3.2.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	*54.6567* **27,328.33**	**10,404.03**	*75.4647* **37,732.36**
1.3.2.2.1 Laborers, (Semi-Skilled)	HR	47.4138	*41.8937* 1,986.34	756.21	*57.8428* 2,742.55
1.3.2.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	*26.9321* 13,466.06	5,126.60	*37.1853* 18,592.66
1.3.2.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	*120.6753* 5,721.67	2,178.27	*166.6170* 7,899.94
1.3.2.2.4 Equip. Operators, Medium	HR	47.4138	*87.9052* 4,167.92	1,586.75	*121.3712* 5,754.67
1.3.2.2.5 Laborers, (Semi-Skilled)	HR	47.4138	*41.8937* 1,986.34	756.21	*57.8428* 2,742.55
1.3.2.3 Silt Fence	**EA**	**1.0000**	*969.1225* **969.12**	**368.95**	*1,338.0722* **1,338.07**
1.3.2.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	*1.9382* 969.12	368.95	*2.6761* 1,338.07
1.3.2.4 Orange Construction Fence	**LF**	**500.0000**	*3.5953* **1,797.63**	**684.37**	*4.9640* **2,482.00**
1.3.2.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	*3.5953* 1,797.63	684.37	*4.9640* 2,482.00
1.4 PED - Monitoring only	**EA**	**1.0000**	*0.0000* **0.00**	**0.00**	*94,999.9800* **94,999.98**
1.4.1 Study Mobilization each year for 5 years	EA	1.0000	*0.0000* 0.00	0.00	*2,500.0000* 2,500.00
			0.0000		*25,000.0000*

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
1.4.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	25,000.00
1.4.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	*0.0000* 0.00	0.00	*8,333.3500* 8,333.35
1.4.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	*0.0000* 0.00	0.00	*9,166.6500* 9,166.65
1.4.5 Report each year for 5 years	EA	1.0000	*0.0000* 0.00	0.00	*11,666.6500* 11,666.65
1.4.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	*0.0000* 0.00	0.00	*3,833.3333* 3,833.33
1.4.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	*0.0000* 0.00	0.00	*2,833.3333* 2,833.33
1.4.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	*0.0000* 0.00	0.00	*2,833.3300* 2,833.33
1.4.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	*0.0000* 0.00	0.00	*500.0000* 500.00
1.4.10 4 subsequence years of monitoring	EA	1.0000	*0.0000* 0.00	0.00	*24,666.6667* 24,666.67
1.4.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	*0.0000* 0.00	0.00	*1,666.6667* 1,666.67
1.4.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	*0.0000* 0.00	0.00	*2,000.0000* 2,000.00
2 Site 3 and 9	**EA**	**1.0000**	*5,087,458.1118* **5,087,458.11**	**1,602,405.03**	*6,912,863.1032* **6,912,863.10**
2.1 Lands and Damages	**EA**	**1.0000**	*0.0000* **0.00**	**0.00**	*33,000.0000* **33,000.00**
2.1.1 RE Cost for site 3, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	*0.0000* 0.00	0.00	*16,500.0000* 16,500.00
2.1.2 RE Cost for site 9, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	*0.0000* 0.00	0.00	*16,500.0000* 16,500.00
2.2 Relocations	**EA**	**1.0000**	*216,703.9589* **216,703.96**	**68,231.41**	*284,935.3639* **284,935.36**
2.2.1 Roads, Construction Activities for Site 3	**EA**	**1.0000**	*216,703.9589* **216,703.96**	**68,231.41**	*284,935.3639* **284,935.36**
2.2.1.1 Bridges. Foundations	**EA**	**1.0000**	*52,015.8336* **52,015.83**	**16,377.70**	*68,393.5381* **68,393.54**
2.2.1.1.1 Concrete	**EA**	**1.0000**	*52,015.8336* **52,015.83**	**16,377.70**	*68,393.5381* **68,393.54**
2.2.1.1.1.1 Concrete, in Place:	**EA**	**1.0000**	*52,015.8336* **52,015.83**	**16,377.70**	*68,393.5381* **68,393.54**

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
			21.1471		*27.8054*
2.2.1.1.1.1.1 C.I.P. concrete forms, equipment foundations, 1 use, includes erecting, bracing, stripping and cleaning	SFC	800.0000	16,917.64	5,326.69	22,244.33
			350.9819		*461.4920*
2.2.1.1.1.1.2 Structural concrete, in place, foundation mat (3000 psi), over 20 C.Y., includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	CY	100.0000	35,098.19	11,051.02	46,149.20
			164,688.1253		*216,541.8258*
2.2.1.2 Bridges, Superstructure and Deck	**EA**	**1.0000**	**164,688.13**	**51,853.70**	**216,541.83**
			164,688.1253		*216,541.8258*
2.2.1.2.1 Metals	**EA**	**1.0000**	**164,688.13**	**51,853.70**	**216,541.83**
			80,020.5431		*105,215.8101*
2.2.1.2.1.1 Steel Trusses, Girders and B	**EA**	**1.0000**	**80,020.54**	**25,195.27**	**105,215.81**
			12.6454		*16.6269*
2.2.1.2.1.1.1 Fabricated pedestrian bridges, steel, trussed or arch spans, complete in place, 10' wide, 150' span, includes erection, excludes foundations	SF	1,500.0000	18,968.05	5,972.28	24,940.33
			174.4981		*229.4406*
2.2.1.2.1.1.2 Mobilization or demobilization, crane, truck-mounted, up to 75 ton, (driver only)	EA	4.0000	697.99	219.77	917.76
			4,311.0360		*5,668.4087*
2.2.1.2.1.1.3 Crane crew, daily use for small jobs, 100-ton truck-mounted hydraulic crane, portal to portal	DAY	14.0000	60,354.50	19,003.22	79,357.72
			7,755.9757		*10,198.0221*
2.2.1.2.1.2 Bearing Pads	**EA**	**1.0000**	**7,755.98**	**2,442.05**	**10,198.02**
			77.5598		*101.9802*
2.2.1.2.1.2.1 Bearing pad, fabric reinforced neoprene, 5000 psi, 1/2" thick	SF	100.0000	7,755.98	2,442.05	10,198.02
			76,911.6064		*101,127.9936*
2.2.1.2.1.3 Miscellaneous Steel (all type	**EA**	**1.0000**	**76,911.61**	**24,216.39**	**101,127.99**
			76,911.6064		*101,127.9936*
2.2.1.2.1.3.1 Bridge Stiffeners	**EA**	**1.0000**	**76,911.61**	**24,216.39**	**101,127.99**
			51.2744		*67.4187*
2.2.1.2.1.3.1.1 Channel framing, structural steel, field fabricated, C6x8.2, incl cutting & welding	LF	1,500.0000	76,911.61	24,216.39	101,127.99
			4,870,754.1530		*6,404,927.7793*
2.3 Bank Stabilization	**EA**	**1.0000**	**4,870,754.15**	**1,534,173.63**	**6,404,927.78**
			3,526,092.1198		*4,636,777.2905*
2.3.1 Bank Stabilization for Site 3	**EA**	**1.0000**	**3,526,092.12**	**1,110,685.17**	**4,636,777.29**
			49,297.4539		*64,819.2495*
2.3.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**49,297.45**	**15,521.80**	**64,819.25**
			45,657.2211		*60,032.8531*
2.3.1.1.1 Mob & Demob	EA	1.0000	45,657.22	14,375.63	60,032.85
			149.4260		*196.4743*
2.3.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	298.85	94.10	392.95
			89.8343		*118.1196*
2.3.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	1,437.35	452.56	1,889.91

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
2.3.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	*3.9667* 1,904.03	599.50	*5.2157* 2,503.53
2.3.1.2 Earthwork	**EA**	**1.0000**	*1,012,653.3548* **1,012,653.35**	**318,844.02**	*1,331,497.3741* **1,331,497.37**
2.3.1.2.1 Site Work	**EA**	**1.0000**	*1,012,653.3548* **1,012,653.35**	**318,844.02**	*1,331,497.3741* **1,331,497.37**
2.3.1.2.1.1 Clearing and Grubbing	**ACR**	**5.1800**	*8,338.4151* **43,192.99**	**13,599.74**	*10,963.8484* **56,792.73**
2.3.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	5.1800	*5,227.0295* 27,076.01	8,525.15	*6,872.8119* 35,601.17
2.3.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	5.1800	*2,577.4091* 13,350.98	4,203.69	*3,388.9320* 17,554.67
2.3.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	500.0000	*5.5320* 2,766.00	870.90	*7.2738* 3,636.90
2.3.1.2.1.2 Excavation, Common	**CY**	**21,500.0000**	*2.4293* **52,229.06**	**16,444.84**	*3.1941* **68,673.90**
2.3.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	21,500.0000	*2.4293* 52,229.06	16,444.84	*3.1941* 68,673.90
2.3.1.2.1.3 Fill	**CY**	**37,800.0000**	*24.2654* **917,231.31**	**288,799.44**	*31.9056* **1,206,030.74**
2.3.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	27,800.0000	*22.7292* 631,871.88	198,951.17	*29.8857* 830,823.05
2.3.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	21,500.0000	*3.0096* 64,706.93	20,373.62	*3.9572* 85,080.56
2.3.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	27,800.0000	*5.6783* 157,857.01	49,702.86	*7.4662* 207,559.87
2.3.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	49,300.0000	*1.2737* 62,795.48	19,771.78	*1.6748* 82,567.26
2.3.1.3 Associated General Items	**EA**	**1.0000**	*2,426,855.6051* **2,426,855.61**	**764,579.58**	*3,191,435.1841* **3,191,435.18**
2.3.1.3.1 Vane	**TON**	**2,475.0000**	*99.9057* **247,266.70**	**77,854.39**	*131.3621* **325,121.09**
2.3.1.3.1.1 Armor Stone Placement	TON	2,475.0000	*84.5047* 209,149.26	65,852.73	*111.1119* 275,001.99
2.3.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,500.0000	*18.4400* 27,659.99	8,709.02	*24.2460* 36,369.01

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
2.3.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	123.7500	*84.5047* 10,457.46	3,292.64	*111.1119* 13,750.10
2.3.1.3.2 J-Hook, Upper Reach	**TON**	**495.0000**	*99.9057* **49,453.34**	**15,570.88**	*131.3621* **65,024.22**
2.3.1.3.2.1 Armor Stone Placement	TON	495.0000	*84.5047* 41,829.85	13,170.55	*111.1119* 55,000.40
2.3.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	300.0000	*18.4400* 5,532.00	1,741.80	*24.2460* 7,273.80
2.3.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	24.7500	*84.5047* 2,091.49	658.53	*111.1119* 2,750.02
2.3.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	*242,569.0819* **242,569.08**	**76,375.30**	*318,944.3792* **318,944.38**
2.3.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	7,232.0000	*33.5411* 242,569.08	76,375.30	*44.1018* 318,944.38
2.3.1.3.4 Misc. Rock	**TON**	**50.0000**	*99.7940* **4,989.70**	**1,571.06**	*131.2151* **6,560.76**
2.3.1.3.4.1 Armor Stone Placement	TON	50.0000	*84.5047* 4,225.24	1,330.36	*111.1119* 5,555.60
2.3.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	30.0000	*18.4400* 553.20	174.18	*24.2460* 727.38
2.3.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	2.5000	*84.5047* 211.26	66.52	*111.1119* 277.78
2.3.1.3.5 Replace Damaged Path	**SY**	**56.0000**	*39.6020* **2,217.71**	**698.27**	*52.0710* **2,915.98**
2.3.1.3.5.1 Fine grading, finish grading, small area, to be paved with grader	SY	56.0000	*4.8534* 271.79	85.58	*6.3815* 357.36
2.3.1.3.5.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	56.0000	*1.8802* 105.29	33.15	*2.4722* 138.45
2.3.1.3.5.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	488.7273	*2.6264* 1,283.60	404.16	*3.4534* 1,687.76
2.3.1.3.5.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	56.0000	*1.0920* 61.15	19.25	*1.4358* 80.41
2.3.1.3.5.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	5.0909	*10.8850* 55.41	17.45	*14.3122* 72.86
2.3.1.3.5.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	48.8727	*0.5844* 28.56	8.99	*0.7683* 37.55
2.3.1.3.5.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base,	SY	56.0000	*7.3553* 411.90	129.69	*9.6712* 541.59

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
compacted, 3/4" stone base, to 6" deep					
2.3.1.3.6 Seed and Mulch	**EA**	**1.0000**	*340,282.9784* **340,282.98**	**107,141.49**	*447,424.4717* **447,424.47**
2.3.1.3.6.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	65,090.0000	*2.7573* 179,471.57	56,508.42	*3.6254* 235,979.99
2.3.1.3.6.2 Seeding, mechanical seeding, 215 lb./acre	ACR	13.4500	*1,261.5607* 16,967.99	5,342.54	*1,658.7757* 22,310.53
2.3.1.3.6.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	585,810.0000	*0.2455* 143,843.42	45,290.54	*0.3229* 189,133.95
2.3.1.3.7 Planting	**EA**	**1.0000**	*487,441.2410* **487,441.24**	**153,475.74**	*640,916.9825* **640,916.98**
2.3.1.3.7.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	1,072.0000	*229.5401* 246,067.03	77,476.66	*301.8131* 323,543.70
2.3.1.3.7.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	1,323.0000	*182.4446* 241,374.21	75,999.08	*239.8891* 317,373.29
2.3.1.3.8 Wooden logs for stabilization and in stream structures	**LF**	**3,000.0000**	*49.4361* **148,308.20**	**46,696.32**	*65.0015* **195,004.52**
2.3.1.3.8.1 Laborers, (Semi-Skilled)	HR	284.4828	*36.6570* 10,428.27	3,283.45	*48.1988* 13,711.72
2.3.1.3.8.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	3,000.0000	*25.1771* 75,531.28	23,781.78	*33.1044* 99,313.06
2.3.1.3.8.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	284.4828	*105.5909* 30,038.79	9,458.01	*138.8372* 39,496.80
2.3.1.3.8.4 Equip. Operators, Medium	HR	284.4828	*76.9171* 21,881.58	6,889.63	*101.1352* 28,771.22
2.3.1.3.8.5 Laborers, (Semi-Skilled)	HR	284.4828	*36.6570* 10,428.27	3,283.45	*48.1988* 13,711.72
2.3.1.3.9 Stabilized Construction Entrance	**TON**	**92.0000**	*22.9798* **2,114.14**	**717.13**	*30.7747* **2,831.27**
2.3.1.3.9.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	92.0000	*11.3158* 1,041.06	353.14	*15.1542* 1,394.19
2.3.1.3.9.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	333.0000	*3.2225* 1,073.08	364.00	*4.3156* 1,437.08
2.3.1.3.10 Mulch Access Road	**EA**	**1.0000**	*179,226.4409* **179,226.44**	**56,431.23**	*235,657.6753* **235,657.68**
2.3.1.3.10.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	11,500.0000	*2.6446* 30,412.58	9,575.70	*3.4772* 39,988.28
2.3.1.3.10.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	465.7500	*319.5145* 148,813.86	46,855.53	*420.1168* 195,669.39

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
2.3.1.3.11 Temporary Seed and Mulch	**EA**	**1.0000**	*340,282.9784* **340,282.98**	**107,141.49**	*447,424.4717* **447,424.47**
2.3.1.3.11.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	65,090.0000	*2.7573* 179,471.57	56,508.42	*3.6254* 235,979.99
2.3.1.3.11.2 Seeding, mechanical seeding, 215 lb./acre	ACR	13.4500	*1,261.5607* 16,967.99	5,342.54	*1,658.7757* 22,310.53
2.3.1.3.11.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	585,810.0000	*0.2455* 143,843.42	45,290.54	*0.3229* 189,133.95
2.3.1.3.12 Orange Construction Fence	**LF**	**5,450.0000**	*2.6770* **14,589.41**	**4,948.86**	*3.5850* **19,538.27**
2.3.1.3.12.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	5,450.0000	*2.6770* 14,589.41	4,948.86	*3.5850* 19,538.27
2.3.1.3.13 Silt Fence	**EA**	**1.0000**	*2,182.5012* **2,182.50**	**740.32**	*2,922.8258* **2,922.83**
2.3.1.3.13.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	1,500.0000	*1.4550* 2,182.50	740.32	*1.9486* 2,922.83
2.3.1.3.14 Upstream Diversion	**EA**	**1.0000**	*187,086.5028* **187,086.50**	**58,906.05**	*245,992.5562* **245,992.56**
2.3.1.3.14.1 Pumping	**DAY**	**180.0000**	*946.5687* **170,382.37**	**53,646.59**	*1,244.6053* **224,028.96**
2.3.1.3.14.1.1 10" Pump, 2 pumps	DAY	180.0000	*281.2887* 50,631.97	15,941.98	*369.8553* 66,573.95
2.3.1.3.14.1.2 Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	18,852.30	*39.3638* 78,727.50
2.3.1.3.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	18,852.30	*39.3638* 78,727.50
2.3.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	*9.2801* **16,704.14**	**5,259.46**	*12.2020* **21,963.60**
2.3.1.3.14.2.1 Sandbags, 14" x 26"	EA	1,800.0000	*0.8462* 1,523.23	479.60	*1.1127* 2,002.83
2.3.1.3.14.2.2 Laborers, (Semi-Skilled)	HR	360.0000	*36.6570* 13,196.51	4,155.05	*48.1988* 17,351.56
2.3.1.3.14.2.3 Equip. Operators, Medium	HR	18.0000	*76.9171* 1,384.51	435.93	*101.1352* 1,820.43
2.3.1.3.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	*33.3277* 599.90	188.88	*43.8213* 788.78
2.3.1.3.15 Downstream Diversion	**EA**	**1.0000**	*178,844.6792* **178,844.68**	**56,311.03**	*235,155.7121* **235,155.71**

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
2.3.1.3.15.1 Pumping	**DAY**	**180.0000**	*946.5687* **170,382.37**	**53,646.59**	*1,244.6053* **224,028.96**
2.3.1.3.15.1.1 10" Pump, 2 pumps	DAY	180.0000	*281.2887* 50,631.97	15,941.98	*369.8553* 66,573.95
2.3.1.3.15.1.2 Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	18,852.30	*39.3638* 78,727.50
2.3.1.3.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	18,852.30	*39.3638* 78,727.50
2.3.1.3.15.2 Sandbags to Be Set Up	**EA**	**900.0000**	*9.4026* **8,462.31**	**2,664.44**	*12.3631* **11,126.76**
2.3.1.3.15.2.1 Sandbags, 14" x 26"	EA	900.0000	*0.8462* 761.61	239.80	*1.1127* 1,001.41
2.3.1.3.15.2.2 Laborers, (Semi-Skilled)	HR	180.0000	*36.6570* 6,598.25	2,077.53	*48.1988* 8,675.78
2.3.1.3.15.2.3 Equip. Operators, Medium	HR	10.0000	*76.9171* 769.17	242.18	*101.1352* 1,011.35
2.3.1.3.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	10.0000	*33.3277* 333.28	104.94	*43.8213* 438.21
2.3.1.4 Adaptive Management Minor Repair *	**EA**	**1.0000**	*37,285.7061* **37,285.71**	**11,739.78**	*49,025.4829* **49,025.48**
2.3.1.4.1 Vane, J-Hook Repairs	**TON**	**100.0000**	*99.9057* **9,990.57**	**3,145.63**	*131.3621* **13,136.21**
2.3.1.4.1.1 Armor Stone Placement	TON	100.0000	*84.5047* 8,450.47	2,660.72	*111.1119* 11,111.19
2.3.1.4.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	*18.4400* 1,117.58	351.88	*24.2460* 1,469.45
2.3.1.4.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	*84.5047* 422.52	133.04	*111.1119* 555.56
2.3.1.4.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	*49.4361* **24,718.03**	**7,782.72**	*65.0015* **32,500.75**
2.3.1.4.2.1 Laborers, (Semi-Skilled)	HR	47.4138	*36.6570* 1,738.05	547.24	*48.1988* 2,285.29
2.3.1.4.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	*25.1771* 12,588.55	3,963.63	*33.1044* 16,552.18
2.3.1.4.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	*105.5909* 5,006.46	1,576.34	*138.8372* 6,582.80
			76.9171		*101.1352*

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
2.3.1.4.2.4 Equip. Operators, Medium	HR	47.4138	3,646.93	1,148.27	4,795.20
			36.6570		*48.1988*
2.3.1.4.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,738.05	547.24	2,285.29
			907.4832		*1,193.2133*
2.3.1.4.3 Silt Fence	**EA**	**1.0000**	**907.48**	**285.73**	**1,193.21**
			1.8150		*2.3864*
2.3.1.4.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	907.48	285.73	1,193.21
			3.3392		*4.3906*
2.3.1.4.4 Orange Construction Fence	**LF**	**500.0000**	**1,669.62**	**525.70**	**2,195.31**
			3.3392		*4.3906*
2.3.1.4.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	1,669.62	525.70	2,195.31
			1,344,662.0332		*1,768,150.4887*
2.3.2 Bank Stabilization for Site 9	**EA**	**1.0000**	**1,344,662.03**	**423,488.46**	**1,768,150.49**
			331,425.4994		*435,778.1270*
2.3.2.1 Earthwork	**EA**	**1.0000**	**331,425.50**	**104,352.63**	**435,778.13**
			331,425.4994		*435,778.1270*
2.3.2.1.1 Site Work	**EA**	**1.0000**	**331,425.50**	**104,352.63**	**435,778.13**
			8,449.8382		*11,110.3542*
2.3.2.1.1.1 Clearing and Grubbing	**ACR**	**3.0000**	**25,349.51**	**7,981.55**	**33,331.06**
			5,227.0295		*6,872.8119*
2.3.2.1.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	3.0000	15,681.09	4,937.35	20,618.44
			2,577.4091		*3,388.9320*
2.3.2.1.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	3.0000	7,732.23	2,434.57	10,166.80
			5.5320		*7.2738*
2.3.2.1.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	350.0000	1,936.20	609.63	2,545.83
			2.4293		*3.1941*
2.3.2.1.1.2 Excavation, Common	**CY**	**1,380.0000**	**3,352.38**	**1,055.53**	**4,407.91**
			2.4293		*3.1941*
2.3.2.1.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	1,380.0000	3,352.38	1,055.53	4,407.91
			8.0086		*10.5301*
2.3.2.1.1.3 Fill	**CY**	**37,800.0000**	**302,723.61**	**95,315.55**	**398,039.16**
			22.7292		*29.8857*
2.3.2.1.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	10,000.0000	227,292.04	71,565.17	298,857.21
			3.0096		*3.9572*
2.3.2.1.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	1,380.0000	4,153.28	1,307.70	5,460.98
			5.6783		*7.4662*
2.3.2.1.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	10,000.0000	56,783.10	17,878.73	74,661.82

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
			1.2737		*1.6748*
2.3.2.1.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	11,380.0000	14,495.18	4,563.95	19,059.14
			975,950.8277		*1,283,346.8789*
2.3.2.2 Associated General Items	**EA**	**1.0000**	**975,950.83**	**307,396.05**	**1,283,346.88**
			99.9057		*131.3621*
2.3.2.2.1 Vane	**TON**	**660.0000**	**65,937.79**	**20,761.17**	**86,698.96**
			84.5047		*111.1119*
2.3.2.2.1.1 Armor Stone Placement	TON	660.0000	55,773.13	17,560.73	73,333.86
			18.4400		*24.2460*
2.3.2.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	400.0000	7,376.00	2,322.41	9,698.40
			84.5047		*111.1119*
2.3.2.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	33.0000	2,788.66	878.04	3,666.69
			99.9057		*131.3621*
2.3.2.2.2 J-Hook, Upper Reach	**TON**	**116.0000**	**11,589.07**	**3,648.93**	**15,238.00**
			84.5047		*111.1119*
2.3.2.2.2.1 Armor Stone Placement	TON	116.0000	9,802.55	3,086.43	12,888.98
			18.4400		*24.2460*
2.3.2.2.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	70.3030	1,296.39	408.18	1,704.57
			84.5047		*111.1119*
2.3.2.2.2.3 Waste/loss factor for armor stones, assume 5%	TON	5.8000	490.13	154.32	644.45
			85,529.7509		*112,459.6470*
2.3.2.2.3 Topsoil 4 in depth	**EA**	**1.0000**	**85,529.75**	**26,929.90**	**112,459.65**
			33.5411		*44.1018*
2.3.2.2.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	2,550.0000	85,529.75	26,929.90	112,459.65
			99.8922		*131.3443*
2.3.2.2.4 Misc. Rock	**TON**	**41.3000**	**4,125.55**	**1,298.97**	**5,424.52**
			84.5047		*111.1119*
2.3.2.2.4.1 Armor Stone Placement	TON	41.3000	3,490.05	1,098.88	4,588.92
			18.4400		*24.2460*
2.3.2.2.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	25.0000	461.00	145.15	606.15
			84.5047		*111.1119*
2.3.2.2.4.3 Waste/loss factor for armor stones, assume 5%	TON	2.0650	174.50	54.94	229.45
			39.6020		*52.0710*
2.3.2.2.5 Replace Damaged Path	**SY**	**34.0000**	**1,346.47**	**423.95**	**1,770.41**
			4.8534		*6.3815*
2.3.2.2.5.1 Fine grading, finish grading, small area, to be paved with grader	SY	34.0000	165.01	51.96	216.97
			1.8802		*2.4722*

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
2.3.2.2.5.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	34.0000	63.93	20.13	84.06
			2.6264		*3.4534*
2.3.2.2.5.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	296.7273	779.33	245.38	1,024.71
			1.0920		*1.4358*
2.3.2.2.5.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	34.0000	37.13	11.69	48.82
			10.8850		*14.3122*
2.3.2.2.5.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	3.0909	33.64	10.59	44.24
			0.5844		*0.7683*
2.3.2.2.5.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	29.6727	17.34	5.46	22.80
			7.3553		*9.6712*
2.3.2.2.5.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	34.0000	250.08	78.74	328.82
			119,952.1802		*157,720.3218*
2.3.2.2.6 Seed and Mulch	**EA**	**1.0000**	**119,952.18**	**37,768.14**	**157,720.32**
			2.7573		*3.6254*
2.3.2.2.6.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	22,945.0000	63,265.87	19,919.89	83,185.76
			1,261.5607		*1,658.7757*
2.3.2.2.6.2 Seeding, mechanical seeding, 215 lb./acre	ACR	4.7400	5,979.80	1,882.80	7,862.60
			0.2455		*0.3229*
2.3.2.2.6.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	206,505.0000	50,706.52	15,965.45	66,671.97
			214,708.1501		*282,311.1549*
2.3.2.2.7 Planting	**EA**	**1.0000**	**214,708.15**	**67,603.00**	**282,311.15**
			229.5401		*301.8131*
2.3.2.2.7.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	472.0000	108,342.95	34,112.86	142,455.81
			182.4446		*239.8891*
2.3.2.2.7.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	583.0000	106,365.20	33,490.15	139,855.35
			49.4361		*65.0015*
2.3.2.2.8 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	**111,231.15**	**35,022.24**	**146,253.39**
			36.6570		*48.1988*
2.3.2.2.8.1 Laborers, (Semi-Skilled)	HR	213.3621	7,821.20	2,462.58	10,283.79
			25.1771		*33.1044*
2.3.2.2.8.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	2,250.0000	56,648.46	17,836.33	74,484.80
			105.5909		*138.8372*
2.3.2.2.8.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	213.3621	22,529.09	7,093.51	29,622.60
			76.9171		*101.1352*
2.3.2.2.8.4 Equip. Operators, Medium	HR	213.3621	16,411.19	5,167.23	21,578.41
			36.6570		*48.1988*
2.3.2.2.8.5 Laborers, (Semi-Skilled)	HR	213.3621	7,821.20	2,462.58	10,283.79
			23.3106		*31.2177*

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
2.3.2.2.9 Stabilized Construction Entrance	**TON**	**18.0000**	**419.59**	**142.33**	**561.92**
			11.3158		*15.1542*
2.3.2.2.9.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	18.0000	203.68	69.09	272.78
			3.2225		*4.3156*
2.3.2.2.9.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	67.0000	215.91	73.24	289.14
			58,957.7066		*77,521.1292*
2.3.2.2.10 Mulch Access Road	**EA**	**1.0000**	**58,957.71**	**18,563.42**	**77,521.13**
			2.6446		*3.4772*
2.3.2.2.10.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	3,783.0000	10,004.42	3,149.99	13,154.41
			319.5145		*420.1168*
2.3.2.2.10.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	153.2115	48,953.29	15,413.43	64,366.72
			119,952.1802		*157,720.3218*
2.3.2.2.11 Temporary Seed and Mulch	**EA**	**1.0000**	**119,952.18**	**37,768.14**	**157,720.32**
			2.7573		*3.6254*
2.3.2.2.11.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	22,945.0000	63,265.87	19,919.89	83,185.76
			1,261.5607		*1,658.7757*
2.3.2.2.11.2 Seeding, mechanical seeding, 215 lb./acre	ACR	4.7400	5,979.80	1,882.80	7,862.60
			0.2455		*0.3229*
2.3.2.2.11.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	206,505.0000	50,706.52	15,965.45	66,671.97
			2.6770		*3.5850*
2.3.2.2.12 Orange Construction Fence	**LF**	**1,340.0000**	**3,587.12**	**1,216.78**	**4,803.91**
			2.6770		*3.5850*
2.3.2.2.12.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	1,340.0000	3,587.12	1,216.78	4,803.91
			436.5002		*584.5652*
2.3.2.2.13 Silt Fence	**EA**	**1.0000**	**436.50**	**148.06**	**584.57**
			1.4550		*1.9486*
2.3.2.2.13.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	300.0000	436.50	148.06	584.57
			178,177.6299		*234,278.6356*
2.3.2.2.14 Upstream Diversion	**EA**	**1.0000**	**178,177.63**	**56,101.01**	**234,278.64**
			3,407.6473		*4,480.5791*
2.3.2.2.14.1 Pumping	**DAY**	**50.0000**	**170,382.37**	**53,646.59**	**224,028.96**
			281.2887		*369.8553*
2.3.2.2.14.1.1 10" Pump, 2 pumps	DAY	180.0000	50,631.97	15,941.98	66,573.95
			29.9376		*39.3638*
2.3.2.2.14.1.2 Rigid Piping	LF	2,000.0000	59,875.20	18,852.30	78,727.50
			29.9376		*39.3638*
2.3.2.2.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	59,875.20	18,852.30	78,727.50
			9.2801		*12.2020*
2.3.2.2.14.2 Sandbags to Be Set Up	**EA**	**840.0000**	**7,795.26**	**2,454.42**	**10,249.68**

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
			0.8462		*1.1127*
2.3.2.2.14.2.1 Sandbags, 14" x 26"	EA	840.0000	710.84	223.81	934.65
			36.6570		*48.1988*
2.3.2.2.14.2.2 Laborers, (Semi-Skilled)	HR	168.0000	6,158.37	1,939.02	8,097.39
			76.9171		*101.1352*
2.3.2.2.14.2.3 Equip. Operators, Medium	HR	8.4000	646.10	203.43	849.54
			33.3277		*43.8213*
2.3.2.2.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	8.4000	279.95	88.15	368.10
			37,285.7061		*49,025.4829*
2.3.2.3 Adaptive Management Minor Repair *	**EA**	**1.0000**	**37,285.71**	**11,739.78**	**49,025.48**
			99.9057		*131.3621*
2.3.2.3.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**9,990.57**	**3,145.63**	**13,136.21**
			84.5047		*111.1119*
2.3.2.3.1.1 Armor Stone Placement	TON	100.0000	8,450.47	2,660.72	11,111.19
			18.4400		*24.2460*
2.3.2.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	1,117.58	351.88	1,469.45
			84.5047		*111.1119*
2.3.2.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	422.52	133.04	555.56
			49.4361		*65.0015*
2.3.2.3.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**24,718.03**	**7,782.72**	**32,500.75**
			36.6570		*48.1988*
2.3.2.3.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,738.05	547.24	2,285.29
			25.1771		*33.1044*
2.3.2.3.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	12,588.55	3,963.63	16,552.18
			105.5909		*138.8372*
2.3.2.3.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	5,006.46	1,576.34	6,582.80
			76.9171		*101.1352*
2.3.2.3.2.4 Equip. Operators, Medium	HR	47.4138	3,646.93	1,148.27	4,795.20
			36.6570		*48.1988*
2.3.2.3.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,738.05	547.24	2,285.29
			907.4832		*1,193.2133*
2.3.2.3.3 Silt Fence	**EA**	**1.0000**	**907.48**	**285.73**	**1,193.21**
			1.8150		*2.3864*
2.3.2.3.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	907.48	285.73	1,193.21
			3.3392		*4.3906*
2.3.2.3.4 Orange Construction Fence	**LF**	**500.0000**	**1,669.62**	**525.70**	**2,195.31**
			3.3392		*4.3906*

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
2.3.2.3.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	1,669.62	525.70	2,195.31
			0.0000		*189,999.9600*
2.4 PED - Monitoring Only	**EA**	**1.0000**	**0.00**	**0.00**	**189,999.96**
			0.0000		*94,999.9800*
2.4.1 PED - Monitoring only for site 3	**EA**	**1.0000**	**0.00**	**0.00**	**94,999.98**
			0.0000		*2,500.0000*
2.4.1.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	2,500.00
			0.0000		*25,000.0000*
2.4.1.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	25,000.00
			0.0000		*8,333.3500*
2.4.1.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	8,333.35
			0.0000		*9,166.6500*
2.4.1.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	0.00	0.00	9,166.65
			0.0000		*11,666.6500*
2.4.1.5 Report each year for 5 years	EA	1.0000	0.00	0.00	11,666.65
			0.0000		*3,833.3333*
2.4.1.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	0.00	0.00	3,833.33
			0.0000		*2,833.3333*
2.4.1.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	0.00	0.00	2,833.33
			0.0000		*2,833.3300*
2.4.1.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	0.00	0.00	2,833.33
			0.0000		*500.0000*
2.4.1.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	0.00	0.00	500.00
			0.0000		*24,666.6667*
2.4.1.10 4 subsequence years of monitoring	EA	1.0000	0.00	0.00	24,666.67
			0.0000		*1,666.6667*
2.4.1.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	0.00	0.00	1,666.67
			0.0000		*2,000.0000*
2.4.1.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	0.00	0.00	2,000.00
			0.0000		*94,999.9800*
2.4.2 PED - Monitoring only for site 9	**EA**	**1.0000**	**0.00**	**0.00**	**94,999.98**
			0.0000		*2,500.0000*
2.4.2.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	2,500.00
			0.0000		*25,000.0000*
2.4.2.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	25,000.00
			0.0000		*8,333.3500*
2.4.2.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	8,333.35
			0.0000		*9,166.6500*
2.4.2.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	0.00	0.00	9,166.65

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
			0.0000		*11,666.6500*
2.4.2.5 Report each year for 5 years	EA	1.0000	0.00	0.00	11,666.65
			0.0000		*3,833.3333*
2.4.2.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	0.00	0.00	3,833.33
			0.0000		*2,833.3333*
2.4.2.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	0.00	0.00	2,833.33
			0.0000		*2,833.3300*
2.4.2.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	0.00	0.00	2,833.33
			0.0000		*500.0000*
2.4.2.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	0.00	0.00	500.00
			0.0000		*24,666.6667*
2.4.2.10 4 subsequence years of monitoring	EA	1.0000	0.00	0.00	24,666.67
			0.0000		*1,666.6667*
2.4.2.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	0.00	0.00	1,666.67
			0.0000		*2,000.0000*
2.4.2.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	0.00	0.00	2,000.00
			4,768,529.5583		*6,649,262.7672*
3 Site 5 and 15	**EA**	**1.0000**	**4,768,529.56**	**1,575,963.25**	**6,649,262.77**
			0.0000		*114,770.0000*
3.1 Lands and Damages	**EA**	**1.0000**	**0.00**	**0.00**	**114,770.00**
			0.0000		*98,270.0000*
3.1.1 RE Cost for site 5, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	0.00	0.00	98,270.00
			0.0000		*16,500.0000*
3.1.2 RE Cost for site 15, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	0.00	0.00	16,500.00
			4,768,529.5583		*6,344,492.8072*
3.2 Bank Stabilization	**EA**	**1.0000**	**4,768,529.56**	**1,575,963.25**	**6,344,492.81**
			3,041,466.2345		*4,046,695.4544*
3.2.1 Bank Stabilization - Site 5	**EA**	**1.0000**	**3,041,466.23**	**1,005,229.22**	**4,046,695.45**
			49,297.4539		*65,588.5384*
3.2.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**49,297.45**	**16,291.08**	**65,588.54**
			45,657.2211		*60,745.3360*
3.2.1.1.1 Mob & Demob	EA	1.0000	45,657.22	15,088.11	60,745.34
			149.4260		*198.8061*
3.2.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	298.85	98.76	397.61
			89.8343		*119.5214*
3.2.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	1,437.35	474.99	1,912.34
			3.9667		*5.2776*
3.2.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	1,904.03	629.22	2,533.25

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
3.2.1.2 Earthwork	**EA**	**1.0000**	*850,739.2888* **850,739.29**	**281,139.58**	*1,131,878.8713* **1,131,878.87**
3.2.1.2.1 Site Work	**EA**	**1.0000**	*850,739.2888* **850,739.29**	**281,139.58**	*1,131,878.8713* **1,131,878.87**
3.2.1.2.1.1 Clearing and Grubbing	**ACR**	**7.1600**	*11,059.0440* **79,182.76**	**26,167.13**	*14,713.6713* **105,349.89**
3.2.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	7.1600	*6,969.3727* 49,900.71	16,490.44	*9,272.5066* 66,391.15
3.2.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	7.1600	*3,436.5454* 24,605.67	8,131.31	*4,572.2035* 32,736.98
3.2.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	634.0000	*7.3760* 4,676.38	1,545.38	*9.8135* 6,221.76
3.2.1.2.1.2 Excavation, Common	**CY**	**17,100.0000**	*3.2390* **55,387.09**	**18,303.50**	*4.3094* **73,690.59**
3.2.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	17,100.0000	*3.2390* 55,387.09	18,303.50	*4.3094* 73,690.59
3.2.1.2.1.3 Fill	**CY**	**34,400.0000**	*20.8189* **716,169.44**	**236,668.95**	*27.6988* **952,838.40**
3.2.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	17,300.0000	*24.8403* 429,737.72	142,013.29	*33.0492* 571,751.01
3.2.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	17,100.0000	*4.0128* 68,619.45	22,676.33	*5.3389* 91,295.77
3.2.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	19,895.0000	*7.5711* 150,626.63	49,776.83	*10.0731* 200,403.47
3.2.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	39,560.0000	*1.6983* 67,185.64	22,202.50	*2.2596* 89,388.15
3.2.1.3 Associated General Items	**EA**	**1.0000**	*2,096,362.9047* **2,096,362.90**	**692,905.62**	*2,789,268.5266* **2,789,268.53**
3.2.1.3.1 Vane	**TON**	**1,815.0000**	*112.3823* **203,973.89**	**67,406.24**	*149.5207* **271,380.13**
3.2.1.3.1.1 Armor Stone Placement	TON	1,815.0000	*92.8393* 168,503.40	55,684.48	*123.5195* 224,187.88
3.2.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,100.0000	*24.5867* 27,045.32	8,937.53	*32.7117* 35,982.85
3.2.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	90.7500	*92.8393* 8,425.17	2,784.22	*123.5195* 11,209.39

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
3.2.1.3.2 J-Hook	**TON**	**825.0000**	*112.3823* **92,715.40**	**30,639.20**	*149.5207* **123,354.60**
3.2.1.3.2.1 Armor Stone Placement	TON	825.0000	*92.8393* 76,592.46	25,311.13	*123.5195* 101,903.58
3.2.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	500.0000	*24.5867* 12,293.33	4,062.51	*32.7117* 16,355.84
3.2.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	41.2500	*92.8393* 3,829.62	1,265.56	*123.5195* 5,095.18
3.2.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	*174,500.4902* **174,500.49**	**57,666.31**	*232,166.7995* **232,166.80**
3.2.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	5,144.0000	*33.9231* 174,500.49	57,666.31	*45.1335* 232,166.80
3.2.1.3.4 Misc. Rock	**TON**	**165.0000**	*112.3823* **18,543.08**	**6,127.84**	*149.5207* **24,670.92**
3.2.1.3.4.1 Armor Stone Placement	TON	165.0000	*92.8393* 15,318.49	5,062.23	*123.5195* 20,380.72
3.2.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	100.0000	*24.5867* 2,458.67	812.50	*32.7117* 3,271.17
3.2.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	8.2500	*92.8393* 765.92	253.11	*123.5195* 1,019.04
3.2.1.3.5 Seed and Mulch	**EA**	**1.0000**	*294,868.9228* **294,868.92**	**97,443.87**	*392,312.7896* **392,312.79**
3.2.1.3.5.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	46,300.0000	*3.4824* 161,237.37	53,283.31	*4.6333* 214,520.68
3.2.1.3.5.2 Seeding, mechanical seeding, 215 lb./acre	ACR	9.5700	*1,435.2621* 13,735.46	4,539.09	*1,909.5660* 18,274.55
3.2.1.3.5.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	416,700.0000	*0.2877* 119,896.09	39,621.47	*0.3828* 159,517.56
3.2.1.3.6 Planting	**EA**	**1.0000**	*510,928.6588* **510,928.66**	**168,844.05**	*679,772.7121* **679,772.71**
3.2.1.3.6.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	1,042.0000	*248.3155* 258,744.79	85,506.10	*330.3751* 344,250.89
3.2.1.3.6.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	1,286.0000	*196.0994* 252,183.87	83,337.95	*260.9034* 335,521.82
3.2.1.3.7 Wooden logs for stabilization and in stream structures	**LF**	**1,500.0000**	*61.6175* **92,426.19**	**30,543.62**	*81.9799* **122,969.82**
3.2.1.3.7.1 Laborers, (Semi-Skilled)	HR	142.2414	*48.8759* 6,952.18	2,297.45	*65.0277* 9,249.64

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
3.2.1.3.7.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	1,500.0000	*29.2722* 43,908.25	14,510.14	*38.9456* 58,418.39
3.2.1.3.7.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	142.2414	*140.7879* 20,025.86	6,617.85	*187.3133* 26,643.71
3.2.1.3.7.4 Equip. Operators, Medium	HR	142.2414	*102.5561* 14,587.72	4,820.73	*136.4473* 19,408.45
3.2.1.3.7.5 Laborers, (Semi-Skilled)	HR	142.2414	*48.8759* 6,952.18	2,297.45	*65.0277* 9,249.64
3.2.1.3.8 Stabilized Construction Entrance	**TON**	**18.0000**	*25.3344* **456.02**	**161.93**	*34.3307* **617.95**
3.2.1.3.8.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	18.0000	*12.2611* 220.70	78.37	*16.6150* 299.07
3.2.1.3.8.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	67.0000	*3.5122* 235.32	83.56	*4.7594* 318.88
3.2.1.3.9 Mulch Access Road	**EA**	**1.0000**	*179,115.4485* **179,115.45**	**59,191.39**	*238,306.8401* **238,306.84**
3.2.1.3.9.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	10,667.0000	*2.7151* 28,962.18	9,570.99	*3.6124* 38,533.17
3.2.1.3.9.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	432.0135	*347.5661* 150,153.27	49,620.40	*462.4246* 199,773.67
3.2.1.3.10 Temporary Seed and Mulch	**EA**	**1.0000**	*294,868.9228* **294,868.92**	**97,443.87**	*392,312.7896* **392,312.79**
3.2.1.3.10.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	46,300.0000	*3.4824* 161,237.37	53,283.31	*4.6333* 214,520.68
3.2.1.3.10.2 Seeding, mechanical seeding, 215 lb./acre	ACR	9.5700	*1,435.2621* 13,735.46	4,539.09	*1,909.5660* 18,274.55
3.2.1.3.10.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	416,700.0000	*0.2877* 119,896.09	39,621.47	*0.3828* 159,517.56
3.2.1.3.11 Orange Construction Fence	**LF**	**1,380.0000**	*3.1559* **4,355.11**	**1,546.51**	*4.2765* **5,901.62**
3.2.1.3.11.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	1,380.0000	*3.1559* 4,355.11	1,546.51	*4.2765* 5,901.62
3.2.1.3.12 Silt Fence	**EA**	**1.0000**	*505.6803* **505.68**	**179.57**	*685.2491* **685.25**
3.2.1.3.12.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	300.0000	*1.6856* 505.68	179.57	*2.2842* 685.25
3.2.1.3.13 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	*123.1943* **36,958.28**	**12,213.42**	*163.9057* **49,171.70**

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
3.2.1.3.13.1 willow stakes @ 4' spacing	EA	7,750.0000	*4.7688* 36,958.28	12,213.42	*6.3447* 49,171.70
3.2.1.3.14 Upstream Diversion	**EA**	**1.0000**	*192,146.8068* **192,146.81**	**63,497.80**	*255,644.6066* **255,644.61**
3.2.1.3.14.1 Pumping	**DAY**	**180.0000**	*946.5687* **170,382.37**	**56,305.41**	*1,259.3766* **226,687.78**
3.2.1.3.14.1.1 10" Pump, 2 pumps	DAY	180.0000	*281.2887* 50,631.97	16,732.09	*374.2448* 67,364.06
3.2.1.3.14.1.2 Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	19,786.66	*39.8309* 79,661.86
3.2.1.3.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	19,786.66	*39.8309* 79,661.86
3.2.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	*12.0914* **21,764.44**	**7,192.39**	*16.0871* **28,956.83**
3.2.1.3.14.2.1 Sandbags, 14" x 26"	EA	1,800.0000	*0.8462* 1,523.23	503.37	*1.1259* 2,026.60
3.2.1.3.14.2.2 Laborers, (Semi-Skilled)	HR	360.0000	*48.8759* 17,595.34	5,814.64	*65.0277* 23,409.99
3.2.1.3.14.2.3 Equip. Operators, Medium	HR	18.0000	*102.5561* 1,846.01	610.04	*136.4473* 2,456.05
3.2.1.3.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	*44.4370* 799.87	264.33	*59.1218* 1,064.19
3.2.1.4 Adaptive Management Minor Repair *	**EA**	**1.0000**	*45,066.5871* **45,066.59**	**14,892.93**	*59,959.5180* **59,959.52**
3.2.1.4.1 Vane, J-Hook Repairs	**TON**	**100.0000**	*112.3823* **11,238.23**	**3,713.84**	*149.5207* **14,952.07**
3.2.1.4.1.1 Armor Stone Placement	TON	100.0000	*92.8393* 9,283.93	3,068.02	*123.5195* 12,351.95
3.2.1.4.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	*24.5867* 1,490.10	492.43	*32.7117* 1,982.53
3.2.1.4.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	*92.8393* 464.20	153.40	*123.5195* 617.60
3.2.1.4.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	*61.6175* **30,808.73**	**10,181.21**	*81.9799* **40,989.94**
3.2.1.4.2.1 Laborers, (Semi-Skilled)	HR	47.4138	*48.8759* 2,317.39	765.82	*65.0277* 3,083.21
3.2.1.4.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or	VLF	500.0000	*29.2722* 14,636.08	4,836.71	*38.9456* 19,472.80

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
demobilization					
3.2.1.4.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	*140.7879* 6,675.29	2,205.95	*187.3133* 8,881.24
3.2.1.4.2.4 Equip. Operators, Medium	HR	47.4138	*102.5561* 4,862.57	1,606.91	*136.4473* 6,469.48
3.2.1.4.2.5 Laborers, (Semi-Skilled)	HR	47.4138	*48.8759* 2,317.39	765.82	*65.0277* 3,083.21
3.2.1.4.3 Silt Fence	**EA**	**1.0000**	*1,051.3083* **1,051.31**	**347.42**	*1,398.7289* **1,398.73**
3.2.1.4.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	*2.1026* 1,051.31	347.42	*2.7975* 1,398.73
3.2.1.4.4 Orange Construction Fence	**LF**	**500.0000**	*3.9366* **1,968.32**	**650.46**	*5.2376* **2,618.78**
3.2.1.4.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	*3.9366* 1,968.32	650.46	*5.2376* 2,618.78
3.2.2 Bank Stabilization - Site 15	**EA**	**1.0000**	*1,727,063.3238* **1,727,063.32**	**570,734.03**	*2,297,797.3528* **2,297,797.35**
3.2.2.1 Earthwork	**EA**	**1.0000**	*205,926.5893* **205,926.59**	**68,051.54**	*273,978.1253* **273,978.13**
3.2.2.1.1 Site Work	**EA**	**1.0000**	*205,926.5893* **205,926.59**	**68,051.54**	*273,978.1253* **273,978.13**
3.2.2.1.1.1 Clearing and Grubbing	**ACR**	**2.7300**	*12,065.1938* **32,937.98**	**10,884.85**	*16,052.3184* **43,822.83**
3.2.2.1.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	2.7300	*7,602.9520* 20,756.06	6,859.15	*10,115.4618* 27,615.21
3.2.2.1.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	2.7300	*3,748.9586* 10,234.66	3,382.20	*4,987.8583* 13,616.85
3.2.2.1.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	242.0000	*8.0465* 1,947.26	643.50	*10.7056* 2,590.77
3.2.2.1.1.2 Excavation, Common	**CY**	**22,600.0000**	*3.5335* **79,856.35**	**26,389.73**	*4.7012* **106,246.08**
3.2.2.1.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	22,600.0000	*3.5335* 79,856.35	26,389.73	*4.7012* 106,246.08
3.2.2.1.1.3 Fill	**CY**	**14,310.0000**	*6.5082* **93,132.26**	**30,776.95**	*8.6589* **123,909.22**
3.2.2.1.1.3.1 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	14,310.0000	*4.3776* 62,643.97	20,701.64	*5.8243* 83,345.62
3.2.2.1.1.3.2 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	16,456.0000	*1.8527* 30,488.29	10,075.31	*2.4650* 40,563.60

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
3.2.2.2 Associated General Items	**EA**	**1.0000**	*1,473,240.7362* **1,473,240.74**	**486,854.54**	*1,960,095.2767* **1,960,095.28**
3.2.2.2.1 Vane	**TON**	**1,650.0000**	*116.9192* **192,916.75**	**63,752.24**	*155.5570* **256,668.99**
3.2.2.2.1.1 Armor Stone Placement	TON	1,650.0000	*95.8701* 158,185.66	52,274.83	*127.5518* 210,460.49
3.2.2.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,000.0000	*26.8218* 26,821.80	8,863.67	*35.6855* 35,685.47
3.2.2.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	82.5000	*95.8701* 7,909.28	2,613.74	*127.5518* 10,523.02
3.2.2.2.2 J-Hook	**TON**	**330.0000**	*116.9192* **38,583.35**	**12,750.45**	*155.5570* **51,333.80**
3.2.2.2.2.1 Armor Stone Placement	TON	330.0000	*95.8701* 31,637.13	10,454.97	*127.5518* 42,092.10
3.2.2.2.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	200.0000	*26.8218* 5,364.36	1,772.73	*35.6855* 7,137.09
3.2.2.2.2.3 Waste/loss factor for armor stones, assume 5%	TON	16.5000	*95.8701* 1,581.86	522.75	*127.5518* 2,104.60
3.2.2.2.3 Topsoil 4 in depth	**EA**	**1.0000**	*100,176.4411* **100,176.44**	**33,104.81**	*133,281.2515* **133,281.25**
3.2.2.2.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	2,941.0000	*34.0620* 100,176.44	33,104.81	*45.3183* 133,281.25
3.2.2.2.4 Misc. Rock	**TON**	**165.0000**	*116.9192* **19,291.68**	**6,375.22**	*155.5570* **25,666.90**
3.2.2.2.4.1 Armor Stone Placement	TON	165.0000	*95.8701* 15,818.57	5,227.48	*127.5518* 21,046.05
3.2.2.2.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	100.0000	*26.8218* 2,682.18	886.37	*35.6855* 3,568.55
3.2.2.2.4.3 Waste/loss factor for armor stones, assume 5%	TON	8.2500	*95.8701* 790.93	261.37	*127.5518* 1,052.30
3.2.2.2.5 Seed and Mulch	**EA**	**1.0000**	*179,536.9159* **179,536.92**	**59,330.67**	*238,867.5878* **238,867.59**
3.2.2.2.5.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	26,467.0000	*3.7461* 99,149.22	32,765.35	*4.9841* 131,914.57
3.2.2.2.5.2 Seeding, mechanical seeding, 215 lb./acre	ACR	5.4700	*1,498.4262* 8,196.39	2,708.62	*1,993.6036* 10,905.01
			0.3031		*0.4032*

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
3.2.2.2.5.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	238,203.0000	72,191.30	23,856.70	96,048.00
			299,847.8461		*398,937.0728*
3.2.2.2.6 Planting	**EA**	**1.0000**	**299,847.85**	**99,089.23**	**398,937.07**
			255.1430		*339.4588*
3.2.2.2.6.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	596.0000	152,065.20	50,252.23	202,317.43
			201.0648		*267.5097*
3.2.2.2.6.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	735.0000	147,782.65	48,837.00	196,619.64
			66.0471		*87.8733*
3.2.2.2.7 Wooden logs for stabilization and in stream structures	**LF**	**1,200.0000**	**79,256.47**	**26,191.49**	**105,447.97**
			53.3192		*70.9393*
3.2.2.2.7.1 Laborers, (Semi-Skilled)	HR	113.7931	6,067.36	2,005.05	8,072.41
			30.7613		*40.9268*
3.2.2.2.7.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	1,200.0000	36,913.54	12,198.63	49,112.17
			153.5868		*204.3418*
3.2.2.2.7.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	113.7931	17,477.11	5,775.57	23,252.69
			111.8794		*148.8516*
3.2.2.2.7.4 Equip. Operators, Medium	HR	113.7931	12,731.10	4,207.18	16,938.29
			53.3192		*70.9393*
3.2.2.2.7.5 Laborers, (Semi-Skilled)	HR	113.7931	6,067.36	2,005.05	8,072.41
			32.1326		*42.7513*
3.2.2.2.8 Stabilized Construction Entrance	**TON**	**55.0000**	**1,767.30**	**584.03**	**2,351.32**
			15.7232		*20.9192*
3.2.2.2.8.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	55.0000	864.78	285.78	1,150.56
			4.5126		*6.0038*
3.2.2.2.8.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	200.0000	902.52	298.25	1,200.77
			142,443.1131		*189,515.5804*
3.2.2.2.9 Mulch Access Road	**EA**	**1.0000**	**142,443.11**	**47,072.47**	**189,515.58**
			2.7408		*3.6465*
3.2.2.2.9.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	8,267.0000	22,657.97	7,487.67	30,145.64
			357.7668		*475.9962*
3.2.2.2.9.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	334.8135	119,785.14	39,584.80	159,369.94
			179,536.9159		*238,867.5878*
3.2.2.2.10 Temporary Seed and Mulch	**EA**	**1.0000**	**179,536.92**	**59,330.67**	**238,867.59**
			3.7461		*4.9841*
3.2.2.2.10.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	26,467.0000	99,149.22	32,765.35	131,914.57
			1,498.4262		*1,993.6036*
3.2.2.2.10.2 Seeding, mechanical seeding, 215 lb./acre	ACR	5.4700	8,196.39	2,708.62	10,905.01
			0.3031		*0.4032*
3.2.2.2.10.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	238,203.0000	72,191.30	23,856.70	96,048.00

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
			4.1539		*5.5266*
3.2.2.2.11 Orange Construction Fence	**LF**	**3,460.0000**	**14,372.39**	**4,749.57**	**19,121.96**
			4.1539		*5.5266*
3.2.2.2.11.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	3,460.0000	14,372.39	4,749.57	19,121.96
			1,964.4228		*2,613.5958*
3.2.2.2.12 Silt Fence	**EA**	**1.0000**	**1,964.42**	**649.17**	**2,613.60**
			2.2072		*2.9366*
3.2.2.2.12.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	890.0000	1,964.42	649.17	2,613.60
			28,016.7599		*37,275.3193*
3.2.2.2.13 STREAMBANK PLANTING - willow stakes	**EA**	**1.0000**	**28,016.76**	**9,258.56**	**37,275.32**
			4.7688		*6.3447*
3.2.2.2.13.1 willow stakes @ 4' spacing	EA	5,875.0000	28,016.76	9,258.56	37,275.32
			45.3961		*60.3980*
3.2.2.2.14 Replace Damaged Path	**SY**	**34.0000**	**1,543.47**	**510.06**	**2,053.53**
			7.0595		*9.3924*
3.2.2.2.14.1 Fine grading, finish grading, small area, to be paved with grader	SY	34.0000	240.02	79.32	319.34
			2.7349		*3.6387*
3.2.2.2.14.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	34.0000	92.99	30.73	123.71
			2.8165		*3.7473*
3.2.2.2.14.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	296.7273	835.75	276.18	1,111.93
			1.4141		*1.8814*
3.2.2.2.14.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	34.0000	48.08	15.89	63.97
			11.1748		*14.8677*
3.2.2.2.14.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	3.0909	34.54	11.41	45.95
			0.7598		*1.0109*
3.2.2.2.14.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	29.6727	22.55	7.45	30.00
			7.9279		*10.5478*
3.2.2.2.14.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	34.0000	269.55	89.08	358.63
			193,986.9173		*258,092.8092*
3.2.2.2.15 Upstream Diversion	**EA**	**1.0000**	**193,986.92**	**64,105.89**	**258,092.81**
			946.5687		*1,259.3766*
3.2.2.2.15.1 Pumping	**DAY**	**180.0000**	**170,382.37**	**56,305.41**	**226,687.78**
			281.2887		*374.2448*
3.2.2.2.15.1.1 10" Pump, 2 pumps	DAY	180.0000	50,631.97	16,732.09	67,364.06
			29.9376		*39.8309*
3.2.2.2.15.1.2 Rigid Piping	LF	2,000.0000	59,875.20	19,786.66	79,661.86
			29.9376		*39.8309*
3.2.2.2.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	59,875.20	19,786.66	79,661.86

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
			13.1136		*17.4472*
3.2.2.2.15.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**23,604.55**	**7,800.48**	**31,405.03**
			0.8462		*1.1259*
3.2.2.2.15.2.1 Sandbags, 14" x 26"	EA	1,800.0000	1,523.23	503.37	2,026.60
			53.3192		*70.9393*
3.2.2.2.15.2.2 Laborers, (Semi-Skilled)	HR	360.0000	19,194.92	6,343.25	25,538.17
			111.8794		*148.8516*
3.2.2.2.15.2.3 Equip. Operators, Medium	HR	18.0000	2,013.83	665.50	2,679.33
			48.4767		*64.4965*
3.2.2.2.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	872.58	288.36	1,160.94
			47,895.9984		*63,723.9508*
3.2.2.3 Adaptive Management Minor Repair *	**EA**	**1.0000**	**47,896.00**	**15,827.95**	**63,723.95**
			116.9192		*155.5570*
3.2.2.3.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**11,691.92**	**3,863.77**	**15,555.70**
			95.8701		*127.5518*
3.2.2.3.1.1 Armor Stone Placement	TON	100.0000	9,587.01	3,168.17	12,755.18
			26.8218		*35.6855*
3.2.2.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	1,625.56	537.19	2,162.76
			95.8701		*127.5518*
3.2.2.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	479.35	158.41	637.76
			66.0471		*87.8733*
3.2.2.3.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**33,023.53**	**10,913.12**	**43,936.65**
			53.3192		*70.9393*
3.2.2.3.2.1 Laborers, (Semi-Skilled)	HR	47.4138	2,528.07	835.44	3,363.50
			30.7613		*40.9268*
3.2.2.3.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	15,380.64	5,082.76	20,463.41
			153.5868		*204.3418*
3.2.2.3.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	7,282.13	2,406.49	9,688.62
			111.8794		*148.8516*
3.2.2.3.2.4 Equip. Operators, Medium	HR	47.4138	5,304.63	1,752.99	7,057.62
			53.3192		*70.9393*
3.2.2.3.2.5 Laborers, (Semi-Skilled)	HR	47.4138	2,528.07	835.44	3,363.50
			1,103.6083		*1,468.3122*
3.2.2.3.3 Silt Fence	**EA**	**1.0000**	**1,103.61**	**364.70**	**1,468.31**
			2.2072		*2.9366*
3.2.2.3.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	1,103.61	364.70	1,468.31
			4.1539		*5.5266*

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
3.2.2.3.4 Orange Construction Fence	**LF**	**500.0000**	**2,076.94**	**686.35**	**2,763.29**
			4.1539		*5.5266*
3.2.2.3.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	2,076.94	686.35	2,763.29
			0.0000		*189,999.9600*
3.3 PED - Monitoring Only	**EA**	**1.0000**	**0.00**	**0.00**	**189,999.96**
			0.0000		*94,999.9800*
3.3.1 PED - Monitoring only for site 5	**EA**	**1.0000**	**0.00**	**0.00**	**94,999.98**
			0.0000		*2,500.0000*
3.3.1.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	2,500.00
			0.0000		*25,000.0000*
3.3.1.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	25,000.00
			0.0000		*8,333.3500*
3.3.1.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	8,333.35
			0.0000		*9,166.6500*
3.3.1.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	0.00	0.00	9,166.65
			0.0000		*11,666.6500*
3.3.1.5 Report each year for 5 years	EA	1.0000	0.00	0.00	11,666.65
			0.0000		*3,833.3333*
3.3.1.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	0.00	0.00	3,833.33
			0.0000		*2,833.3333*
3.3.1.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	0.00	0.00	2,833.33
			0.0000		*2,833.3300*
3.3.1.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	0.00	0.00	2,833.33
			0.0000		*500.0000*
3.3.1.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	0.00	0.00	500.00
			0.0000		*24,666.6667*
3.3.1.10 4 subsequence years of monitoring	EA	1.0000	0.00	0.00	24,666.67
			0.0000		*1,666.6667*
3.3.1.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	0.00	0.00	1,666.67
			0.0000		*2,000.0000*
3.3.1.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	0.00	0.00	2,000.00
			0.0000		*94,999.9800*
3.3.2 PED - Monitoring only for site 15	**EA**	**1.0000**	**0.00**	**0.00**	**94,999.98**
			0.0000		*2,500.0000*
3.3.2.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	2,500.00
			0.0000		*25,000.0000*
3.3.2.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	25,000.00
			0.0000		*8,333.3500*
3.3.2.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	8,333.35

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
3.3.2.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	*0.0000* 0.00	0.00	*9,166.6500* 9,166.65
3.3.2.5 Report each year for 5 years	EA	1.0000	*0.0000* 0.00	0.00	*11,666.6500* 11,666.65
3.3.2.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	*0.0000* 0.00	0.00	*3,833.3333* 3,833.33
3.3.2.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	*0.0000* 0.00	0.00	*2,833.3333* 2,833.33
3.3.2.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	*0.0000* 0.00	0.00	*2,833.3300* 2,833.33
3.3.2.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	*0.0000* 0.00	0.00	*500.0000* 500.00
3.3.2.10 4 subsequence years of monitoring	EA	1.0000	*0.0000* 0.00	0.00	*24,666.6667* 24,666.67
3.3.2.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	*0.0000* 0.00	0.00	*1,666.6667* 1,666.67
3.3.2.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	*0.0000* 0.00	0.00	*2,000.0000* 2,000.00
4 Site 11	**EA**	**1.0000**	*2,533,916.9937* **2,533,916.99**	**887,757.41**	*3,602,474.3849* **3,602,474.38**
4.1 Lands and Damages	**EA**	**1.0000**	*0.0000* **0.00**	**0.00**	*85,800.0000* **85,800.00**
4.1.1 RE Cost, based on Excel estimate from RE specialist dated 22 May 2017	EA	1.0000	*0.0000* 0.00	0.00	*85,800.0000* 85,800.00
4.2 Bank Stabilization	**EA**	**1.0000**	*2,533,916.9937* **2,533,916.99**	**887,757.41**	*3,421,674.4049* **3,421,674.40**
4.2.1 Bank Stabilization	**EA**	**1.0000**	*2,496,631.2876* **2,496,631.29**	**874,698.68**	*3,371,329.9656* **3,371,329.97**
4.2.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	*45,899.1230* **45,899.12**	**16,075.45**	*61,974.5704* **61,974.57**
4.2.1.1.1 Mob and Demob	EA	1.0000	*42,258.8903* 42,258.89	14,800.51	*57,059.4033* 57,059.40
4.2.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	*149.4260* 298.85	104.67	*201.7602* 403.52
4.2.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	*89.8343* 1,437.35	503.41	*121.2974* 1,940.76
4.2.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	*3.9667* 1,904.03	666.86	*5.3560* 2,570.89

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
4.2.1.2 Earthwork	**EA**	**1.0000**	*235,589.1572* **235,589.16**	**82,511.40**	*318,100.5616* **318,100.56**
4.2.1.2.1 Site Work	**EA**	**1.0000**	*235,589.1572* **235,589.16**	**82,511.40**	*318,100.5616* **318,100.56**
4.2.1.2.1.1 Clearing and Grubbing	**ACR**	**9.6100**	*8,293.7411* **79,702.85**	**27,914.67**	*11,198.4938* **107,617.53**
4.2.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	9.6100	*5,227.0295* 50,231.75	17,592.88	*7,057.7146* 67,824.64
4.2.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	9.6100	*2,577.4091* 24,768.90	8,674.92	*3,480.1061* 33,443.82
4.2.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	850.0000	*5.5320* 4,702.20	1,646.87	*7.4695* 6,349.07
4.2.1.2.1.2 Excavation, Common	**CY**	**20,800.0000**	*2.4293* **50,528.58**	**17,696.84**	*3.2801* **68,225.42**
4.2.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	20,800.0000	*2.4293* 50,528.58	17,696.84	*3.2801* 68,225.42
4.2.1.2.1.3 Fill	**CY**	**21,200.0000**	*4.9697* **105,357.73**	**36,899.89**	*6.7103* **142,257.62**
4.2.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	400.0000	*22.7292* 9,091.68	3,184.22	*30.6898* 12,275.90
4.2.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	20,800.0000	*3.0096* 62,600.20	21,924.74	*4.0637* 84,524.93
4.2.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	460.0000	*5.6783* 2,612.02	914.82	*7.6670* 3,526.84
4.2.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	24,380.0000	*1.2737* 31,053.83	10,876.12	*1.7199* 41,929.94
4.2.1.3 Associated General Items	**EA**	**1.0000**	*2,215,143.0074* **2,215,143.01**	**776,111.83**	*2,991,254.8336* **2,991,254.83**
4.2.1.3.1 Vane	**TON**	**1,815.0000**	*99.9057* **181,328.92**	**63,507.61**	*134.8962* **244,836.52**
4.2.1.3.1.1 Armor Stone Placement	TON	1,815.0000	*84.5047* 153,376.12	53,717.58	*114.1012* 207,093.70
4.2.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,100.0000	*18.4400* 20,283.99	7,104.15	*24.8983* 27,388.14
4.2.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	90.7500	*84.5047* 7,668.81	2,685.88	*114.1012* 10,354.68

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
4.2.1.3.2 J-Hook	**TON**	**495.0000**	*99.9057* **49,453.34**	**17,320.26**	*134.8962* **66,773.60**
4.2.1.3.2.1 Armor Stone Placement	TON	495.0000	*84.5047* 41,829.85	14,650.25	*114.1012* 56,480.10
4.2.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	300.0000	*18.4400* 5,532.00	1,937.50	*24.8983* 7,469.49
4.2.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	24.7500	*84.5047* 2,091.49	732.51	*114.1012* 2,824.00
4.2.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	*183,167.8313* **183,167.83**	**64,151.66**	*247,319.4891* **247,319.49**
4.2.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	5,461.0000	*33.5411* 183,167.83	64,151.66	*45.2883* 247,319.49
4.2.1.3.4 Misc. Rock	**TON**	**165.0000**	*99.9057* **16,484.45**	**5,773.42**	*134.8962* **22,257.87**
4.2.1.3.4.1 Armor Stone Placement	TON	165.0000	*84.5047* 13,943.28	4,883.42	*114.1012* 18,826.70
4.2.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	100.0000	*18.4400* 1,844.00	645.83	*24.8983* 2,489.83
4.2.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	8.2500	*84.5047* 697.16	244.17	*114.1012* 941.33
4.2.1.3.5 Seed and Mulch	**EA**	**1.0000**	*256,912.8719* **256,912.87**	**89,979.70**	*346,892.5726* **346,892.57**
4.2.1.3.5.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	49,144.0000	*2.7573* 135,503.93	47,458.12	*3.7230* 182,962.06
4.2.1.3.5.2 Seeding, mechanical seeding, 215 lb./acre	ACR	10.1500	*1,261.5607* 12,804.84	4,484.69	*1,703.4025* 17,289.54
4.2.1.3.5.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	442,296.0000	*0.2455* 108,604.10	38,036.88	*0.3315* 146,640.98
4.2.1.3.6 Planting	**EA**	**1.0000**	*502,908.2791* **502,908.28**	**176,135.73**	*679,044.0100* **679,044.01**
4.2.1.3.6.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	1,106.0000	*229.5401* 253,871.40	88,914.47	*309.9330* 342,785.87
4.2.1.3.6.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	1,365.0000	*182.4446* 249,036.88	87,221.26	*246.3430* 336,258.14
4.2.1.3.7 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	*49.4361* **111,231.15**	**38,956.96**	*66.7503* **150,188.11**
4.2.1.3.7.1 Laborers, (Semi-Skilled)	HR	213.3621	*36.6570* 7,821.20	2,739.25	*49.4955* 10,560.46

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
4.2.1.3.7.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	2,250.0000	*25.1771* 56,648.46	19,840.23	*33.9950* 76,488.70
4.2.1.3.7.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	213.3621	*105.5909* 22,529.09	7,890.46	*142.5724* 30,419.55
4.2.1.3.7.4 Equip. Operators, Medium	HR	213.3621	*76.9171* 16,411.19	5,747.76	*103.8561* 22,158.95
4.2.1.3.7.5 Laborers, (Semi-Skilled)	HR	213.3621	*36.6570* 7,821.20	2,739.25	*49.4955* 10,560.46
4.2.1.3.8 Stabilized Construction Entrance	**TON**	**73.0000**	*23.1021* **1,686.45**	**632.82**	*31.7709* **2,319.28**
4.2.1.3.8.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	73.0000	*11.3158* 826.05	309.97	*15.5620* 1,136.02
4.2.1.3.8.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	267.0000	*3.2225* 860.40	322.86	*4.4317* 1,183.25
4.2.1.3.9 Mulch Access Road	**EA**	**1.0000**	*223,378.4850* **223,378.49**	**78,234.81**	*301,613.2931* **301,613.29**
4.2.1.3.9.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	14,333.0000	*2.6446* 37,904.65	13,275.51	*3.5708* 51,180.16
4.2.1.3.9.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	580.4865	*319.5145* 185,473.83	64,959.30	*431.4194* 250,433.13
4.2.1.3.10 Temporary Seed and Mulch	**EA**	**1.0000**	*256,912.8719* **256,912.87**	**89,979.70**	*346,892.5726* **346,892.57**
4.2.1.3.10.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	49,144.0000	*2.7573* 135,503.93	47,458.12	*3.7230* 182,962.06
4.2.1.3.10.2 Seeding, mechanical seeding, 215 lb./acre	ACR	10.1500	*1,261.5607* 12,804.84	4,484.69	*1,703.4025* 17,289.54
4.2.1.3.10.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	442,296.0000	*0.2455* 108,604.10	38,036.88	*0.3315* 146,640.98
4.2.1.3.11 Orange Construction Fence	**LF**	**3,260.0000**	*2.6770* **8,726.88**	**3,274.66**	*3.6815* **12,001.54**
4.2.1.3.11.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	3,260.0000	*2.6770* 8,726.88	3,274.66	*3.6815* 12,001.54
4.2.1.3.12 Silt Fence	**EA**	**1.0000**	*1,294.9509* **1,294.95**	**485.92**	*1,780.8665* **1,780.87**
4.2.1.3.12.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	890.0000	*1.4550* 1,294.95	485.92	*2.0010* 1,780.87
4.2.1.3.13 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	*123.9891* **37,196.72**	**13,027.57**	*167.4143* **50,224.29**

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
4.2.1.3.13.1 willow stakes @ 4' spacing	EA	7,800.0000	*4.7688* 37,196.72	13,027.57	*6.4390* 50,224.29
4.2.1.3.14 Upstream Diversion	**EA**	**1.0000**	*196,350.8176* **196,350.82**	**68,768.79**	*265,119.6095* **265,119.61**
4.2.1.3.14.1 Pumping	**DAY**	**180.0000**	*998.0371* **179,646.68**	**62,918.43**	*1,347.5839* **242,565.11**
4.2.1.3.14.1.1 10" Pump, 2 pumps	DAY	180.0000	*281.2887* 50,631.97	17,733.05	*379.8057* 68,365.02
4.2.1.3.14.1.2 Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	20,970.35	*40.4228* 80,845.55
4.2.1.3.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	20,970.35	*40.4228* 80,845.55
4.2.1.3.14.1.4 Additional Labor to Relocate Rigid Piping due to tight space	LF	2,000.0000	*4.6322* 9,264.31	3,244.68	*6.2545* 12,509.00
4.2.1.3.14.1.5 Pipe, plastic, PVC, 10" diameter, schedule 80, includes couplings 10' OC, and hangers 3 per 10'	LF	0.0000	*0.0000* 0.00	0.00	*0.0000* 0.00
4.2.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	*9.2801* **16,704.14**	**5,850.36**	*12.5303* **22,554.50**
4.2.1.3.14.2.1 Sandbags, 14" x 26"	EA	1,800.0000	*0.8462* 1,523.23	533.49	*1.1426* 2,056.71
4.2.1.3.14.2.2 Laborers, (Semi-Skilled)	HR	360.0000	*36.6570* 13,196.51	4,621.87	*49.4955* 17,818.37
4.2.1.3.14.2.3 Equip. Operators, Medium	HR	18.0000	*76.9171* 1,384.51	484.90	*103.8561* 1,869.41
4.2.1.3.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	*33.3277* 599.90	210.11	*45.0002* 810.00
4.2.1.3.15 Downstream Diversion	**EA**	**1.0000**	*188,108.9940* **188,108.99**	**65,882.22**	*253,991.2165* **253,991.22**
4.2.1.3.15.1 Pumping	**DAY**	**180.0000**	*998.0371* **179,646.68**	**62,918.43**	*1,347.5839* **242,565.11**
4.2.1.3.15.1.1 10" Pump, 2 pumps	DAY	180.0000	*281.2887* 50,631.97	17,733.05	*379.8057* 68,365.02
4.2.1.3.15.1.2 Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	20,970.35	*40.4228* 80,845.55
4.2.1.3.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	*29.9376* 59,875.20	20,970.35	*40.4228* 80,845.55
4.2.1.3.15.1.4 Additional Labor to Relocate Rigid Piping due to tight space	LF	2,000.0000	*4.6322* 9,264.31	3,244.68	*6.2545* 12,509.00

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
			9.4026		*12.6957*
4.2.1.3.15.2 Sandbags to Be Set Up	**EA**	**900.0000**	**8,462.31**	**2,963.79**	**11,426.11**
			0.8462		*1.1426*
4.2.1.3.15.2.1 Sandbags, 14" x 26"	EA	900.0000	761.61	266.74	1,028.36
			36.6570		*49.4955*
4.2.1.3.15.2.2 Laborers, (Semi-Skilled)	HR	180.0000	6,598.25	2,310.93	8,909.19
			76.9171		*103.8561*
4.2.1.3.15.2.3 Equip. Operators, Medium	HR	10.0000	769.17	269.39	1,038.56
			33.3277		*45.0002*
4.2.1.3.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	10.0000	333.28	116.73	450.00
			37,285.7061		*50,344.4393*
4.2.2 Adaptive Management Minor Repair *	**EA**	**1.0000**	**37,285.71**	**13,058.73**	**50,344.44**
			99.9057		*134.8962*
4.2.2.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**9,990.57**	**3,499.04**	**13,489.62**
			84.5047		*114.1012*
4.2.2.1.1 Armor Stone Placement	TON	100.0000	8,450.47	2,959.65	11,410.12
			18.4400		*24.8983*
4.2.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	1,117.58	391.41	1,508.99
			84.5047		*114.1012*
4.2.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	422.52	147.98	570.51
			49.4361		*66.7503*
4.2.2.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**24,718.03**	**8,657.10**	**33,375.14**
			36.6570		*49.4955*
4.2.2.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,738.05	608.72	2,346.77
			25.1771		*33.9950*
4.2.2.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	12,588.55	4,408.94	16,997.49
			105.5909		*142.5724*
4.2.2.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	5,006.46	1,753.44	6,759.90
			76.9171		*103.8561*
4.2.2.2.4 Equip. Operators, Medium	HR	47.4138	3,646.93	1,277.28	4,924.21
			36.6570		*49.4955*
4.2.2.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,738.05	608.72	2,346.77
			907.4832		*1,225.3149*
4.2.2.3 Silt Fence	**EA**	**1.0000**	**907.48**	**317.83**	**1,225.31**
			1.8150		*2.4506*
4.2.2.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	907.48	317.83	1,225.31
			3.3392		*4.5087*

Currency in US dollars

Description	UOM	Quantity	CostToPrime	PrimeCMU	ContractCost
4.2.2.4 Orange Construction Fence	**LF**	**500.0000**	**1,669.62**	**584.76**	**2,254.37**
			3.3392		*4.5087*
4.2.2.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	1,669.62	584.76	2,254.37
			0.0000		*94,999.9800*
4.3 PED - Monitoring only	**EA**	**1.0000**	**0.00**	**0.00**	**94,999.98**
			0.0000		*2,500.0000*
4.3.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	2,500.00
			0.0000		*25,000.0000*
4.3.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	25,000.00
			0.0000		*8,333.3500*
4.3.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	8,333.35
			0.0000		*9,166.6500*
4.3.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	0.00	0.00	9,166.65
			0.0000		*11,666.6500*
4.3.5 Report each year for 5 years	EA	1.0000	0.00	0.00	11,666.65
			0.0000		*3,833.3333*
4.3.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	0.00	0.00	3,833.33
			0.0000		*2,833.3333*
4.3.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	0.00	0.00	2,833.33
			0.0000		*2,833.3300*
4.3.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	0.00	0.00	2,833.33
			0.0000		*500.0000*
4.3.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	0.00	0.00	500.00
			0.0000		*24,666.6667*
4.3.10 4 subsequence years of monitoring	EA	1.0000	0.00	0.00	24,666.67
			0.0000		*1,666.6667*
4.3.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	0.00	0.00	1,666.67
			0.0000		*2,000.0000*
4.3.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	0.00	0.00	2,000.00

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
Cost to Prime			**12,931,233.04**	**2,965,431.14**	**15,040,294.30**
1 Site 13	**EA**	**1.0000**	**2,282,076.05**	**516,113.57**	**2,650,389.64**
1.1 Lands and Damages	**EA**	**1.0000**	**52,800.00**	**0.00**	**0.00**
1.1.1 RE Cost, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	52,800.00	0.00	0.00
1.2 Relocations	**EA**	**1.0000**	**207,468.25**	**51,327.64**	**258,795.89**
1.2.1 Roads, Construction Activities	**EA**	**1.0000**	**207,468.25**	**51,327.64**	**258,795.89**
1.2.1.1 Bridges. Foundations	**EA**	**1.0000**	**52,605.54**	**13,014.61**	**65,620.15**
1.2.1.1.1 Concrete	**EA**	**1.0000**	**52,605.54**	**13,014.61**	**65,620.15**
1.2.1.1.1.1 Concrete, in Place:	**CY**	**130.0000**	**52,605.54**	**13,014.61**	**65,620.15**
1.2.1.1.1.1.1 C.I.P. concrete forms, equipment foundations, 1 use, includes erecting, bracing, stripping and cleaning	SFC	1,040.0000	17,415.74	4,308.65	21,724.40
1.2.1.1.1.1.2 Structural concrete, in place, foundation mat (3000 psi), over 20 C.Y., includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	CY	130.0000	35,189.80	8,705.96	43,895.76
1.2.1.2 Bridges, Superstructure and Deck	**EA**	**1.0000**	**154,862.71**	**38,313.03**	**193,175.74**
1.2.1.2.1 Metals	**EA**	**1.0000**	**154,862.71**	**38,313.03**	**193,175.74**
1.2.1.2.1.1 Steel Trusses, Girders and B	**EA**	**1.0000**	**67,451.69**	**16,687.55**	**84,139.23**
1.2.1.2.1.1.1 Fabricated pedestrian bridges, steel, trussed or arch spans, complete in place, 10' wide, 150' span, includes erection, excludes foundations	SF	1,950.0000	19,767.89	4,890.58	24,658.46
1.2.1.2.1.1.2 Mobilization or demobilization, crane, truck-mounted, up to 75 ton, (driver only)	EA	4.0000	559.56	138.43	697.99
1.2.1.2.1.1.3 Crane crew, daily use for small jobs, 100-ton truck-mounted hydraulic crane, portal to portal	DAY	14.0000	47,124.24	11,658.54	58,782.78
1.2.1.2.1.2 Bearing Pads	**EA**	**1.0000**	**7,993.33**	**1,977.55**	**9,970.88**
1.2.1.2.1.2.1 Bearing pad, fabric reinforced neoprene, 5000 psi, 1/2" thick	SF	130.0000	7,993.33	1,977.55	9,970.88
1.2.1.2.1.3 Miscellaneous Steel (all type	**EA**	**1.0000**	**79,417.69**	**19,647.94**	**99,065.63**
1.2.1.2.1.3.1 Bridge Stiffeners	**EA**	**1.0000**	**79,417.69**	**19,647.94**	**99,065.63**
1.2.1.2.1.3.1.1 Channel framing, structural steel, field fabricated, C6x8.2, incl cutting & welding	LF	1,950.0000	79,417.69	19,647.94	99,065.63
1.3 Bank Stabilization	**EA**	**1.0000**	**1,926,807.82**	**464,785.92**	**2,391,593.74**
1.3.1 Bank Stabilization	**EA**	**1.0000**	**1,894,243.79**	**456,729.58**	**2,350,973.37**
1.3.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**36,795.83**	**9,103.29**	**45,899.12**
1.3.1.1.1 Mob and Demob	EA	1.0000	33,877.58	8,381.31	42,258.89
1.3.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	239.58	59.27	298.85
1.3.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	1,152.28	285.07	1,437.35
1.3.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	1,526.40	377.63	1,904.03
1.3.1.2 Earthwork	**EA**	**1.0000**	**228,776.23**	**48,101.79**	**276,878.01**
1.3.1.2.1 Site Work	**EA**	**1.0000**	**228,776.23**	**48,101.79**	**276,878.01**
1.3.1.2.1.1 Clearing and Grubbing	**ACR**	**4.5200**	**34,347.02**	**0.00**	**34,347.02**
1.3.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	4.5200	21,646.13	0.00	21,646.13
1.3.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	4.5200	10,673.54	0.00	10,673.54
1.3.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	400.0000	2,027.35	0.00	2,027.35
1.3.1.2.1.2 Excavation, Common	**CY**	**20,500.0000**	**45,626.15**	**11,287.91**	**56,914.05**
1.3.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	20,500.0000	45,626.15	11,287.91	56,914.05
1.3.1.2.1.3 Fill	**CY**	**23,200.0000**	**148,803.06**	**36,813.88**	**185,616.94**
1.3.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	2,700.0000	51,155.79	12,655.94	63,811.73
1.3.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	20,500.0000	56,526.54	13,984.67	70,511.21
1.3.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	2,700.0000	14,046.53	3,475.11	17,521.64
1.3.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	23,200.0000	27,074.20	6,698.16	33,772.36
1.3.1.3 Associated General Items	**EA**	**1.0000**	**1,628,671.73**	**399,524.51**	**2,028,196.24**
1.3.1.3.1 Vane	**TON**	**2,805.0000**	**236,679.67**	**58,554.55**	**295,234.22**

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
1.3.1.3.1.1 Armor Stone Placement	TON	2,805.0000	198,056.11	48,999.08	247,055.19
1.3.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,700.0000	28,720.75	7,105.51	35,826.27
1.3.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	140.2500	9,902.81	2,449.95	12,352.76
1.3.1.3.2 J-Hook, Upper Reach	**TON**	**990.0000**	**83,534.00**	**20,666.31**	**104,200.31**
1.3.1.3.2.1 Armor Stone Placement	TON	990.0000	69,902.16	17,293.79	87,195.95
1.3.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	600.0000	10,136.74	2,507.83	12,644.56
1.3.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	49.5000	3,495.11	864.69	4,359.80
1.3.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**103,513.80**	**25,609.31**	**129,123.12**
1.3.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	3,831.0000	103,513.80	25,609.31	129,123.12
1.3.1.3.4 Misc. Rock	**TON**	**330.0000**	**27,844.67**	**6,888.77**	**34,733.44**
1.3.1.3.4.1 Armor Stone Placement	TON	330.0000	23,300.72	5,764.60	29,065.32
1.3.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	200.0000	3,378.91	835.94	4,214.85
1.3.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	16.5000	1,165.04	288.23	1,453.27
1.3.1.3.5 Replace Damaged Path	**SY**	**334.0000**	**11,091.29**	**2,743.98**	**13,835.27**
1.3.1.3.5.1 Fine grading, finish grading, small area, to be paved with grader	SY	334.0000	1,485.17	367.43	1,852.60
1.3.1.3.5.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	334.0000	575.37	142.35	717.71
1.3.1.3.5.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	2,914.9091	6,277.02	1,552.94	7,829.96
1.3.1.3.5.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	334.0000	319.50	79.04	398.54
1.3.1.3.5.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	30.3636	267.17	66.10	333.27
1.3.1.3.5.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	291.4909	149.44	36.97	186.41
1.3.1.3.5.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	334.0000	2,017.62	499.16	2,516.78
1.3.1.3.6 Seed and Mulch	**EA**	**1.0000**	**158,005.65**	**39,090.60**	**197,096.25**
1.3.1.3.6.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	34,478.0000	84,801.08	20,979.79	105,780.86
1.3.1.3.6.2 Seeding, mechanical seeding, 215 lb./acre	ACR	7.1200	7,625.74	1,886.61	9,512.35
1.3.1.3.6.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	310,302.0000	65,578.83	16,224.20	81,803.04
1.3.1.3.7 Planting	**EA**	**1.0000**	**292,412.64**	**72,342.89**	**364,755.52**
1.3.1.3.7.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	776.0000	147,801.27	36,566.04	184,367.31
1.3.1.3.7.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	958.0000	144,611.36	35,776.85	180,388.21
1.3.1.3.8 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	**98,587.06**	**24,390.44**	**122,977.50**
1.3.1.3.8.1 Laborers, (Semi-Skilled)	HR	213.3621	7,165.72	1,772.80	8,938.52
1.3.1.3.8.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	2,250.0000	48,578.87	12,018.41	60,597.28
1.3.1.3.8.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	213.3621	20,640.96	5,106.57	25,747.53
1.3.1.3.8.4 Equip. Operators, Medium	HR	213.3621	15,035.79	3,719.85	18,755.64
1.3.1.3.8.5 Laborers, (Semi-Skilled)	HR	213.3621	7,165.72	1,772.80	8,938.52
1.3.1.3.9 Stabilized Construction Entrance	**TON**	**55.0000**	**1,313.98**	**0.00**	**1,313.98**
1.3.1.3.9.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	55.0000	644.65	0.00	644.65
1.3.1.3.9.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	200.0000	669.33	0.00	669.33
1.3.1.3.10 Mulch Access Road	**EA**	**1.0000**	**141,993.29**	**35,129.14**	**177,122.44**
1.3.1.3.10.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	11,000.0000	23,587.36	5,835.51	29,422.87
1.3.1.3.10.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	445.5000	118,405.93	29,293.63	147,699.56
1.3.1.3.11 Temporary Seed and Mulch	**EA**	**1.0000**	**157,941.83**	**39,074.81**	**197,016.64**
1.3.1.3.11.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	34,478.0000	84,801.08	20,979.79	105,780.86
1.3.1.3.11.2 Seeding, mechanical seeding, 215 lb./acre	ACR	7.1200	7,625.74	1,886.61	9,512.35
1.3.1.3.11.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	310,000.0000	65,515.01	16,208.41	81,723.42

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
1.3.1.3.12 Orange Construction Fence	**LF**	**3,570.0000**	**10,289.48**	**0.00**	**10,289.48**
1.3.1.3.12.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	3,570.0000	10,289.48	0.00	10,289.48
1.3.1.3.13 Silt Fence	**EA**	**1.0000**	**2,175.36**	**0.00**	**2,175.36**
1.3.1.3.13.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	1,400.0000	2,175.36	0.00	2,175.36
1.3.1.3.14 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	**7,313.40**	**1,809.33**	**9,122.73**
1.3.1.3.14.1 willow stakes @ 4' spacing	EA	1,913.0000	7,313.40	1,809.33	9,122.73
1.3.1.3.15 Upstream Diversion	**EA**	**1.0000**	**151,719.74**	**37,535.46**	**189,255.20**
1.3.1.3.15.1 Pumping	**DAY**	**180.0000**	**136,590.00**	**33,792.37**	**170,382.37**
1.3.1.3.15.1.1 10" Pump, 2 pumps	DAY	180.0000	40,590.00	10,041.97	50,631.97
1.3.1.3.15.1.2 Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
1.3.1.3.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
1.3.1.3.15.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**15,129.74**	**3,743.10**	**18,872.84**
1.3.1.3.15.2.1 Sandbags, 14" x 26"	EA	1,800.0000	1,221.12	302.11	1,523.23
1.3.1.3.15.2.2 Laborers, (Semi-Skilled)	HR	360.0000	12,090.52	2,991.20	15,081.72
1.3.1.3.15.2.3 Equip. Operators, Medium	HR	18.0000	1,268.47	313.82	1,582.29
1.3.1.3.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	549.62	135.98	685.60
1.3.1.3.16 Downstream Diversion	**EA**	**1.0000**	**144,255.88**	**35,688.90**	**179,944.78**
1.3.1.3.16.1 Pumping	**DAY**	**180.0000**	**136,590.00**	**33,792.37**	**170,382.37**
1.3.1.3.16.1.1 10" Pump, 2 pumps	DAY	180.0000	40,590.00	10,041.97	50,631.97
1.3.1.3.16.1.2 Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
1.3.1.3.16.1.3 Local Relocate Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
1.3.1.3.16.2 Sandbags to Be Set Up	**EA**	**900.0000**	**7,665.88**	**1,896.54**	**9,562.41**
1.3.1.3.16.2.1 Sandbags, 14" x 26"	EA	900.0000	610.56	151.05	761.61
1.3.1.3.16.2.2 Laborers, (Semi-Skilled)	HR	180.0000	6,045.26	1,495.60	7,540.86
1.3.1.3.16.2.3 Equip. Operators, Medium	HR	10.0000	704.71	174.34	879.05
1.3.1.3.16.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	10.0000	305.35	75.54	380.89
1.3.2 Adaptive Management Minor Repair *	**EA**	**1.0000**	**32,564.03**	**8,056.34**	**40,620.37**
1.3.2.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**8,437.78**	**2,087.51**	**10,525.28**
1.3.2.1.1 Armor Stone Placement	TON	100.0000	7,060.82	1,746.85	8,807.67
1.3.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	1,023.91	253.32	1,277.23
1.3.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	353.04	87.34	440.38
1.3.2.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**21,908.24**	**5,420.10**	**27,328.33**
1.3.2.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,592.38	393.96	1,986.34
1.3.2.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	10,795.30	2,670.76	13,466.06
1.3.2.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	4,586.88	1,134.79	5,721.67
1.3.2.2.4 Equip. Operators, Medium	HR	47.4138	3,341.29	826.63	4,167.92
1.3.2.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,592.38	393.96	1,986.34
1.3.2.3 Silt Fence	**EA**	**1.0000**	**776.91**	**192.21**	**969.12**
1.3.2.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	776.91	192.21	969.12
1.3.2.4 Orange Construction Fence	**LF**	**500.0000**	**1,441.10**	**356.53**	**1,797.63**
1.3.2.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	1,441.10	356.53	1,797.63
1.4 PED - Monitoring only	**EA**	**1.0000**	**94,999.98**	**0.00**	**0.00**
1.4.1 Study Mobilization each year for 5 years	EA	1.0000	2,500.00	0.00	0.00
1.4.2 Field Sampling each year for 5 years	EA	1.0000	25,000.00	0.00	0.00
1.4.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	8,333.35	0.00	0.00

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
1.4.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	9,166.65	0.00	0.00
1.4.5 Report each year for 5 years	EA	1.0000	11,666.65	0.00	0.00
1.4.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	3,833.33	0.00	0.00
1.4.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	2,833.33	0.00	0.00
1.4.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	2,833.33	0.00	0.00
1.4.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	500.00	0.00	0.00
1.4.10 4 subsequence years of monitoring	EA	1.0000	24,666.67	0.00	0.00
1.4.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	1,666.67	0.00	0.00
1.4.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	2,000.00	0.00	0.00
2 Site 3 and 9	**EA**	**1.0000**	**4,306,076.58**	**1,004,381.50**	**5,087,458.11**
2.1 Lands and Damages	**EA**	**1.0000**	**33,000.00**	**0.00**	**0.00**
2.1.1 RE Cost for site 3, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	16,500.00	0.00	0.00
2.1.2 RE Cost for site 9, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	16,500.00	0.00	0.00
2.2 Relocations	**EA**	**1.0000**	**173,724.51**	**42,979.44**	**216,703.96**
2.2.1 Roads, Construction Activities for Site 3	**EA**	**1.0000**	**173,724.51**	**42,979.44**	**216,703.96**
2.2.1.1 Bridges. Foundations	**EA**	**1.0000**	**41,699.40**	**10,316.43**	**52,015.83**
2.2.1.1.1 Concrete	**EA**	**1.0000**	**41,699.40**	**10,316.43**	**52,015.83**
2.2.1.1.1.1 Concrete, in Place:	**EA**	**1.0000**	**41,699.40**	**10,316.43**	**52,015.83**
2.2.1.1.1.1.1 C.I.P. concrete forms, equipment foundations, 1 use, includes erecting, bracing, stripping and cleaning	SFC	800.0000	13,562.33	3,355.32	16,917.64
2.2.1.1.1.1.2 Structural concrete, in place, foundation mat (3000 psi), over 20 C.Y., includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	CY	100.0000	28,137.08	6,961.11	35,098.19
2.2.1.2 Bridges, Superstructure and Deck	**EA**	**1.0000**	**132,025.11**	**32,663.01**	**164,688.13**
2.2.1.2.1 Metals	**EA**	**1.0000**	**132,025.11**	**32,663.01**	**164,688.13**
2.2.1.2.1.1 Steel Trusses, Girders and B	**EA**	**1.0000**	**64,149.87**	**15,870.68**	**80,020.54**
2.2.1.2.1.1.1 Fabricated pedestrian bridges, steel, trussed or arch spans, complete in place, 10' wide, 150' span, includes erection, excludes foundations	SF	1,500.0000	15,206.07	3,761.98	18,968.05
2.2.1.2.1.1.2 Mobilization or demobilization, crane, truck-mounted, up to 75 ton, (driver only)	EA	4.0000	559.56	138.43	697.99
2.2.1.2.1.1.3 Crane crew, daily use for small jobs, 100-ton truck-mounted hydraulic crane, portal to portal	DAY	14.0000	48,384.24	11,970.26	60,354.50
2.2.1.2.1.2 Bearing Pads	**EA**	**1.0000**	**6,217.71**	**1,538.26**	**7,755.98**
2.2.1.2.1.2.1 Bearing pad, fabric reinforced neoprene, 5000 psi, 1/2" thick	SF	100.0000	6,217.71	1,538.26	7,755.98
2.2.1.2.1.3 Miscellaneous Steel (all type	**EA**	**1.0000**	**61,657.53**	**15,254.07**	**76,911.61**
2.2.1.2.1.3.1 Bridge Stiffeners	**EA**	**1.0000**	**61,657.53**	**15,254.07**	**76,911.61**
2.2.1.2.1.3.1.1 Channel framing, structural steel, field fabricated, C6x8.2, incl cutting & welding	LF	1,500.0000	61,657.53	15,254.07	76,911.61
2.3 Bank Stabilization	**EA**	**1.0000**	**3,909,352.10**	**961,402.05**	**4,870,754.15**
2.3.1 Bank Stabilization for Site 3	**EA**	**1.0000**	**2,830,499.06**	**695,593.06**	**3,526,092.12**
2.3.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**39,520.17**	**9,777.29**	**49,297.45**
2.3.1.1.1 Mob & Demob	EA	1.0000	36,601.91	9,055.31	45,657.22
2.3.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	239.58	59.27	298.85
2.3.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	1,152.28	285.07	1,437.35
2.3.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	1,526.40	377.63	1,904.03
2.3.1.2 Earthwork	**EA**	**1.0000**	**811,811.25**	**200,842.10**	**1,012,653.35**
2.3.1.2.1 Site Work	**EA**	**1.0000**	**811,811.25**	**200,842.10**	**1,012,653.35**
2.3.1.2.1.1 Clearing and Grubbing	**ACR**	**5.1800**	**34,626.42**	**8,566.58**	**43,192.99**
2.3.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	5.1800	21,705.96	5,370.05	27,076.01
2.3.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	5.1800	10,703.05	2,647.93	13,350.98
2.3.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	500.0000	2,217.41	548.59	2,766.00
2.3.1.2.1.2 Excavation, Common	**CY**	**21,500.0000**	**41,870.34**	**10,358.72**	**52,229.06**

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
2.3.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	21,500.0000	41,870.34	10,358.72	52,229.06
2.3.1.2.1.3 Fill	**CY**	**37,800.0000**	**735,314.50**	**181,916.81**	**917,231.31**
2.3.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	27,800.0000	506,551.13	125,320.75	631,871.88
2.3.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	21,500.0000	51,873.44	12,833.49	64,706.93
2.3.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	27,800.0000	126,548.83	31,308.18	157,857.01
2.3.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	49,300.0000	50,341.09	12,454.39	62,795.48
2.3.1.3 Associated General Items	**EA**	**1.0000**	**1,949,276.91**	**477,578.70**	**2,426,855.61**
2.3.1.3.1 Vane	**TON**	**2,475.0000**	**198,225.67**	**49,041.03**	**247,266.70**
2.3.1.3.1.1 Armor Stone Placement	TON	2,475.0000	167,668.15	41,481.10	209,149.26
2.3.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,500.0000	22,174.11	5,485.87	27,659.99
2.3.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	123.7500	8,383.41	2,074.06	10,457.46
2.3.1.3.2 J-Hook, Upper Reach	**TON**	**495.0000**	**39,645.13**	**9,808.21**	**49,453.34**
2.3.1.3.2.1 Armor Stone Placement	TON	495.0000	33,533.63	8,296.22	41,829.85
2.3.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	300.0000	4,434.82	1,097.17	5,532.00
2.3.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	24.7500	1,676.68	414.81	2,091.49
2.3.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**194,459.74**	**48,109.34**	**242,569.08**
2.3.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	7,232.0000	194,459.74	48,109.34	242,569.08
2.3.1.3.4 Misc. Rock	**TON**	**50.0000**	**4,000.08**	**989.62**	**4,989.70**
2.3.1.3.4.1 Armor Stone Placement	TON	50.0000	3,387.24	838.00	4,225.24
2.3.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	30.0000	443.48	109.72	553.20
2.3.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	2.5000	169.36	41.90	211.26
2.3.1.3.5 Replace Damaged Path	**SY**	**56.0000**	**1,777.87**	**439.84**	**2,217.71**
2.3.1.3.5.1 Fine grading, finish grading, small area, to be paved with grader	SY	56.0000	217.88	53.90	271.79
2.3.1.3.5.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	56.0000	84.41	20.88	105.29
2.3.1.3.5.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	488.7273	1,029.02	254.58	1,283.60
2.3.1.3.5.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	56.0000	49.02	12.13	61.15
2.3.1.3.5.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	5.0909	44.42	10.99	55.41
2.3.1.3.5.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	48.8727	22.89	5.66	28.56
2.3.1.3.5.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	56.0000	330.20	81.69	411.90
2.3.1.3.6 Seed and Mulch	**EA**	**1.0000**	**272,793.79**	**67,489.18**	**340,282.98**
2.3.1.3.6.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	65,090.0000	143,876.52	35,595.05	179,471.57
2.3.1.3.6.2 Seeding, mechanical seeding, 215 lb./acre	ACR	13.4500	13,602.69	3,365.30	16,967.99
2.3.1.3.6.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	585,810.0000	115,314.59	28,528.83	143,843.42
2.3.1.3.7 Planting	**EA**	**1.0000**	**390,765.79**	**96,675.46**	**487,441.24**
2.3.1.3.7.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	1,072.0000	197,263.94	48,803.10	246,067.03
2.3.1.3.7.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	1,323.0000	193,501.85	47,872.36	241,374.21
2.3.1.3.8 Wooden logs for stabilization and in stream structures	**LF**	**3,000.0000**	**118,893.86**	**29,414.34**	**148,308.20**
2.3.1.3.8.1 Laborers, (Semi-Skilled)	HR	284.4828	8,360.01	2,068.27	10,428.27
2.3.1.3.8.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	3,000.0000	60,550.97	14,980.31	75,531.28
2.3.1.3.8.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	284.4828	24,081.12	5,957.67	30,038.79
2.3.1.3.8.4 Equip. Operators, Medium	HR	284.4828	17,541.75	4,339.83	21,881.58
2.3.1.3.8.5 Laborers, (Semi-Skilled)	HR	284.4828	8,360.01	2,068.27	10,428.27

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
2.3.1.3.9 Stabilized Construction Entrance	**TON**	**92.0000**	**2,114.14**	**0.00**	**2,114.14**
2.3.1.3.9.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	92.0000	1,041.06	0.00	1,041.06
2.3.1.3.9.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	333.0000	1,073.08	0.00	1,073.08
2.3.1.3.10 Mulch Access Road	**EA**	**1.0000**	**143,680.01**	**35,546.43**	**179,226.44**
2.3.1.3.10.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	11,500.0000	24,380.78	6,031.80	30,412.58
2.3.1.3.10.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	465.7500	119,299.23	29,514.63	148,813.86
2.3.1.3.11 Temporary Seed and Mulch	**EA**	**1.0000**	**272,793.79**	**67,489.18**	**340,282.98**
2.3.1.3.11.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	65,090.0000	143,876.52	35,595.05	179,471.57
2.3.1.3.11.2 Seeding, mechanical seeding, 215 lb./acre	ACR	13.4500	13,602.69	3,365.30	16,967.99
2.3.1.3.11.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	585,810.0000	115,314.59	28,528.83	143,843.42
2.3.1.3.12 Orange Construction Fence	**LF**	**5,450.0000**	**14,589.41**	**0.00**	**14,589.41**
2.3.1.3.12.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	5,450.0000	14,589.41	0.00	14,589.41
2.3.1.3.13 Silt Fence	**EA**	**1.0000**	**2,182.50**	**0.00**	**2,182.50**
2.3.1.3.13.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	1,500.0000	2,182.50	0.00	2,182.50
2.3.1.3.14 Upstream Diversion	**EA**	**1.0000**	**149,981.16**	**37,105.34**	**187,086.50**
2.3.1.3.14.1 Pumping	**DAY**	**180.0000**	**136,590.00**	**33,792.37**	**170,382.37**
2.3.1.3.14.1.1 10" Pump, 2 pumps	DAY	180.0000	40,590.00	10,041.97	50,631.97
2.3.1.3.14.1.2 Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
2.3.1.3.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
2.3.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**13,391.16**	**3,312.97**	**16,704.14**
2.3.1.3.14.2.1 Sandbags, 14" x 26"	EA	1,800.0000	1,221.12	302.11	1,523.23
2.3.1.3.14.2.2 Laborers, (Semi-Skilled)	HR	360.0000	10,579.21	2,617.30	13,196.51
2.3.1.3.14.2.3 Equip. Operators, Medium	HR	18.0000	1,109.91	274.59	1,384.51
2.3.1.3.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	480.92	118.98	599.90
2.3.1.3.15 Downstream Diversion	**EA**	**1.0000**	**143,373.96**	**35,470.72**	**178,844.68**
2.3.1.3.15.1 Pumping	**DAY**	**180.0000**	**136,590.00**	**33,792.37**	**170,382.37**
2.3.1.3.15.1.1 10" Pump, 2 pumps	DAY	180.0000	40,590.00	10,041.97	50,631.97
2.3.1.3.15.1.2 Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
2.3.1.3.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
2.3.1.3.15.2 Sandbags to Be Set Up	**EA**	**900.0000**	**6,783.96**	**1,678.35**	**8,462.31**
2.3.1.3.15.2.1 Sandbags, 14" x 26"	EA	900.0000	610.56	151.05	761.61
2.3.1.3.15.2.2 Laborers, (Semi-Skilled)	HR	180.0000	5,289.60	1,308.65	6,598.25
2.3.1.3.15.2.3 Equip. Operators, Medium	HR	10.0000	616.62	152.55	769.17
2.3.1.3.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	10.0000	267.18	66.10	333.28
2.3.1.4 Adaptive Management Minor Repair *	**EA**	**1.0000**	**29,890.74**	**7,394.97**	**37,285.71**
2.3.1.4.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**8,009.12**	**1,981.46**	**9,990.57**
2.3.1.4.1.1 Armor Stone Placement	TON	100.0000	6,774.47	1,676.00	8,450.47
2.3.1.4.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	895.92	221.65	1,117.58
2.3.1.4.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	338.72	83.80	422.52
2.3.1.4.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**19,815.64**	**4,902.39**	**24,718.03**
2.3.1.4.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	344.71	1,738.05
2.3.1.4.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	10,091.83	2,496.72	12,588.55
2.3.1.4.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	4,013.52	992.94	5,006.46
2.3.1.4.2.4 Equip. Operators, Medium	HR	47.4138	2,923.63	723.30	3,646.93
2.3.1.4.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	344.71	1,738.05

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
2.3.1.4.3 Silt Fence	**EA**	**1.0000**	**727.50**	**179.98**	**907.48**
2.3.1.4.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	727.50	179.98	907.48
2.3.1.4.4 Orange Construction Fence	**LF**	**500.0000**	**1,338.48**	**331.14**	**1,669.62**
2.3.1.4.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	1,338.48	331.14	1,669.62
2.3.2 Bank Stabilization for Site 9	**EA**	**1.0000**	**1,078,853.04**	**265,808.99**	**1,344,662.03**
2.3.2.1 Earthwork	**EA**	**1.0000**	**265,693.04**	**65,732.46**	**331,425.50**
2.3.2.1.1 Site Work	**EA**	**1.0000**	**265,693.04**	**65,732.46**	**331,425.50**
2.3.2.1.1.1 Clearing and Grubbing	**ACR**	**3.0000**	**20,321.88**	**5,027.63**	**25,349.51**
2.3.2.1.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	3.0000	12,571.02	3,110.07	15,681.09
2.3.2.1.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	3.0000	6,198.67	1,533.55	7,732.23
2.3.2.1.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	350.0000	1,552.19	384.01	1,936.20
2.3.2.1.1.2 Excavation, Common	**CY**	**1,380.0000**	**2,687.49**	**664.89**	**3,352.38**
2.3.2.1.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	1,380.0000	2,687.49	664.89	3,352.38
2.3.2.1.1.3 Fill	**CY**	**37,800.0000**	**242,683.67**	**60,039.94**	**302,723.61**
2.3.2.1.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	10,000.0000	182,212.64	45,079.41	227,292.04
2.3.2.1.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	1,380.0000	3,329.55	823.73	4,153.28
2.3.2.1.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	10,000.0000	45,521.16	11,261.94	56,783.10
2.3.2.1.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	11,380.0000	11,620.32	2,874.87	14,495.18
2.3.2.2 Associated General Items	**EA**	**1.0000**	**783,269.26**	**192,681.57**	**975,950.83**
2.3.2.2.1 Vane	**TON**	**660.0000**	**52,860.18**	**13,077.61**	**65,937.79**
2.3.2.2.1.1 Armor Stone Placement	TON	660.0000	44,711.51	11,061.63	55,773.13
2.3.2.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	400.0000	5,913.10	1,462.90	7,376.00
2.3.2.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	33.0000	2,235.58	553.08	2,788.66
2.3.2.2.2 J-Hook, Upper Reach	**TON**	**116.0000**	**9,290.58**	**2,298.49**	**11,589.07**
2.3.2.2.2.1 Armor Stone Placement	TON	116.0000	7,858.39	1,944.16	9,802.55
2.3.2.2.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	70.3030	1,039.27	257.12	1,296.39
2.3.2.2.2.3 Waste/loss factor for armor stones, assume 5%	TON	5.8000	392.92	97.21	490.13
2.3.2.2.3 Topsoil 4 in depth	**EA**	**1.0000**	**68,566.42**	**16,963.33**	**85,529.75**
2.3.2.2.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	2,550.0000	68,566.42	16,963.33	85,529.75
2.3.2.2.4 Misc. Rock	**TON**	**41.3000**	**3,307.32**	**818.23**	**4,125.55**
2.3.2.2.4.1 Armor Stone Placement	TON	41.3000	2,797.86	692.19	3,490.05
2.3.2.2.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	25.0000	369.57	91.43	461.00
2.3.2.2.4.3 Waste/loss factor for armor stones, assume 5%	TON	2.0650	139.89	34.61	174.50
2.3.2.2.5 Replace Damaged Path	**SY**	**34.0000**	**1,079.42**	**267.05**	**1,346.47**
2.3.2.2.5.1 Fine grading, finish grading, small area, to be paved with grader	SY	34.0000	132.29	32.73	165.01
2.3.2.2.5.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	34.0000	51.25	12.68	63.93
2.3.2.2.5.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	296.7273	624.76	154.57	779.33
2.3.2.2.5.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	34.0000	29.76	7.36	37.13
2.3.2.2.5.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	3.0909	26.97	6.67	33.64
2.3.2.2.5.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	29.6727	13.90	3.44	17.34
2.3.2.2.5.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	34.0000	200.48	49.60	250.08
2.3.2.2.6 Seed and Mulch	**EA**	**1.0000**	**96,161.76**	**23,790.42**	**119,952.18**

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
2.3.2.2.6.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	22,945.0000	50,718.19	12,547.68	63,265.87
2.3.2.2.6.2 Seeding, mechanical seeding, 215 lb./acre	ACR	4.7400	4,793.81	1,185.99	5,979.80
2.3.2.2.6.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	206,505.0000	40,649.77	10,056.75	50,706.52
2.3.2.2.7 Planting	**EA**	**1.0000**	**172,124.54**	**42,583.61**	**214,708.15**
2.3.2.2.7.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	472.0000	86,855.02	21,487.93	108,342.95
2.3.2.2.7.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	583.0000	85,269.52	21,095.68	106,365.20
2.3.2.2.8 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	**89,170.39**	**22,060.76**	**111,231.15**
2.3.2.2.8.1 Laborers, (Semi-Skilled)	HR	213.3621	6,270.01	1,551.20	7,821.20
2.3.2.2.8.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	2,250.0000	45,413.23	11,235.23	56,648.46
2.3.2.2.8.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	213.3621	18,060.84	4,468.25	22,529.09
2.3.2.2.8.4 Equip. Operators, Medium	HR	213.3621	13,156.31	3,254.87	16,411.19
2.3.2.2.8.5 Laborers, (Semi-Skilled)	HR	213.3621	6,270.01	1,551.20	7,821.20
2.3.2.2.9 Stabilized Construction Entrance	**TON**	**18.0000**	**419.59**	**0.00**	**419.59**
2.3.2.2.9.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	18.0000	203.68	0.00	203.68
2.3.2.2.9.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	67.0000	215.91	0.00	215.91
2.3.2.2.10 Mulch Access Road	**EA**	**1.0000**	**47,264.48**	**11,693.23**	**58,957.71**
2.3.2.2.10.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	3,783.0000	8,020.21	1,984.20	10,004.42
2.3.2.2.10.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	153.2115	39,244.26	9,709.03	48,953.29
2.3.2.2.11 Temporary Seed and Mulch	**EA**	**1.0000**	**96,161.76**	**23,790.42**	**119,952.18**
2.3.2.2.11.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	22,945.0000	50,718.19	12,547.68	63,265.87
2.3.2.2.11.2 Seeding, mechanical seeding, 215 lb./acre	ACR	4.7400	4,793.81	1,185.99	5,979.80
2.3.2.2.11.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	206,505.0000	40,649.77	10,056.75	50,706.52
2.3.2.2.12 Orange Construction Fence	**LF**	**1,340.0000**	**3,587.12**	**0.00**	**3,587.12**
2.3.2.2.12.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	1,340.0000	3,587.12	0.00	3,587.12
2.3.2.2.13 Silt Fence	**EA**	**1.0000**	**436.50**	**0.00**	**436.50**
2.3.2.2.13.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	300.0000	436.50	0.00	436.50
2.3.2.2.14 Upstream Diversion	**EA**	**1.0000**	**142,839.21**	**35,338.42**	**178,177.63**
2.3.2.2.14.1 Pumping	**DAY**	**50.0000**	**136,590.00**	**33,792.37**	**170,382.37**
2.3.2.2.14.1.1 10" Pump, 2 pumps	DAY	180.0000	40,590.00	10,041.97	50,631.97
2.3.2.2.14.1.2 Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
2.3.2.2.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
2.3.2.2.14.2 Sandbags to Be Set Up	**EA**	**840.0000**	**6,249.21**	**1,546.05**	**7,795.26**
2.3.2.2.14.2.1 Sandbags, 14" x 26"	EA	840.0000	569.86	140.98	710.84
2.3.2.2.14.2.2 Laborers, (Semi-Skilled)	HR	168.0000	4,936.96	1,221.40	6,158.37
2.3.2.2.14.2.3 Equip. Operators, Medium	HR	8.4000	517.96	128.14	646.10
2.3.2.2.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	8.4000	224.43	55.52	279.95
2.3.2.3 Adaptive Management Minor Repair *	**EA**	**1.0000**	**29,890.74**	**7,394.97**	**37,285.71**
2.3.2.3.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**8,009.12**	**1,981.46**	**9,990.57**
2.3.2.3.1.1 Armor Stone Placement	TON	100.0000	6,774.47	1,676.00	8,450.47
2.3.2.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	895.92	221.65	1,117.58
2.3.2.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	338.72	83.80	422.52
2.3.2.3.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**19,815.64**	**4,902.39**	**24,718.03**
2.3.2.3.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	344.71	1,738.05
2.3.2.3.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	10,091.83	2,496.72	12,588.55
2.3.2.3.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	4,013.52	992.94	5,006.46

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
2.3.2.3.2.4 Equip. Operators, Medium	HR	47.4138	2,923.63	723.30	3,646.93
2.3.2.3.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	344.71	1,738.05
2.3.2.3.3 Silt Fence	**EA**	**1.0000**	**727.50**	**179.98**	**907.48**
2.3.2.3.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	727.50	179.98	907.48
2.3.2.3.4 Orange Construction Fence	**LF**	**500.0000**	**1,338.48**	**331.14**	**1,669.62**
2.3.2.3.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	1,338.48	331.14	1,669.62
2.4 PED - Monitoring Only	**EA**	**1.0000**	**189,999.96**	**0.00**	**0.00**
2.4.1 PED - Monitoring only for site 3	**EA**	**1.0000**	**94,999.98**	**0.00**	**0.00**
2.4.1.1 Study Mobilization each year for 5 years	EA	1.0000	2,500.00	0.00	0.00
2.4.1.2 Field Sampling each year for 5 years	EA	1.0000	25,000.00	0.00	0.00
2.4.1.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	8,333.35	0.00	0.00
2.4.1.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	9,166.65	0.00	0.00
2.4.1.5 Report each year for 5 years	EA	1.0000	11,666.65	0.00	0.00
2.4.1.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	3,833.33	0.00	0.00
2.4.1.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	2,833.33	0.00	0.00
2.4.1.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	2,833.33	0.00	0.00
2.4.1.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	500.00	0.00	0.00
2.4.1.10 4 subsequence years of monitoring	EA	1.0000	24,666.67	0.00	0.00
2.4.1.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	1,666.67	0.00	0.00
2.4.1.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	2,000.00	0.00	0.00
2.4.2 PED - Monitoring only for site 9	**EA**	**1.0000**	**94,999.98**	**0.00**	**0.00**
2.4.2.1 Study Mobilization each year for 5 years	EA	1.0000	2,500.00	0.00	0.00
2.4.2.2 Field Sampling each year for 5 years	EA	1.0000	25,000.00	0.00	0.00
2.4.2.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	8,333.35	0.00	0.00
2.4.2.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	9,166.65	0.00	0.00
2.4.2.5 Report each year for 5 years	EA	1.0000	11,666.65	0.00	0.00
2.4.2.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	3,833.33	0.00	0.00
2.4.2.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	2,833.33	0.00	0.00
2.4.2.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	2,833.33	0.00	0.00
2.4.2.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	500.00	0.00	0.00
2.4.2.10 4 subsequence years of monitoring	EA	1.0000	24,666.67	0.00	0.00
2.4.2.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	1,666.67	0.00	0.00
2.4.2.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	2,000.00	0.00	0.00
3 Site 5 and 15	**EA**	**1.0000**	**4,128,599.47**	**944,700.04**	**4,768,529.56**
3.1 Lands and Damages	**EA**	**1.0000**	**114,770.00**	**0.00**	**0.00**
3.1.1 RE Cost for site 5, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	98,270.00	0.00	0.00
3.1.2 RE Cost for site 15, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	16,500.00	0.00	0.00
3.2 Bank Stabilization	**EA**	**1.0000**	**3,823,829.51**	**944,700.04**	**4,768,529.56**
3.2.1 Bank Stabilization - Site 5	**EA**	**1.0000**	**2,439,299.03**	**602,167.20**	**3,041,466.23**
3.2.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**39,520.17**	**9,777.29**	**49,297.45**
3.2.1.1.1 Mob & Demob	EA	1.0000	36,601.91	9,055.31	45,657.22
3.2.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	239.58	59.27	298.85
3.2.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	1,152.28	285.07	1,437.35
3.2.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	1,526.40	377.63	1,904.03
3.2.1.2 Earthwork	**EA**	**1.0000**	**682,010.01**	**168,729.28**	**850,739.29**
3.2.1.2.1 Site Work	**EA**	**1.0000**	**682,010.01**	**168,729.28**	**850,739.29**
3.2.1.2.1.1 Clearing and Grubbing	**ACR**	**7.1600**	**63,478.24**	**15,704.52**	**79,182.76**

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
3.2.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	7.1600	40,003.77	9,896.93	49,900.71
3.2.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	7.1600	19,725.56	4,880.10	24,605.67
3.2.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	634.0000	3,748.90	927.48	4,676.38
3.2.1.2.1.2 Excavation, Common	**CY**	**17,100.0000**	**44,402.03**	**10,985.06**	**55,387.09**
3.2.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	17,100.0000	44,402.03	10,985.06	55,387.09
3.2.1.2.1.3 Fill	**CY**	**34,400.0000**	**574,129.74**	**142,039.70**	**716,169.44**
3.2.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	17,300.0000	344,506.75	85,230.97	429,737.72
3.2.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	17,100.0000	55,009.98	13,609.47	68,619.45
3.2.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	19,895.0000	120,752.47	29,874.16	150,626.63
3.2.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	39,560.0000	53,860.54	13,325.10	67,185.64
3.2.1.3 Associated General Items	**EA**	**1.0000**	**1,681,640.44**	**414,722.47**	**2,096,362.90**
3.2.1.3.1 Vane	**TON**	**1,815.0000**	**163,519.23**	**40,454.66**	**203,973.89**
3.2.1.3.1.1 Armor Stone Placement	TON	1,815.0000	135,083.69	33,419.71	168,503.40
3.2.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,100.0000	21,681.35	5,363.97	27,045.32
3.2.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	90.7500	6,754.18	1,670.99	8,425.17
3.2.1.3.2 J-Hook	**TON**	**825.0000**	**74,326.92**	**18,388.48**	**92,715.40**
3.2.1.3.2.1 Armor Stone Placement	TON	825.0000	61,401.68	15,190.78	76,592.46
3.2.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	500.0000	9,855.16	2,438.17	12,293.33
3.2.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	41.2500	3,070.08	759.54	3,829.62
3.2.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**139,891.37**	**34,609.12**	**174,500.49**
3.2.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	5,144.0000	139,891.37	34,609.12	174,500.49
3.2.1.3.4 Misc. Rock	**TON**	**165.0000**	**14,865.38**	**3,677.70**	**18,543.08**
3.2.1.3.4.1 Armor Stone Placement	TON	165.0000	12,280.34	3,038.16	15,318.49
3.2.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	100.0000	1,971.03	487.63	2,458.67
3.2.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	8.2500	614.02	151.91	765.92
3.2.1.3.5 Seed and Mulch	**EA**	**1.0000**	**236,386.82**	**58,482.10**	**294,868.92**
3.2.1.3.5.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	46,300.0000	129,258.76	31,978.62	161,237.37
3.2.1.3.5.2 Seeding, mechanical seeding, 215 lb./acre	ACR	9.5700	11,011.27	2,724.19	13,735.46
3.2.1.3.5.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	416,700.0000	96,116.80	23,779.30	119,896.09
3.2.1.3.6 Planting	**EA**	**1.0000**	**409,594.88**	**101,333.77**	**510,928.66**
3.2.1.3.6.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	1,042.0000	207,427.28	51,317.51	258,744.79
3.2.1.3.6.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	1,286.0000	202,167.61	50,016.27	252,183.87
3.2.1.3.7 Wooden logs for stabilization and in stream structures	**LF**	**1,500.0000**	**74,095.07**	**18,331.12**	**92,426.19**
3.2.1.3.7.1 Laborers, (Semi-Skilled)	HR	142.2414	5,573.34	1,378.84	6,952.18
3.2.1.3.7.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	1,500.0000	35,199.82	8,708.43	43,908.25
3.2.1.3.7.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	142.2414	16,054.08	3,971.78	20,025.86
3.2.1.3.7.4 Equip. Operators, Medium	HR	142.2414	11,694.50	2,893.22	14,587.72
3.2.1.3.7.5 Laborers, (Semi-Skilled)	HR	142.2414	5,573.34	1,378.84	6,952.18
3.2.1.3.8 Stabilized Construction Entrance	**TON**	**18.0000**	**456.02**	**0.00**	**456.02**
3.2.1.3.8.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	18.0000	220.70	0.00	220.70
3.2.1.3.8.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	67.0000	235.32	0.00	235.32
3.2.1.3.9 Mulch Access Road	**EA**	**1.0000**	**143,591.03**	**35,524.42**	**179,115.45**

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
3.2.1.3.9.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	10,667.0000	23,218.04	5,744.14	28,962.18
3.2.1.3.9.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	432.0135	120,372.99	29,780.28	150,153.27
3.2.1.3.10 Temporary Seed and Mulch	**EA**	**1.0000**	**236,386.82**	**58,482.10**	**294,868.92**
3.2.1.3.10.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	46,300.0000	129,258.76	31,978.62	161,237.37
3.2.1.3.10.2 Seeding, mechanical seeding, 215 lb./acre	ACR	9.5700	11,011.27	2,724.19	13,735.46
3.2.1.3.10.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	416,700.0000	96,116.80	23,779.30	119,896.09
3.2.1.3.11 Orange Construction Fence	**LF**	**1,380.0000**	**4,355.11**	**0.00**	**4,355.11**
3.2.1.3.11.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	1,380.0000	4,355.11	0.00	4,355.11
3.2.1.3.12 Silt Fence	**EA**	**1.0000**	**505.68**	**0.00**	**505.68**
3.2.1.3.12.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	300.0000	505.68	0.00	505.68
3.2.1.3.13 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	**29,628.25**	**7,330.03**	**36,958.28**
3.2.1.3.13.1 willow stakes @ 4' spacing	EA	7,750.0000	29,628.25	7,330.03	36,958.28
3.2.1.3.14 Upstream Diversion	**EA**	**1.0000**	**154,037.84**	**38,108.96**	**192,146.81**
3.2.1.3.14.1 Pumping	**DAY**	**180.0000**	**136,590.00**	**33,792.37**	**170,382.37**
3.2.1.3.14.1.1 10" Pump, 2 pumps	DAY	180.0000	40,590.00	10,041.97	50,631.97
3.2.1.3.14.1.2 Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
3.2.1.3.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
3.2.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**17,447.84**	**4,316.60**	**21,764.44**
3.2.1.3.14.2.1 Sandbags, 14" x 26"	EA	1,800.0000	1,221.12	302.11	1,523.23
3.2.1.3.14.2.2 Laborers, (Semi-Skilled)	HR	360.0000	14,105.61	3,489.73	17,595.34
3.2.1.3.14.2.3 Equip. Operators, Medium	HR	18.0000	1,479.89	366.12	1,846.01
3.2.1.3.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	641.23	158.64	799.87
3.2.1.4 Adaptive Management Minor Repair *	**EA**	**1.0000**	**36,128.42**	**8,938.17**	**45,066.59**
3.2.1.4.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**9,009.32**	**2,228.91**	**11,238.23**
3.2.1.4.1.1 Armor Stone Placement	TON	100.0000	7,442.63	1,841.31	9,283.93
3.2.1.4.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	1,194.56	295.54	1,490.10
3.2.1.4.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	372.13	92.07	464.20
3.2.1.4.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**24,698.36**	**6,110.37**	**30,808.73**
3.2.1.4.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,857.78	459.61	2,317.39
3.2.1.4.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	11,733.27	2,902.81	14,636.08
3.2.1.4.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	5,351.36	1,323.93	6,675.29
3.2.1.4.2.4 Equip. Operators, Medium	HR	47.4138	3,898.17	964.41	4,862.57
3.2.1.4.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,857.78	459.61	2,317.39
3.2.1.4.3 Silt Fence	**EA**	**1.0000**	**842.80**	**208.51**	**1,051.31**
3.2.1.4.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	842.80	208.51	1,051.31
3.2.1.4.4 Orange Construction Fence	**LF**	**500.0000**	**1,577.94**	**390.38**	**1,968.32**
3.2.1.4.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	1,577.94	390.38	1,968.32
3.2.2 Bank Stabilization - Site 15	**EA**	**1.0000**	**1,384,530.48**	**342,532.84**	**1,727,063.32**
3.2.2.1 Earthwork	**EA**	**1.0000**	**165,084.65**	**40,841.94**	**205,926.59**
3.2.2.1.1 Site Work	**EA**	**1.0000**	**165,084.65**	**40,841.94**	**205,926.59**
3.2.2.1.1.1 Clearing and Grubbing	**ACR**	**2.7300**	**26,405.31**	**6,532.67**	**32,937.98**
3.2.2.1.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	2.7300	16,639.46	4,116.60	20,756.06
3.2.2.1.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	2.7300	8,204.79	2,029.87	10,234.66
3.2.2.1.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	242.0000	1,561.06	386.21	1,947.26
3.2.2.1.1.2 Excavation, Common	**CY**	**22,600.0000**	**64,018.24**	**15,838.11**	**79,856.35**

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
3.2.2.1.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	22,600.0000	64,018.24	15,838.11	79,856.35
3.2.2.1.1.3 Fill	**CY**	**14,310.0000**	**74,661.10**	**18,471.16**	**93,132.26**
3.2.2.1.1.3.1 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	14,310.0000	50,219.64	12,424.34	62,643.97
3.2.2.1.1.3.2 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	16,456.0000	24,441.47	6,046.82	30,488.29
3.2.2.2 Associated General Items	**EA**	**1.0000**	**1,181,049.17**	**292,191.56**	**1,473,240.74**
3.2.2.2.1 Vane	**TON**	**1,650.0000**	**154,655.08**	**38,261.67**	**192,916.75**
3.2.2.2.1.1 Armor Stone Placement	TON	1,650.0000	126,812.30	31,373.36	158,185.66
3.2.2.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,000.0000	21,502.17	5,319.64	26,821.80
3.2.2.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	82.5000	6,340.62	1,568.67	7,909.28
3.2.2.2.2 J-Hook	**TON**	**330.0000**	**30,931.02**	**7,652.33**	**38,583.35**
3.2.2.2.2.1 Armor Stone Placement	TON	330.0000	25,362.46	6,274.67	31,637.13
3.2.2.2.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	200.0000	4,300.43	1,063.93	5,364.36
3.2.2.2.2.3 Waste/loss factor for armor stones, assume 5%	TON	16.5000	1,268.12	313.73	1,581.86
3.2.2.2.3 Topsoil 4 in depth	**EA**	**1.0000**	**80,308.19**	**19,868.25**	**100,176.44**
3.2.2.2.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	2,941.0000	80,308.19	19,868.25	100,176.44
3.2.2.2.4 Misc. Rock	**TON**	**165.0000**	**15,465.51**	**3,826.17**	**19,291.68**
3.2.2.2.4.1 Armor Stone Placement	TON	165.0000	12,681.23	3,137.34	15,818.57
3.2.2.2.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	100.0000	2,150.22	531.96	2,682.18
3.2.2.2.4.3 Waste/loss factor for armor stones, assume 5%	TON	8.2500	634.06	156.87	790.93
3.2.2.2.5 Seed and Mulch	**EA**	**1.0000**	**143,928.90**	**35,608.01**	**179,536.92**
3.2.2.2.5.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	26,467.0000	79,484.71	19,664.52	99,149.22
3.2.2.2.5.2 Seeding, mechanical seeding, 215 lb./acre	ACR	5.4700	6,570.78	1,625.61	8,196.39
3.2.2.2.5.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	238,203.0000	57,873.42	14,317.88	72,191.30
3.2.2.2.6 Planting	**EA**	**1.0000**	**240,378.26**	**59,469.58**	**299,847.85**
3.2.2.2.6.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	596.0000	121,905.72	30,159.48	152,065.20
3.2.2.2.6.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	735.0000	118,472.54	29,310.11	147,782.65
3.2.2.2.7 Wooden logs for stabilization and in stream structures	**LF**	**1,200.0000**	**63,537.34**	**15,719.14**	**79,256.47**
3.2.2.2.7.1 Laborers, (Semi-Skilled)	HR	113.7931	4,864.00	1,203.35	6,067.36
3.2.2.2.7.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	1,200.0000	29,592.38	7,321.16	36,913.54
3.2.2.2.7.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	113.7931	14,010.83	3,466.28	17,477.11
3.2.2.2.7.4 Equip. Operators, Medium	HR	113.7931	10,206.11	2,524.99	12,731.10
3.2.2.2.7.5 Laborers, (Semi-Skilled)	HR	113.7931	4,864.00	1,203.35	6,067.36
3.2.2.2.8 Stabilized Construction Entrance	**TON**	**55.0000**	**1,416.78**	**350.51**	**1,767.30**
3.2.2.2.8.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	55.0000	693.26	171.51	864.78
3.2.2.2.8.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	200.0000	723.52	179.00	902.52
3.2.2.2.9 Mulch Access Road	**EA**	**1.0000**	**114,192.01**	**28,251.10**	**142,443.11**
3.2.2.2.9.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	8,267.0000	18,164.16	4,493.81	22,657.97
3.2.2.2.9.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	334.8135	96,027.85	23,757.29	119,785.14
3.2.2.2.10 Temporary Seed and Mulch	**EA**	**1.0000**	**143,928.90**	**35,608.01**	**179,536.92**
3.2.2.2.10.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	26,467.0000	79,484.71	19,664.52	99,149.22
3.2.2.2.10.2 Seeding, mechanical seeding, 215 lb./acre	ACR	5.4700	6,570.78	1,625.61	8,196.39
3.2.2.2.10.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	238,203.0000	57,873.42	14,317.88	72,191.30
3.2.2.2.11 Orange Construction Fence	**LF**	**3,460.0000**	**11,521.88**	**2,850.51**	**14,372.39**
3.2.2.2.11.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	3,460.0000	11,521.88	2,850.51	14,372.39
3.2.2.2.12 Silt Fence	**EA**	**1.0000**	**1,574.81**	**389.61**	**1,964.42**

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
3.2.2.2.12.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	890.0000	1,574.81	389.61	1,964.42
3.2.2.2.13 STREAMBANK PLANTING - willow stakes	**EA**	**1.0000**	**22,460.13**	**5,556.63**	**28,016.76**
3.2.2.2.13.1 willow stakes @ 4' spacing	EA	5,875.0000	22,460.13	5,556.63	28,016.76
3.2.2.2.14 Replace Damaged Path	**SY**	**34.0000**	**1,237.35**	**306.12**	**1,543.47**
3.2.2.2.14.1 Fine grading, finish grading, small area, to be paved with grader	SY	34.0000	192.42	47.60	240.02
3.2.2.2.14.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	34.0000	74.54	18.44	92.99
3.2.2.2.14.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	296.7273	669.99	165.76	835.75
3.2.2.2.14.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	34.0000	38.54	9.54	48.08
3.2.2.2.14.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	3.0909	27.69	6.85	34.54
3.2.2.2.14.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	29.6727	18.07	4.47	22.55
3.2.2.2.14.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	34.0000	216.09	53.46	269.55
3.2.2.2.15 Upstream Diversion	**EA**	**1.0000**	**155,513.00**	**38,473.92**	**193,986.92**
3.2.2.2.15.1 Pumping	**DAY**	**180.0000**	**136,590.00**	**33,792.37**	**170,382.37**
3.2.2.2.15.1.1 10" Pump, 2 pumps	DAY	180.0000	40,590.00	10,041.97	50,631.97
3.2.2.2.15.1.2 Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
3.2.2.2.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
3.2.2.2.15.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**18,923.00**	**4,681.55**	**23,604.55**
3.2.2.2.15.2.1 Sandbags, 14" x 26"	EA	1,800.0000	1,221.12	302.11	1,523.23
3.2.2.2.15.2.2 Laborers, (Semi-Skilled)	HR	360.0000	15,387.94	3,806.98	19,194.92
3.2.2.2.15.2.3 Equip. Operators, Medium	HR	18.0000	1,614.42	399.41	2,013.83
3.2.2.2.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	699.52	173.06	872.58
3.2.2.3 Adaptive Management Minor Repair *	**EA**	**1.0000**	**38,396.66**	**9,499.33**	**47,896.00**
3.2.2.3.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**9,373.04**	**2,318.89**	**11,691.92**
3.2.2.3.1.1 Armor Stone Placement	TON	100.0000	7,685.59	1,901.42	9,587.01
3.2.2.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	1,303.16	322.40	1,625.56
3.2.2.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	384.28	95.07	479.35
3.2.2.3.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**26,473.89**	**6,549.64**	**33,023.53**
3.2.2.3.2.1 Laborers, (Semi-Skilled)	HR	47.4138	2,026.67	501.40	2,528.07
3.2.2.3.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	12,330.16	3,050.48	15,380.64
3.2.2.3.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	5,837.85	1,444.28	7,282.13
3.2.2.3.2.4 Equip. Operators, Medium	HR	47.4138	4,252.55	1,052.08	5,304.63
3.2.2.3.2.5 Laborers, (Semi-Skilled)	HR	47.4138	2,026.67	501.40	2,528.07
3.2.2.3.3 Silt Fence	**EA**	**1.0000**	**884.73**	**218.88**	**1,103.61**
3.2.2.3.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	884.73	218.88	1,103.61
3.2.2.3.4 Orange Construction Fence	**LF**	**500.0000**	**1,665.01**	**411.92**	**2,076.94**
3.2.2.3.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	1,665.01	411.92	2,076.94
3.3 PED - Monitoring Only	**EA**	**1.0000**	**189,999.96**	**0.00**	**0.00**
3.3.1 PED - Monitoring only for site 5	**EA**	**1.0000**	**94,999.98**	**0.00**	**0.00**
3.3.1.1 Study Mobilization each year for 5 years	EA	1.0000	2,500.00	0.00	0.00
3.3.1.2 Field Sampling each year for 5 years	EA	1.0000	25,000.00	0.00	0.00
3.3.1.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	8,333.35	0.00	0.00
3.3.1.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	9,166.65	0.00	0.00
3.3.1.5 Report each year for 5 years	EA	1.0000	11,666.65	0.00	0.00
3.3.1.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	3,833.33	0.00	0.00
3.3.1.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	2,833.33	0.00	0.00

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
3.3.1.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	2,833.33	0.00	0.00
3.3.1.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	500.00	0.00	0.00
3.3.1.10 4 subsequence years of monitoring	EA	1.0000	24,666.67	0.00	0.00
3.3.1.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	1,666.67	0.00	0.00
3.3.1.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	2,000.00	0.00	0.00
3.3.2 PED - Monitoring only for site 15	**EA**	**1.0000**	**94,999.98**	**0.00**	**0.00**
3.3.2.1 Study Mobilization each year for 5 years	EA	1.0000	2,500.00	0.00	0.00
3.3.2.2 Field Sampling each year for 5 years	EA	1.0000	25,000.00	0.00	0.00
3.3.2.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	8,333.35	0.00	0.00
3.3.2.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	9,166.65	0.00	0.00
3.3.2.5 Report each year for 5 years	EA	1.0000	11,666.65	0.00	0.00
3.3.2.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	3,833.33	0.00	0.00
3.3.2.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	2,833.33	0.00	0.00
3.3.2.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	2,833.33	0.00	0.00
3.3.2.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	500.00	0.00	0.00
3.3.2.10 4 subsequence years of monitoring	EA	1.0000	24,666.67	0.00	0.00
3.3.2.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	1,666.67	0.00	0.00
3.3.2.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	2,000.00	0.00	0.00
4 Site 11	**EA**	**1.0000**	**2,214,480.93**	**500,236.04**	**2,533,916.99**
4.1 Lands and Damages	**EA**	**1.0000**	**85,800.00**	**0.00**	**0.00**
4.1.1 RE Cost, based on Excel estimate from RE specialist dated 22 May 2017	EA	1.0000	85,800.00	0.00	0.00
4.2 Bank Stabilization	**EA**	**1.0000**	**2,033,680.95**	**500,236.04**	**2,533,916.99**
4.2.1 Bank Stabilization	**EA**	**1.0000**	**2,003,790.22**	**492,841.07**	**2,496,631.29**
4.2.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**36,795.83**	**9,103.29**	**45,899.12**
4.2.1.1.1 Mob and Demob	EA	1.0000	33,877.58	8,381.31	42,258.89
4.2.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	239.58	59.27	298.85
4.2.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	1,152.28	285.07	1,437.35
4.2.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	1,526.40	377.63	1,904.03
4.2.1.2 Earthwork	**EA**	**1.0000**	**188,864.16**	**46,724.99**	**235,589.16**
4.2.1.2.1 Site Work	**EA**	**1.0000**	**188,864.16**	**46,724.99**	**235,589.16**
4.2.1.2.1.1 Clearing and Grubbing	**ACR**	**9.6100**	**63,895.18**	**15,807.67**	**79,702.85**
4.2.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	9.6100	40,269.16	9,962.59	50,231.75
4.2.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	9.6100	19,856.42	4,912.48	24,768.90
4.2.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	850.0000	3,769.60	932.60	4,702.20
4.2.1.2.1.2 Excavation, Common	**CY**	**20,800.0000**	**40,507.12**	**10,021.46**	**50,528.58**
4.2.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	20,800.0000	40,507.12	10,021.46	50,528.58
4.2.1.2.1.3 Fill	**CY**	**21,200.0000**	**84,461.86**	**20,895.87**	**105,357.73**
4.2.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	400.0000	7,288.51	1,803.18	9,091.68
4.2.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	20,800.0000	50,184.54	12,415.66	62,600.20
4.2.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	460.0000	2,093.97	518.05	2,612.02
4.2.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	24,380.0000	24,894.84	6,158.98	31,053.83
4.2.1.3 Associated General Items	**EA**	**1.0000**	**1,778,130.22**	**437,012.79**	**2,215,143.01**
4.2.1.3.1 Vane	**TON**	**1,815.0000**	**145,365.49**	**35,963.42**	**181,328.92**
4.2.1.3.1.1 Armor Stone Placement	TON	1,815.0000	122,956.65	30,419.47	153,376.12

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
4.2.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,100.0000	16,261.01	4,022.97	20,283.99
4.2.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	90.7500	6,147.83	1,520.97	7,668.81
4.2.1.3.2 J-Hook	**TON**	**495.0000**	**39,645.13**	**9,808.21**	**49,453.34**
4.2.1.3.2.1 Armor Stone Placement	TON	495.0000	33,533.63	8,296.22	41,829.85
4.2.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	300.0000	4,434.82	1,097.17	5,532.00
4.2.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	24.7500	1,676.68	414.81	2,091.49
4.2.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**146,839.69**	**36,328.14**	**183,167.83**
4.2.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	5,461.0000	146,839.69	36,328.14	183,167.83
4.2.1.3.4 Misc. Rock	**TON**	**165.0000**	**13,215.04**	**3,269.40**	**16,484.45**
4.2.1.3.4.1 Armor Stone Placement	TON	165.0000	11,177.88	2,765.41	13,943.28
4.2.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	100.0000	1,478.27	365.72	1,844.00
4.2.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	8.2500	558.89	138.27	697.16
4.2.1.3.5 Seed and Mulch	**EA**	**1.0000**	**205,958.69**	**50,954.18**	**256,912.87**
4.2.1.3.5.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	49,144.0000	108,629.09	26,874.84	135,503.93
4.2.1.3.5.2 Seeding, mechanical seeding, 215 lb./acre	ACR	10.1500	10,265.22	2,539.62	12,804.84
4.2.1.3.5.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	442,296.0000	87,064.37	21,539.73	108,604.10
4.2.1.3.6 Planting	**EA**	**1.0000**	**403,165.21**	**99,743.07**	**502,908.28**
4.2.1.3.6.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	1,106.0000	203,520.44	50,350.96	253,871.40
4.2.1.3.6.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	1,365.0000	199,644.77	49,392.12	249,036.88
4.2.1.3.7 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	**89,170.39**	**22,060.76**	**111,231.15**
4.2.1.3.7.1 Laborers, (Semi-Skilled)	HR	213.3621	6,270.01	1,551.20	7,821.20
4.2.1.3.7.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	2,250.0000	45,413.23	11,235.23	56,648.46
4.2.1.3.7.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	213.3621	18,060.84	4,468.25	22,529.09
4.2.1.3.7.4 Equip. Operators, Medium	HR	213.3621	13,156.31	3,254.87	16,411.19
4.2.1.3.7.5 Laborers, (Semi-Skilled)	HR	213.3621	6,270.01	1,551.20	7,821.20
4.2.1.3.8 Stabilized Construction Entrance	**TON**	**73.0000**	**1,686.45**	**0.00**	**1,686.45**
4.2.1.3.8.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	73.0000	826.05	0.00	826.05
4.2.1.3.8.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	267.0000	860.40	0.00	860.40
4.2.1.3.9 Mulch Access Road	**EA**	**1.0000**	**179,075.26**	**44,303.22**	**223,378.49**
4.2.1.3.9.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	14,333.0000	30,386.93	7,517.73	37,904.65
4.2.1.3.9.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	580.4865	148,688.34	36,785.49	185,473.83
4.2.1.3.10 Temporary Seed and Mulch	**EA**	**1.0000**	**205,958.69**	**50,954.18**	**256,912.87**
4.2.1.3.10.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	49,144.0000	108,629.09	26,874.84	135,503.93
4.2.1.3.10.2 Seeding, mechanical seeding, 215 lb./acre	ACR	10.1500	10,265.22	2,539.62	12,804.84
4.2.1.3.10.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	442,296.0000	87,064.37	21,539.73	108,604.10
4.2.1.3.11 Orange Construction Fence	**LF**	**3,260.0000**	**8,726.88**	**0.00**	**8,726.88**
4.2.1.3.11.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	3,260.0000	8,726.88	0.00	8,726.88
4.2.1.3.12 Silt Fence	**EA**	**1.0000**	**1,294.95**	**0.00**	**1,294.95**
4.2.1.3.12.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	890.0000	1,294.95	0.00	1,294.95
4.2.1.3.13 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	**29,819.40**	**7,377.32**	**37,196.72**
4.2.1.3.13.1 willow stakes @ 4' spacing	EA	7,800.0000	29,819.40	7,377.32	37,196.72
4.2.1.3.14 Upstream Diversion	**EA**	**1.0000**	**157,408.06**	**38,942.75**	**196,350.82**
4.2.1.3.14.1 Pumping	**DAY**	**180.0000**	**144,016.90**	**35,629.78**	**179,646.68**
4.2.1.3.14.1.1 10" Pump, 2 pumps	DAY	180.0000	40,590.00	10,041.97	50,631.97
4.2.1.3.14.1.2 Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
4.2.1.3.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
4.2.1.3.14.1.4 Additional Labor to Relocate Rigid Piping due to tight space	LF	2,000.0000	7,426.90	1,837.42	9,264.31
4.2.1.3.14.1.5 Pipe, plastic, PVC, 10" diameter, schedule 80, includes couplings 10' OC, and hangers 3 per 10'	LF	0.0000	0.00	0.00	0.00
4.2.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**13,391.16**	**3,312.97**	**16,704.14**
4.2.1.3.14.2.1 Sandbags, 14" x 26"	EA	1,800.0000	1,221.12	302.11	1,523.23
4.2.1.3.14.2.2 Laborers, (Semi-Skilled)	HR	360.0000	10,579.21	2,617.30	13,196.51
4.2.1.3.14.2.3 Equip. Operators, Medium	HR	18.0000	1,109.91	274.59	1,384.51
4.2.1.3.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	480.92	118.98	599.90
4.2.1.3.15 Downstream Diversion	**EA**	**1.0000**	**150,800.86**	**37,308.13**	**188,108.99**
4.2.1.3.15.1 Pumping	**DAY**	**180.0000**	**144,016.90**	**35,629.78**	**179,646.68**
4.2.1.3.15.1.1 10" Pump, 2 pumps	DAY	180.0000	40,590.00	10,041.97	50,631.97
4.2.1.3.15.1.2 Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
4.2.1.3.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	48,000.00	11,875.20	59,875.20
4.2.1.3.15.1.4 Additional Labor to Relocate Rigid Piping due to tight space	LF	2,000.0000	7,426.90	1,837.42	9,264.31
4.2.1.3.15.2 Sandbags to Be Set Up	**EA**	**900.0000**	**6,783.96**	**1,678.35**	**8,462.31**
4.2.1.3.15.2.1 Sandbags, 14" x 26"	EA	900.0000	610.56	151.05	761.61
4.2.1.3.15.2.2 Laborers, (Semi-Skilled)	HR	180.0000	5,289.60	1,308.65	6,598.25
4.2.1.3.15.2.3 Equip. Operators, Medium	HR	10.0000	616.62	152.55	769.17
4.2.1.3.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	10.0000	267.18	66.10	333.28
4.2.2 Adaptive Management Minor Repair *	**EA**	**1.0000**	**29,890.74**	**7,394.97**	**37,285.71**
4.2.2.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**8,009.12**	**1,981.46**	**9,990.57**
4.2.2.1.1 Armor Stone Placement	TON	100.0000	6,774.47	1,676.00	8,450.47
4.2.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	895.92	221.65	1,117.58
4.2.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	338.72	83.80	422.52
4.2.2.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**19,815.64**	**4,902.39**	**24,718.03**
4.2.2.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	344.71	1,738.05
4.2.2.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	10,091.83	2,496.72	12,588.55
4.2.2.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	4,013.52	992.94	5,006.46
4.2.2.2.4 Equip. Operators, Medium	HR	47.4138	2,923.63	723.30	3,646.93
4.2.2.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	344.71	1,738.05
4.2.2.3 Silt Fence	**EA**	**1.0000**	**727.50**	**179.98**	**907.48**
4.2.2.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	727.50	179.98	907.48
4.2.2.4 Orange Construction Fence	**LF**	**500.0000**	**1,338.48**	**331.14**	**1,669.62**
4.2.2.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	1,338.48	331.14	1,669.62
4.3 PED - Monitoring only	**EA**	**1.0000**	**94,999.98**	**0.00**	**0.00**
4.3.1 Study Mobilization each year for 5 years	EA	1.0000	2,500.00	0.00	0.00
4.3.2 Field Sampling each year for 5 years	EA	1.0000	25,000.00	0.00	0.00
4.3.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	8,333.35	0.00	0.00
4.3.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	9,166.65	0.00	0.00
4.3.5 Report each year for 5 years	EA	1.0000	11,666.65	0.00	0.00
4.3.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	3,833.33	0.00	0.00
4.3.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	2,833.33	0.00	0.00
4.3.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	2,833.33	0.00	0.00
4.3.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	500.00	0.00	0.00
4.3.10 4 subsequence years of monitoring	EA	1.0000	24,666.67	0.00	0.00

Currency in US dollars

Description	UOM	Quantity	DirectCost	SubCMU	CostToPrime
4.3.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	1,666.67	0.00	0.00
4.3.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	2,000.00	0.00	0.00

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
Direct Cost			**3,872,494.55**	**1,581,758.72**	**5,301,120.39**	**857,328.20**	**0.00**	**12,931,233.04**
1 Site 13	**EA**	**1.0000**	**708,101.43**	**269,226.24**	**876,215.42**	**148,039.56**	**0.00**	**2,282,076.05**
1.1 Lands and Damages	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**52,800.00**	**0.00**	**52,800.00**
1.1.1 RE Cost, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	0.00	0.00	0.00	52,800.00	0.00	52,800.00
1.2 Relocations	**EA**	**1.0000**	**124,496.91**	**21,463.34**	**61,508.00**	**0.00**	**0.00**	**207,468.25**
1.2.1 Roads, Construction Activities	**EA**	**1.0000**	**124,496.91**	**21,463.34**	**61,508.00**	**0.00**	**0.00**	**207,468.25**
1.2.1.1 Bridges. Foundations	**EA**	**1.0000**	**25,796.59**	**80.95**	**26,728.00**	**0.00**	**0.00**	**52,605.54**
1.2.1.1.1 Concrete	**EA**	**1.0000**	**25,796.59**	**80.95**	**26,728.00**	**0.00**	**0.00**	**52,605.54**
1.2.1.1.1.1 Concrete, in Place:	**CY**	**130.0000**	**25,796.59**	**80.95**	**26,728.00**	**0.00**	**0.00**	**52,605.54**
1.2.1.1.1.1.1 C.I.P. concrete forms, equipment foundations, 1 use, includes erecting, bracing, stripping and cleaning	SFC	1,040.0000	13,827.74	0.00	3,588.00	0.00	0.00	17,415.74
1.2.1.1.1.1.2 Structural concrete, in place, foundation mat (3000 psi), over 20 C.Y., includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	CY	130.0000	11,968.85	80.95	23,140.00	0.00	0.00	35,189.80
1.2.1.2 Bridges, Superstructure and Deck	**EA**	**1.0000**	**98,700.32**	**21,382.39**	**34,780.00**	**0.00**	**0.00**	**154,862.71**
1.2.1.2.1 Metals	**EA**	**1.0000**	**98,700.32**	**21,382.39**	**34,780.00**	**0.00**	**0.00**	**154,862.71**
1.2.1.2.1.1 Steel Trusses, Girders and B	**EA**	**1.0000**	**27,657.33**	**18,794.36**	**21,000.00**	**0.00**	**0.00**	**67,451.69**
1.2.1.2.1.1.1 Fabricated pedestrian bridges, steel, trussed or arch spans, complete in place, 10' wide, 150' span, includes erection, excludes foundations	SF	1,950.0000	16,539.32	3,228.57	0.00	0.00	0.00	19,767.89
1.2.1.2.1.1.2 Mobilization or demobilization, crane, truck-mounted, up to 75 ton, (driver only)	EA	4.0000	559.56	0.00	0.00	0.00	0.00	559.56
1.2.1.2.1.1.3 Crane crew, daily use for small jobs, 100-ton truck-mounted hydraulic crane, portal to portal	DAY	14.0000	10,558.46	15,565.79	21,000.00	0.00	0.00	47,124.24
1.2.1.2.1.2 Bearing Pads	**EA**	**1.0000**	**6,498.33**	**0.00**	**1,495.00**	**0.00**	**0.00**	**7,993.33**
1.2.1.2.1.2.1 Bearing pad, fabric reinforced neoprene, 5000 psi, 1/2" thick	SF	130.0000	6,498.33	0.00	1,495.00	0.00	0.00	7,993.33
1.2.1.2.1.3 Miscellaneous Steel (all type	**EA**	**1.0000**	**64,544.66**	**2,588.04**	**12,285.00**	**0.00**	**0.00**	**79,417.69**
1.2.1.2.1.3.1 Bridge Stiffeners	**EA**	**1.0000**	**64,544.66**	**2,588.04**	**12,285.00**	**0.00**	**0.00**	**79,417.69**
1.2.1.2.1.3.1.1 Channel framing, structural steel, field fabricated, C6x8.2, incl cutting & welding	LF	1,950.0000	64,544.66	2,588.04	12,285.00	0.00	0.00	79,417.69
1.3 Bank Stabilization	**EA**	**1.0000**	**583,604.53**	**247,762.89**	**814,707.42**	**239.58**	**0.00**	**1,926,807.82**
1.3.1 Bank Stabilization	**EA**	**1.0000**	**570,374.90**	**239,606.19**	**803,529.72**	**239.58**	**0.00**	**1,894,243.79**
1.3.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**29,198.45**	**5,831.41**	**1,526.40**	**239.58**	**0.00**	**36,795.83**
1.3.1.1.1 Mob and Demob	EA	1.0000	28,046.17	5,831.41	0.00	0.00	0.00	33,877.58
1.3.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	0.00	0.00	0.00	239.58	0.00	239.58
1.3.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	1,152.28	0.00	0.00	0.00	0.00	1,152.28
1.3.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	0.00	0.00	1,526.40	0.00	0.00	1,526.40
1.3.1.2 Earthwork	**EA**	**1.0000**	**108,368.92**	**84,918.50**	**35,488.80**	**0.00**	**0.00**	**228,776.23**
1.3.1.2.1 Site Work	**EA**	**1.0000**	**108,368.92**	**84,918.50**	**35,488.80**	**0.00**	**0.00**	**228,776.23**
1.3.1.2.1.1 Clearing and Grubbing	**ACR**	**4.5200**	**20,491.92**	**13,855.10**	**0.00**	**0.00**	**0.00**	**34,347.02**
1.3.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	4.5200	14,480.04	7,166.09	0.00	0.00	0.00	21,646.13
1.3.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	4.5200	5,043.02	5,630.52	0.00	0.00	0.00	10,673.54
1.3.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	400.0000	968.86	1,058.49	0.00	0.00	0.00	2,027.35
1.3.1.2.1.2 Excavation, Common	**CY**	**20,500.0000**	**27,608.21**	**18,017.94**	**0.00**	**0.00**	**0.00**	**45,626.15**
1.3.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	20,500.0000	27,608.21	18,017.94	0.00	0.00	0.00	45,626.15
1.3.1.2.1.3 Fill	**CY**	**23,200.0000**	**60,268.80**	**53,045.46**	**35,488.80**	**0.00**	**0.00**	**148,803.06**
1.3.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer,	CY	2,700.0000	6,629.36	9,037.63	35,488.80	0.00	0.00	51,155.79

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
includes load at pit and haul, excludes compaction								
1.3.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	20,500.0000	23,851.93	32,674.61	0.00	0.00	0.00	56,526.54
1.3.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	2,700.0000	5,813.14	8,233.39	0.00	0.00	0.00	14,046.53
1.3.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	23,200.0000	23,974.37	3,099.83	0.00	0.00	0.00	27,074.20
1.3.1.3 Associated General Items	**EA**	**1.0000**	**432,807.53**	**148,856.28**	**766,514.52**	**0.00**	**0.00**	**1,628,671.73**
1.3.1.3.1 Vane	**TON**	**2,805.0000**	**43,761.82**	**52,429.42**	**140,488.43**	**0.00**	**0.00**	**236,679.67**
1.3.1.3.1.1 Armor Stone Placement	TON	2,805.0000	28,606.05	35,651.56	133,798.50	0.00	0.00	198,056.11
1.3.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,700.0000	13,725.47	14,995.28	0.00	0.00	0.00	28,720.75
1.3.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	140.2500	1,430.30	1,782.58	6,689.93	0.00	0.00	9,902.81
1.3.1.3.2 J-Hook, Upper Reach	**TON**	**990.0000**	**15,445.35**	**18,504.50**	**49,584.15**	**0.00**	**0.00**	**83,534.00**
1.3.1.3.2.1 Armor Stone Placement	TON	990.0000	10,096.25	12,582.90	47,223.00	0.00	0.00	69,902.16
1.3.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	600.0000	4,844.28	5,292.45	0.00	0.00	0.00	10,136.74
1.3.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	49.5000	504.81	629.15	2,361.15	0.00	0.00	3,495.11
1.3.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**2,757.16**	**1,265.58**	**99,491.07**	**0.00**	**0.00**	**103,513.80**
1.3.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	3,831.0000	2,757.16	1,265.58	99,491.07	0.00	0.00	103,513.80
1.3.1.3.4 Misc. Rock	**TON**	**330.0000**	**5,148.45**	**6,168.17**	**16,528.05**	**0.00**	**0.00**	**27,844.67**
1.3.1.3.4.1 Armor Stone Placement	TON	330.0000	3,365.42	4,194.30	15,741.00	0.00	0.00	23,300.72
1.3.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	200.0000	1,614.76	1,764.15	0.00	0.00	0.00	3,378.91
1.3.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	16.5000	168.27	209.72	787.05	0.00	0.00	1,165.04
1.3.1.3.5 Replace Damaged Path	**SY**	**334.0000**	**2,004.44**	**1,896.30**	**7,190.55**	**0.00**	**0.00**	**11,091.29**
1.3.1.3.5.1 Fine grading, finish grading, small area, to be paved with grader	SY	334.0000	695.09	790.08	0.00	0.00	0.00	1,485.17
1.3.1.3.5.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	334.0000	310.89	264.48	0.00	0.00	0.00	575.37
1.3.1.3.5.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	2,914.9091	598.42	518.63	5,159.97	0.00	0.00	6,277.02
1.3.1.3.5.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	334.0000	127.09	89.73	102.67	0.00	0.00	319.50
1.3.1.3.5.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	30.3636	12.04	5.70	249.44	0.00	0.00	267.17
1.3.1.3.5.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	291.4909	103.09	0.00	46.35	0.00	0.00	149.44
1.3.1.3.5.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	334.0000	157.81	227.69	1,632.12	0.00	0.00	2,017.62
1.3.1.3.6 Seed and Mulch	**EA**	**1.0000**	**100,891.16**	**7,204.71**	**49,909.78**	**0.00**	**0.00**	**158,005.65**
1.3.1.3.6.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	34,478.0000	63,102.62	5,617.92	16,080.54	0.00	0.00	84,801.08
1.3.1.3.6.2 Seeding, mechanical seeding, 215 lb./acre	ACR	7.1200	2,239.81	1,159.50	4,226.43	0.00	0.00	7,625.74
1.3.1.3.6.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	310,302.0000	35,548.73	427.29	29,602.81	0.00	0.00	65,578.83
1.3.1.3.7 Planting	**EA**	**1.0000**	**51,426.51**	**24,574.41**	**216,411.72**	**0.00**	**0.00**	**292,412.64**
1.3.1.3.7.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	776.0000	27,097.32	12,948.59	107,755.36	0.00	0.00	147,801.27
1.3.1.3.7.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	958.0000	24,329.18	11,625.82	108,656.36	0.00	0.00	144,611.36

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
1.3.1.3.8 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	**47,071.46**	**28,261.85**	**23,253.75**	**0.00**	**0.00**	**98,587.06**
1.3.1.3.8.1 Laborers, (Semi-Skilled)	HR	213.3621	7,165.72	0.00	0.00	0.00	0.00	7,165.72
1.3.1.3.8.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	2,250.0000	17,704.23	7,620.89	23,253.75	0.00	0.00	48,578.87
1.3.1.3.8.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	213.3621	0.00	20,640.96	0.00	0.00	0.00	20,640.96
1.3.1.3.8.4 Equip. Operators, Medium	HR	213.3621	15,035.79	0.00	0.00	0.00	0.00	15,035.79
1.3.1.3.8.5 Laborers, (Semi-Skilled)	HR	213.3621	7,165.72	0.00	0.00	0.00	0.00	7,165.72
1.3.1.3.9 Stabilized Construction Entrance	**TON**	**55.0000**	**312.84**	**64.10**	**937.04**	**0.00**	**0.00**	**1,313.98**
1.3.1.3.9.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	55.0000	163.68	14.57	466.40	0.00	0.00	644.65
1.3.1.3.9.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	200.0000	149.16	49.53	470.64	0.00	0.00	669.33
1.3.1.3.10 Mulch Access Road	**EA**	**1.0000**	**36,073.99**	**407.96**	**105,511.34**	**0.00**	**0.00**	**141,993.29**
1.3.1.3.10.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	11,000.0000	2,132.96	0.00	21,454.40	0.00	0.00	23,587.36
1.3.1.3.10.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	445.5000	33,941.03	407.96	84,056.94	0.00	0.00	118,405.93
1.3.1.3.11 Temporary Seed and Mulch	**EA**	**1.0000**	**100,856.56**	**7,204.29**	**49,880.97**	**0.00**	**0.00**	**157,941.83**
1.3.1.3.11.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	34,478.0000	63,102.62	5,617.92	16,080.54	0.00	0.00	84,801.08
1.3.1.3.11.2 Seeding, mechanical seeding, 215 lb./acre	ACR	7.1200	2,239.81	1,159.50	4,226.43	0.00	0.00	7,625.74
1.3.1.3.11.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	310,000.0000	35,514.14	426.87	29,574.00	0.00	0.00	65,515.01
1.3.1.3.12 Orange Construction Fence	**LF**	**3,570.0000**	**5,861.97**	**0.00**	**4,427.51**	**0.00**	**0.00**	**10,289.48**
1.3.1.3.12.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	3,570.0000	5,861.97	0.00	4,427.51	0.00	0.00	10,289.48
1.3.1.3.13 Silt Fence	**EA**	**1.0000**	**1,086.86**	**20.02**	**1,068.48**	**0.00**	**0.00**	**2,175.36**
1.3.1.3.13.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	1,400.0000	1,086.86	20.02	1,068.48	0.00	0.00	2,175.36
1.3.1.3.14 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7,313.40**
1.3.1.3.14.1 willow stakes @ 4' spacing	EA	1,913.0000	0.00	0.00	0.00	0.00	0.00	7,313.40
1.3.1.3.15 Upstream Diversion	**EA**	**1.0000**	**13,359.00**	**549.62**	**1,221.12**	**0.00**	**0.00**	**151,719.74**
1.3.1.3.15.1 Pumping	**DAY**	**180.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**136,590.00**
1.3.1.3.15.1.1 10" Pump, 2 pumps	DAY	180.0000	0.00	0.00	0.00	0.00	0.00	40,590.00
1.3.1.3.15.1.2 Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
1.3.1.3.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
1.3.1.3.15.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**13,359.00**	**549.62**	**1,221.12**	**0.00**	**0.00**	**15,129.74**
1.3.1.3.15.2.1 Sandbags, 14" x 26"	EA	1,800.0000	0.00	0.00	1,221.12	0.00	0.00	1,221.12
1.3.1.3.15.2.2 Laborers, (Semi-Skilled)	HR	360.0000	12,090.52	0.00	0.00	0.00	0.00	12,090.52
1.3.1.3.15.2.3 Equip. Operators, Medium	HR	18.0000	1,268.47	0.00	0.00	0.00	0.00	1,268.47
1.3.1.3.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	0.00	549.62	0.00	0.00	0.00	549.62
1.3.1.3.16 Downstream Diversion	**EA**	**1.0000**	**6,749.97**	**305.35**	**610.56**	**0.00**	**0.00**	**144,255.88**
1.3.1.3.16.1 Pumping	**DAY**	**180.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**136,590.00**
1.3.1.3.16.1.1 10" Pump, 2 pumps	DAY	180.0000	0.00	0.00	0.00	0.00	0.00	40,590.00
1.3.1.3.16.1.2 Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
1.3.1.3.16.1.3 Local Relocate Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
1.3.1.3.16.2 Sandbags to Be Set Up	**EA**	**900.0000**	**6,749.97**	**305.35**	**610.56**	**0.00**	**0.00**	**7,665.88**
1.3.1.3.16.2.1 Sandbags, 14" x 26"	EA	900.0000	0.00	0.00	610.56	0.00	0.00	610.56
1.3.1.3.16.2.2 Laborers, (Semi-Skilled)	HR	180.0000	6,045.26	0.00	0.00	0.00	0.00	6,045.26
1.3.1.3.16.2.3 Equip. Operators, Medium	HR	10.0000	704.71	0.00	0.00	0.00	0.00	704.71
1.3.1.3.16.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END	HR	10.0000	0.00	305.35	0.00	0.00	0.00	305.35

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4								
1.3.2 Adaptive Management Minor Repair *	**EA**	**1.0000**	**13,229.63**	**8,156.70**	**11,177.70**	**0.00**	**0.00**	**32,564.03**
1.3.2.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**1,560.14**	**1,869.14**	**5,008.50**	**0.00**	**0.00**	**8,437.78**
1.3.2.1.1 Armor Stone Placement	TON	100.0000	1,019.82	1,271.00	4,770.00	0.00	0.00	7,060.82
1.3.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	489.32	534.59	0.00	0.00	0.00	1,023.91
1.3.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	50.99	63.55	238.50	0.00	0.00	353.04
1.3.2.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**10,460.32**	**6,280.41**	**5,167.50**	**0.00**	**0.00**	**21,908.24**
1.3.2.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,592.38	0.00	0.00	0.00	0.00	1,592.38
1.3.2.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	3,934.27	1,693.53	5,167.50	0.00	0.00	10,795.30
1.3.2.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	0.00	4,586.88	0.00	0.00	0.00	4,586.88
1.3.2.2.4 Equip. Operators, Medium	HR	47.4138	3,341.29	0.00	0.00	0.00	0.00	3,341.29
1.3.2.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,592.38	0.00	0.00	0.00	0.00	1,592.38
1.3.2.3 Silt Fence	**EA**	**1.0000**	**388.16**	**7.15**	**381.60**	**0.00**	**0.00**	**776.91**
1.3.2.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	388.16	7.15	381.60	0.00	0.00	776.91
1.3.2.4 Orange Construction Fence	**LF**	**500.0000**	**821.00**	**0.00**	**620.10**	**0.00**	**0.00**	**1,441.10**
1.3.2.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	821.00	0.00	620.10	0.00	0.00	1,441.10
1.4 PED - Monitoring only	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**94,999.98**	**0.00**	**94,999.98**
1.4.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	0.00	2,500.00	0.00	2,500.00
1.4.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	0.00	25,000.00	0.00	25,000.00
1.4.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	0.00	8,333.35	0.00	8,333.35
1.4.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	0.00	0.00	0.00	9,166.65	0.00	9,166.65
1.4.5 Report each year for 5 years	EA	1.0000	0.00	0.00	0.00	11,666.65	0.00	11,666.65
1.4.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	3,833.33	0.00	3,833.33
1.4.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
1.4.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
1.4.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	0.00	0.00	0.00	500.00	0.00	500.00
1.4.10 4 subsequence years of monitoring	EA	1.0000	0.00	0.00	0.00	24,666.67	0.00	24,666.67
1.4.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	0.00	0.00	0.00	1,666.67	0.00	1,666.67
1.4.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	0.00	0.00	0.00	2,000.00	0.00	2,000.00
2 Site 3 and 9	**EA**	**1.0000**	**1,217,572.48**	**530,923.69**	**1,924,570.87**	**223,239.54**	**0.00**	**4,306,076.58**
2.1 Lands and Damages	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**33,000.00**	**0.00**	**33,000.00**
2.1.1 RE Cost for site 3, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	0.00	0.00	0.00	16,500.00	0.00	16,500.00
2.1.2 RE Cost for site 9, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	0.00	0.00	0.00	16,500.00	0.00	16,500.00
2.2 Relocations	**EA**	**1.0000**	**98,332.55**	**20,102.37**	**55,289.60**	**0.00**	**0.00**	**173,724.51**
2.2.1 Roads, Construction Activities for Site 3	**EA**	**1.0000**	**98,332.55**	**20,102.37**	**55,289.60**	**0.00**	**0.00**	**173,724.51**
2.2.1.1 Bridges. Foundations	**EA**	**1.0000**	**19,843.53**	**62.27**	**21,793.60**	**0.00**	**0.00**	**41,699.40**
2.2.1.1.1 Concrete	**EA**	**1.0000**	**19,843.53**	**62.27**	**21,793.60**	**0.00**	**0.00**	**41,699.40**
2.2.1.1.1.1 Concrete, in Place:	**EA**	**1.0000**	**19,843.53**	**62.27**	**21,793.60**	**0.00**	**0.00**	**41,699.40**
2.2.1.1.1.1.1 C.I.P. concrete forms, equipment foundations, 1 use, includes	SFC	800.0000	10,636.73	0.00	2,925.60	0.00	0.00	13,562.33

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
erecting, bracing, stripping and cleaning								
2.2.1.1.1.1.2 Structural concrete, in place, foundation mat (3000 psi), over 20 C.Y., includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	CY	100.0000	9,206.81	62.27	18,868.00	0.00	0.00	28,137.08
2.2.1.2 Bridges, Superstructure and Deck	**EA**	**1.0000**	**78,489.01**	**20,040.10**	**33,496.00**	**0.00**	**0.00**	**132,025.11**
2.2.1.2.1 Metals	**EA**	**1.0000**	**78,489.01**	**20,040.10**	**33,496.00**	**0.00**	**0.00**	**132,025.11**
2.2.1.2.1.1 Steel Trusses, Girders and B	**EA**	**1.0000**	**23,840.57**	**18,049.30**	**22,260.00**	**0.00**	**0.00**	**64,149.87**
2.2.1.2.1.1.1 Fabricated pedestrian bridges, steel, trussed or arch spans, complete in place, 10' wide, 150' span, includes erection, excludes foundations	SF	1,500.0000	12,722.55	2,483.51	0.00	0.00	0.00	15,206.07
2.2.1.2.1.1.2 Mobilization or demobilization, crane, truck-mounted, up to 75 ton, (driver only)	EA	4.0000	559.56	0.00	0.00	0.00	0.00	559.56
2.2.1.2.1.1.3 Crane crew, daily use for small jobs, 100-ton truck-mounted hydraulic crane, portal to portal	DAY	14.0000	10,558.46	15,565.79	22,260.00	0.00	0.00	48,384.24
2.2.1.2.1.2 Bearing Pads	**EA**	**1.0000**	**4,998.71**	**0.00**	**1,219.00**	**0.00**	**0.00**	**6,217.71**
2.2.1.2.1.2.1 Bearing pad, fabric reinforced neoprene, 5000 psi, 1/2" thick	SF	100.0000	4,998.71	0.00	1,219.00	0.00	0.00	6,217.71
2.2.1.2.1.3 Miscellaneous Steel (all type	**EA**	**1.0000**	**49,649.74**	**1,990.80**	**10,017.00**	**0.00**	**0.00**	**61,657.53**
2.2.1.2.1.3.1 Bridge Stiffeners	**EA**	**1.0000**	**49,649.74**	**1,990.80**	**10,017.00**	**0.00**	**0.00**	**61,657.53**
2.2.1.2.1.3.1.1 Channel framing, structural steel, field fabricated, C6x8.2, incl cutting & welding	LF	1,500.0000	49,649.74	1,990.80	10,017.00	0.00	0.00	61,657.53
2.3 Bank Stabilization	**EA**	**1.0000**	**1,119,239.93**	**510,821.33**	**1,869,281.27**	**239.58**	**0.00**	**3,909,352.10**
2.3.1 Bank Stabilization for Site 3	**EA**	**1.0000**	**824,404.14**	**374,310.12**	**1,358,365.22**	**239.58**	**0.00**	**2,830,499.06**
2.3.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**31,922.78**	**5,831.41**	**1,526.40**	**239.58**	**0.00**	**39,520.17**
2.3.1.1.1 Mob & Demob	EA	1.0000	30,770.50	5,831.41	0.00	0.00	0.00	36,601.91
2.3.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	0.00	0.00	0.00	239.58	0.00	239.58
2.3.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	1,152.28	0.00	0.00	0.00	0.00	1,152.28
2.3.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	0.00	0.00	1,526.40	0.00	0.00	1,526.40
2.3.1.2 Earthwork	**EA**	**1.0000**	**224,535.81**	**221,872.25**	**365,403.20**	**0.00**	**0.00**	**811,811.25**
2.3.1.2.1 Site Work	**EA**	**1.0000**	**224,535.81**	**221,872.25**	**365,403.20**	**0.00**	**0.00**	**811,811.25**
2.3.1.2.1.1 Clearing and Grubbing	**ACR**	**5.1800**	**20,636.69**	**13,989.73**	**0.00**	**0.00**	**0.00**	**34,626.42**
2.3.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	5.1800	14,520.05	7,185.91	0.00	0.00	0.00	21,705.96
2.3.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	5.1800	5,056.95	5,646.09	0.00	0.00	0.00	10,703.05
2.3.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	500.0000	1,059.69	1,157.72	0.00	0.00	0.00	2,217.41
2.3.1.2.1.2 Excavation, Common	**CY**	**21,500.0000**	**25,335.58**	**16,534.76**	**0.00**	**0.00**	**0.00**	**41,870.34**
2.3.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	21,500.0000	25,335.58	16,534.76	0.00	0.00	0.00	41,870.34
2.3.1.2.1.3 Fill	**CY**	**37,800.0000**	**178,563.54**	**191,347.76**	**365,403.20**	**0.00**	**0.00**	**735,314.50**
2.3.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	27,800.0000	59,725.60	81,422.33	365,403.20	0.00	0.00	506,551.13
2.3.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	21,500.0000	21,888.51	29,984.94	0.00	0.00	0.00	51,873.44
2.3.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	27,800.0000	52,372.08	74,176.75	0.00	0.00	0.00	126,548.83
2.3.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	49,300.0000	44,577.35	5,763.74	0.00	0.00	0.00	50,341.09
2.3.1.3 Associated General Items	**EA**	**1.0000**	**556,369.64**	**139,469.35**	**980,257.92**	**0.00**	**0.00**	**1,949,276.91**
2.3.1.3.1 Vane	**TON**	**2,475.0000**	**33,786.70**	**40,478.60**	**123,960.38**	**0.00**	**0.00**	**198,225.67**
2.3.1.3.1.1 Armor Stone Placement	TON	2,475.0000	22,085.55	27,525.10	118,057.50	0.00	0.00	167,668.15

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
2.3.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,500.0000	10,596.87	11,577.24	0.00	0.00	0.00	22,174.11
2.3.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	123.7500	1,104.28	1,376.26	5,902.88	0.00	0.00	8,383.41
2.3.1.3.2 J-Hook, Upper Reach	**TON**	**495.0000**	**6,757.34**	**8,095.72**	**24,792.08**	**0.00**	**0.00**	**39,645.13**
2.3.1.3.2.1 Armor Stone Placement	TON	495.0000	4,417.11	5,505.02	23,611.50	0.00	0.00	33,533.63
2.3.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	300.0000	2,119.37	2,315.45	0.00	0.00	0.00	4,434.82
2.3.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	24.7500	220.86	275.25	1,180.58	0.00	0.00	1,676.68
2.3.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**4,554.24**	**2,090.46**	**187,815.04**	**0.00**	**0.00**	**194,459.74**
2.3.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	7,232.0000	4,554.24	2,090.46	187,815.04	0.00	0.00	194,459.74
2.3.1.3.4 Misc. Rock	**TON**	**50.0000**	**680.42**	**815.41**	**2,504.25**	**0.00**	**0.00**	**4,000.08**
2.3.1.3.4.1 Armor Stone Placement	TON	50.0000	446.17	556.06	2,385.00	0.00	0.00	3,387.24
2.3.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	30.0000	211.94	231.54	0.00	0.00	0.00	443.48
2.3.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	2.5000	22.31	27.80	119.25	0.00	0.00	169.36
2.3.1.3.5 Replace Damaged Path	**SY**	**56.0000**	**294.06**	**278.20**	**1,205.60**	**0.00**	**0.00**	**1,777.87**
2.3.1.3.5.1 Fine grading, finish grading, small area, to be paved with grader	SY	56.0000	101.97	115.91	0.00	0.00	0.00	217.88
2.3.1.3.5.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	56.0000	45.61	38.80	0.00	0.00	0.00	84.41
2.3.1.3.5.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	488.7273	87.79	76.09	865.15	0.00	0.00	1,029.02
2.3.1.3.5.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	56.0000	18.65	13.16	17.21	0.00	0.00	49.02
2.3.1.3.5.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	5.0909	1.77	0.84	41.82	0.00	0.00	44.42
2.3.1.3.5.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	48.8727	15.12	0.00	7.77	0.00	0.00	22.89
2.3.1.3.5.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	56.0000	23.15	33.40	273.65	0.00	0.00	330.20
2.3.1.3.6 Seed and Mulch	**EA**	**1.0000**	**166,663.07**	**11,902.55**	**94,228.17**	**0.00**	**0.00**	**272,793.79**
2.3.1.3.6.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	65,090.0000	104,238.37	9,280.17	30,357.98	0.00	0.00	143,876.52
2.3.1.3.6.2 Seeding, mechanical seeding, 215 lb./acre	ACR	13.4500	3,702.21	1,916.55	7,983.92	0.00	0.00	13,602.69
2.3.1.3.6.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	585,810.0000	58,722.48	705.83	55,886.27	0.00	0.00	115,314.59
2.3.1.3.7 Planting	**EA**	**1.0000**	**62,153.06**	**29,700.15**	**298,912.58**	**0.00**	**0.00**	**390,765.79**
2.3.1.3.7.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	1,072.0000	32,754.24	15,651.77	148,857.92	0.00	0.00	197,263.94
2.3.1.3.7.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	1,323.0000	29,398.82	14,048.37	150,054.66	0.00	0.00	193,501.85
2.3.1.3.8 Wooden logs for stabilization and in stream structures	**LF**	**3,000.0000**	**54,916.70**	**32,972.16**	**31,005.00**	**0.00**	**0.00**	**118,893.86**
2.3.1.3.8.1 Laborers, (Semi-Skilled)	HR	284.4828	8,360.01	0.00	0.00	0.00	0.00	8,360.01
2.3.1.3.8.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	3,000.0000	20,654.93	8,891.04	31,005.00	0.00	0.00	60,550.97
2.3.1.3.8.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	284.4828	0.00	24,081.12	0.00	0.00	0.00	24,081.12
2.3.1.3.8.4 Equip. Operators, Medium	HR	284.4828	17,541.75	0.00	0.00	0.00	0.00	17,541.75
2.3.1.3.8.5 Laborers, (Semi-Skilled)	HR	284.4828	8,360.01	0.00	0.00	0.00	0.00	8,360.01
2.3.1.3.9 Stabilized Construction Entrance	**TON**	**92.0000**	**456.88**	**93.49**	**1,563.78**	**0.00**	**0.00**	**2,114.14**
2.3.1.3.9.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	92.0000	239.57	21.33	780.16	0.00	0.00	1,041.06

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
2.3.1.3.9.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	333.0000	217.31	72.16	783.62	0.00	0.00	1,073.08
2.3.1.3.10 Mulch Access Road	**EA**	**1.0000**	**32,999.50**	**373.19**	**110,307.31**	**0.00**	**0.00**	**143,680.01**
2.3.1.3.10.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	11,500.0000	1,951.18	0.00	22,429.60	0.00	0.00	24,380.78
2.3.1.3.10.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	465.7500	31,048.33	373.19	87,877.71	0.00	0.00	119,299.23
2.3.1.3.11 Temporary Seed and Mulch	**EA**	**1.0000**	**166,663.07**	**11,902.55**	**94,228.17**	**0.00**	**0.00**	**272,793.79**
2.3.1.3.11.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	65,090.0000	104,238.37	9,280.17	30,357.98	0.00	0.00	143,876.52
2.3.1.3.11.2 Seeding, mechanical seeding, 215 lb./acre	ACR	13.4500	3,702.21	1,916.55	7,983.92	0.00	0.00	13,602.69
2.3.1.3.11.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	585,810.0000	58,722.48	705.83	55,886.27	0.00	0.00	115,314.59
2.3.1.3.12 Orange Construction Fence	**LF**	**5,450.0000**	**7,830.32**	**0.00**	**6,759.09**	**0.00**	**0.00**	**14,589.41**
2.3.1.3.12.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	5,450.0000	7,830.32	0.00	6,759.09	0.00	0.00	14,589.41
2.3.1.3.13 Silt Fence	**EA**	**1.0000**	**1,018.93**	**18.77**	**1,144.80**	**0.00**	**0.00**	**2,182.50**
2.3.1.3.13.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	1,500.0000	1,018.93	18.77	1,144.80	0.00	0.00	2,182.50
2.3.1.3.14 Upstream Diversion	**EA**	**1.0000**	**11,689.12**	**480.92**	**1,221.12**	**0.00**	**0.00**	**149,981.16**
2.3.1.3.14.1 Pumping	**DAY**	**180.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**136,590.00**
2.3.1.3.14.1.1 10" Pump, 2 pumps	DAY	180.0000	0.00	0.00	0.00	0.00	0.00	40,590.00
2.3.1.3.14.1.2 Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
2.3.1.3.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
2.3.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**11,689.12**	**480.92**	**1,221.12**	**0.00**	**0.00**	**13,391.16**
2.3.1.3.14.2.1 Sandbags, 14" x 26"	EA	1,800.0000	0.00	0.00	1,221.12	0.00	0.00	1,221.12
2.3.1.3.14.2.2 Laborers, (Semi-Skilled)	HR	360.0000	10,579.21	0.00	0.00	0.00	0.00	10,579.21
2.3.1.3.14.2.3 Equip. Operators, Medium	HR	18.0000	1,109.91	0.00	0.00	0.00	0.00	1,109.91
2.3.1.3.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	0.00	480.92	0.00	0.00	0.00	480.92
2.3.1.3.15 Downstream Diversion	**EA**	**1.0000**	**5,906.22**	**267.18**	**610.56**	**0.00**	**0.00**	**143,373.96**
2.3.1.3.15.1 Pumping	**DAY**	**180.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**136,590.00**
2.3.1.3.15.1.1 10" Pump, 2 pumps	DAY	180.0000	0.00	0.00	0.00	0.00	0.00	40,590.00
2.3.1.3.15.1.2 Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
2.3.1.3.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
2.3.1.3.15.2 Sandbags to Be Set Up	**EA**	**900.0000**	**5,906.22**	**267.18**	**610.56**	**0.00**	**0.00**	**6,783.96**
2.3.1.3.15.2.1 Sandbags, 14" x 26"	EA	900.0000	0.00	0.00	610.56	0.00	0.00	610.56
2.3.1.3.15.2.2 Laborers, (Semi-Skilled)	HR	180.0000	5,289.60	0.00	0.00	0.00	0.00	5,289.60
2.3.1.3.15.2.3 Equip. Operators, Medium	HR	10.0000	616.62	0.00	0.00	0.00	0.00	616.62
2.3.1.3.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	10.0000	0.00	267.18	0.00	0.00	0.00	267.18
2.3.1.4 Adaptive Management Minor Repair *	**EA**	**1.0000**	**11,575.92**	**7,137.12**	**11,177.70**	**0.00**	**0.00**	**29,890.74**
2.3.1.4.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**1,365.12**	**1,635.50**	**5,008.50**	**0.00**	**0.00**	**8,009.12**
2.3.1.4.1.1 Armor Stone Placement	TON	100.0000	892.35	1,112.13	4,770.00	0.00	0.00	6,774.47
2.3.1.4.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	428.16	467.77	0.00	0.00	0.00	895.92
2.3.1.4.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	44.62	55.61	238.50	0.00	0.00	338.72
2.3.1.4.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**9,152.78**	**5,495.36**	**5,167.50**	**0.00**	**0.00**	**19,815.64**
2.3.1.4.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	0.00	0.00	0.00	0.00	1,393.33
2.3.1.4.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	3,442.49	1,481.84	5,167.50	0.00	0.00	10,091.83
2.3.1.4.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY	HR	47.4138	0.00	4,013.52	0.00	0.00	0.00	4,013.52

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
BUCKET, 23.25' MAX DIGGING DEPTH								
2.3.1.4.2.4 Equip. Operators, Medium	HR	47.4138	2,923.63	0.00	0.00	0.00	0.00	2,923.63
2.3.1.4.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	0.00	0.00	0.00	0.00	1,393.33
2.3.1.4.3 Silt Fence	**EA**	**1.0000**	**339.64**	**6.26**	**381.60**	**0.00**	**0.00**	**727.50**
2.3.1.4.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	339.64	6.26	381.60	0.00	0.00	727.50
2.3.1.4.4 Orange Construction Fence	**LF**	**500.0000**	**718.38**	**0.00**	**620.10**	**0.00**	**0.00**	**1,338.48**
2.3.1.4.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	718.38	0.00	620.10	0.00	0.00	1,338.48
2.3.2 Bank Stabilization for Site 9	**EA**	**1.0000**	**294,835.79**	**136,511.21**	**510,916.05**	**0.00**	**0.00**	**1,078,853.04**
2.3.2.1 Earthwork	**EA**	**1.0000**	**65,723.71**	**68,529.33**	**131,440.00**	**0.00**	**0.00**	**265,693.04**
2.3.2.1.1 Site Work	**EA**	**1.0000**	**65,723.71**	**68,529.33**	**131,440.00**	**0.00**	**0.00**	**265,693.04**
2.3.2.1.1.1 Clearing and Grubbing	**ACR**	**3.0000**	**12,079.81**	**8,242.07**	**0.00**	**0.00**	**0.00**	**20,321.88**
2.3.2.1.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	3.0000	8,409.29	4,161.72	0.00	0.00	0.00	12,571.02
2.3.2.1.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	3.0000	2,928.74	3,269.94	0.00	0.00	0.00	6,198.67
2.3.2.1.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	350.0000	741.78	810.41	0.00	0.00	0.00	1,552.19
2.3.2.1.1.2 Excavation, Common	**CY**	**1,380.0000**	**1,626.19**	**1,061.30**	**0.00**	**0.00**	**0.00**	**2,687.49**
2.3.2.1.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	1,380.0000	1,626.19	1,061.30	0.00	0.00	0.00	2,687.49
2.3.2.1.1.3 Fill	**CY**	**37,800.0000**	**52,017.71**	**59,225.96**	**131,440.00**	**0.00**	**0.00**	**242,683.67**
2.3.2.1.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	10,000.0000	21,484.03	29,288.61	131,440.00	0.00	0.00	182,212.64
2.3.2.1.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	1,380.0000	1,404.94	1,924.61	0.00	0.00	0.00	3,329.55
2.3.2.1.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	10,000.0000	18,838.88	26,682.29	0.00	0.00	0.00	45,521.16
2.3.2.1.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	11,380.0000	10,289.86	1,330.45	0.00	0.00	0.00	11,620.32
2.3.2.2 Associated General Items	**EA**	**1.0000**	**217,536.15**	**60,844.76**	**368,298.35**	**0.00**	**0.00**	**783,269.26**
2.3.2.2.1 Vane	**TON**	**660.0000**	**9,009.79**	**10,794.29**	**33,056.10**	**0.00**	**0.00**	**52,860.18**
2.3.2.2.1.1 Armor Stone Placement	TON	660.0000	5,889.48	7,340.03	31,482.00	0.00	0.00	44,711.51
2.3.2.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	400.0000	2,825.83	3,087.26	0.00	0.00	0.00	5,913.10
2.3.2.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	33.0000	294.47	367.00	1,574.10	0.00	0.00	2,235.58
2.3.2.2.2 J-Hook, Upper Reach	**TON**	**116.0000**	**1,583.54**	**1,897.18**	**5,809.86**	**0.00**	**0.00**	**9,290.58**
2.3.2.2.2.1 Armor Stone Placement	TON	116.0000	1,035.12	1,290.07	5,533.20	0.00	0.00	7,858.39
2.3.2.2.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	70.3030	496.66	542.61	0.00	0.00	0.00	1,039.27
2.3.2.2.2.3 Waste/loss factor for armor stones, assume 5%	TON	5.8000	51.76	64.50	276.66	0.00	0.00	392.92
2.3.2.2.3 Topsoil 4 in depth	**EA**	**1.0000**	**1,605.82**	**737.10**	**66,223.50**	**0.00**	**0.00**	**68,566.42**
2.3.2.2.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	2,550.0000	1,605.82	737.10	66,223.50	0.00	0.00	68,566.42
2.3.2.2.4 Misc. Rock	**TON**	**41.3000**	**563.58**	**675.23**	**2,068.51**	**0.00**	**0.00**	**3,307.32**
2.3.2.2.4.1 Armor Stone Placement	TON	41.3000	368.54	459.31	1,970.01	0.00	0.00	2,797.86
2.3.2.2.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	25.0000	176.61	192.95	0.00	0.00	0.00	369.57
2.3.2.2.4.3 Waste/loss factor for armor stones, assume 5%	TON	2.0650	18.43	22.97	98.50	0.00	0.00	139.89

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
2.3.2.2.5 Replace Damaged Path	**SY**	**34.0000**	**178.54**	**168.91**	**731.97**	**0.00**	**0.00**	**1,079.42**
2.3.2.2.5.1 Fine grading, finish grading, small area, to be paved with grader	SY	34.0000	61.91	70.37	0.00	0.00	0.00	132.29
2.3.2.2.5.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	34.0000	27.69	23.56	0.00	0.00	0.00	51.25
2.3.2.2.5.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	296.7273	53.30	46.19	525.27	0.00	0.00	624.76
2.3.2.2.5.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	34.0000	11.32	7.99	10.45	0.00	0.00	29.76
2.3.2.2.5.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	3.0909	1.07	0.51	25.39	0.00	0.00	26.97
2.3.2.2.5.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	29.6727	9.18	0.00	4.72	0.00	0.00	13.90
2.3.2.2.5.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	34.0000	14.06	20.28	166.14	0.00	0.00	200.48
2.3.2.2.6 Seed and Mulch	**EA**	**1.0000**	**58,750.36**	**4,195.61**	**33,215.79**	**0.00**	**0.00**	**96,161.76**
2.3.2.2.6.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	22,945.0000	36,745.27	3,271.37	10,701.55	0.00	0.00	50,718.19
2.3.2.2.6.2 Seeding, mechanical seeding, 215 lb./acre	ACR	4.7400	1,304.72	675.42	2,813.66	0.00	0.00	4,793.81
2.3.2.2.6.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	206,505.0000	20,700.37	248.81	19,700.58	0.00	0.00	40,649.77
2.3.2.2.7 Planting	**EA**	**1.0000**	**27,376.68**	**13,082.08**	**131,665.78**	**0.00**	**0.00**	**172,124.54**
2.3.2.2.7.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	472.0000	14,421.64	6,891.45	65,541.92	0.00	0.00	86,855.02
2.3.2.2.7.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	583.0000	12,955.04	6,190.63	66,123.86	0.00	0.00	85,269.52
2.3.2.2.8 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	**41,187.52**	**24,729.12**	**23,253.75**	**0.00**	**0.00**	**89,170.39**
2.3.2.2.8.1 Laborers, (Semi-Skilled)	HR	213.3621	6,270.01	0.00	0.00	0.00	0.00	6,270.01
2.3.2.2.8.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	2,250.0000	15,491.20	6,668.28	23,253.75	0.00	0.00	45,413.23
2.3.2.2.8.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	213.3621	0.00	18,060.84	0.00	0.00	0.00	18,060.84
2.3.2.2.8.4 Equip. Operators, Medium	HR	213.3621	13,156.31	0.00	0.00	0.00	0.00	13,156.31
2.3.2.2.8.5 Laborers, (Semi-Skilled)	HR	213.3621	6,270.01	0.00	0.00	0.00	0.00	6,270.01
2.3.2.2.9 Stabilized Construction Entrance	**TON**	**18.0000**	**90.59**	**18.69**	**310.30**	**0.00**	**0.00**	**419.59**
2.3.2.2.9.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	18.0000	46.87	4.17	152.64	0.00	0.00	203.68
2.3.2.2.9.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	67.0000	43.72	14.52	157.66	0.00	0.00	215.91
2.3.2.2.10 Mulch Access Road	**EA**	**1.0000**	**10,855.40**	**122.76**	**36,286.31**	**0.00**	**0.00**	**47,264.48**
2.3.2.2.10.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	3,783.0000	641.85	0.00	7,378.36	0.00	0.00	8,020.21
2.3.2.2.10.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	153.2115	10,213.55	122.76	28,907.95	0.00	0.00	39,244.26
2.3.2.2.11 Temporary Seed and Mulch	**EA**	**1.0000**	**58,750.36**	**4,195.61**	**33,215.79**	**0.00**	**0.00**	**96,161.76**
2.3.2.2.11.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	22,945.0000	36,745.27	3,271.37	10,701.55	0.00	0.00	50,718.19
2.3.2.2.11.2 Seeding, mechanical seeding, 215 lb./acre	ACR	4.7400	1,304.72	675.42	2,813.66	0.00	0.00	4,793.81
2.3.2.2.11.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	206,505.0000	20,700.37	248.81	19,700.58	0.00	0.00	40,649.77
2.3.2.2.12 Orange Construction Fence	**LF**	**1,340.0000**	**1,925.25**	**0.00**	**1,661.87**	**0.00**	**0.00**	**3,587.12**
2.3.2.2.12.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	1,340.0000	1,925.25	0.00	1,661.87	0.00	0.00	3,587.12
2.3.2.2.13 Silt Fence	**EA**	**1.0000**	**203.79**	**3.75**	**228.96**	**0.00**	**0.00**	**436.50**
2.3.2.2.13.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	300.0000	203.79	3.75	228.96	0.00	0.00	436.50

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
2.3.2.2.14 Upstream Diversion	**EA**	**1.0000**	**5,454.92**	**224.43**	**569.86**	**0.00**	**0.00**	**142,839.21**
2.3.2.2.14.1 Pumping	**DAY**	**50.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**136,590.00**
2.3.2.2.14.1.1 10" Pump, 2 pumps	DAY	180.0000	0.00	0.00	0.00	0.00	0.00	40,590.00
2.3.2.2.14.1.2 Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
2.3.2.2.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
2.3.2.2.14.2 Sandbags to Be Set Up	**EA**	**840.0000**	**5,454.92**	**224.43**	**569.86**	**0.00**	**0.00**	**6,249.21**
2.3.2.2.14.2.1 Sandbags, 14" x 26"	EA	840.0000	0.00	0.00	569.86	0.00	0.00	569.86
2.3.2.2.14.2.2 Laborers, (Semi-Skilled)	HR	168.0000	4,936.96	0.00	0.00	0.00	0.00	4,936.96
2.3.2.2.14.2.3 Equip. Operators, Medium	HR	8.4000	517.96	0.00	0.00	0.00	0.00	517.96
2.3.2.2.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	8.4000	0.00	224.43	0.00	0.00	0.00	224.43
2.3.2.3 Adaptive Management Minor Repair *	**EA**	**1.0000**	**11,575.92**	**7,137.12**	**11,177.70**	**0.00**	**0.00**	**29,890.74**
2.3.2.3.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**1,365.12**	**1,635.50**	**5,008.50**	**0.00**	**0.00**	**8,009.12**
2.3.2.3.1.1 Armor Stone Placement	TON	100.0000	892.35	1,112.13	4,770.00	0.00	0.00	6,774.47
2.3.2.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	428.16	467.77	0.00	0.00	0.00	895.92
2.3.2.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	44.62	55.61	238.50	0.00	0.00	338.72
2.3.2.3.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**9,152.78**	**5,495.36**	**5,167.50**	**0.00**	**0.00**	**19,815.64**
2.3.2.3.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	0.00	0.00	0.00	0.00	1,393.33
2.3.2.3.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	3,442.49	1,481.84	5,167.50	0.00	0.00	10,091.83
2.3.2.3.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	0.00	4,013.52	0.00	0.00	0.00	4,013.52
2.3.2.3.2.4 Equip. Operators, Medium	HR	47.4138	2,923.63	0.00	0.00	0.00	0.00	2,923.63
2.3.2.3.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	0.00	0.00	0.00	0.00	1,393.33
2.3.2.3.3 Silt Fence	**EA**	**1.0000**	**339.64**	**6.26**	**381.60**	**0.00**	**0.00**	**727.50**
2.3.2.3.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	339.64	6.26	381.60	0.00	0.00	727.50
2.3.2.3.4 Orange Construction Fence	**LF**	**500.0000**	**718.38**	**0.00**	**620.10**	**0.00**	**0.00**	**1,338.48**
2.3.2.3.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	718.38	0.00	620.10	0.00	0.00	1,338.48
2.4 PED - Monitoring Only	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**189,999.96**	**0.00**	**189,999.96**
2.4.1 PED - Monitoring only for site 3	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**94,999.98**	**0.00**	**94,999.98**
2.4.1.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	0.00	2,500.00	0.00	2,500.00
2.4.1.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	0.00	25,000.00	0.00	25,000.00
2.4.1.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	0.00	8,333.35	0.00	8,333.35
2.4.1.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	0.00	0.00	0.00	9,166.65	0.00	9,166.65
2.4.1.5 Report each year for 5 years	EA	1.0000	0.00	0.00	0.00	11,666.65	0.00	11,666.65
2.4.1.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	3,833.33	0.00	3,833.33
2.4.1.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
2.4.1.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
2.4.1.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	0.00	0.00	0.00	500.00	0.00	500.00
2.4.1.10 4 subsequence years of monitoring	EA	1.0000	0.00	0.00	0.00	24,666.67	0.00	24,666.67
2.4.1.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	0.00	0.00	0.00	1,666.67	0.00	1,666.67
2.4.1.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	0.00	0.00	0.00	2,000.00	0.00	2,000.00

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
2.4.2 PED - Monitoring only for site 9	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**94,999.98**	**0.00**	**94,999.98**
2.4.2.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	0.00	2,500.00	0.00	2,500.00
2.4.2.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	0.00	25,000.00	0.00	25,000.00
2.4.2.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	0.00	8,333.35	0.00	8,333.35
2.4.2.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	0.00	0.00	0.00	9,166.65	0.00	9,166.65
2.4.2.5 Report each year for 5 years	EA	1.0000	0.00	0.00	0.00	11,666.65	0.00	11,666.65
2.4.2.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	3,833.33	0.00	3,833.33
2.4.2.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
2.4.2.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
2.4.2.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	0.00	0.00	0.00	500.00	0.00	500.00
2.4.2.10 4 subsequence years of monitoring	EA	1.0000	0.00	0.00	0.00	24,666.67	0.00	24,666.67
2.4.2.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	0.00	0.00	0.00	1,666.67	0.00	1,666.67
2.4.2.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	0.00	0.00	0.00	2,000.00	0.00	2,000.00
3 Site 5 and 15	**EA**	**1.0000**	**1,329,708.35**	**571,238.85**	**1,597,374.36**	**305,009.54**	**0.00**	**4,128,599.47**
3.1 Lands and Damages	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**114,770.00**	**0.00**	**114,770.00**
3.1.1 RE Cost for site 5, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	0.00	0.00	0.00	98,270.00	0.00	98,270.00
3.1.2 RE Cost for site 15, based on Excel estimate from RE specialist dated 30 Mar 2017	EA	1.0000	0.00	0.00	0.00	16,500.00	0.00	16,500.00
3.2 Bank Stabilization	**EA**	**1.0000**	**1,329,708.35**	**571,238.85**	**1,597,374.36**	**239.58**	**0.00**	**3,823,829.51**
3.2.1 Bank Stabilization - Site 5	**EA**	**1.0000**	**830,642.72**	**382,126.75**	**1,060,071.73**	**239.58**	**0.00**	**2,439,299.03**
3.2.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**31,922.78**	**5,831.41**	**1,526.40**	**239.58**	**0.00**	**39,520.17**
3.2.1.1.1 Mob & Demob	EA	1.0000	30,770.50	5,831.41	0.00	0.00	0.00	36,601.91
3.2.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	0.00	0.00	0.00	239.58	0.00	239.58
3.2.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	1,152.28	0.00	0.00	0.00	0.00	1,152.28
3.2.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	0.00	0.00	1,526.40	0.00	0.00	1,526.40
3.2.1.2 Earthwork	**EA**	**1.0000**	**235,174.81**	**219,444.00**	**227,391.20**	**0.00**	**0.00**	**682,010.01**
3.2.1.2.1 Site Work	**EA**	**1.0000**	**235,174.81**	**219,444.00**	**227,391.20**	**0.00**	**0.00**	**682,010.01**
3.2.1.2.1.1 Clearing and Grubbing	**ACR**	**7.1600**	**37,871.71**	**25,606.52**	**0.00**	**0.00**	**0.00**	**63,478.24**
3.2.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	7.1600	26,760.24	13,243.53	0.00	0.00	0.00	40,003.77
3.2.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	7.1600	9,319.89	10,405.67	0.00	0.00	0.00	19,725.56
3.2.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	634.0000	1,791.58	1,957.33	0.00	0.00	0.00	3,748.90
3.2.1.2.1.2 Excavation, Common	**CY**	**17,100.0000**	**26,867.50**	**17,534.53**	**0.00**	**0.00**	**0.00**	**44,402.03**
3.2.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	17,100.0000	26,867.50	17,534.53	0.00	0.00	0.00	44,402.03
3.2.1.2.1.3 Fill	**CY**	**34,400.0000**	**170,435.60**	**176,302.94**	**227,391.20**	**0.00**	**0.00**	**574,129.74**
3.2.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	17,300.0000	49,556.49	67,559.06	227,391.20	0.00	0.00	344,506.75
3.2.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	17,100.0000	23,212.00	31,797.98	0.00	0.00	0.00	55,009.98
3.2.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	19,895.0000	49,973.26	70,779.21	0.00	0.00	0.00	120,752.47

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
3.2.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	39,560.0000	47,693.85	6,166.70	0.00	0.00	0.00	53,860.54
3.2.1.3 Associated General Items	**EA**	**1.0000**	**548,110.56**	**147,335.19**	**819,976.43**	**0.00**	**0.00**	**1,681,640.44**
3.2.1.3.1 Vane	**TON**	**1,815.0000**	**33,035.88**	**39,579.07**	**90,904.28**	**0.00**	**0.00**	**163,519.23**
3.2.1.3.1.1 Armor Stone Placement	TON	1,815.0000	21,594.76	26,913.43	86,575.50	0.00	0.00	135,083.69
3.2.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,100.0000	10,361.38	11,319.97	0.00	0.00	0.00	21,681.35
3.2.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	90.7500	1,079.74	1,345.67	4,328.78	0.00	0.00	6,754.18
3.2.1.3.2 J-Hook	**TON**	**825.0000**	**15,016.31**	**17,990.49**	**41,320.13**	**0.00**	**0.00**	**74,326.92**
3.2.1.3.2.1 Armor Stone Placement	TON	825.0000	9,815.80	12,233.38	39,352.50	0.00	0.00	61,401.68
3.2.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	500.0000	4,709.72	5,145.44	0.00	0.00	0.00	9,855.16
3.2.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	41.2500	490.79	611.67	1,967.63	0.00	0.00	3,070.08
3.2.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**4,319.14**	**1,982.55**	**133,589.68**	**0.00**	**0.00**	**139,891.37**
3.2.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	5,144.0000	4,319.14	1,982.55	133,589.68	0.00	0.00	139,891.37
3.2.1.3.4 Misc. Rock	**TON**	**165.0000**	**3,003.26**	**3,598.10**	**8,264.03**	**0.00**	**0.00**	**14,865.38**
3.2.1.3.4.1 Armor Stone Placement	TON	165.0000	1,963.16	2,446.68	7,870.50	0.00	0.00	12,280.34
3.2.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	100.0000	941.94	1,029.09	0.00	0.00	0.00	1,971.03
3.2.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	8.2500	98.16	122.33	393.53	0.00	0.00	614.02
3.2.1.3.5 Seed and Mulch	**EA**	**1.0000**	**158,069.31**	**11,289.26**	**67,028.25**	**0.00**	**0.00**	**236,386.82**
3.2.1.3.5.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	46,300.0000	98,862.84	8,801.59	21,594.32	0.00	0.00	129,258.76
3.2.1.3.5.2 Seeding, mechanical seeding, 215 lb./acre	ACR	9.5700	3,512.29	1,818.23	5,680.75	0.00	0.00	11,011.27
3.2.1.3.5.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	416,700.0000	55,694.19	669.43	39,753.18	0.00	0.00	96,116.80
3.2.1.3.6 Planting	**EA**	**1.0000**	**80,552.32**	**38,492.32**	**290,550.24**	**0.00**	**0.00**	**409,594.88**
3.2.1.3.6.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	1,042.0000	42,450.15	20,285.01	144,692.12	0.00	0.00	207,427.28
3.2.1.3.6.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	1,286.0000	38,102.17	18,207.31	145,858.12	0.00	0.00	202,167.61
3.2.1.3.7 Wooden logs for stabilization and in stream structures	**LF**	**1,500.0000**	**36,611.13**	**21,981.44**	**15,502.50**	**0.00**	**0.00**	**74,095.07**
3.2.1.3.7.1 Laborers, (Semi-Skilled)	HR	142.2414	5,573.34	0.00	0.00	0.00	0.00	5,573.34
3.2.1.3.7.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	1,500.0000	13,769.95	5,927.36	15,502.50	0.00	0.00	35,199.82
3.2.1.3.7.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	142.2414	0.00	16,054.08	0.00	0.00	0.00	16,054.08
3.2.1.3.7.4 Equip. Operators, Medium	HR	142.2414	11,694.50	0.00	0.00	0.00	0.00	11,694.50
3.2.1.3.7.5 Laborers, (Semi-Skilled)	HR	142.2414	5,573.34	0.00	0.00	0.00	0.00	5,573.34
3.2.1.3.8 Stabilized Construction Entrance	**TON**	**18.0000**	**120.79**	**24.92**	**310.30**	**0.00**	**0.00**	**456.02**
3.2.1.3.8.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	18.0000	62.50	5.56	152.64	0.00	0.00	220.70
3.2.1.3.8.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	67.0000	58.30	19.36	157.66	0.00	0.00	235.32
3.2.1.3.9 Mulch Access Road	**EA**	**1.0000**	**40,812.25**	**461.55**	**102,317.22**	**0.00**	**0.00**	**143,591.03**
3.2.1.3.9.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	10,667.0000	2,413.12	0.00	20,804.92	0.00	0.00	23,218.04
3.2.1.3.9.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	432.0135	38,399.13	461.55	81,512.31	0.00	0.00	120,372.99
3.2.1.3.10 Temporary Seed and Mulch	**EA**	**1.0000**	**158,069.31**	**11,289.26**	**67,028.25**	**0.00**	**0.00**	**236,386.82**
3.2.1.3.10.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	46,300.0000	98,862.84	8,801.59	21,594.32	0.00	0.00	129,258.76
3.2.1.3.10.2 Seeding, mechanical seeding, 215 lb./acre	ACR	9.5700	3,512.29	1,818.23	5,680.75	0.00	0.00	11,011.27

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
3.2.1.3.10.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	416,700.0000	55,694.19	669.43	39,753.18	0.00	0.00	96,116.80
3.2.1.3.11 Orange Construction Fence	**LF**	**1,380.0000**	**2,643.63**	**0.00**	**1,711.48**	**0.00**	**0.00**	**4,355.11**
3.2.1.3.11.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	1,380.0000	2,643.63	0.00	1,711.48	0.00	0.00	4,355.11
3.2.1.3.12 Silt Fence	**EA**	**1.0000**	**271.72**	**5.00**	**228.96**	**0.00**	**0.00**	**505.68**
3.2.1.3.12.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	300.0000	271.72	5.00	228.96	0.00	0.00	505.68
3.2.1.3.13 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**29,628.25**
3.2.1.3.13.1 willow stakes @ 4' spacing	EA	7,750.0000	0.00	0.00	0.00	0.00	0.00	29,628.25
3.2.1.3.14 Upstream Diversion	**EA**	**1.0000**	**15,585.50**	**641.23**	**1,221.12**	**0.00**	**0.00**	**154,037.84**
3.2.1.3.14.1 Pumping	**DAY**	**180.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**136,590.00**
3.2.1.3.14.1.1 10" Pump, 2 pumps	DAY	180.0000	0.00	0.00	0.00	0.00	0.00	40,590.00
3.2.1.3.14.1.2 Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
3.2.1.3.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
3.2.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**15,585.50**	**641.23**	**1,221.12**	**0.00**	**0.00**	**17,447.84**
3.2.1.3.14.2.1 Sandbags, 14" x 26"	EA	1,800.0000	0.00	0.00	1,221.12	0.00	0.00	1,221.12
3.2.1.3.14.2.2 Laborers, (Semi-Skilled)	HR	360.0000	14,105.61	0.00	0.00	0.00	0.00	14,105.61
3.2.1.3.14.2.3 Equip. Operators, Medium	HR	18.0000	1,479.89	0.00	0.00	0.00	0.00	1,479.89
3.2.1.3.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	0.00	641.23	0.00	0.00	0.00	641.23
3.2.1.4 Adaptive Management Minor Repair *	**EA**	**1.0000**	**15,434.56**	**9,516.15**	**11,177.70**	**0.00**	**0.00**	**36,128.42**
3.2.1.4.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**1,820.16**	**2,180.67**	**5,008.50**	**0.00**	**0.00**	**9,009.32**
3.2.1.4.1.1 Armor Stone Placement	TON	100.0000	1,189.79	1,482.83	4,770.00	0.00	0.00	7,442.63
3.2.1.4.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	570.88	623.69	0.00	0.00	0.00	1,194.56
3.2.1.4.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	59.49	74.14	238.50	0.00	0.00	372.13
3.2.1.4.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**12,203.71**	**7,327.15**	**5,167.50**	**0.00**	**0.00**	**24,698.36**
3.2.1.4.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,857.78	0.00	0.00	0.00	0.00	1,857.78
3.2.1.4.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	4,589.98	1,975.79	5,167.50	0.00	0.00	11,733.27
3.2.1.4.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	0.00	5,351.36	0.00	0.00	0.00	5,351.36
3.2.1.4.2.4 Equip. Operators, Medium	HR	47.4138	3,898.17	0.00	0.00	0.00	0.00	3,898.17
3.2.1.4.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,857.78	0.00	0.00	0.00	0.00	1,857.78
3.2.1.4.3 Silt Fence	**EA**	**1.0000**	**452.86**	**8.34**	**381.60**	**0.00**	**0.00**	**842.80**
3.2.1.4.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	452.86	8.34	381.60	0.00	0.00	842.80
3.2.1.4.4 Orange Construction Fence	**LF**	**500.0000**	**957.84**	**0.00**	**620.10**	**0.00**	**0.00**	**1,577.94**
3.2.1.4.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	957.84	0.00	620.10	0.00	0.00	1,577.94
3.2.2 Bank Stabilization - Site 15	**EA**	**1.0000**	**499,065.63**	**189,112.10**	**537,302.63**	**0.00**	**0.00**	**1,384,530.48**
3.2.2.1 Earthwork	**EA**	**1.0000**	**97,324.38**	**67,760.27**	**0.00**	**0.00**	**0.00**	**165,084.65**
3.2.2.1.1 Site Work	**EA**	**1.0000**	**97,324.38**	**67,760.27**	**0.00**	**0.00**	**0.00**	**165,084.65**
3.2.2.1.1.1 Clearing and Grubbing	**ACR**	**2.7300**	**15,753.45**	**10,651.86**	**0.00**	**0.00**	**0.00**	**26,405.31**
3.2.2.1.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	2.7300	11,130.85	5,508.61	0.00	0.00	0.00	16,639.46
3.2.2.1.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	2.7300	3,876.58	4,328.21	0.00	0.00	0.00	8,204.79
3.2.2.1.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	242.0000	746.02	815.04	0.00	0.00	0.00	1,561.06

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
3.2.2.1.1.2 Excavation, Common	**CY**	**22,600.0000**	**38,737.19**	**25,281.05**	**0.00**	**0.00**	**0.00**	**64,018.24**
3.2.2.1.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	22,600.0000	38,737.19	25,281.05	0.00	0.00	0.00	64,018.24
3.2.2.1.1.3 Fill	**CY**	**14,310.0000**	**42,833.74**	**31,827.36**	**0.00**	**0.00**	**0.00**	**74,661.10**
3.2.2.1.1.3.1 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	14,310.0000	21,190.67	29,028.97	0.00	0.00	0.00	50,219.64
3.2.2.1.1.3.2 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	16,456.0000	21,643.07	2,798.40	0.00	0.00	0.00	24,441.47
3.2.2.2 Associated General Items	**EA**	**1.0000**	**384,903.54**	**110,970.58**	**526,124.93**	**0.00**	**0.00**	**1,181,049.17**
3.2.2.2.1 Vane	**TON**	**1,650.0000**	**32,762.86**	**39,251.97**	**82,640.25**	**0.00**	**0.00**	**154,655.08**
3.2.2.2.1.1 Armor Stone Placement	TON	1,650.0000	21,416.29	26,691.01	78,705.00	0.00	0.00	126,812.30
3.2.2.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,000.0000	10,275.75	11,226.42	0.00	0.00	0.00	21,502.17
3.2.2.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	82.5000	1,070.81	1,334.55	3,935.25	0.00	0.00	6,340.62
3.2.2.2.2 J-Hook	**TON**	**330.0000**	**6,552.57**	**7,850.39**	**16,528.05**	**0.00**	**0.00**	**30,931.02**
3.2.2.2.2.1 Armor Stone Placement	TON	330.0000	4,283.26	5,338.20	15,741.00	0.00	0.00	25,362.46
3.2.2.2.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	200.0000	2,055.15	2,245.28	0.00	0.00	0.00	4,300.43
3.2.2.2.2.3 Waste/loss factor for armor stones, assume 5%	TON	16.5000	214.16	266.91	787.05	0.00	0.00	1,268.12
3.2.2.2.3 Topsoil 4 in depth	**EA**	**1.0000**	**2,693.89**	**1,236.54**	**76,377.77**	**0.00**	**0.00**	**80,308.19**
3.2.2.2.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	2,941.0000	2,693.89	1,236.54	76,377.77	0.00	0.00	80,308.19
3.2.2.2.4 Misc. Rock	**TON**	**165.0000**	**3,276.29**	**3,925.20**	**8,264.03**	**0.00**	**0.00**	**15,465.51**
3.2.2.2.4.1 Armor Stone Placement	TON	165.0000	2,141.63	2,669.10	7,870.50	0.00	0.00	12,681.23
3.2.2.2.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	100.0000	1,027.58	1,122.64	0.00	0.00	0.00	2,150.22
3.2.2.2.4.3 Waste/loss factor for armor stones, assume 5%	TON	8.2500	107.08	133.46	393.53	0.00	0.00	634.06
3.2.2.2.5 Seed and Mulch	**EA**	**1.0000**	**98,573.18**	**7,039.96**	**38,315.77**	**0.00**	**0.00**	**143,928.90**
3.2.2.2.5.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	26,467.0000	61,651.75	5,488.75	12,344.21	0.00	0.00	79,484.71
3.2.2.2.5.2 Seeding, mechanical seeding, 215 lb./acre	ACR	5.4700	2,190.05	1,133.74	3,246.99	0.00	0.00	6,570.78
3.2.2.2.5.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	238,203.0000	34,731.39	417.46	22,724.57	0.00	0.00	57,873.42
3.2.2.2.6 Planting	**EA**	**1.0000**	**50,244.45**	**24,009.56**	**166,124.26**	**0.00**	**0.00**	**240,378.26**
3.2.2.2.6.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	596.0000	26,487.83	12,657.34	82,760.56	0.00	0.00	121,905.72
3.2.2.2.6.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	735.0000	23,756.62	11,352.22	83,363.70	0.00	0.00	118,472.54
3.2.2.2.7 Wooden logs for stabilization and in stream structures	**LF**	**1,200.0000**	**31,951.53**	**19,183.80**	**12,402.00**	**0.00**	**0.00**	**63,537.34**
3.2.2.2.7.1 Laborers, (Semi-Skilled)	HR	113.7931	4,864.00	0.00	0.00	0.00	0.00	4,864.00
3.2.2.2.7.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	1,200.0000	12,017.42	5,172.97	12,402.00	0.00	0.00	29,592.38
3.2.2.2.7.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	113.7931	0.00	14,010.83	0.00	0.00	0.00	14,010.83
3.2.2.2.7.4 Equip. Operators, Medium	HR	113.7931	10,206.11	0.00	0.00	0.00	0.00	10,206.11
3.2.2.2.7.5 Laborers, (Semi-Skilled)	HR	113.7931	4,864.00	0.00	0.00	0.00	0.00	4,864.00
3.2.2.2.8 Stabilized Construction Entrance	**TON**	**55.0000**	**398.16**	**81.58**	**937.04**	**0.00**	**0.00**	**1,416.78**
3.2.2.2.8.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	55.0000	208.32	18.55	466.40	0.00	0.00	693.26
3.2.2.2.8.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	200.0000	189.84	63.04	470.64	0.00	0.00	723.52
3.2.2.2.9 Mulch Access Road	**EA**	**1.0000**	**34,505.22**	**390.22**	**79,296.57**	**0.00**	**0.00**	**114,192.01**
3.2.2.2.9.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty,	SY	8,267.0000	2,040.20	0.00	16,123.96	0.00	0.00	18,164.16

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
600 lb. tensile strength								
3.2.2.2.9.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	334.8135	32,465.01	390.22	63,172.61	0.00	0.00	96,027.85
3.2.2.2.10 Temporary Seed and Mulch	**EA**	**1.0000**	**98,573.18**	**7,039.96**	**38,315.77**	**0.00**	**0.00**	**143,928.90**
3.2.2.2.10.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	26,467.0000	61,651.75	5,488.75	12,344.21	0.00	0.00	79,484.71
3.2.2.2.10.2 Seeding, mechanical seeding, 215 lb./acre	ACR	5.4700	2,190.05	1,133.74	3,246.99	0.00	0.00	6,570.78
3.2.2.2.10.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	238,203.0000	34,731.39	417.46	22,724.57	0.00	0.00	57,873.42
3.2.2.2.11 Orange Construction Fence	**LF**	**3,460.0000**	**7,230.79**	**0.00**	**4,291.09**	**0.00**	**0.00**	**11,521.88**
3.2.2.2.11.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	3,460.0000	7,230.79	0.00	4,291.09	0.00	0.00	11,521.88
3.2.2.2.12 Silt Fence	**EA**	**1.0000**	**879.37**	**16.20**	**679.25**	**0.00**	**0.00**	**1,574.81**
3.2.2.2.12.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	890.0000	879.37	16.20	679.25	0.00	0.00	1,574.81
3.2.2.2.13 STREAMBANK PLANTING - willow stakes	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**22,460.13**
3.2.2.2.13.1 willow stakes @ 4' spacing	EA	5,875.0000	0.00	0.00	0.00	0.00	0.00	22,460.13
3.2.2.2.14 Replace Damaged Path	**SY**	**34.0000**	**259.69**	**245.68**	**731.97**	**0.00**	**0.00**	**1,237.35**
3.2.2.2.14.1 Fine grading, finish grading, small area, to be paved with grader	SY	34.0000	90.06	102.36	0.00	0.00	0.00	192.42
3.2.2.2.14.2 Base course drainage layers, prepare and roll sub-base, small areas to 2500 S.Y.	SY	34.0000	40.28	34.27	0.00	0.00	0.00	74.54
3.2.2.2.14.3 Asphaltic concrete paving, parking lots & driveways, binder course, 4" thick, no asphalt hauling included	SF	296.7273	77.53	67.19	525.27	0.00	0.00	669.99
3.2.2.2.14.4 Asphalt surface treatment, tack coat, emulsion, 0.05 gallons per S.Y., 1000 S.Y.	SY	34.0000	16.47	11.63	10.45	0.00	0.00	38.54
3.2.2.2.14.5 Pavement overlay, polypropylene, prime coat, bituminous, 0.28 gallons/S.Y.	CSF	3.0909	1.56	0.74	25.39	0.00	0.00	27.69
3.2.2.2.14.6 Lines on pavement, parking stall, paint, white, 6" wide	LF	29.6727	13.36	0.00	4.72	0.00	0.00	18.07
3.2.2.2.14.7 Base course drainage layers, aggregate base course for roadways and large paved areas, stone base, compacted, 3/4" stone base, to 6" deep	SY	34.0000	20.45	29.50	166.14	0.00	0.00	216.09
3.2.2.2.15 Upstream Diversion	**EA**	**1.0000**	**17,002.36**	**699.52**	**1,221.12**	**0.00**	**0.00**	**155,513.00**
3.2.2.2.15.1 Pumping	**DAY**	**180.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**136,590.00**
3.2.2.2.15.1.1 10" Pump, 2 pumps	DAY	180.0000	0.00	0.00	0.00	0.00	0.00	40,590.00
3.2.2.2.15.1.2 Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
3.2.2.2.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
3.2.2.2.15.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**17,002.36**	**699.52**	**1,221.12**	**0.00**	**0.00**	**18,923.00**
3.2.2.2.15.2.1 Sandbags, 14" x 26"	EA	1,800.0000	0.00	0.00	1,221.12	0.00	0.00	1,221.12
3.2.2.2.15.2.2 Laborers, (Semi-Skilled)	HR	360.0000	15,387.94	0.00	0.00	0.00	0.00	15,387.94
3.2.2.2.15.2.3 Equip. Operators, Medium	HR	18.0000	1,614.42	0.00	0.00	0.00	0.00	1,614.42
3.2.2.2.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	0.00	699.52	0.00	0.00	0.00	699.52
3.2.2.3 Adaptive Management Minor Repair *	**EA**	**1.0000**	**16,837.71**	**10,381.26**	**11,177.70**	**0.00**	**0.00**	**38,396.66**
3.2.2.3.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**1,985.63**	**2,378.91**	**5,008.50**	**0.00**	**0.00**	**9,373.04**
3.2.2.3.1.1 Armor Stone Placement	TON	100.0000	1,297.96	1,617.64	4,770.00	0.00	0.00	7,685.59
3.2.2.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	622.77	680.39	0.00	0.00	0.00	1,303.16
3.2.2.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	64.90	80.88	238.50	0.00	0.00	384.28
3.2.2.3.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**13,313.14**	**7,993.25**	**5,167.50**	**0.00**	**0.00**	**26,473.89**
3.2.2.3.2.1 Laborers, (Semi-Skilled)	HR	47.4138	2,026.67	0.00	0.00	0.00	0.00	2,026.67
3.2.2.3.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	5,007.26	2,155.40	5,167.50	0.00	0.00	12,330.16

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
3.2.2.3.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	0.00	5,837.85	0.00	0.00	0.00	5,837.85
3.2.2.3.2.4 Equip. Operators, Medium	HR	47.4138	4,252.55	0.00	0.00	0.00	0.00	4,252.55
3.2.2.3.2.5 Laborers, (Semi-Skilled)	HR	47.4138	2,026.67	0.00	0.00	0.00	0.00	2,026.67
3.2.2.3.3 Silt Fence	**EA**	**1.0000**	**494.03**	**9.10**	**381.60**	**0.00**	**0.00**	**884.73**
3.2.2.3.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	494.03	9.10	381.60	0.00	0.00	884.73
3.2.2.3.4 Orange Construction Fence	**LF**	**500.0000**	**1,044.91**	**0.00**	**620.10**	**0.00**	**0.00**	**1,665.01**
3.2.2.3.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	1,044.91	0.00	620.10	0.00	0.00	1,665.01
3.3 PED - Monitoring Only	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**189,999.96**	**0.00**	**189,999.96**
3.3.1 PED - Monitoring only for site 5	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**94,999.98**	**0.00**	**94,999.98**
3.3.1.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	0.00	2,500.00	0.00	2,500.00
3.3.1.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	0.00	25,000.00	0.00	25,000.00
3.3.1.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	0.00	8,333.35	0.00	8,333.35
3.3.1.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	0.00	0.00	0.00	9,166.65	0.00	9,166.65
3.3.1.5 Report each year for 5 years	EA	1.0000	0.00	0.00	0.00	11,666.65	0.00	11,666.65
3.3.1.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	3,833.33	0.00	3,833.33
3.3.1.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
3.3.1.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
3.3.1.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	0.00	0.00	0.00	500.00	0.00	500.00
3.3.1.10 4 subsequence years of monitoring	EA	1.0000	0.00	0.00	0.00	24,666.67	0.00	24,666.67
3.3.1.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	0.00	0.00	0.00	1,666.67	0.00	1,666.67
3.3.1.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	0.00	0.00	0.00	2,000.00	0.00	2,000.00
3.3.2 PED - Monitoring only for site 15	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**94,999.98**	**0.00**	**94,999.98**
3.3.2.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	0.00	2,500.00	0.00	2,500.00
3.3.2.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	0.00	25,000.00	0.00	25,000.00
3.3.2.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	0.00	8,333.35	0.00	8,333.35
3.3.2.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	0.00	0.00	0.00	9,166.65	0.00	9,166.65
3.3.2.5 Report each year for 5 years	EA	1.0000	0.00	0.00	0.00	11,666.65	0.00	11,666.65
3.3.2.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	3,833.33	0.00	3,833.33
3.3.2.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
3.3.2.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
3.3.2.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	0.00	0.00	0.00	500.00	0.00	500.00
3.3.2.10 4 subsequence years of monitoring	EA	1.0000	0.00	0.00	0.00	24,666.67	0.00	24,666.67
3.3.2.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	0.00	0.00	0.00	1,666.67	0.00	1,666.67
3.3.2.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	0.00	0.00	0.00	2,000.00	0.00	2,000.00
4 Site 11	**EA**	**1.0000**	**617,112.30**	**210,369.94**	**902,959.74**	**181,039.56**	**0.00**	**2,214,480.93**
4.1 Lands and Damages	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**85,800.00**	**0.00**	**85,800.00**
4.1.1 RE Cost, based on Excel estimate from RE specialist dated 22 May 2017	EA	1.0000	0.00	0.00	0.00	85,800.00	0.00	85,800.00
4.2 Bank Stabilization	**EA**	**1.0000**	**617,112.30**	**210,369.94**	**902,959.74**	**239.58**	**0.00**	**2,033,680.95**

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
4.2.1 Bank Stabilization	**EA**	**1.0000**	**605,536.37**	**203,232.83**	**891,782.04**	**239.58**	**0.00**	**2,003,790.22**
4.2.1.1 Mob, Demob & Preparatory Work	**EA**	**1.0000**	**29,198.45**	**5,831.41**	**1,526.40**	**239.58**	**0.00**	**36,795.83**
4.2.1.1.1 Mob and Demob	EA	1.0000	28,046.17	5,831.41	0.00	0.00	0.00	33,877.58
4.2.1.1.2 Personnel travel, per diem for Superintendent	DAY	2.0000	0.00	0.00	0.00	239.58	0.00	239.58
4.2.1.1.3 General Superintendents (P.M.), assumed from out of town	HR	16.0000	1,152.28	0.00	0.00	0.00	0.00	1,152.28
4.2.1.1.4 Fuel, for 12 trucks, 20 gal per trip x 2 for mob and demob	GAL	480.0000	0.00	0.00	1,526.40	0.00	0.00	1,526.40
4.2.1.2 Earthwork	**EA**	**1.0000**	**107,578.01**	**76,028.55**	**5,257.60**	**0.00**	**0.00**	**188,864.16**
4.2.1.2.1 Site Work	**EA**	**1.0000**	**107,578.01**	**76,028.55**	**5,257.60**	**0.00**	**0.00**	**188,864.16**
4.2.1.2.1.1 Clearing and Grubbing	**ACR**	**9.6100**	**38,120.96**	**25,774.22**	**0.00**	**0.00**	**0.00**	**63,895.18**
4.2.1.2.1.1.1 Clear and grub, cut and chip, medium trees, to 10" diameter	ACR	9.6100	26,937.77	13,331.39	0.00	0.00	0.00	40,269.16
4.2.1.2.1.1.2 Clear and grub, medium stumps, to 10" diameter, includes loading on site	ACR	9.6100	9,381.72	10,474.70	0.00	0.00	0.00	19,856.42
4.2.1.2.1.1.3 Hauling, excavated or borrow material, loose cubic yards, 12 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	850.0000	1,801.47	1,968.13	0.00	0.00	0.00	3,769.60
4.2.1.2.1.2 Excavation, Common	**CY**	**20,800.0000**	**24,510.70**	**15,996.41**	**0.00**	**0.00**	**0.00**	**40,507.12**
4.2.1.2.1.2.1 Excavate and load, bank measure, medium material, 1-1/2 C.Y. bucket, hydraulic excavator	BCY	20,800.0000	24,510.70	15,996.41	0.00	0.00	0.00	40,507.12
4.2.1.2.1.3 Fill	**CY**	**21,200.0000**	**44,946.35**	**34,257.92**	**5,257.60**	**0.00**	**0.00**	**84,461.86**
4.2.1.2.1.3.1 Soils for earthwork, common borrow, spread with 200 H.P. dozer, includes load at pit and haul, excludes compaction	CY	400.0000	859.36	1,171.54	5,257.60	0.00	0.00	7,288.51
4.2.1.2.1.3.2 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	LCY	20,800.0000	21,175.86	29,008.68	0.00	0.00	0.00	50,184.54
4.2.1.2.1.3.3 Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 10 miles, 35 MPH, excludes loading equipment	LCY	460.0000	866.59	1,227.39	0.00	0.00	0.00	2,093.97
4.2.1.2.1.3.4 Compaction, 2 passes, 6" to 11", 8" lifts, rammer tamper	ECY	24,380.0000	22,044.54	2,850.30	0.00	0.00	0.00	24,894.84
4.2.1.3 Associated General Items	**EA**	**1.0000**	**468,759.91**	**121,372.87**	**884,998.04**	**0.00**	**0.00**	**1,778,130.22**
4.2.1.3.1 Vane	**TON**	**1,815.0000**	**24,776.91**	**29,684.30**	**90,904.28**	**0.00**	**0.00**	**145,365.49**
4.2.1.3.1.1 Armor Stone Placement	TON	1,815.0000	16,196.07	20,185.07	86,575.50	0.00	0.00	122,956.65
4.2.1.3.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	1,100.0000	7,771.04	8,489.98	0.00	0.00	0.00	16,261.01
4.2.1.3.1.3 Waste/loss factor for armor stones, assume 5%	TON	90.7500	809.80	1,009.25	4,328.78	0.00	0.00	6,147.83
4.2.1.3.2 J-Hook	**TON**	**495.0000**	**6,757.34**	**8,095.72**	**24,792.08**	**0.00**	**0.00**	**39,645.13**
4.2.1.3.2.1 Armor Stone Placement	TON	495.0000	4,417.11	5,505.02	23,611.50	0.00	0.00	33,533.63
4.2.1.3.2.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	300.0000	2,119.37	2,315.45	0.00	0.00	0.00	4,434.82
4.2.1.3.2.3 Waste/loss factor for armor stones, assume 5%	TON	24.7500	220.86	275.25	1,180.58	0.00	0.00	1,676.68
4.2.1.3.3 Topsoil 4 in depth	**EA**	**1.0000**	**3,438.98**	**1,578.54**	**141,822.17**	**0.00**	**0.00**	**146,839.69**
4.2.1.3.3.1 Borrow, topsoil or loam, 1-1/2 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	BCY	5,461.0000	3,438.98	1,578.54	141,822.17	0.00	0.00	146,839.69
4.2.1.3.4 Misc. Rock	**TON**	**165.0000**	**2,252.45**	**2,698.57**	**8,264.03**	**0.00**	**0.00**	**13,215.04**
4.2.1.3.4.1 Armor Stone Placement	TON	165.0000	1,472.37	1,835.01	7,870.50	0.00	0.00	11,177.88
4.2.1.3.4.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	100.0000	706.46	771.82	0.00	0.00	0.00	1,478.27
4.2.1.3.4.3 Waste/loss factor for armor stones, assume 5%	TON	8.2500	73.62	91.75	393.53	0.00	0.00	558.89
4.2.1.3.5 Seed and Mulch	**EA**	**1.0000**	**125,831.94**	**8,985.91**	**71,140.84**	**0.00**	**0.00**	**205,958.69**
4.2.1.3.5.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	49,144.0000	78,701.65	7,006.68	22,920.76	0.00	0.00	108,629.09
4.2.1.3.5.2 Seeding, mechanical seeding, 215 lb./acre	ACR	10.1500	2,793.86	1,446.32	6,025.04	0.00	0.00	10,265.22

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
4.2.1.3.5.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	442,296.0000	44,336.42	532.91	42,195.04	0.00	0.00	87,064.37
4.2.1.3.6 Planting	**EA**	**1.0000**	**64,125.20**	**30,642.54**	**308,397.46**	**0.00**	**0.00**	**403,165.21**
4.2.1.3.6.1 Deciduous trees, dogwood, balled & burlapped (B&B), 4' - 5', in prepared beds	EA	1,106.0000	33,793.09	16,148.19	153,579.16	0.00	0.00	203,520.44
4.2.1.3.6.2 Shrubs and trees, evergreen, in prepared beds, juniper, skyrocket, B & B, 18" - 24", in prepared beds	EA	1,365.0000	30,332.12	14,494.35	154,818.30	0.00	0.00	199,644.77
4.2.1.3.7 Wooden logs for stabilization and in stream structures	**LF**	**2,250.0000**	**41,187.52**	**24,729.12**	**23,253.75**	**0.00**	**0.00**	**89,170.39**
4.2.1.3.7.1 Laborers, (Semi-Skilled)	HR	213.3621	6,270.01	0.00	0.00	0.00	0.00	6,270.01
4.2.1.3.7.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	2,250.0000	15,491.20	6,668.28	23,253.75	0.00	0.00	45,413.23
4.2.1.3.7.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	213.3621	0.00	18,060.84	0.00	0.00	0.00	18,060.84
4.2.1.3.7.4 Equip. Operators, Medium	HR	213.3621	13,156.31	0.00	0.00	0.00	0.00	13,156.31
4.2.1.3.7.5 Laborers, (Semi-Skilled)	HR	213.3621	6,270.01	0.00	0.00	0.00	0.00	6,270.01
4.2.1.3.8 Stabilized Construction Entrance	**TON**	**73.0000**	**364.33**	**74.78**	**1,247.34**	**0.00**	**0.00**	**1,686.45**
4.2.1.3.8.1 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	TON	73.0000	190.09	16.92	619.04	0.00	0.00	826.05
4.2.1.3.8.2 Drainage geotextiles, non-woven polypropylene, 120 mils thick	SY	267.0000	174.24	57.86	628.30	0.00	0.00	860.40
4.2.1.3.9 Mulch Access Road	**EA**	**1.0000**	**41,128.86**	**465.13**	**137,481.28**	**0.00**	**0.00**	**179,075.26**
4.2.1.3.9.1 Geosynthetic soil stabilization, geotextile fabric, woven, heavy duty, 600 lb. tensile strength	SY	14,333.0000	2,431.84	0.00	27,955.08	0.00	0.00	30,386.93
4.2.1.3.9.2 Soil preparation, mulching, wood chips, 2" deep, skid steer loader	MSF	580.4865	38,697.02	465.13	109,526.19	0.00	0.00	148,688.34
4.2.1.3.10 Temporary Seed and Mulch	**EA**	**1.0000**	**125,831.94**	**8,985.91**	**71,140.84**	**0.00**	**0.00**	**205,958.69**
4.2.1.3.10.1 Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	SY	49,144.0000	78,701.65	7,006.68	22,920.76	0.00	0.00	108,629.09
4.2.1.3.10.2 Seeding, mechanical seeding, 215 lb./acre	ACR	10.1500	2,793.86	1,446.32	6,025.04	0.00	0.00	10,265.22
4.2.1.3.10.3 Soil preparation, mulching, pine straw, 1" deep, skid steer loader	SF	442,296.0000	44,336.42	532.91	42,195.04	0.00	0.00	87,064.37
4.2.1.3.11 Orange Construction Fence	**LF**	**3,260.0000**	**4,683.83**	**0.00**	**4,043.05**	**0.00**	**0.00**	**8,726.88**
4.2.1.3.11.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	3,260.0000	4,683.83	0.00	4,043.05	0.00	0.00	8,726.88
4.2.1.3.12 Silt Fence	**EA**	**1.0000**	**604.57**	**11.14**	**679.25**	**0.00**	**0.00**	**1,294.95**
4.2.1.3.12.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	890.0000	604.57	11.14	679.25	0.00	0.00	1,294.95
4.2.1.3.13 STREAMBANK PLANTING - willow stakes	**EA**	**300.0000**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**29,819.40**
4.2.1.3.13.1 willow stakes @ 4' spacing	EA	7,800.0000	0.00	0.00	0.00	0.00	0.00	29,819.40
4.2.1.3.14 Upstream Diversion	**EA**	**1.0000**	**16,779.47**	**2,817.47**	**1,221.12**	**0.00**	**0.00**	**157,408.06**
4.2.1.3.14.1 Pumping	**DAY**	**180.0000**	**5,090.35**	**2,336.55**	**0.00**	**0.00**	**0.00**	**144,016.90**
4.2.1.3.14.1.1 10" Pump, 2 pumps	DAY	180.0000	0.00	0.00	0.00	0.00	0.00	40,590.00
4.2.1.3.14.1.2 Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
4.2.1.3.14.1.3 Local Relocate Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
4.2.1.3.14.1.4 Additional Labor to Relocate Rigid Piping due to tight space	LF	2,000.0000	5,090.35	2,336.55	0.00	0.00	0.00	7,426.90
4.2.1.3.14.1.5 Pipe, plastic, PVC, 10" diameter, schedule 80, includes couplings 10' OC, and hangers 3 per 10'	LF	0.0000	0.00	0.00	0.00	0.00	0.00	0.00
4.2.1.3.14.2 Sandbags to Be Set Up	**EA**	**1,800.0000**	**11,689.12**	**480.92**	**1,221.12**	**0.00**	**0.00**	**13,391.16**
4.2.1.3.14.2.1 Sandbags, 14" x 26"	EA	1,800.0000	0.00	0.00	1,221.12	0.00	0.00	1,221.12
4.2.1.3.14.2.2 Laborers, (Semi-Skilled)	HR	360.0000	10,579.21	0.00	0.00	0.00	0.00	10,579.21
4.2.1.3.14.2.3 Equip. Operators, Medium	HR	18.0000	1,109.91	0.00	0.00	0.00	0.00	1,109.91
4.2.1.3.14.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	18.0000	0.00	480.92	0.00	0.00	0.00	480.92
4.2.1.3.15 Downstream Diversion	**EA**	**1.0000**	**10,996.57**	**2,603.73**	**610.56**	**0.00**	**0.00**	**150,800.86**

Currency in US dollars

Description	UOM	Quantity	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	MiscDirect	DirectCost
4.2.1.3.15.1 Pumping	**DAY**	**180.0000**	**5,090.35**	**2,336.55**	**0.00**	**0.00**	**0.00**	**144,016.90**
4.2.1.3.15.1.1 10" Pump, 2 pumps	DAY	180.0000	0.00	0.00	0.00	0.00	0.00	40,590.00
4.2.1.3.15.1.2 Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
4.2.1.3.15.1.3 Local Relocate Rigid Piping	LF	2,000.0000	0.00	0.00	0.00	0.00	0.00	48,000.00
4.2.1.3.15.1.4 Additional Labor to Relocate Rigid Piping due to tight space	LF	2,000.0000	5,090.35	2,336.55	0.00	0.00	0.00	7,426.90
4.2.1.3.15.2 Sandbags to Be Set Up	**EA**	**900.0000**	**5,906.22**	**267.18**	**610.56**	**0.00**	**0.00**	**6,783.96**
4.2.1.3.15.2.1 Sandbags, 14" x 26"	EA	900.0000	0.00	0.00	610.56	0.00	0.00	610.56
4.2.1.3.15.2.2 Laborers, (Semi-Skilled)	HR	180.0000	5,289.60	0.00	0.00	0.00	0.00	5,289.60
4.2.1.3.15.2.3 Equip. Operators, Medium	HR	10.0000	616.62	0.00	0.00	0.00	0.00	616.62
4.2.1.3.15.2.4 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4	HR	10.0000	0.00	267.18	0.00	0.00	0.00	267.18
4.2.2 Adaptive Management Minor Repair *	**EA**	**1.0000**	**11,575.92**	**7,137.12**	**11,177.70**	**0.00**	**0.00**	**29,890.74**
4.2.2.1 Vane, J-Hook Repairs	**TON**	**100.0000**	**1,365.12**	**1,635.50**	**5,008.50**	**0.00**	**0.00**	**8,009.12**
4.2.2.1.1 Armor Stone Placement	TON	100.0000	892.35	1,112.13	4,770.00	0.00	0.00	6,774.47
4.2.2.1.2 Hauling, excavated or borrow material, loose cubic yards, 24 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	LCY	60.6061	428.16	467.77	0.00	0.00	0.00	895.92
4.2.2.1.3 Waste/loss factor for armor stones, assume 5%	TON	5.0000	44.62	55.61	238.50	0.00	0.00	338.72
4.2.2.2 Wooden logs for stabilization and in stream structures	**LF**	**500.0000**	**9,152.78**	**5,495.36**	**5,167.50**	**0.00**	**0.00**	**19,815.64**
4.2.2.2.1 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	0.00	0.00	0.00	0.00	1,393.33
4.2.2.2.2 Timber piles, treated wood pile, C.C.A., 2.5 lb./C.F., 10' - 20' long, 12" butts, excludes mobilization or demobilization	VLF	500.0000	3,442.49	1,481.84	5,167.50	0.00	0.00	10,091.83
4.2.2.2.3 HYDRAULIC EXCAVATOR, CRAWLER, 60,700 LBS, 1.75 CY BUCKET, 23.25' MAX DIGGING DEPTH	HR	47.4138	0.00	4,013.52	0.00	0.00	0.00	4,013.52
4.2.2.2.4 Equip. Operators, Medium	HR	47.4138	2,923.63	0.00	0.00	0.00	0.00	2,923.63
4.2.2.2.5 Laborers, (Semi-Skilled)	HR	47.4138	1,393.33	0.00	0.00	0.00	0.00	1,393.33
4.2.2.3 Silt Fence	**EA**	**1.0000**	**339.64**	**6.26**	**381.60**	**0.00**	**0.00**	**727.50**
4.2.2.3.1 Synthetic erosion control, silt fence, install and maintain, remove, 3' high	LF	500.0000	339.64	6.26	381.60	0.00	0.00	727.50
4.2.2.4 Orange Construction Fence	**LF**	**500.0000**	**718.38**	**0.00**	**620.10**	**0.00**	**0.00**	**1,338.48**
4.2.2.4.1 Temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'	LF	500.0000	718.38	0.00	620.10	0.00	0.00	1,338.48
4.3 PED - Monitoring only	**EA**	**1.0000**	**0.00**	**0.00**	**0.00**	**94,999.98**	**0.00**	**94,999.98**
4.3.1 Study Mobilization each year for 5 years	EA	1.0000	0.00	0.00	0.00	2,500.00	0.00	2,500.00
4.3.2 Field Sampling each year for 5 years	EA	1.0000	0.00	0.00	0.00	25,000.00	0.00	25,000.00
4.3.3 Laboratory Processing (Sorting and Taxonomy) each year for 5 years	EA	1.0000	0.00	0.00	0.00	8,333.35	0.00	8,333.35
4.3.4 Data Entry/Management/Analysis each year for 5 years	EA	1.0000	0.00	0.00	0.00	9,166.65	0.00	9,166.65
4.3.5 Report each year for 5 years	EA	1.0000	0.00	0.00	0.00	11,666.65	0.00	11,666.65
4.3.6 1st year of monitoring, Establish vertical control benchmark on-site* (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	3,833.33	0.00	3,833.33
4.3.7 1st year of monitoring, Survey cross sections in field (2 cross sections per stream)	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
4.3.8 1st year of monitoring, Office work to generate cross sections	EA	1.0000	0.00	0.00	0.00	2,833.33	0.00	2,833.33
4.3.9 1st year of monitoring, Generate Report for Stream Stability Surveys	EA	1.0000	0.00	0.00	0.00	500.00	0.00	500.00
4.3.10 4 subsequence years of monitoring	EA	1.0000	0.00	0.00	0.00	24,666.67	0.00	24,666.67
4.3.11 Vegetative cover and invasive species assessment (2 people for two days in years 1 and 3; year 5 cost included with wetlands delineation)	EA	1.0000	0.00	0.00	0.00	1,666.67	0.00	1,666.67
4.3.12 Wetland Delineation - labor and post-processing (2 people for one week in year 5)	EA	1.0000	0.00	0.00	0.00	2,000.00	0.00	2,000.00

Currency in US dollars

ANACOSTIA WATERSHED RESTORATION, PRINCE GEORGE'S COUNTY, MD

COST NARRATIVE

Summary of Scope of Work:

Most sites have the same types of work. Quantities for each site vary depending on the hydrology of the site. Construction work for each site typically includes site clearing, cut and fill, in-stream structures such as cross vanes, j-hooks, miscellaneous stones for bank protection, log structures, damaged path restoration, topsoil, seed and mulch, forest planting, erosion control measures, access roads, and some sites, pedestrian bridge relocation.

Construction Cost Estimate:

The following methodology is used in the preparation of the cost estimate for PG County Stream Restoration Project:

a. The estimate is in accordance with the guidance contained in ER 1110-2-1302, Civil Works Cost Engineering.

b. The estimate is presented in Civilworks Work Breakdown Structure.

c. The price level for the estimate is in 3rd Quarter of FY2017.

d. Construction costs developed by Estimating and Specifications Section are based on the design and quantities developed by NAB Engineering team. Unit costs are developed using the M-CACES Second Generation (MII) software containing the 2015 English Cost Book Library which was used as a starting point. Historical cost data from similar projects are used to compare, and vendor quotes are used to update material unit costs. The estimate is documented with notes to explain the assumed construction methods, crews, productivity, and other specific information. The intent is to provide or convey a "fair and reasonable" estimate that which depicts the local market conditions.

e. Labor costs are based on the National Labor Library which is updated with latest Davis Bacon wage rates for PG County area.

f. Bid competition: PDT is deciding that small business competitive is what will be the acquisition strategy to mimic what was done in the past for this type of project. The estimate is set up to meet the level of competitiveness for this acquisition strategy. Bidding competition is assumed to be limited and reflected in the Abbreviated Risk Analysis.

g. Contract Acquisition Strategy: PDT is deciding that small business competitive is what will be the acquisition strategy to mimic what was done in the past for this type of project. The estimate is set up to meet this acquisition strategy. To reflect the historical market condition for this type of work, Prime Contractor is assumed to perform minimal work such as minor erosion control work and will sub-contract out all remaining work.

h. Labor Shortages: It is assumed that there will be a normal labor market

i. Materials: Most recent vendor quotes such as armor stones are used in the estimate. Assumptions include:

1. Materials will be purchased as part of the construction contract. No government furnished materials are assumed. When lack of delivery charge, hauling cost is estimated.
2. Materials will be purchased from local nearest available sources.
3. Hauling: most hauling will be done by trucks. For trucking, it is assumed that the average speed is 30 mph factoring traffic hours in often congested major routes.
4. For the following materials, it is assumed as follows:
   - Seeding item. There should not be anything out of ordinary about this activity. A typical Cost Book item should cover it.
   - Mulch will have a very minimal price change. No Specs is available at current design, but in general mulch for seed and mulch item will be straw mulch and mulch for mulch access road will be wood chips (9" thick mulch road). These items are not very expensive in general and will not have price differences from year to year.
   - Armor stones are updated on September 2017 with a quote from Vulcan Materials, at $45/ton. Armor stone price is revised from $65/ton to $45/cy
   - Common soil are typically not sold by anyone. Usually it is just a hauling cost and is around $4/cy to $12/cy depending on where it comes from. Common soil is found typically from excess materials of construction nearby. It is hard to determine right now where the next nearby construction will be when this project will be ready for ground breaking if it gets approved to move forward to construction. It is best to leave this cost item as is at the moment b/c current RSM $12.4/cy price is a conservative number for a Feasibility Study estimate.
   - Shrubs and trees. At the current design level, there is no specific species of shrubs and trees for detail pricing. Prices for trees and shrubs from local markets and nurseries are typically consistent throughout state of MD. There isn't much saving to buy from one place versus others.
   - Topsoil. Same situation with common soil. More than likely that the topsoil will be coming from excess materials of construction nearby. Future construction jobs nearby this project are hard to predict. It is best to leave the topsoil unit cost at $24.50/cy from Cost Book as is b/c it may be at the high end of the spectrum as far as hauling free topsoil from somewhere.

j. Equipment: Rates used are based from the latest USACE EP-1110-1-8, Region II. Adjustments are made for fuel and facility capital cost of money (FCCM). Judicious use of owned verses rental rates was considered based on typical contractor usage and local equipment availability. Full FCCM/Cost of Money rate is latest available; MII program takes EP recommended discount, no other adjustments have been made to the FCCM.

k. Fuels (gasoline, on and off-road diesel) were based on local market averages for on-road and off-road for the PG County area. Since fuels fluctuate irrationally, an average was used.

l. Major crew and productivity rates were developed and studied by senior USACE estimators familiar with the type of work. All of the work is typical to the Baltimore District. The crews and productivities were checked by local NAB estimators, discussions with contractors and comparisons with historical cost data. Major crews include hauling, stonework, and planting.

m. Production Rates. Crews for typical earthwork items can be from Cost Book. No need for creating new crews. However, the production rate for each site is revised and was based on best judgment, visual inspection, and past work on similar sites.

- Site 13 earthwork has 70% productivity. Site access and stream size may pose a slight issue similar to Northwest Branch work that productivity is deviated from the norm.

- Site 3 and 9, 80%. Site access and stream size may pose a slight issue similar to Northwest Branch work that productivity is slightly deviated from the norm. However, it is noted that the issue may be not as challenging as site 13 since less stone work is involved. The thought process is also that work in both site 3 and 9 can be more efficient when combined together in 1 contract.

- Site 5, 60%. Site access and large stream size may pose a major issue similar to the work at Paint Branch that contractor may only be able to do two third of a normal earthwork. It is noted that the issue can be a bit more challenging than site 13.

- Site 15, 55%. Site access and large stream size may pose a major issue similar to the work at Paint Branch that contractor may only be able to do about half of a normal earthwork. It is noted that the issue can be a bit more challenging than site 5.

- Site 11, 80%. Site access and stream size may pose a minor issue similar to Northwest Branch work that productivity is slightly deviated from the norm. However, it is noted that the issue may be not as challenging as site 13 since less stone work is involved.

n. Development of cost items that have major contribution to the estimate:

- Mob and demob was detail developed to include mobilizing equipment and labor. There are several scenarios that could happen to this item depending on the size of the company of the contractor, whether he sub out most of his work or not, where he may be coming from and where he's going to after the job is done. The estimate is developed with a conservative approach that Prime contractor is a small business that will sub out most of the work and may need to take 8 hrs to move equipment and workers to project site and 8 hrs to demobilize them to another location. This is more conservative than estimating a few truck drivers hauling equipment to site and a superintendent. However, per reviewer's suggestion, mob and demob is revised with a few truck drivers hauling equipment to site and a superintendent who may be from out of town.

- Cycle hauling. This is the hauling cost for fill materials which may already be accounted for in the fill material unit cost depending on where material is coming from. Typically common earth fill materials can be hauled from local construction jobs nearby the project but for a FS level, the MII estimate was developed with a conservative approach that extra miles may be required in case a source location is a little further out. It is best to leave this item as is.
- Fill from stockpile. This is just a cost to spread the excavated materials to be reused as fill. It may take less than 300' haul with a front end loader crawler, but it's included just in case. Plus, there's lower productivity rate applied to be on the safe side. It is best to leave this item as is.
- Rigid Piping. This is for pumping around, aka stream diversion. This is a budgetary price for what was used in the past in a similar project nearby. It's an all inclusive cost for pipes and fittings. Pipe size needed is depending on the flow of the stream (mostly slow flow) but specifically unknown at the moment. Material cost is expected to be the same. For a FS estimate, the same budgetary cost was used. With ARA contingency at 301% applied to all items, the estimated cost for this item is considered well-covered.
- Relocate Rigid Piping. This is a labor cost to relocate the stream diversion pipe. For a FS estimate, it is conservatively estimated using the same cost as Rigid Piping. The unit cost will probably be less than anticipated, but included with same unit cost just in case. With ARA contingency at 31% applied to all items, the estimated cost for this item is considered well-covered.
- 10" Pump, 2 pumps. This is a cost to pump the water around for an estimated 180 days in 1 location of a site. 1620 days is the total number of days for all sites which may never be constructed together at the same time. It's a historical cost from a similar project nearby (Northwest Branch) and it is anticipated that this cost will have a minimal change, if any. Number of pumping days are on conservative side per discussion with in-house HH Engineer based on his best judgment. With ARA contingency at 31% applied to all items, the estimated cost for this item is considered well-covered.
- Willow stakes. It's a cost to plant willow stakes (material and labor). Cost is borrowed from Northwest Branch project. Willow stake material cost is very minimal and has been shown to be the same from year to year at $2.10/ea (http://www.pinelandsnursery.com/search/label/Trees_and_Shrubs). Labor cost may be high considering the estimated production rate for this task being

conservative at 14 stakes per hour. With ARA contingency at 31% applied to all items, the estimated cost for this item is considered well-covered.

- Orange Construction Fence. Home Depot sells this fence without posts for $0.30 per lf. Cost was borrowed from the Northwest Branch estimate. Unit material price is expected to be the same. Installation cost may be a little higher. To be on the safe side, this item is replaced with "temporary fencing, plastic safety fence, 4' high, light duty, posts at 10'."

o. Most crew work hours are assumed to be 8 hrs 5 days/week which is typical to the area. It is anticipated that no overtime is required for reasons such as time of year restriction because there is none.

p. Mobilization and demobilization: Contractor mobilization and demobilization are based on the assumption that most of the contractors will take about one 8 hrs day to mobilize and one 8 hrs day to demobilize.

q. Field Office Overhead: Typically large civil works project has field office overhead ranging from 9% to 11%. 10% was used for Job Office Overhead. Overhead assumptions may include: Superintendent, office manager, pickups, periodic travel, costs, communications, temporary offices (contractor and government), office furniture, office supplies, computers and software, as-built drawings and minor designs, tool trailers, staging setup, camp and kitchen maintenance and utilities, utility service, toilets, safety equipment, security and fencing, small hand and power tools, project signs, traffic control, surveys, temp fuel tank station, generators, compressors, lighting, and minor miscellaneous.

r. Home Office Overhead: A typical 5% was used. The rates are based upon estimating and negotiating experience, and consultation with local construction representatives.

s. Profit: Since the Construction Cost Estimate is currently in a Feasibility Study phase, profit is included at 10% for Prime and 8% Prime’s Profit on Sub’s work. These are typical average profit rates. Sub-contractors’ profit is 8%.

t. Sales Tax: Only State sales tax was applied. No local sales tax was included in the estimate.

u. Bond: Bond is assumed at 1.5% applied against the prime contractor.

v. Contingency: Contingency is based the outcome of the Abbreviated Risk Analysis for Recommended Plan which was done in March 2017.

w. Escalation: No escalation to midpoint of construction according to tentative construction start dates is included in the estimate, but will be included in the Total Project Cost Summary (TPCS) to avoid duplicates.

x. Adaptive Management. It is a cost for minor repairs and correction of structures to improve bank stabilization. It is estimated with the assumption that minor repair for each site is needed.

y. Operations and Maintenance. This is an estimated annual sponsor cost to maintain the project after it was built. It includes annual inspection, post storm inspection, and tree and debris removal. It is a separate estimate for economic calculation purpose only and is not part of initial construction cost nor consideration in the ARA.

z. Monitoring. This is an estimated annual sponsor cost to monitor the project to see if it meets the environmental goals. It is a separate estimate based on historical costs and based on consultation with the appropriate disciplines of the project delivery team.

aa. HTRW: The estimate includes no costs for Hazardous, Toxic, and Radioactive Waste (HTRW) since there is no potential concern for HTRW.

Abbreviated Risk Analysis

Project (less than $40M): **Site 3 NW Branch Upstream and Site 9 Sligo Creek - Anacos**

Alternative: **Alt 2**

Project Development Stage/Alternative: **Feasibility (Recommended Plan)**

Risk Category: **Moderate Risk: Typical Project Construction Type**

Meeting Date: **3/17/2017**

Total Estimated Construction Contract Cost = $ 6,689,863

	CWWBS	Feature of Work	Estimated Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ 33,000		20%	$ 6,600	$ 39,600
1	02 RELOCATIONS	Pedestrian Bridge Relocation	$ 284,935		31%	$ 89,000	$ 373,935
2	16 BANK STABILIZATION	Mob, Demob & Preparatory Work	$ 64,819		31%	$ 20,000	$ 84,819
3	16 BANK STABILIZATION	Earthwork	$ 1,767,276		31%	$ 550,000	$ 2,317,276
4	16 BANK STABILIZATION	In-stream Structures and Associated Items	$ 4,572,833		31%	$ 1,423,000	$ 5,995,833
5							
6							
7							
8							
9							
10							
11							
12	All Other	Remaining Construction Items		0.0%	0%	$ -	$ -
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ 668,986		13%	$ 85,000	$ 753,986
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ 802,784		9%	$ 74,000	$ 876,784
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)					$ -	

Totals				
Real Estate	$ 33,000	20%	$ 6,600	$ 39,600.00
Total Construction Estimate	$ 6,689,863	31.12%	$ 2,082,000	$ 8,771,863
Total Planning, Engineering & Design	$ 668,986	12.71%	$ 85,000	$ 753,986
Total Construction Management	$ 802,784	9.22%	$ 74,000	$ 876,784
Total Excluding Real Estate	$ 8,161,633	27%	$ 2,241,000	$ 10,402,633

	Base	50%	80%
Confidence Level Range Estimate ($000's)	$8,162k	$9,507k	$10,403k

* 50% based on base is at 5% CL.

Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.	

Abbreviated Risk Analysis

Project (less than $40M): **Site 5 Paint Branch and Site 15 Calvert Road Disc Golf Park** — **Alternative:** Alt 2

Project Development Stage/Alternative: **Feasibility (Recommended Plan)**

Risk Category: **Moderate Risk: Typical Project Construction Type** — **Meeting Date:** 3/17/2017

Total Estimated Construction Contract Cost = $ 6,344,493

	CWWBS	Feature of Work	Estimated Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ 114,770		20%	$ 22,954	$ 137,724
1	16 BANK STABILIZATION	Mob, Demob & Preparatory Work	$ 65,589		30%	$ 20,000	$ 85,589
2	16 BANK STABILIZATION	Earthwork	$ 1,405,857		31%	$ 437,000	$ 1,842,857
3	16 BANK STABILIZATION	In-stream Structures and Associated Items	$ 4,873,047		31%	$ 1,516,000	$ 6,389,047
4							
5							
6							
7							
8							
9							
10							
11							
12	All Other	Remaining Construction Items		0.0%	0%	$ -	$ -
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ 634,449		13%	$ 81,000	$ 715,449
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ 761,339		9%	$ 71,000	$ 832,339
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)					$ -	

Totals

	Estimated Cost	% Contingency	$ Contingency	Total
Real Estate	$ 114,770	20%	$ 22,954	$ 137,724.00
Total Construction Estimate	$ 6,344,493	31.0978%	$ 1,973,000	$ 8,317,493
Total Planning, Engineering & Design	$ 634,449	12.7670%	$ 81,000	$ 715,449
Total Construction Management	$ 761,339	9.3257%	$ 71,000	$ 832,339
Total Excluding Real Estate	$ 7,740,281	27%	$ 2,125,000	$ 9,865,281

	Base	50%	80%
Confidence Level Range Estimate ($000's)	$7,740k	$9,015k	$9,865k

* 50% based on base is at 5% CL.

Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.	

Abbreviated Risk Analysis

Project (less than $40M): **Site 11 Indian Creek - Anacostia Watershed Restoration, Pri**

Project Development Stage/Alternative: **Feasibility (Recommended Plan)**

Risk Category: **Moderate Risk: Typical Project Construction Type**

Alternative: **Alt 2**

Meeting Date: **3/17/2017**

Total Estimated Construction Contract Cost = $ 3,421,674

	CWWBS	Feature of Work	Estimated Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ 85,800		20%	$ 17,160	$ 102,960
1	16 BANK STABILIZATION	Mob, Demob & Preparatory Work	$ 61,975		31%	$ 19,000	$ 80,975
2	16 BANK STABILIZATION	Earthwork	$ 318,101		31%	$ 99,000	$ 417,101
3	16 BANK STABILIZATION	In-stream Structures and Associated Items	$ 3,041,599		31%	$ 946,000	$ 3,987,599
4							
5							
6							
7							
8							
9							
10							
11							
12	All Other	Remaining Construction Items		0.0%	0%	$ -	$ -
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ 342,167		13%	$ 44,000	$ 386,167
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ 410,601		9%	$ 38,000	$ 448,601
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)					$ -	

Totals						
Real Estate	$	85,800	20%	$ 17,160	$	102,960.00
Total Construction Estimate	$	3,421,674	31.0959%	$ 1,064,000	$	4,485,674
Total Planning, Engineering & Design	$	342,167	12.8592%	$ 44,000	$	386,167
Total Construction Management	$	410,601	9.2547%	$ 38,000	$	448,601
Total Excluding Real Estate	$	4,174,443	27%	$ 1,146,000	$	5,320,443

	Base	50%	80%
Confidence Level Range Estimate ($000's)	$4,174k	$4,862k	$5,320k

Abbreviated Risk Analysis

Project (less than $40M): **Site 13 - NW Branch EastWest Highway - Anacostia Watersl**

Project Development Stage/Alternative: **Feasibility (Recommended Plan)**

Risk Category: **Moderate Risk: Typical Project Construction Type**

Alternative: **Alt 1**

Meeting Date: **3/17/2017**

Total Estimated Construction Contract Cost = $ 3,660,636

	CWWBS	Feature of Work	Estimated Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ 52,800		20%	$ 10,560	$ 63,360
1	02 RELOCATIONS	Pedestrian Bridge Relocation	$ 357,321		36%	$ 127,000	$ 484,321
2	16 BANK STABILIZATION	Mob, Demob & Preparatory Work	$ 63,373		35%	$ 22,000	$ 85,373
3	16 BANK STABILIZATION	Earthwork	$ 383,165		35%	$ 136,000	$ 519,165
4	16 BANK STABILIZATION	In-stream Structures and Associated Items	$ 2,856,778		35%	$ 1,011,000	$ 3,867,778
5							
6							
7							
8							
9							
10							
11							
12	All Other	Remaining Construction Items		0.0%	0%	$ -	$ -
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ 366,064		13%	$ 47,000	$ 413,064
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ 439,276		9%	$ 41,000	$ 480,276
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)					$ -	

Totals				
Real Estate	$ 52,800	20%	$ 10,560	$ 63,360.00
Total Construction Estimate	$ 3,660,636	35.40%	$ 1,296,000	$ 4,956,636
Total Planning, Engineering & Design	$ 366,064	12.8%	$ 47,000	$ 413,064
Total Construction Management	$ 439,276	9.3%	$ 41,000	$ 480,276
Total Excluding Real Estate	$ 4,465,976	31%	$ 1,384,000	$ 5,849,976

	Base	50%	80%
Confidence Level Range Estimate ($000's)	$4,466k	$5,296k	$5,850k

* 50% based on base is at 5% CL.

Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.	