DEPARTMENT OF THE NAVY
NAVAL SUPPORT ACTIVITY SOUTH POTOMAC
6509 SAMPSON ROAD, SUITE 217
DAHLGREN, VIRGINIA 22448-5108

IN REPLY REFER TO

5090
Ser PRSI42SB/111
DEC 18 2018

US Army Corps of Engineers, Baltimore District
ATTN: Erica Anuszewski-Schmidt
10 S. Howard Street
Baltimore, Maryland 21201

Re: Corps Permit Tracking Number: CENAB-OPR-M (US NAVY/NSF INDIAN HEAD/ WEST NOBLE ROAD) 2017-60335

To Whom It May Concern:

Naval Support Facility Indian Head (NSFIH) is submitting the Nationwide Permit (NWP) #27 annual monitoring report (Enclosure 1) for Corps Permit Tracking Number: CENAB-OPR-M (US NAVY/NSF INDIAN HEAD/WEST NOBLE ROAD) 2017-60335. This submittal meets the requirements of NWP #27 special condition #7. The survey work for the annual monitoring report was completed on October 25, 2018. The annual monitoring report also includes the quarterly and major storm event inspections that were required by the NWP #27 special condition #6.

Please direct all written correspondence to:

Director, Environmental Division
Department of Navy, PWD South Potomac
3972 Ward Road, Suite 101
Indian Head, MD 20640-5157

If you have any further questions or concerns, please contact Mr. Seth Berry at (301) 744-2273 or by email at seth.m.berry@navy.mil.

Sincerely,

JEFFREY C. BOSSART
By direction

Enclosure: (1) Annual Monitoring Report for Corps Permit Tracking Number CENAB-OPR-M (US NAVY/NSF INDIAN HEAD/ WEST NOBLE ROAD) 2017-60335

ANNUAL STREAM MONITORING REPORT FOR STREAM RESTORATION (BIAZZI) AT NAVAL SUPPORT FACILITY INDIAN HEAD, MD

Monitoring Year One-2018

Prime Contract: N40080-15-2-0011
Prime Contractor: Marstel-Day LLC.
Task Order: TO18F4927

Prepared For:

Naval Facilities Engineering Command, Washington
1314 Harwood Street, SE
Washington, DC 20374-5018

Prepared By:

ENVIRONMENTAL SYSTEMS ANALYSIS, INC.
2141 Priest Bridge Drive, Suite 1
Crofton, Maryland 21114

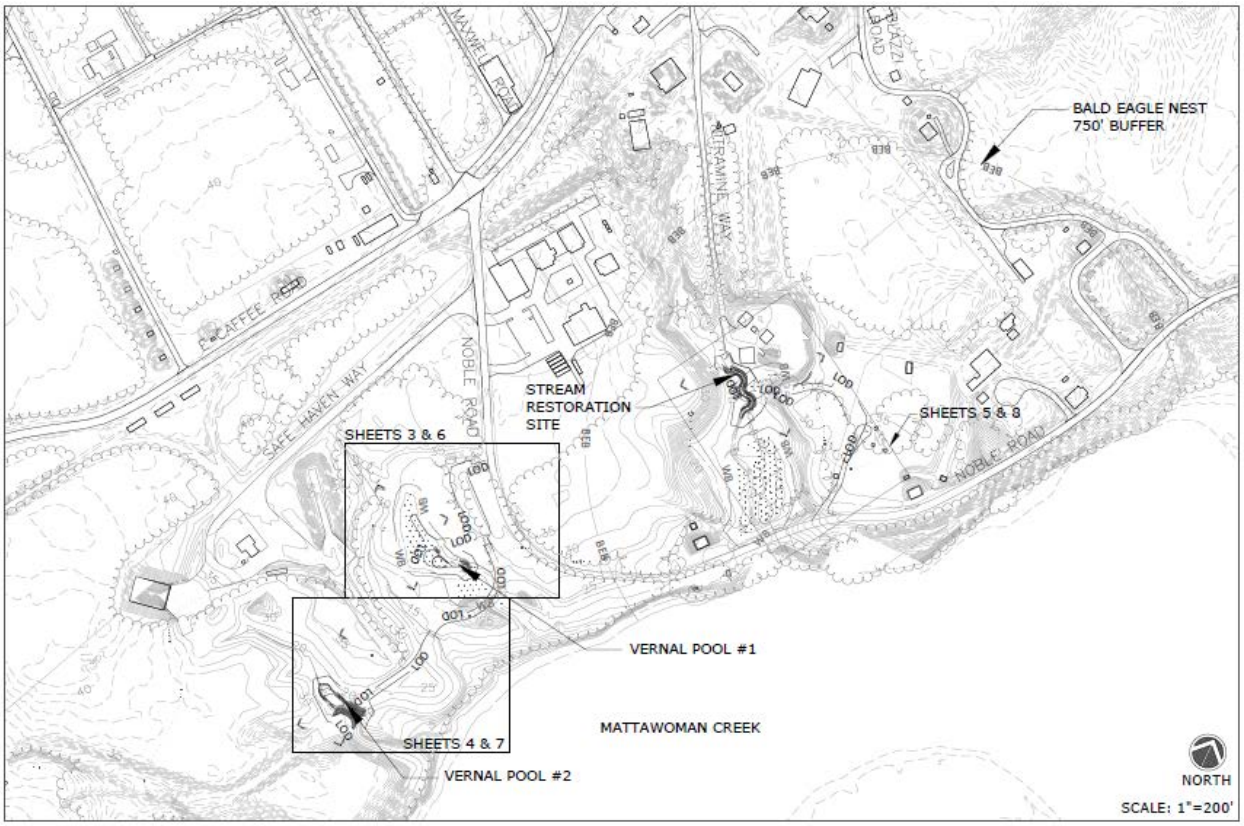
December 2018

Table of Contents

1.0 INTRODUCTION AND PROJECT DESCRIPTION

The primary objective of Contract N40080-15-2-0011 was to complete a design-build project that addresses stream instability along 200-linear feet of an unnamed perennial tributary to Mattawoman Creek located south of the terminus of Nitramine Way on Mainside at Naval Support Facility Indian Head (NSFIH) (Figure 1). Additionally, two areas were selected west of Noble Road to re-establish vernal pools (Vernal Pools #1 and #2), primarily as habitat for wildlife. A third area was evaluated for potential vernal pool re-establishment, but was rejected to avoid impacts to jurisdictional waters of the United States.

Figure 1. Stream and Vernal Pool Project Areas (Source: Final Design 2017; NTS)



The stream restoration site is south of the terminus of Nitramine Way in the Agile Chemical Facility. The site previously had a degraded perennial stream channel with areas of unstable stream geometry and eroding banks. If left unaddressed, the unstable eroding stream banks would have continued to release sediments to Mattawoman Creek, which is listed by the Environmental Protection Agency as impaired under Section 303(d) of the Clean Water Act for excess nutrients, sediment, and loss of living resources. Therefore, restorative measures in this watershed that help to address these impairments are in the best interest of the public.

Construction of the stream restoration features has resulted in substantial functional uplift including improved water quality, reduced sediment yield, stable stream geometry and banks,

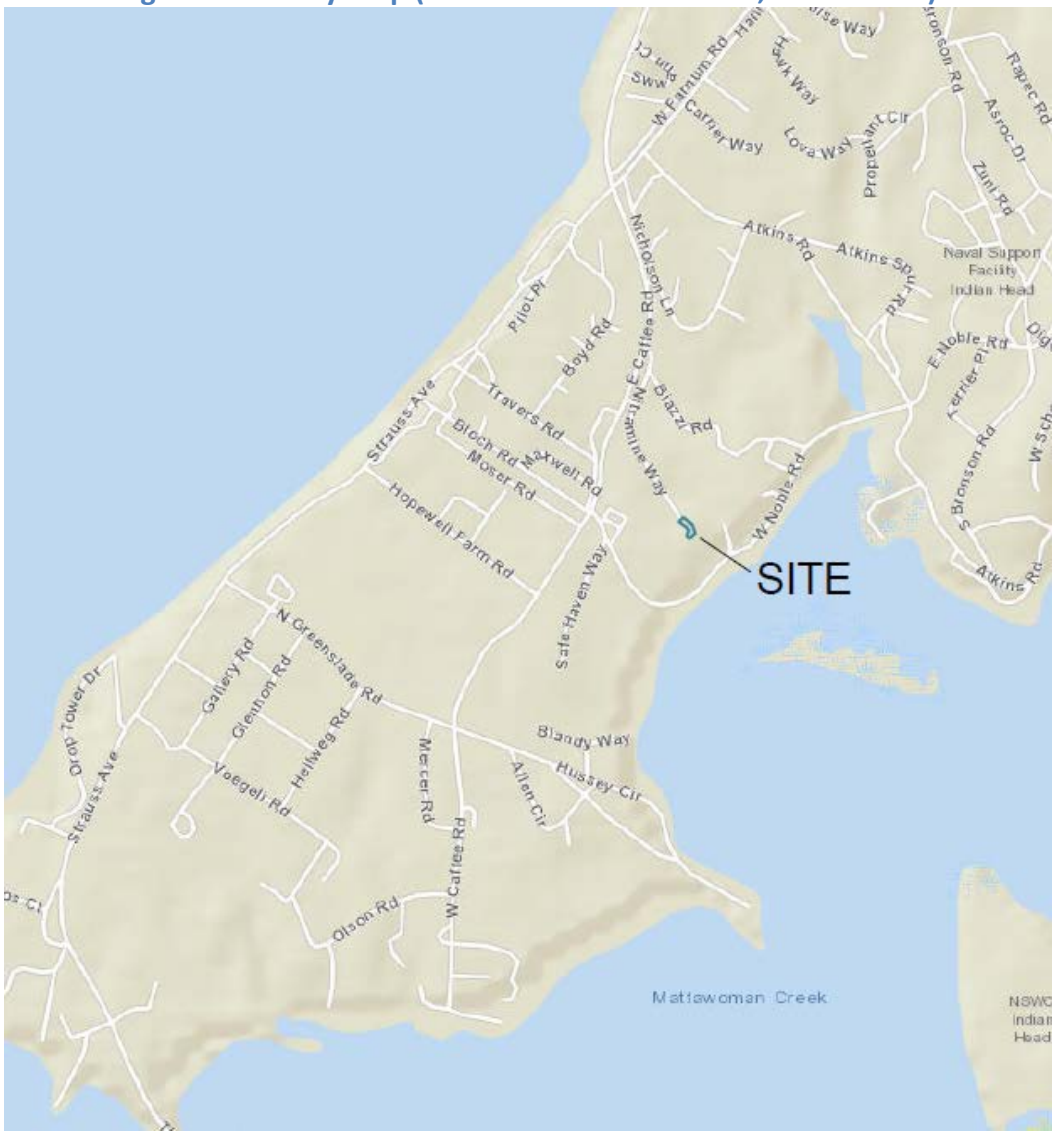
and improved aquatic and riparian habitat. Project techniques included installation of wrapped soil lifts, stone toe, bank grading, and planting of native vegetation. Construction was completed between August and November 2017.

Table 1. GPS coordinates of site.

LATITUDE	LONGITUDE
38.577080	-77.188709

The overall NSFIH base spans across a 3,500-acre peninsula along the eastern shoreline of the Potomac River in Charles County, Maryland, and is approximately 30 miles south of Washington, D.C. A vicinity map of the project area is provided in Figure 2 below. NSFIH is intersected by numerous perennial streams that provide spawning habitat and shelter for anadromous and freshwater fish species.

Figure 2. Vicinity Map (source: MD DNR-MERLIN, not to scale)



2.0 PERMITTING AND REQUIREMENTS

Draft design plans were submitted to the Navy in September 2016 and revised to final in accordance with Navy comments. The Navy submitted a joint permit application (JPA) to regulatory authorities in December 2016. Corps Nationwide Permit 2017-60335 was issued in June 20, 2017. MDE issued a Letter of Approval 17-NT-0062/201760335 on June 22, 2017.

Stormwater Management and Sediment and Erosion Control approval 17-SF-0114 was issued on June 23, 2017. Modification 1 to 17-SF-0114 was issued on August 28, 2017. Coverage under the 2014 General Permit for Stormwater Associated with Construction Activity MDRCIF05E was issued July 25, 2017.

NSFIH issued a Final Work Approval Permit through the Comprehensive Work Approval Planning (CWAP; NDW-15-041B) in June 2017. The Phase 2 Accident Prevention Plan (APP) was approved in July 2017.

Specifically, the Corps Nationwide Permit authorized:

"…a stream restoration and enhancement project by emplacing soil wraps and stone toe along the banks impacting approximately 200 square feet along 181 linear feet of an unnamed tributary of Mattawoman Creek and emplacing 2 5-foot wide by 10-foot long clay plugs within existing wetlands creating vernal pools impacting approximately 500 square feet of nontidal wetlands abutting unnamed tributaries to Mattawoman Creek at Naval Support facility Indian Head, Indian Head, Charles County, MD. "

The permit contained a total of 8 Special Conditions. The conditions applicable to post construction monitoring are provided below. Other conditions involved submitting an as-built survey and report, maintaining as-built integrity, and identifying the party responsible for site monitoring and permit compliance. The as-built survey and report were submitted by Versar in January, 2018 and Environmental Systems Analysis, Inc. (ESA) has been contracted to conduct annual monitoring with assistance from Versar.

- Condition 4: The permittee must maintain the as-built integrity of the authorized stream project by ensuring that the project is functionally mature and self-sustaining and in conformance with the terms and conditions of the permit. The permittee must notify and provide to the Corps, a detailed description of any necessary corrective measures, including maintenance and repair, or alternation in any way, of the permitted stream restoration no later than 15 days prior to performance of such corrective measures for review and approval. The permittee is not relieved of this requirement if the permittee abandons the permitted activity. Should the permittee wish to cease to maintain the authorized activity or should the permittee desire to abandon it without a good faith transfer the permittee must obtain a modification of this permit from the office which may require restoration.

- Condition 6: For five years following construction of the authorized project, the permittee must quarterly, and after any major storm event, such as hurricanes and nor'easters, inspect and document stream conditions on the project site and determine if structural and/or stream condition deterioration occurs as a result of the project. An annual inspection should include visual inspection within eyesight of at least 200 feet downstream to determine if excess sedimentation occurs in the stream and wetlands downstream of the project area as a result of this project.

- Condition 7: The permittee must provide annual reports (one hardcopy and one digital copy) for 5 (five) years following construction of the stream restoration project and must include all of the required surveys listed in Special Condition 4 above. The annual reports are due to this office by December 31 of each year.

- Condition 8: If the Corps determines that the stream project is functionally mature and self-sustaining, the inspection and documentation required during the 5-year monitoring period may be reduced or eliminated, upon written approval by this office.

This report documents activities that were taken in order to satisfy these requirements. In order to determine that the stream is functioning, self-sustaining, and stabile, the following are evaluated:

- Two monument cross sections
- A 200 linear foot longitudinal profile
- Particle analysis at the two cross sections
- Vegetation survival assessments
- Visual inspection of stream condition quarterly and following major storms
- Visual inspection for excess sedimentation 200 feet downstream of project limits.

These data are to be compared to as-built conditions and data collected from previous post-construction monitoring periods.

Post-construction monitoring of the vernal pools associated with this authorization were not required through this permit, and therefore will not be discussed in this report. Additional information about vernal pool design and construction can be found in *Project Summary Report for Stream Restoration and Vernal Pool Re-Establishment at Naval Support Facility Indian Head, MD (Prime Contract: N40080-15-2-0011*) submitted January 2018.

3.0 METHODOLOGY

3.1. Cross-Sections and Longitudinal Profile

Cross-section and longitudinal profile locations were used to monitor stream stability. Locations are provided in **Appendix A**. Cross-section and longitudinal profile measurements were based on protocols outlined in the *Stream Channel Reference Sites: An Illustrated Guide to Field*

Technique (Harrelson et al. 1994). Permanent cross-section and longitudinal profile monuments were installed using concrete and steel pins, which surveyed for elevations. Measurements were made using a stadia rod, level, and tape measure. Water surface elevation and bankfull elevations were collected.

A 200-foot longitudinal profile was surveyed, which encompassed the entire area stream work occurred. The profile was used to determine changes in channel slope and the location, distribution, and frequency of bed features. Cross-sectional and longitudinal data were processed using RIVERMorph 5.1.8.

3.2. Particle Analysis

Active channel pebble counts were conducted within the wetted width of each riffle cross-section to determine the D_{50} and D_{84} of particles, which were used to determine Rosgen stream classification. D_{50} is the particle size of which 50 percent of the sample is finer, and D_{84} is the particle size of which 84 percent of the sample is finer. Pebble counts were conducted using the random step toe procedure at evenly spaced intervals across ten transects within the wetted width. For each count, the intermediate axis of 100 particles were measured by sampling ten particles in ten transects. Pebble count data were used in conjunction with cross sectional data to determine the Rosgen stream classification (Rosgen, 1996).

3.3. Vegetation Survival Assessment

Following construction, the site was planted with nursery grown trees and shrubs. Survival of planted species was recorded. Survivorship is assessed on percent survival of each species, and percent survival of total planted stems. Recruitment of volunteer woody species was also assessed and quantified through recording the species and total number of stems greater than 12-inches in height.

3.4. Quarterly Inspections and Storm Assessments

As specified in Condition 6, each quarter and following large storms such as hurricanes and nor-Easters, the site was visually inspected and photo documented for channel stability. Project elements are reviewed for stability such as riffle grade controls, revetments, wrapped soil lifts, bank grading, changes in vegetation coverage, and pool location. Observations were used to determine if corrective actions were required. Photos taken during storm assessments are provided in **Appendix C**.

3.5. Visual Inspection

During annual monitoring and storm assessments, the floodplain, wetlands and stream corridor within 200-feet of the project's downstream limits were visually inspected for excess sediment deposition. If applicable, sediment deposition was documented for sediment type, extent, and source. Photos of the downstream area are provided in **Appendix C.**

4.0 RESULTS AND DISCUSSION

4.1. Cross-Section and Longitudinal Profile

Cross-section graphs and the stream profile graph are provided in **Appendix B**, and stream geomorphology results are summarized in Tables 2, 3, and 4. Overall, cross-sections changed minimally from those taken during the as-built survey and are classified as B channels, which are considered stable. Some adjustments in geometry have occurred, but are primarily attributed to settling of the stream, which is expected to occur during the first period of monitoring. Cross Section 1 (Sta. 1+34) has deepened approximately 0.5-feet and the thalweg has shifted to the left (facing downstream). Cross Section 2 (Sta, 0+74) has shifted minimally.

The longitudinal profile taken during the as-built shows a slope of 0.0099 ft/ft compared to a slope of 0.0065 ft/ft during Year 1 monitoring. Changes to the longitudinal profile are more difficult to assess due to the coarse scale in which as-built data were collected, making bedform difficult to evaluate, however longitudinal profile appears to be stable based on cross sectional stability, stream classifications, and general site observations.

Table 2. Cross Section 1 (Sta. 1+34) Summary

	as-built	2018	2019	2020	2021	2022
Bankfull Width (ft)	12.09	12.07				
Bankfull Mean Depth (ft)	0.64	0.66				
Bankfull Area (sq ft)	7.77	7.93				
Entrenchment ratio	1.53	1.97				
Width/Depth	18.89	18.29				
D_{50} (mm)	N/A	0.67				
D_{84} (mm)	N/A	13.22				
Rosgen Stream Type	B	B5c				

Table 3. Cross Section 2 (Sta. 0+74) Summary

	as-built	2018	2019	2020	2021	2022
Bankfull Width (ft)	10.64	9.58				
Bankfull Mean Depth (ft)	0.84	0.81				
Bankfull Area (sq ft)	8.97	7.78				
Entrenchment ratio	2.00	2.17				
Width/Depth	12.67	11.83				
D_{50} (mm)	N/A	0.20				
D_{84} (mm)	N/A	20.62				
Rosgen Stream Type	B	B5c				

Table 4. Longitudinal Profile Summary

	as-built	2018	2019	2020	2021	2022
Water Surface Slope (ft/ft)	N/A	0.0059				
Channel Slope (ft/ft)	0.0099	0.0065				

4.2 Particle Analysis

Tables 2 and 3 contain results of the pebble counts collected 2018 at Cross Section 1 and Cross Section 2. Pebble counts were not conducted during the as-built surveys (2017), so cannot be directly compared. The D_{50} for each cross section was composed for medium to fine sand and the D_{84} was medium to coarse gravel.

4.3. Vegetation Survival Assessment

A total of 47 trees and shrubs were installed at the stream restoration site. The quantities and species, as well as survival rates are provided in Table 5. The overall survival rate was 68%. All pawpaw and winterberry plants survived, whereas spicebush had 100% mortality and 14% of American hollies survived. Mortality was primarily contributed to damage caused by deer browse and buck rubbing.

Strong recruitment of sweetgum, pawpaw, and red maple seedlings was observed throughout the site. These seedlings were under 12-inches in height and therefore not quantified during Year 1 monitoring, however they are expected to grow rapidly due to their behavior as early successional species.

Table 5. Vegetation Survival

Species		Quantity Planted	Quantity Survival					Percent Survival
Common Name	**Scientific Name**		**2018**	**2019**	**2020**	**2021**	**2022**	
Pawpaw	*Asimina triloba*	3	3					100%
Spicebush	*Lindera benzoin*	3	0					0%
Winterberry	*Ilex verticillata*	6	6					100%
Red maple	*Acer rubrum*	7	5					71%
River birch	*Betula nigra*	7	5					71%
American holly	*Ilex opaca*	7	1					14%
Willow oak	*Quercus phellos*	7	5					71%
Sycamore	*Plantanus occidentalis*	7	7					100%
Total		**47**	**32**					**68%**

4.4. Quarterly Inspections and Storm Assessments

A total of 4 quarterly inspections and 1 post-storm inspection were conducted in 2018, with dates provided in Table 6. The post-storm inspection evaluated effects of a 5.41-inches rain event that occurred on 7/21/2018. Annual monitoring on 10/25/2018 served as the 4th quarter inspection. Photos provided in **Appendix C** were taken during 4th quarter monitoring unless noted otherwise. Photos from 2nd quarter monitoring (6/6/2018) are not available.

These inspections found that the channel depth had deepened approximately 0.5-1.2-feet in the vicinity of Cross Section 1. Approximately 12-feet of bank scour was also observed at the end of the stone toe installed along the right bank (facing downstream), directly downstream of the culvert's rip-rap outfall (**Appendix C**, Photo 3).

A head cut was observed downstream of Cross Section 2 (**Appendix C**, Photo 4). The headcut is forming from overland flow and has persisting saturated soils. Hydrology appears to be originating from an adjacent manhole and associated pipes, which have potentially failed.

Table 6. Visual Stream Inspection Dates

Quarter	2018	2019	2020	2021	2022
1st	2/28/2018				
2nd	6/6/2018				
3rd - storm	7/23/2018				
3rd	9/10/2018				
4th	10/25/2018				

4.5. Visual Inspection

A visual inspection of the floodplain and wetlands within 200-feet of the downstream project limit was performed on the dates provided in Table 6 above. The purpose of this inspection was to identify if excess sediment was depositing within these areas, and if so, to determine if sediments originated from the stream restoration project. No excess sediments were observed during these inspections.

5. DISCUSSION AND CONCLUSIONS

Year One monitoring (2018) was much wetter than the average year, which produced numerous rain events including a 5.41-inch storm on July 21, 2018. In response to the numerous bankfull events in 2018, the stream has made some channel adjustments and downcut within the vicinity of Cross Section 1 as well as along the stone toe installed downstream of the culvert. Adjustments are to be expected within the first year of construction as the stream settles, and the overall site appears stable. Both Cross Sections were found to be stable B channels.

During annual monitoring, bank erosion was noted at the end of the stone toe installed downstream of the culvert. Approximately 12-linear feet of bank are exposed, which occurs along the terminus of a meander. Class II riprap on top of geotextile cloth was installed along this area to stabilize the bank.

The overland headcut downstream of Cross Section 2 is likely due to a failed pipe connection near the manhole located approximately 20 to 30-feet from the stream left bank, making soils persistently saturated. The Navy will repair the headcut downstream of Cross Section 2 through a project to make lighting and walkway repairs throughout the Biazzi Plant. The project will also address several drainage issues and this is one of the areas that will be repaired. The project is currently being designed with work anticipated to be completed by the end of 2019.

Survival of planted trees and shrubs at this site was 68%. This is below the 85% survival rate specified in the planting plan. Mortality was primarily driven by deer browse and buck rub. Tree

protection was not utilized at this site, and the addition of this measure may increase survival. Additionally, mowing operations have occurred up to the soil lifts near the existing structure, and have caused stress/damage to some plants. Working with the landscaping crews to establish a no-mow zone around planted areas may further increase survival.

An abundance of sweetgum, red maple, and pawpaw seedlings were observed throughout the site. The adjacent forests and floodplain provide an excellent seed source for this site, and volunteer woody species are expected to continue colonizing this area. Stems greater than 12-inches tall will be documented in future years. Due to the rapid growth rate of these species, it is possible to exceed 47 woody stems greater than 12-inches tall in Year 4 and/or Year 5 monitoring.

With the exception of the 12-linear feet of bank erosion and deer damage, the site is performing as designed. The measures described above should be implemented to stabilize the eroding bank near Station 1+05, and plants should be back filled. Natural regeneration should also be considered as a viable option at this site due to the strong recruitment observed in Year 1. Vegetation survival will be reassessed in Year 2, and the quantity of volunteer species will be evaluated. If necessary, plants will be backfilled. Vertical stability will continue to be monitored via the longitudinal profile.

6. REFERENCES

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

Maryland Department of the Environment. Maryland designated uses for surface waters. Website http://www.mde.maryland.gov/programs/Water/TMDL/Water%20Quality%20Standards/Pages/programs/waterprograms/tmdl/wqstandards/wqs_designated_uses.aspx [Accessed November 2018].

Maryland Department of the Environment. Maryland Environmental Resources & Land Information Network. https://gisapps.dnr.state.md.us/MERLIN/index.html. [Accessed November 2018].

National Oceanic and Atmospheric Administration. 2015. National Centers for Environmental Information. Daily Summaries Station Details. Website https://www.ncdc.noaa.gov/cdo-web/datasets/ [Accessed November 2018].

Rosgen, D., 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

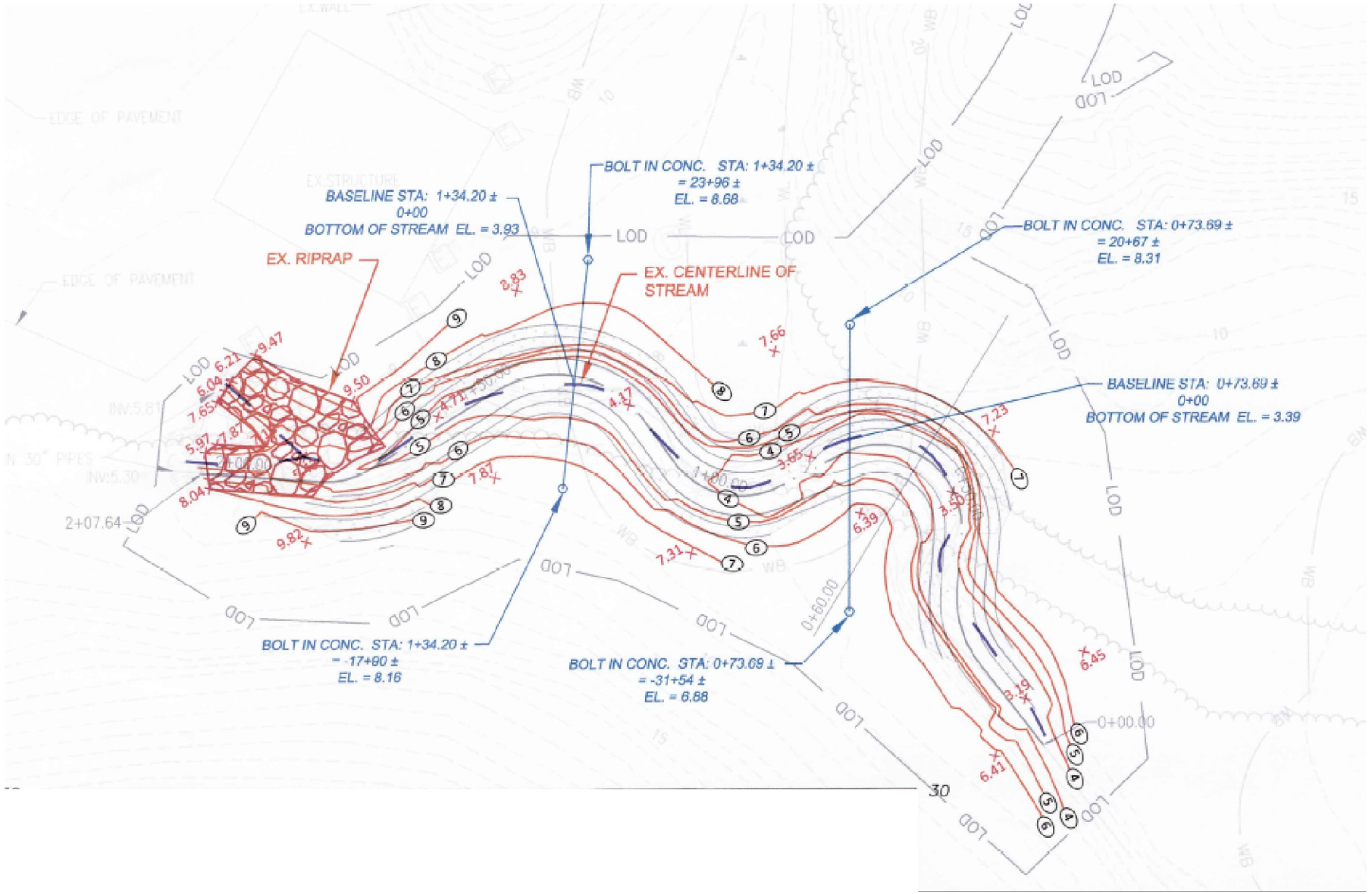
Rosgen, D.L. and H.L. Silvey, 2005. The Reference Reach Field Book. Wildland Hydrology Books.Fort Collins, Colorado.

Stribling, J.B., E.W. Leppo, and C. Daley. 1999. Biological Assessment of the Streams and Watersheds of Prince George's County, Maryland. Spring Index Period 1999. PGDER Report No 99-1. Prince George's County, Dept. of Env. Rsrs., Programs and Planning Division, Largo, MD

U.S. Department of Agriculture, Natural Resources Conservation Service. 2017. *Field Indicators of Hydric Soils in the United States*, Version 8.1. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

APPENDIX A

AS-BUILT/MONITORING STATION LOCATION MAP



Prepared by:

Environmental Systems Analysis, Inc.
Natural Resources Management
Ecological Restoration
2141 Priest Bridge Drive
Crofton, MD 21114
410-267-0495

AS-BUILT/MONITORING STATION MAP

BIAZZI STREAM RESTORATION

Indian Head, Maryland

NORTH

SCALE: 1"=25'

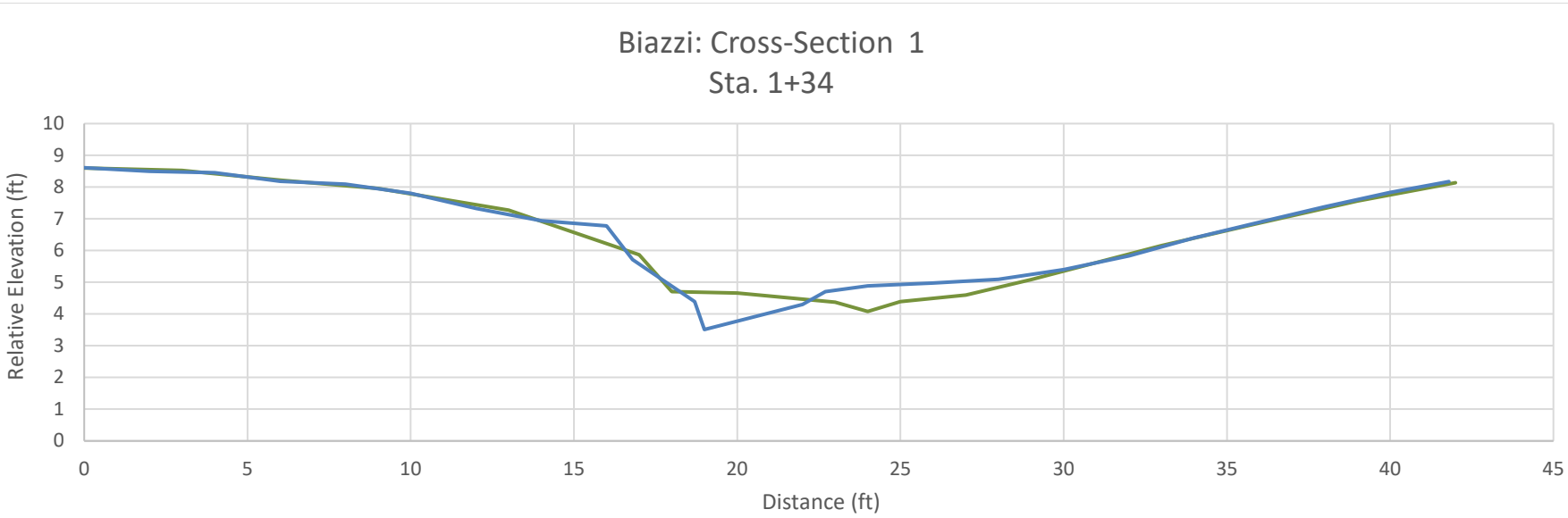
DATE: 11.2016

ESA PROJECT NAMB
2018-41 Indian Head/CAD

SHEET: 1 of 1

APPENDIX B

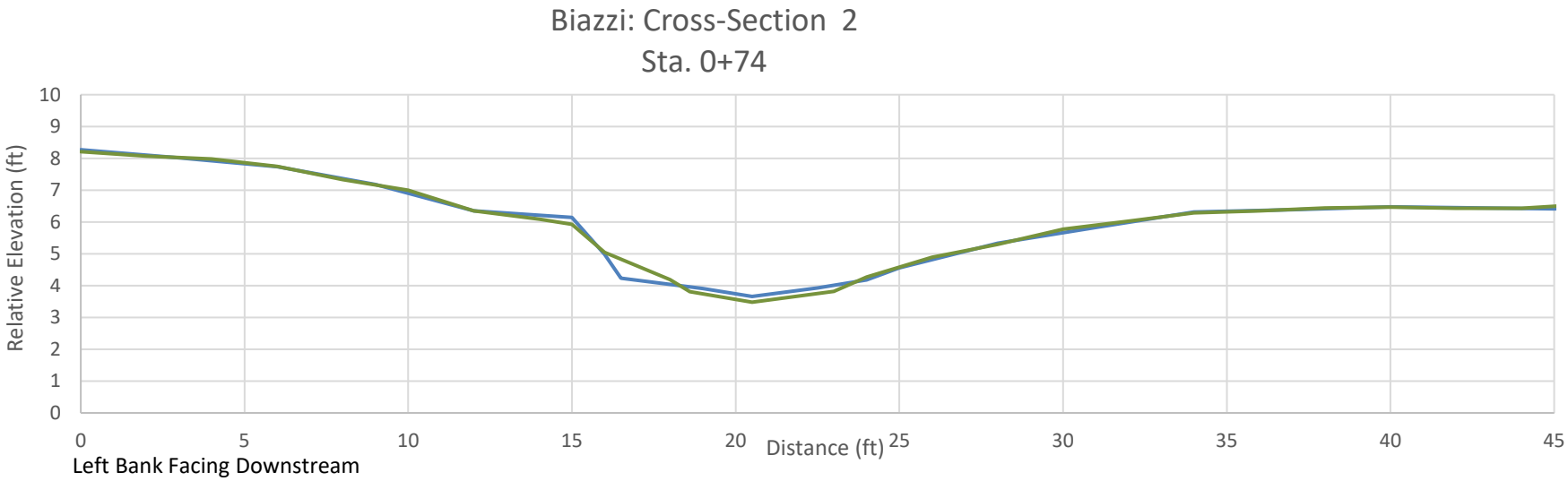
CROSS-SECTIONS AND LONGITUDINAL PROFILE
PARTICLE DISTRIBUTION FIGURES



Left Bank Facing Downstream

Cross Section #1 Facing Upstream
October 2018

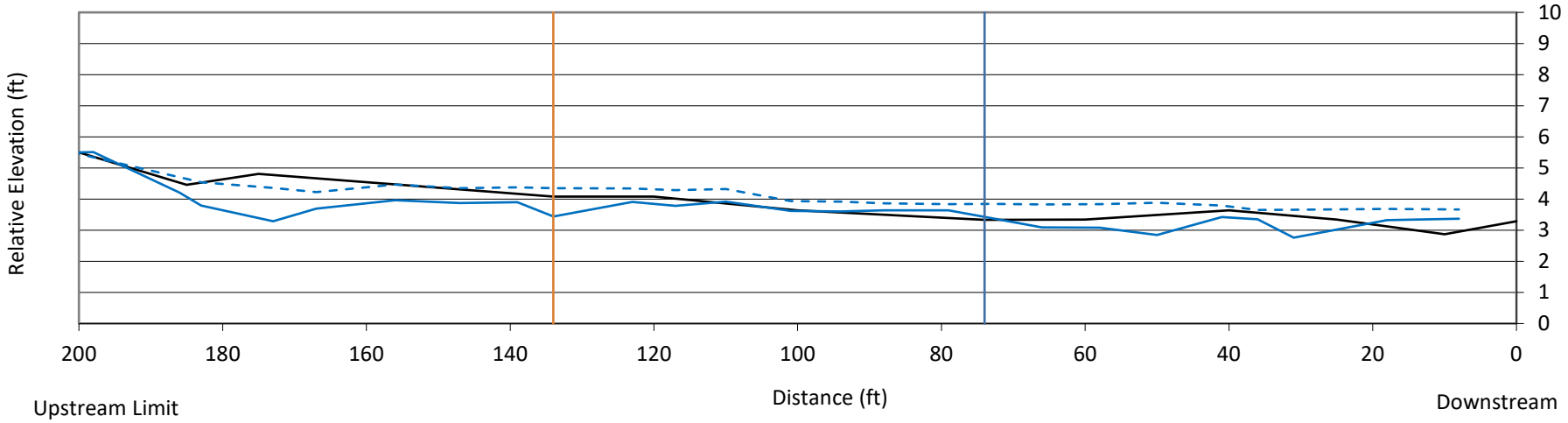
Cross Section #1 Facing Downstream
October 2018



Cross Section #2 Facing Upstream
October 2018

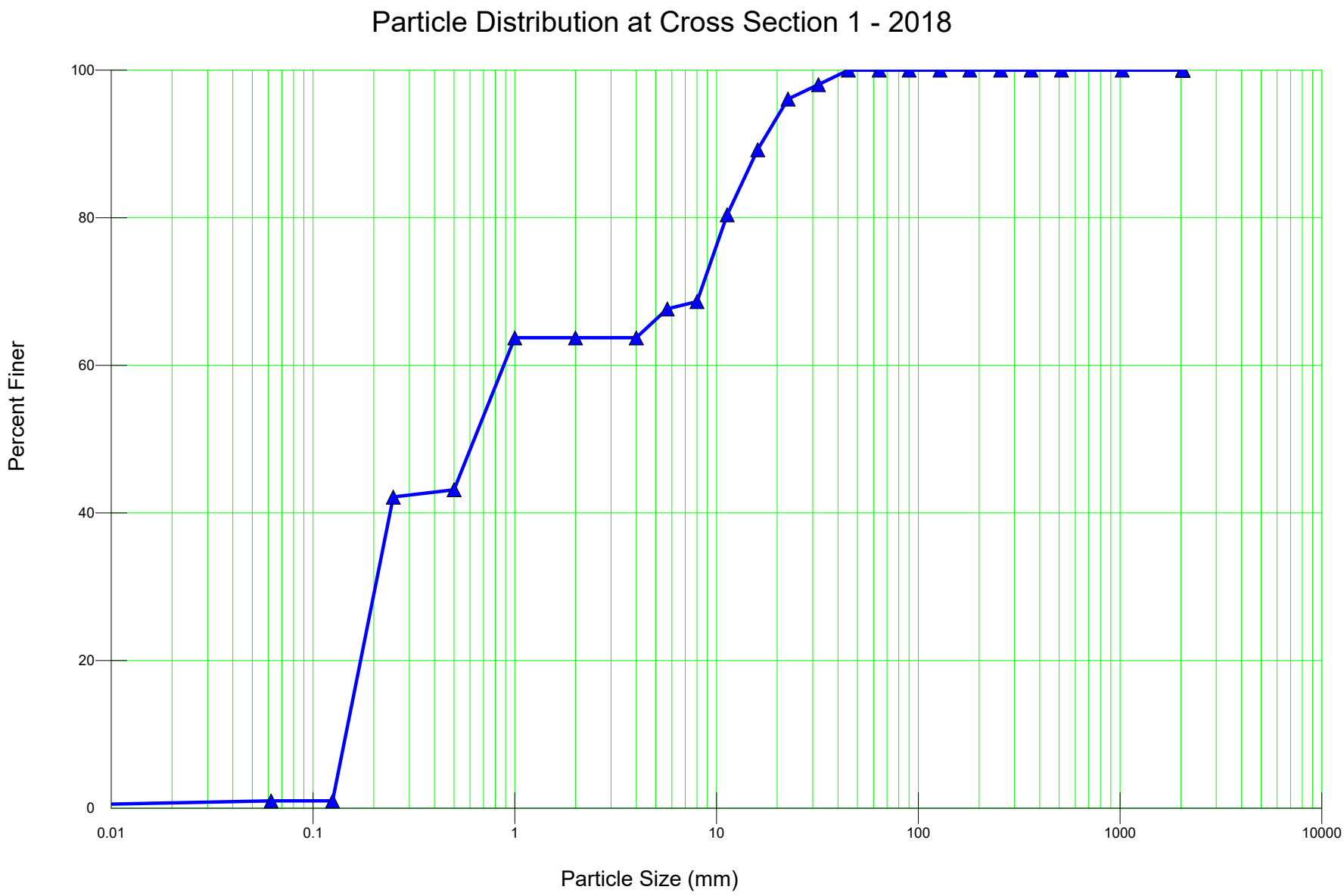
Cross Section #2 Facing Downstream
October 2018

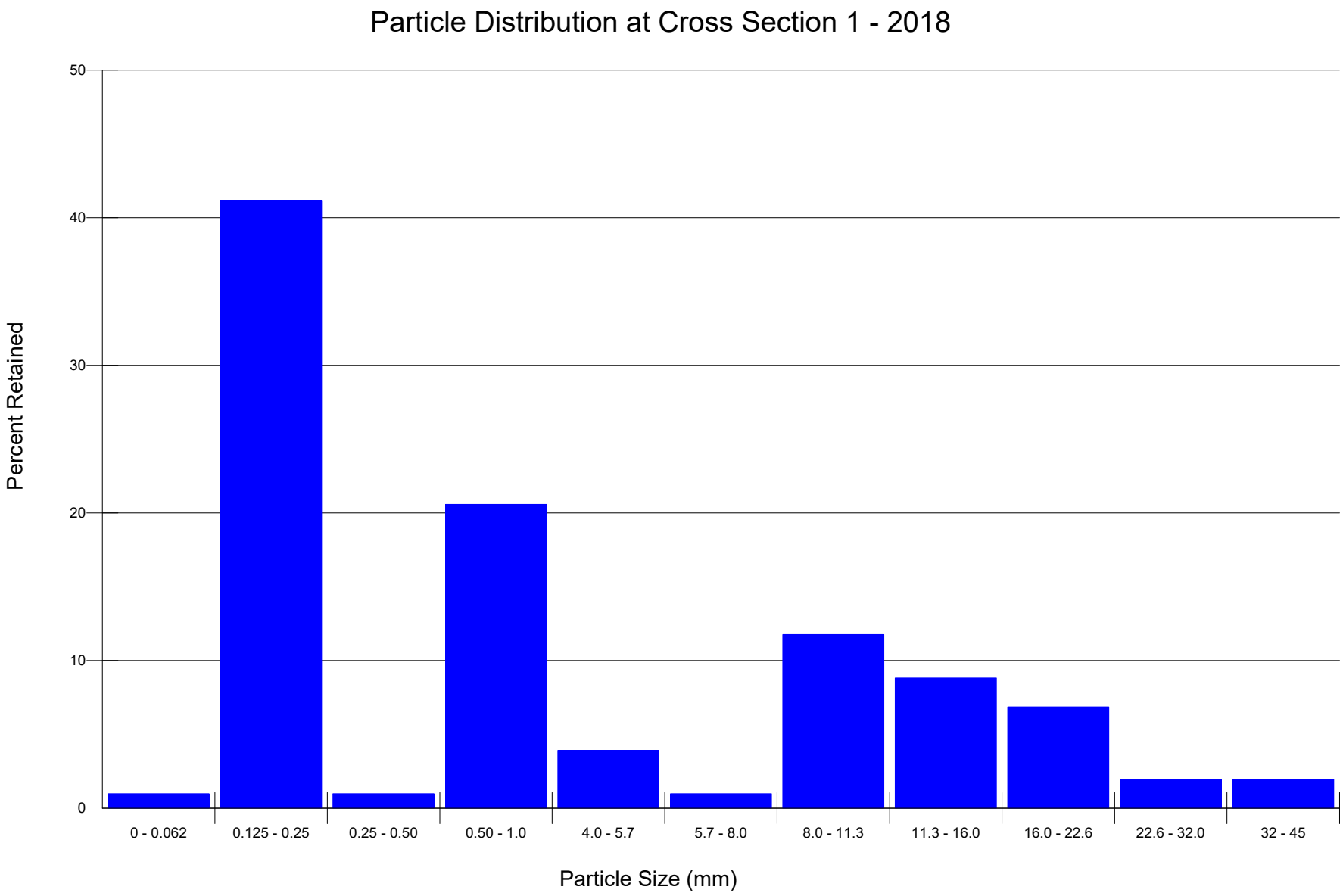
Biazzi: Longitudinal Profile

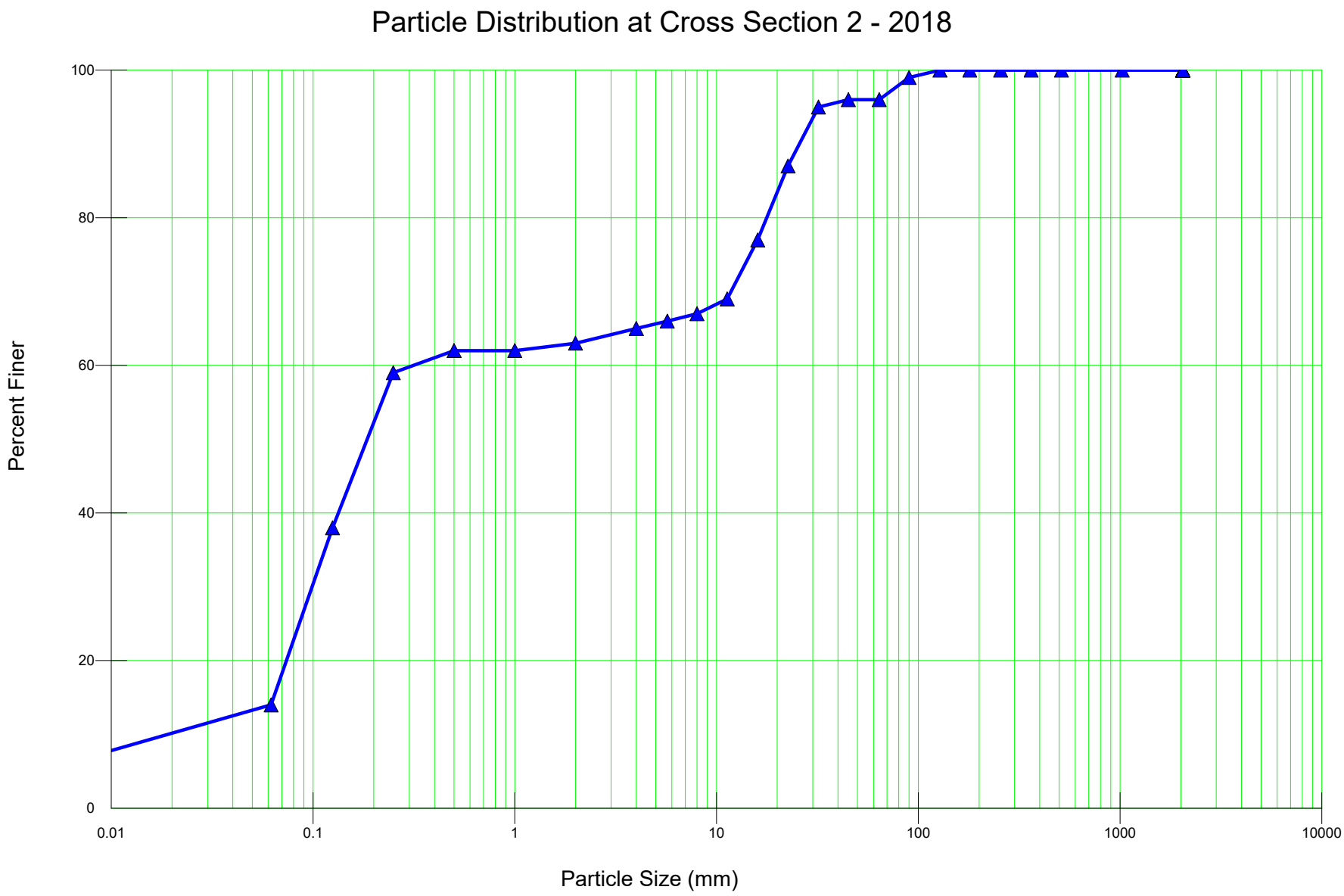


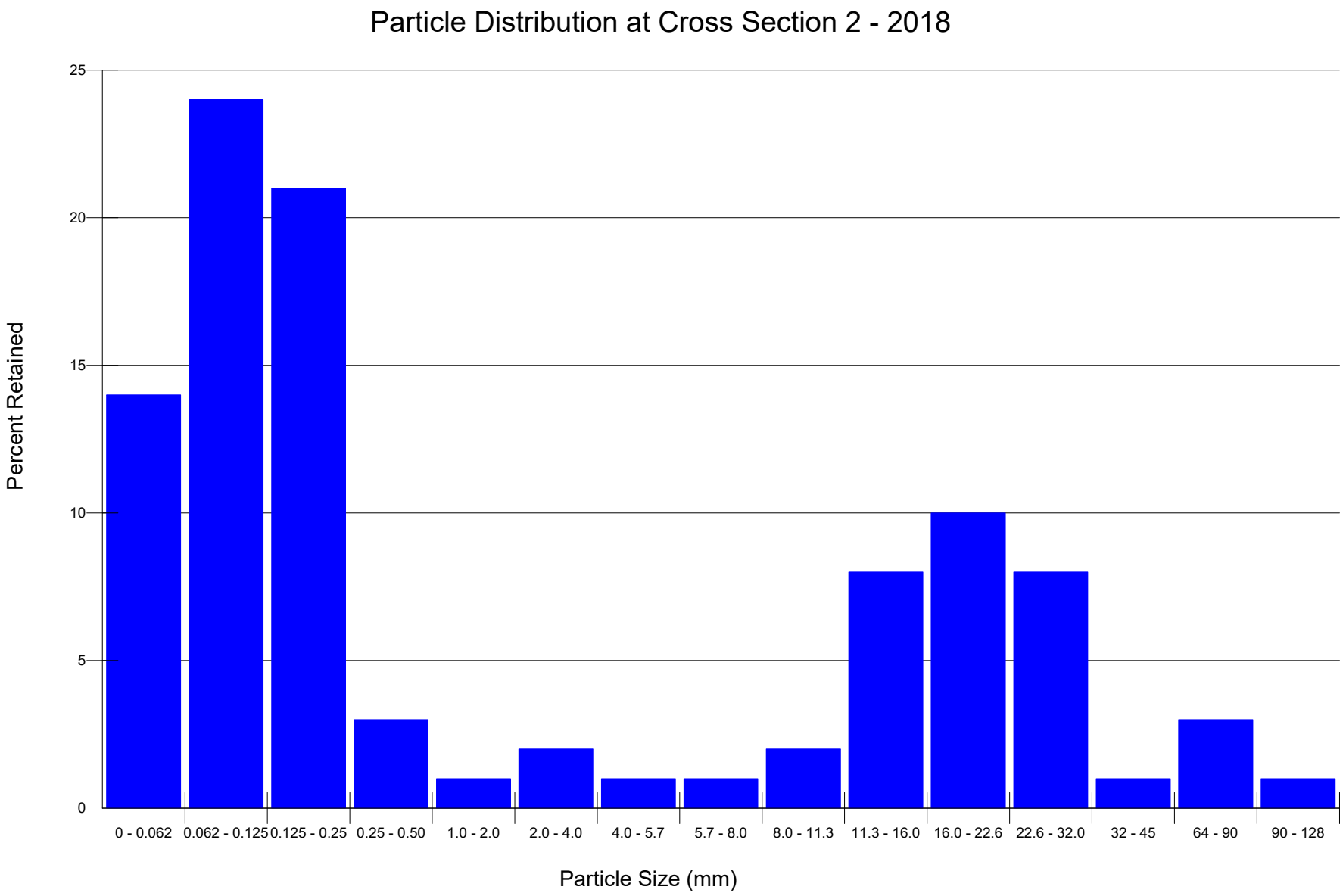
*Stations based on as-built survey, which placed Sta. 2+00 at the upstream project limits, and Sta. 0+00 at downstream project limits.

2017 Thalweg | 2018 Thalweg | 2018 Water Surface | Cross Section 1 | Cross Section 2


Particle Distribution at Cross Section 1 - 2018
Percent Finer
100
80
60
40
20
0
0.01
0.1
1
10
100
1000
10000
Particle Size (mm)


Particle Distribution at Cross Section 1 - 2018
Percent Retained
50
40
30
20
10
0
0 - 0.062
0.125 - 0.25
0.25 - 0.50
0.50 - 1.0
4.0 - 5.7
5.7 - 8.0
8.0 - 11.3
11.3 - 16.0
16.0 - 22.6
22.6 - 32.0
32 - 45
Particle Size (mm)


Particle Distribution at Cross Section 2 - 2018
Percent Finer
100
80
60
40
20
0
0.01
0.1
1
10
100
1000
10000
Particle Size (mm)


Particle Distribution at Cross Section 2 - 2018
Percent Retained
25
20
15
10
5
0
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.50
1.0 - 2.0
2.0 - 4.0
4.0 - 5.7
5.7 - 8.0
8.0 - 11.3
11.3 - 16.0
16.0 - 22.6
22.6 - 32.0
32 - 45
64 - 90
90 - 128
Particle Size (mm)

APPENDIX C

SITE ASSESSMENT PHOTOGRAPHS

Biazzi Annual Stream Monitoring Photographs
Year One

Photo 1. Typical condition of site facing downstream.

Photo 2. Typical condition of site facing downstream from middle of site. Soil lifts, stone toe, grading, and vegetation are performing as designed.

Biazzi Annual Stream Monitoring Photographs
Year One

Photo 3. Ten to twelve feet of bank erosion at end of stone toe located along right bank (facing downstream) below culvert.

Photo 4. Headcut forming under soil matting. Hydrology likely coming from adjacent manhole and associated pipes.

Biazzi Annual Stream Monitoring Photographs
Year One

Photo 5. Visual inspection of wetlands and floodplain located within 200-linear feet of project limit. No excess sediment deposition observed.

Photo 6. Visual inspection of wetlands and floodplain located within 200-linear feet of project limit. No excess sediment deposition observed.

Biazzi Annual Stream Monitoring Photographs
Year One

Photo 7. First Quarter monitoring (2/28/2018) facing upstream.

Photo 8. First Quarter monitoring (2/28/2018) facing downstream.

Biazzi Annual Stream Monitoring Photographs
Year One

Photo 9. Post-storm inspection on 7/23/2018 following 5.41-inch storm (facing upstream). Slight bank scour at end of stone toe.

Photo 10. Post-storm inspection following 5.41-inch storm (facing down-stream). Slight bank scour at end of stone toe.

Biazzi Annual Stream Monitoring Photographs
Year One

Photo 11. Third Quarter monitoring (9/10/2018) facing upstream near Cross Section 1.

Photo 12. Third Quarter monitoring (9/10/2018) facing upstream near Cross Section 2.