APPENDIX A
Site Selection Criteria

APPENDIX A
SITE SELECTION CRITERIA

USACE Baltimore District and Maryland Department of the Environment
July 2019

Mitigation Site Name | **Eccleston Mitigation Project**

Principal Criteria (check all that apply)

- ☒ **Site activities will result in at least 80% of wetland credits obtained through wetland restoration/establishment/re-establishment.**
- ☒ **Site activities will result in at least 50% of stream credits obtained through stream restoration/enhancement/re-establishment/ rehabilitation.**
- ☒ **Site is contiguous or connected to other aquatic resources.**
- ☐ **Site contains minimal or no invasive/undesirable/nuisance species.**

  Due to site impairments, invasive species have established dominance. These species are to be controlled through site activities and mitigation of the impairments.
- ☒ **Site has not been logged in the past 5 years.**
- ☐ **Site abuts and/or adjoins an existing preservation/conservation area, etc.**
- ☒ **Site has no known encumbrances (ie easements, liens, rights of way, reserved timber, severed surface or subsurface mineral or natural gas rights, etc.) on the site, on adjacent properties or within the watershed of the site that will negatively affect the compensation goals.**
- ☒ **Immediately adjacent land is less than 10% impervious cover.**
- ☒ **Site does not contain any impoundments that are not proposed for removal.**
- ☒ **Site is able to be protected long-term through the recordation of an appropriate site protection instrument or other mechanism that will support the long-term protection of the site.**
- ☒ **Site is expected to provide in-kind compensation (similar hydrologic regime).**

Watershed Scale Features (check all that apply) ****Explanation Required**	☒	**Site activities will contribute to habitat diversity.**** The upper Jones Falls is considered a blue-ribbon trout stream by Maryland Department of Natural Resources. Improving this section of the Jones Falls will further improve trout habitat in the tributary and increase the habitat for prey species that trout feed upon.
	☒	**Site activities will contribute to habitat connectivity.**** A significant flow diversion and dam occurs in the property, which causes drastic changes to the habitat and segregates the upper Jones Falls from the lower for small fish and younger trout. Removing these flow and obstruction barriers restores connectivity between the upper and lower Jones Falls and tributaries.
	☒	**Site activities will remove pollutants from downstream waters.**** The site is in one of the most impaired tributaries in the state, as the Jones Falls watershed is impacted by multiple Total Maximum Daily Loads (TMDLs). Improving this tributary will have downstream benefits for the residents of Baltimore County and Baltimore City.
	☒	**Site activities will remediate inputs of substantial amounts of sediments to downstream waters.**** Channelization has disrupted the natural sediment transport processes. Ongoing loss of sediment from erosion causes various impairments within the project reach and downstream. Restoration activities will address these impacts.
	☒	**Site is in the same HUC-8 as the impact.**
	☒	**Site is in an adjoining HUC-8 as the impact.**
	☒	**Site is in the same physiographic province as the impact.**
Development Trends in the Watershed Where Site is Located (check all that apply) ****Explanation Required**	☒	**Site will address watershed needs for habitat protection as identified in the state wildlife action plan, compensation planning framework, Habitat Conservation Plan, etc.**** The Eccleston property represents a threshold in the quality and function of the Jones Falls. The upper reaches of the project are reference areas which hold natural trout reproduction areas worthy of protection under easement. Downstream of the project location, the character of the Jones Falls changes considerably and more closely resembles a warm water fishery in the mainstem, though some high-quality tributaries are assumed to be present as well (they are potentially not studied well downstream).
	☐	**Site will address watershed needs for flood management as identified in the state wildlife action plan, compensation planning framework, Habitat Conservation Plan, etc. ****
	☒	**Site will address watershed needs for water quality improvement as identified through the 303(d) list.****

The restoration of the Jones Falls through this project will reduce sediment and nutrient sources, in support of TMDL goals for the watershed and in support of 303(d) watershed goals. This, however, is not the primary goal of the project, but rather an incidentally achieved goal.

☒ **Site will address watershed needs for reduction of sediment loads as identified through the 303(d) list.****

The restoration of the Jones Falls through this project will reduce sediment and nutrient sources, in support of TMDL goals for the watershed and in support of 303(d) watershed goals. This, however, is not the primary goal of the project, but rather an incidentally achieved goal.

☒ **Less than 50% of land use within the watershed is residential/commercial/industrial.**

☒ **Less than 50% of land use within the watershed is agricultural.**

☒ **Future land use plans (i.e. local comprehensive plans, conservation plans) show minimal or no change.**

☒ **No water withdrawal permits issued within the vicinity of the site.**

☒ **No point source permits within the vicinity of the site.**

Watershed vs. Site Specific Water Quality Goals (check all that apply)

****Explanation Required**

☒ **Site is likely to contribute to improved water quality within the watershed and not solely within the site boundaries.****

The site is in one of the most impaired tributaries in the state, as the Jones Falls watershed is impacted by multiple Total Maximum Daily Loads (TMDLs). Improving this tributary will have downstream benefits for the residents of Baltimore County and Baltimore City.

☐ **Site will include preservation/establishment/rehabilitation of the entire watershed upstream of the project to the drainage divide.**

☒ **No downstream impoundments (excluding drinking water) that would limit the watershed benefits derived from site activities.**

Positive Effects Site will have on Ecological/ Cultural Resources (check all that apply)

****Explanation Required**

☒ **Site activities will conserve/restore habitat for species identified as rare by MD DNR.****

MD DNR, both internally and through comments on the project, have identified trout as a special species of concern here. In conjunction with local NGO groups and the MD DNR, restoration is proposed to restore habitats with the long-term goal of preserving the system as a trout stream into the future, correcting the principle impairments to the site and working against watershed impairments.

☐ **Site activities will conserve/restore natural communities identified by MDDNR as imperiled.****

☒ **Site activities are within areas that have been identified by MD DNR as meriting improvement.****

MD DNR, both internally and through comments on the project, have identified trout as a special species of concern here. In conjunction with local NGO groups and the MD DNR, restoration is proposed to restore habitats with the long-term goal of preserving the system as a trout stream into the future, correcting the principle impairments to the site and working against watershed impairments.

☒ **Site activities will conserve/restore areas designated by MD DNR as wild trout streams.****

The upper Jones Falls is considered a blue-ribbon trout stream by Maryland Department of Natural Resources. Improving this section of the Jones Falls will further improve trout habitat in the tributary and increase the habitat for prey species that trout feed upon.

☐ **Site activities will conserve/restore areas designated by MD DNR as anadromous fish use areas.****

☐ **Site activities will protect state or feder al threatened and/or endangered species.****

☐ **Site contains historical cultural resources that will be preserved.****

☒ **Site activities will establish new or expand existing wildlife corridors.****

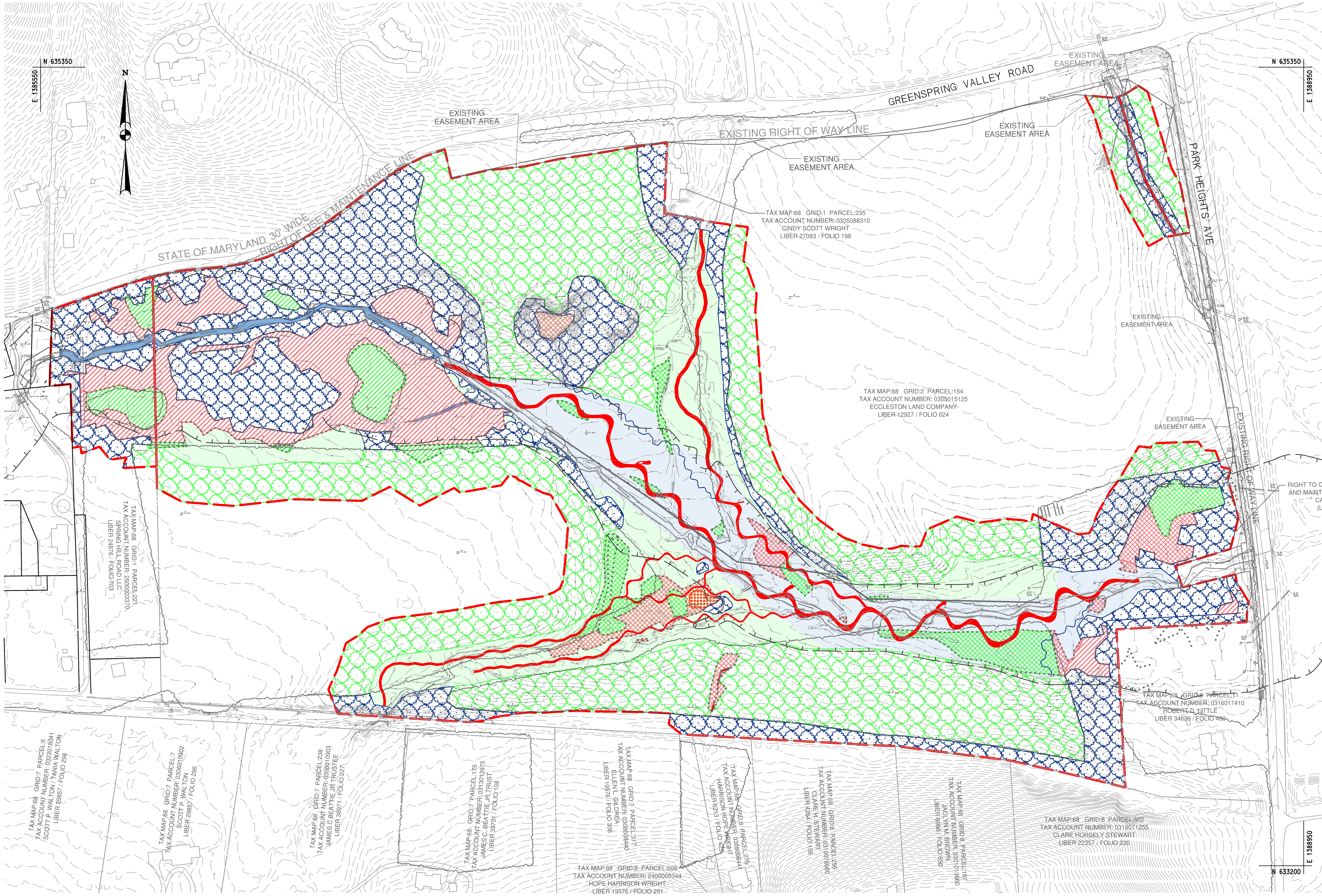
A significant flow diversion and dam occurs in the property, which limits use of areas of the existing corridor for aquatic wildlife. Removing these flow and obstruction barriers expands the existing wildlife corridor by restoring connectivity between the upper and lower Jones Falls and tributaries.

☒ **Site activities will result in removal of barriers to fish passage.****

A significant flow diversion and dam occurs in the property, which causes drastic changes to the habitat and segregates the upper Jones Falls from the lower for small fish and younger trout. Removing these flow and obstruction barriers restores connectivity between the upper and lower Jones Falls and tributaries.

Hydrologic Sources/ Ecological Features (check all that apply)	☒	**Site activities do not consist of wetland creation in the uplands.**
	☐	**Site activities do not consist of stream creation.** Length to be added.
	☒	**Site activities do not entail impounding or diverting water from other areas to the project site.**
	☐	**Site activities do not entail excavation to reach groundwater.** Excavation will be included due to buried hydric soil.
Physical/ Chemical Characteristics (check all that apply) ****Explanation Required**	☒	**Sites receiving waters are 303(d) listed.** Yes
	☐	**Site qualifies for preservation only, as 1) the resources provide important physical, chemical, or biological functions to the watershed; 2) the resources contribute significantly to the ecological sustainability of the watershed; 3) the IRT has determined that preservation is appropriate and practicable; 4) the resources are under threat of destruction or adverse modification; and 5) the site will be permanently protected through an appropriate real estate instrument.****
	☒	**Site activities will not result in the construction of artificial or unnatural wetlands that will have limited opportunity to provide the desired functions.**
	☐	**Past land use was PC crop or ditched wetlands.**
	☒	**Past land use was agriculture/silviculture.**** The proposed site is in a large farm field; thus, the restoration, enhancement and preservation will improve environmental resources and define clear monitored boundaries for farming practices.
	☐	**Past land use was commercial or industrial.****
	☐	**No impoundments exist upstream of the site that will cause thermal increases in water temperature, decreases in dissolved oxygen, erosion and degradation of the channel downstream from the impoundment, or dam failure from a storm event.****
	☒	**Site activities will result in all onsite impoundments being removed and streams re-established/rehabilitated.**

APPENDIX B
Mitigation Credit Map



LEGEND

	PROPOSED EASEMENT
	FORESTED BUFFER PRESERVATION 15.59 ac.
	BUFFER ENHANCEMENT 22.82 ac.
	WETLAND REMOVAL AREA 0.06 ac.
	PERENNIAL STREAM RESTORATION 8,461.94 LF
	PERENNIAL STREAM PRESERVATION 1,468.95 LF
	PFO RESTORATION 7.29 ac.
	PFO ENHANCEMENT 1.45 ac.
	PFO PRESERVATION 4.50 ac.
	PEM RESTORATION 6.96 ac.
	PEM ENHANCEMENT 1.87 ac.
	PEM PRESERVATION 1.21 ac.

150' 0 150' 300'

SCALE: 1" = 150'

OWNER /DEVELOPER INFORMATION

JOHNSON MIRMIRAN AND THOMPSON
40 WIGHT AVE.
COCKEYSVILLE, MD 21030

CONTACT

JEREMY KOSER
40 WIGHT AVE.
HUNT VALLEY, MD 21030
TEL: 410-329-3100

MARYLAND COORDINATE SYSTEM - HOR. NAD 83/91 MD STATE PLANE VERT. NAVD 88

GREENSPRING VALLEY ROAD
SW CORNER PARK HEIGHTS AVE
OWINGS MILLS, MD 21117

BALTIMORE COUNTY ELECTION DISTRICT: 3 COUNCILMANIC DISTRICT 2

MITIGATION CREDIT MAP

SCALE AS SHOWN DATE JULY 2019 PROJECT NO. 17-10977-001

DESIGNED BY JM COUNTY BALTIMORE COUNTY
DRAWN BY KNH LOGMILE
CHECKED BY JJ CD G HORIZONTAL SCALE N/A
F.A.P. NO. SEE TITLE SHEET VERTICAL SCALE N/A

DRAWING NO. OF SHEET NO. xx OF xx

ECCLESTON MITIGATION SITE

REVISIONS

CONCEPT SUBMISSION

NOT FOR CONSTRUCTION

DESIGN PROFESSIONAL

JEREMY KOSER

JOHNSON, MIRMIRAN & THOMPSON, INC.
40 WIGHT AVENUE, HUNT VALLEY, MD 21030

TEL: 410-329-3100
EMAIL: JKoser@jmt.com

PROFESSIONAL CERTIFICATION

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 31183, EXPIRATION DATE: 1/13/2021.

STATE OF MARYLAND JEREMY SCOTT KOSER No. 31183 PROFESSIONAL ENGINEER

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future®

BY: KHiggins -

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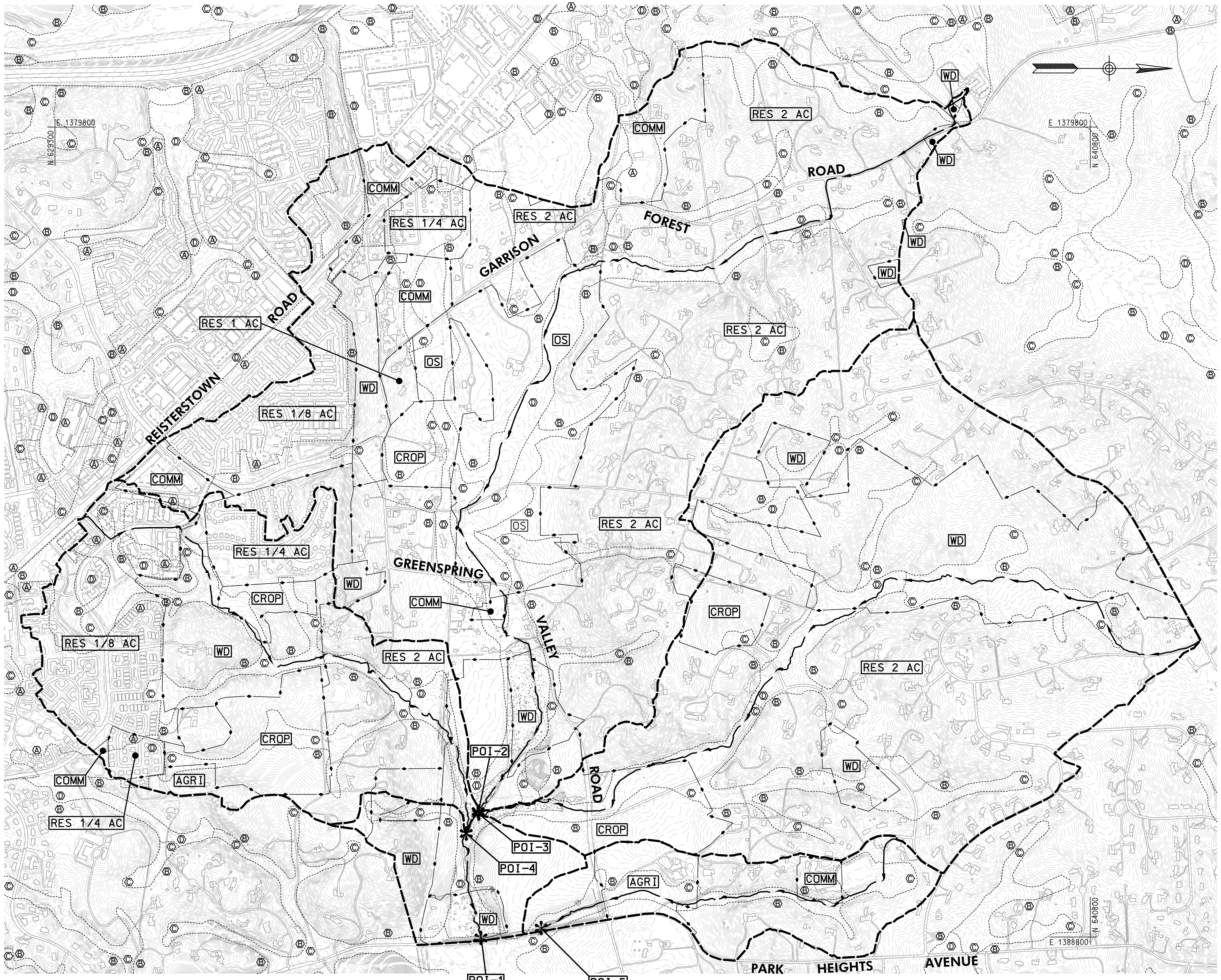
Monday, July 29, 2019 AT 11:55 AM

APPENDIX C
Hydrologic Analysis Data

DRAINAGE AREA SUMMARY TABLE			
POI	D.A. (SQ. MI.)	TcPATH	RCN
1	2.783	1.505	71
2	1.323	1.377	72
3	0.920	1.241	67
4	0.450	1.130	75
5	0.139	0.609	73

DISCHARGE SUMMARY TABLE			
POI	Q_2	Q_{10}	Q_{100}
1	593.4	1438.7	3050.4
2	317.9	736.5	1526.6
3	161.4	439.0	998.8
4	151.7	322.2	622.1
5	62.2	133.9	256.2



600' 0 600' 1200'

SCALE: 1"=600'

LEGEND

- EXISTING CONTOUR
- SOIL BOUNDARY
- SOIL TYPE
- POINT OF INVESTIGATION (POI)
- TcPATH (TIME OF CONCENTRATION)
- DRAINAGE AREA BOUNDARY
- LAND USE BOUNDARY
- RES 1/4 AC — RESIDENTIAL 1/4 ACRE
- RES 1/8 AC — RESIDENTIAL 1/8 ACRE
- RES 1 AC — RESIDENTAIL 1 ACRE
- RES 2 AC — RESIDENTAIL 2 ACRE
- AGRI — AGRICULTURAL
- COMM — COMMERCIAL
- CROP — CROP
- OS — OPEN SPACE
- WD — WOODS

JOHNSON, MIRMIRAN & THOMPSON
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ECCLESTON MITIGATION SITE

DRAINAGE AREA MAP EXISTING CONDITIONS

REVISIONS

CONCEPT SUBMISSION

NOT FOR CONSTRUCTION

SCALE AS SHOWN DATE APRIL, 2018 CONTRACT NO.

DESIGNED BY MRG COUNTY BALTIMORE COUNTY
DRAWN BY MRG LOGMILE
CHECKED BY FAB HORIZONTAL SCALE N/A
F.A.P. NO. SEE TITLE SHEET VERTICAL SCALE N/A

DRAWING NO. OF SHEET NO. OF XX

BY: Cwagner -

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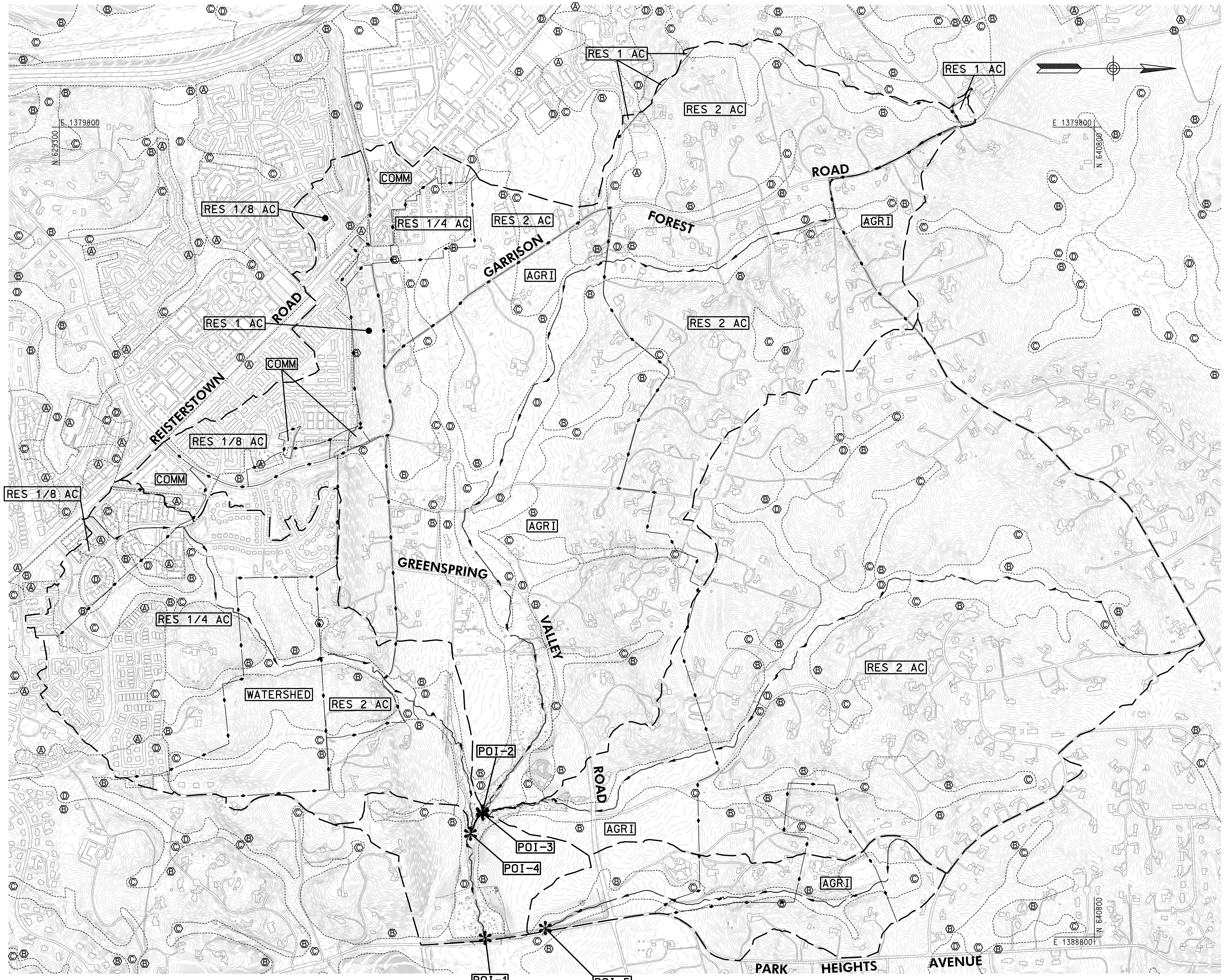
Monday, June 25, 2018 AT 04:32 PM



DRAINAGE AREA SUMMARY TABLE			
POI	D.A. (SQ. MI.)	TcPATH	RCN
1	2.783	1.505	72
2	1.323	1.377	74
3	0.920	1.241	68
4	0.450	1.130	75
5	0.139	.609	74

DISCHARGE SUMMARY TABLE			
POI	Q_2	Q_{10}	Q_{100}
1	655.4	1520.5	3144.3
2	363.3	798.4	1593.4
3	175.5	459.7	1025.9
4	151.7	146.8	622.1
5	66.3	138.9	261.2

LEGEND

- EXISTING CONTOUR
- SOIL BOUNDARY
- SOIL TYPE
- ✻ POINT OF INVESTIGATION (POI)
- TcPATH (TIME OF CONCENTRATION)
- DRAINAGE AREA BOUNDARY
- LAND USE BOUNDARY
- RES 1/4 AC — RESIDENTIAL 1/4 ACRE
- RES 1/8 AC — RESIDENTIAL 1/8 ACRE
- RES 1 AC — RESIDENTAIL 1 ACRE
- RES 2 AC — RESIDENTAIL 2 ACRE
- AGRI — AGRICULTURAL
- COMM — COMMERCIAL
- WATERSHED — WATERSHED

600' 0 600' 1200'
SCALE: 1"=600'

JMT
JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future®

BY: RBucci

ECCLESTON MITIGATION BANK

DRAINAGE AREA MAP
ULTIMATE CONDITIONS

REVISIONS

CONCEPT SUBMISSION

NOT FOR CONSTRUCTION

SCALE AS SHOWN DATE APRIL, 2018 CONTRACT NO.

DESIGNED BY MRG COUNTY BALTIMORE COUNTY
DRAWN BY MRG LOGMILE
CHECKED BY FAB HORIZONTAL SCALE N/A
F.A.P. NO. SEE TITLE SHEET VERTICAL SCALE N/A

DRAWING NO. OF SHEET NO. OF XX

GISHydro Release Version Date: January 8, 2011
Hydro Extension Version Date: January 8, 2011
Analysis Date: June 5, 2018

Landuse and Soil Distributions for: Eccelston

Distribution of Landuse by Soil Group

Land Use	Acres on Indicated Soil Group A-Soil	B-Soil	C-Soil	D-Soil
Low Density Residential	0	668.07	20.02	21.35
Medium Density Residential	0	54.93	5.34	0
High Density Residential	0	130.1	6.67	0
Commercial	0	30.25	8.01	0
Institutional	0	24.02	0	0
Open Urban Land	0	102.75	4.89	0
Cropland	0	107.64	26.46	0
Pasture	0	5.78	2.67	0
Deciduous Forest	0	183.03	7.56	4.67
Large Lot Agricultural	0	110.97	11.12	4
Large Lot Forest	0	177.69	9.79	7.34
Total Area:	0	1595.23	102.52	37.36

Distribution of Land Use and Curve Numbers Used

Land Use	Acres	Percent	A	B	C	D
Low Density Residential	709.44	40.89	54	70	80	85
Medium Density Residential	60.27	3.47	61	75	83	87
High Density Residential	136.77	7.88	77	85	90	92
Commercial	38.25	2.2	89	92	94	95
Institutional	24.02	1.38	69	80	86	89
Open Urban Land	107.64	6.2	39	61	74	80
Cropland	134.1	7.73	67	78	85	89
Pasture	8.45	0.49	39	61	74	80
Deciduous Forest	195.26	11.25	30	55	70	77
Large Lot Agricultural	126.1	7.27	67	78	85	89
Large Lot Forest	194.82	11.23	30	55	70	77

```
Watershed Statistics for: Eccelston
GISHydro Release Version Date: January 8, 2011
Hydro Extension Version Date:  January 8, 2011
Analysis Date:                 June 5, 2018

Data Selected:
     Quadrangles Used: cockeysville, reisterstown, hampstead, hereford
     DEM Coverage: NED DEMs
     Land Use Coverage: 2010 MOP Landuse
     Soil Coverage: Ragan Soils
     Hydrologic Condition: (see Lookup Table)
     Impose NHD stream Locations: Yes
     Outlet Easting:        423369 m. (MD Stateplane, NAD 1983)
     Outlet Northing:       193262 m. (MD Stateplane, NAD 1983)

Findings:
     Outlet Location:       Piedmont
     Outlet State:          Maryland
     Drainage Area          2.7 square miles
       -Piedmont (100.0% of area)
     Channel Slope:         77.1 feet/mile
     Land Slope:            0.072 ft/ft
     Urban Area:            54.4%
     Impervious Area:       22.7%
 ******************************************************
     URBAN DEVELOPMENT IN WATERSHED EXCEEDS 15%.
     Calculated discharges from USGS Regression
     Equations may not be appropriate.
 ******************************************************
     Time of Concentration: 2.1 hours  [W.O. Thomas, Jr. Equation]
     Time of Concentration: 2.2 hours  [From SCS Lag Equation * 1.67]
     Longest Flow Path:     2.68 miles
     Basin Relief:          146.4 feet
     Average CN:            70
     % Forest Cover:        22.5
     % Storage:             0.0
     % Limestone:           0.0
     Selected Soils Data Statistics:
        % A Soils:          0.0
        % B Soils:          91.9
        % C Soils:          5.9
        % D Soils:          2.2
     SSURGO Soils Data Statistics (used in Regression Equations):
        % A Soils:          0.8
        % B Soils:          80.7
        % C Soils:          9.7
        % D Soils:          8.8
     2-Year,24-hour Prec.:  3.27 inches
     Mean Annual Prec.:     46.07 inches
```

U.S.G.S. Peak Flow Estimates for: Eccelston
GISHydro Release Version Date: January 8, 2011
Hydro Extension Version Date: January 8, 2011
Analysis Date: June 5, 2018

Geographic Province(s):
-Piedmont (100.0% of area)

Q(2): 335 cfs
Q(5): 646 cfs
Q(10): 937 cfs
Q(25): 1400 cfs
Q(50): 1810 cfs
Q(100): 2300 cfs
Q(500): 3790 cfs

Area Weighted Prediction Intervals (from Tasker)

Return	50 PERCENT		67 PERCENT		90 PERCENT		95 PERCENT	
Period	lower	upper	lower	upper	lower	upper	lower	upper
2	258	434	229	491	178	631	155	722
5	509	819	455	917	361	1160	319	1310
10	740	1190	662	1330	526	1670	466	1890
25	1090	1790	971	2010	763	2560	671	2910
50	1390	2360	1230	2670	952	3450	831	3960
100	1730	3050	1520	3490	1150	4600	994	5320
500	2700	5320	2300	6250	1650	8700	1380	10400

Individual Province Tasker Analyses Follow:

Flood frequency estimates for
Eccelston
REGION: Piedmont region
area= 2.70: forest = 22.50 :skew= 0.53

Return Period	Discharge (cfs)	Standard Error of Prediction (percent)	Equivalent Years of Record	Standard Error of Prediction (logs)
2	335.	39.6	3.27	0.1659
5	646.	36.2	7.35	0.1523
10	937.	35.9	11.33	0.1512
25	1400.	37.7	15.85	0.1585
50	1810.	40.3	18.19	0.1685
100	2300.	43.6	19.66	0.1812
500	3790.	53.4	20.69	0.2175

P R E D I C T I O N I N T E R V A L S

Return	50 PERCENT		67 PERCENT		90 PERCENT		95 PERCENT	
Period	lower	upper	lower	upper	lower	upper	lower	upper
2	258.	434.	229.	491.	178.	631.	155.	722.
5	509.	819.	455.	917.	361.	1160.	319.	1310.
10	740.	1190.	662.	1330.	526.	1670.	466.	1890.
25	1090.	1790.	971.	2010.	763.	2560.	671.	2910.
50	1390.	2360.	1230.	2670.	952.	3450.	831.	3960.
100	1730.	3050.	1520.	3490.	1150.	4600.	994.	5320.
500	2700.	5320.	2300.	6250.	1650.	8700.	1380.	10400.

POI 5 basincomposition.txt

GISHydro Release Version Date: January 8, 2011
Hydro Extension Version Date: January 8, 2011
Analysis Date: June 5, 2018

Landuse and Soil Distributions for: Eccelston POI 6

Distribution of Landuse by Soil Group

Land Use	Acres on Indicated Soil Group A-Soil	B-Soil	C-Soil	D-Soil
Low Density Residential	0	40.48	0	0
Institutional	0	4.89	0	0
Cropland	0	8.45	0	0
Deciduous Forest	0	8.67	0.67	0
Large Lot Agricultural	0	25.58	0	0
Large Lot Forest	0	9.34	0	0
Total Area:	0	97.41	0.67	0

Distribution of Land Use and Curve Numbers Used

Land Use	Acres	Percent	A	B	C	D
Low Density Residential	40.48	41.27	54	70	80	85
Institutional	4.89	4.99	69	80	86	89
Cropland	8.45	8.62	67	78	85	89
Deciduous Forest	9.34	9.52	30	55	70	77
Large Lot Agricultural	25.58	26.08	67	78	85	89
Large Lot Forest	9.34	9.52	30	55	70	77

```
Watershed Statistics for: Eccelston POI 6
GISHydro Release Version Date: January 8, 2011
Hydro Extension Version Date:  January 8, 2011
Analysis Date:                 June 5, 2018

Data Selected:
     Quadrangles Used: cockeysville, reisterstown, hereford, hampstead
     DEM Coverage: NED DEMs
     Land Use Coverage: 2010 MOP Landuse
     Soil Coverage: Ragan Soils
     Hydrologic Condition: (see Lookup Table)
     Impose NHD stream Locations: Yes
     Outlet Easting:         423252 m. (MD Stateplane, NAD 1983)
     Outlet Northing:        193531 m. (MD Stateplane, NAD 1983)

Findings:
     Outlet Location:        Piedmont
     Outlet State:           Maryland
     Drainage Area           0.2 square miles
       -Piedmont (100.0% of area)
     Channel Slope:          169.2 feet/mile
     Land Slope:             0.065 ft/ft
     Urban Area:             41.3%
     Impervious Area:        18.2%
 ******************************************************
     URBAN DEVELOPMENT IN WATERSHED EXCEEDS 15%.
     Calculated discharges from USGS Regression
     Equations may not be appropriate.
 ******************************************************
     Time of Concentration: 1.2 hours  [W.O. Thomas, Jr. Equation]
     Time of Concentration: 1.0 hours  [From SCS Lag Equation * 1.67]
     Longest Flow Path:      0.98 miles
     Basin Relief:           90.6 feet
     Average CN:             71
     % Forest Cover:         19.0
     % Storage:              0.0
     % Limestone:            0.0
     Selected Soils Data Statistics:
        % A Soils:           0.0
        % B Soils:           99.3
        % C Soils:           0.7
        % D Soils:           0.0
     SSURGO Soils Data Statistics (used in Regression Equations):
        % A Soils:           0.0
        % B Soils:           82.5
        % C Soils:           17.5
        % D Soils:           0.0
     2-Year,24-hour Prec.:  3.28 inches
     Mean Annual Prec.:     46.32 inches
```

U.S.G.S. Peak Flow Estimates for: Eccelston POI 6
GISHydro Release Version Date: January 8, 2011
Hydro Extension Version Date: January 8, 2011
Analysis Date: June 5, 2018

Geographic Province(s):
-Piedmont (100.0% of area)

Q(2): 66 cfs
Q(5): 137 cfs
Q(10): 208 cfs
Q(25): 323 cfs
Q(50): 429 cfs
Q(100): 555 cfs
Q(500): 948 cfs

Area Weighted Prediction Intervals (from Tasker)

Return	50 PERCENT		67 PERCENT		90 PERCENT		95 PERCENT	
Period	lower	upper	lower	upper	lower	upper	lower	upper
2	50	87	44	99	34	129	29	149
5	106	178	94	201	73	258	64	294
10	161	269	142	304	111	391	97	447
25	246	424	216	483	166	630	144	725
50	321	574	279	659	210	874	181	1020
100	406	759	350	881	258	1190	219	1400
500	652	1380	545	1650	378	2380	312	2890

Individual Province Tasker Analyses Follow:

Flood frequency estimates for
Eccelston POI 6
REGION: Piedmont region
area= 0.20: forest = 19.00 :skew= 0.53

Return Period	Discharge (cfs)	Standard Error of Prediction (percent)	Equivalent Years of Record	Standard Error of Prediction (logs)
2	66.	42.2	3.79	0.1758
5	137.	39.3	8.19	0.1647
10	208.	39.5	12.36	0.1653
25	323.	41.9	17.00	0.1747
50	429.	45.0	19.39	0.1863
100	555.	48.8	20.90	0.2006
500	948.	59.9	22.04	0.2405

P R E D I C T I O N I N T E R V A L S

Return	50 PERCENT		67 PERCENT		90 PERCENT		95 PERCENT	
Period	lower	upper	lower	upper	lower	upper	lower	upper
2	50.	87.	44.	99.	34.	129.	29.	149.
5	106.	178.	94.	201.	73.	258.	64.	294.
10	161.	269.	142.	304.	111.	391.	97.	447.
25	246.	424.	216.	483.	166.	630.	144.	725.
50	321.	574.	279.	659.	210.	874.	181.	1020.
100	406.	759.	350.	881.	258.	1190.	219.	1400.
500	652.	1380.	545.	1650.	378.	2380.	312.	2890.

WARNING -- Prediction beyond observed data
WARNING - Drainage area out of range of observed data

```
WinTR-20: version 3.20                   0         0                   0
Eccelston Mitigation POI 1-4 Existing

SUB-AREA:
          DA1       OUTLET               0.0900312 75.       .260       YY
          DA4       CON-1                0.4501281 75.       1.13       YY
          DA2       CON-1                1.3229781 72.       1.377      YY
          DA3       CON-1                0.9202734 67.       1.241      YY


STREAM REACH:
          CON-1     OUTLET    XS1                  1547.3143           YY   Y


STORM ANALYSIS:
          1_yr_sm                        2.7       1_yr_sm   2         3.27
          2_yr_sm                        3.27      2_yr_sm   2         3.27
          5_yr_sm                        4.21      5_yr_sm   2         3.27
          10_yr_sm                       5.03      10_yr_sm  2         3.27
          25_yr_sm                       6.29      25_yr_sm  2         3.27
          50_yr_sm                       7.41      50_yr_sm  2         3.27
          100_yr_sm                      8.68      100_yr_sm 2         3.27
          500_yr_sm                      12.35     500_yr_sm 2         3.27


STREAM CROSS SECTION:
          XS1       361.8
                    360.16    0.00      0.00      2.        .1
                    360.57    1.92      1.80      2.
                    360.98    11.84     6.44      2.
                    361.39    31.78     12.95     2.
                    361.80    63.07     21.08     2.
                    362.57    246.03    172.72    2.
                    363.35    678.76    348.03    2.
                    364.12    1313.55   539.74    2.
                    364.89    2034.29   766.67    2.
                    365.67    3178.49   1025.20   2.
                    366.44    4545.31   1296.17   2.
                    367.21    6128.84   1579.56   2.
                    367.99    7541.79   1894.24   2.
                    368.76    9145.25   2251.86   2.
                    369.53    11751.18  2644.71   2.
                    370.31    14631.71  3047.25   2.
                    371.08    17781.04  3459.48   2.
                    371.85    21194.89  3881.38   2.
                    372.63    24870.16  4312.97   2.
                    373.40    28804.62  4754.24   2.
```

RAINFALL DISTRIBUTION:

1_yr_sm		0.1			
	0.0000	0.0011	0.0022	0.0033	0.0044
	0.0055	0.0067	0.0078	0.0089	0.0100
	0.0111	0.0122	0.0133	0.0144	0.0155
	0.0166	0.0178	0.0189	0.0200	0.0211
	0.0222	0.0233	0.0244	0.0255	0.0266
	0.0277	0.0289	0.0300	0.0311	0.0322
	0.0333	0.0344	0.0355	0.0366	0.0377
	0.0388	0.0399	0.0411	0.0422	0.0433
	0.0444	0.0455	0.0466	0.0477	0.0488
	0.0499	0.0510	0.0522	0.0533	0.0544
	0.0555	0.0566	0.0577	0.0588	0.0599
	0.0610	0.0621	0.0633	0.0644	0.0655
	0.0666	0.0693	0.0721	0.0748	0.0776
	0.0803	0.0830	0.0858	0.0885	0.0913
	0.0940	0.0967	0.0995	0.1022	0.1050
	0.1077	0.1105	0.1132	0.1159	0.1187
	0.1214	0.1242	0.1269	0.1297	0.1324
	0.1351	0.1379	0.1406	0.1434	0.1461
	0.1488	0.1535	0.1581	0.1627	0.1674
	0.1720	0.1766	0.1813	0.1859	0.1905
	0.1951	0.1998	0.2044	0.2090	0.2137
	0.2183	0.2224	0.2266	0.2307	0.2348
	0.2390	0.2476	0.2562	0.2648	0.2734
	0.2820	0.2992	0.3165	0.3440	0.3877
	0.5000	0.6123	0.6560	0.6835	0.7008
	0.7180	0.7266	0.7352	0.7438	0.7524
	0.7610	0.7652	0.7693	0.7734	0.7776
	0.7817	0.7863	0.7910	0.7956	0.8002
	0.8049	0.8095	0.8141	0.8187	0.8234
	0.8280	0.8326	0.8373	0.8419	0.8465
	0.8512	0.8539	0.8566	0.8594	0.8621
	0.8649	0.8676	0.8703	0.8731	0.8758
	0.8786	0.8813	0.8841	0.8868	0.8895
	0.8923	0.8950	0.8978	0.9005	0.9033
	0.9060	0.9087	0.9115	0.9142	0.9170
	0.9197	0.9224	0.9252	0.9279	0.9307
	0.9334	0.9345	0.9356	0.9367	0.9379
	0.9390	0.9401	0.9412	0.9423	0.9434
	0.9445	0.9456	0.9467	0.9478	0.9490
	0.9501	0.9512	0.9523	0.9534	0.9545
	0.9556	0.9567	0.9578	0.9589	0.9601
	0.9612	0.9623	0.9634	0.9645	0.9656
	0.9667	0.9678	0.9689	0.9700	0.9711
	0.9723	0.9734	0.9745	0.9756	0.9767
	0.9778	0.9789	0.9800	0.9811	0.9822
	0.9834	0.9845	0.9856	0.9867	0.9878
	0.9889	0.9900	0.9911	0.9922	0.9933
	0.9945	0.9956	0.9967	0.9978	0.9989
	1.0000				
2_yr_sm		0.1			
	0.0000	0.0011	0.0022	0.0033	0.0044
	0.0055	0.0066	0.0077	0.0088	0.0099
	0.0110	0.0122	0.0133	0.0144	0.0155
	0.0166	0.0177	0.0188	0.0199	0.0210
	0.0221	0.0232	0.0243	0.0254	0.0265
	0.0276	0.0287	0.0298	0.0309	0.0320
	0.0331	0.0343	0.0354	0.0365	0.0376

	0.0387	0.0398	0.0409	0.0420	0.0431
	0.0442	0.0453	0.0464	0.0475	0.0486
	0.0497	0.0508	0.0519	0.0530	0.0541
	0.0552	0.0564	0.0575	0.0586	0.0597
	0.0608	0.0619	0.0630	0.0641	0.0652
	0.0663	0.0690	0.0717	0.0745	0.0772
	0.0799	0.0826	0.0853	0.0881	0.0908
	0.0935	0.0962	0.0989	0.1017	0.1044
	0.1071	0.1098	0.1125	0.1153	0.1180
	0.1207	0.1234	0.1261	0.1289	0.1316
	0.1343	0.1370	0.1397	0.1425	0.1452
	0.1479	0.1525	0.1571	0.1616	0.1662
	0.1708	0.1754	0.1799	0.1845	0.1891
	0.1937	0.1982	0.2028	0.2074	0.2120
	0.2165	0.2207	0.2248	0.2289	0.2330
	0.2372	0.2457	0.2543	0.2629	0.2714
	0.2800	0.2979	0.3158	0.3440	0.3886
	0.5000	0.6114	0.6560	0.6842	0.7021
	0.7200	0.7286	0.7371	0.7457	0.7543
	0.7628	0.7670	0.7711	0.7752	0.7793
	0.7835	0.7880	0.7926	0.7972	0.8018
	0.8063	0.8109	0.8155	0.8201	0.8246
	0.8292	0.8338	0.8384	0.8429	0.8475
	0.8521	0.8548	0.8575	0.8603	0.8630
	0.8657	0.8684	0.8711	0.8739	0.8766
	0.8793	0.8820	0.8847	0.8875	0.8902
	0.8929	0.8956	0.8983	0.9011	0.9038
	0.9065	0.9092	0.9119	0.9147	0.9174
	0.9201	0.9228	0.9255	0.9283	0.9310
	0.9337	0.9348	0.9359	0.9370	0.9381
	0.9392	0.9403	0.9414	0.9425	0.9436
	0.9448	0.9459	0.9470	0.9481	0.9492
	0.9503	0.9514	0.9525	0.9536	0.9547
	0.9558	0.9569	0.9580	0.9591	0.9602
	0.9613	0.9624	0.9635	0.9646	0.9657
	0.9669	0.9680	0.9691	0.9702	0.9713
	0.9724	0.9735	0.9746	0.9757	0.9768
	0.9779	0.9790	0.9801	0.9812	0.9823
	0.9834	0.9845	0.9856	0.9867	0.9878
	0.9890	0.9901	0.9912	0.9923	0.9934
	0.9945	0.9956	0.9967	0.9978	0.9989
	1.0000				
5_yr_sm		0.1			
	0.0000	0.0012	0.0024	0.0035	0.0047
	0.0059	0.0071	0.0082	0.0094	0.0106
	0.0118	0.0129	0.0141	0.0153	0.0165
	0.0176	0.0188	0.0200	0.0212	0.0223
	0.0235	0.0247	0.0259	0.0270	0.0282
	0.0294	0.0306	0.0317	0.0329	0.0341
	0.0353	0.0364	0.0376	0.0388	0.0400
	0.0411	0.0423	0.0435	0.0447	0.0458
	0.0470	0.0482	0.0494	0.0505	0.0517
	0.0529	0.0541	0.0552	0.0564	0.0576
	0.0588	0.0599	0.0611	0.0623	0.0635
	0.0646	0.0658	0.0670	0.0682	0.0693
	0.0705	0.0733	0.0761	0.0788	0.0816
	0.0844	0.0871	0.0899	0.0927	0.0954
	0.0982	0.1010	0.1037	0.1065	0.1093
	0.1120	0.1148	0.1176	0.1203	0.1231
	0.1259	0.1286	0.1314	0.1342	0.1369
	0.1397	0.1425	0.1452	0.1480	0.1508
	0.1535	0.1580	0.1624	0.1669	0.1713
	0.1758	0.1802	0.1847	0.1891	0.1936

	0.1981	0.2025	0.2070	0.2114	0.2159
	0.2203	0.2245	0.2287	0.2329	0.2371
	0.2413	0.2501	0.2588	0.2676	0.2763
	0.2851	0.3040	0.3229	0.3522	0.3968
	0.5000	0.6032	0.6478	0.6771	0.6960
	0.7149	0.7237	0.7324	0.7412	0.7499
	0.7587	0.7629	0.7671	0.7713	0.7755
	0.7797	0.7841	0.7886	0.7930	0.7975
	0.8019	0.8064	0.8109	0.8153	0.8198
	0.8242	0.8287	0.8331	0.8376	0.8420
	0.8465	0.8492	0.8520	0.8548	0.8575
	0.8603	0.8631	0.8658	0.8686	0.8714
	0.8741	0.8769	0.8797	0.8824	0.8852
	0.8880	0.8907	0.8935	0.8963	0.8990
	0.9018	0.9046	0.9073	0.9101	0.9129
	0.9156	0.9184	0.9212	0.9239	0.9267
	0.9295	0.9307	0.9318	0.9330	0.9342
	0.9354	0.9365	0.9377	0.9389	0.9401
	0.9412	0.9424	0.9436	0.9448	0.9459
	0.9471	0.9483	0.9495	0.9506	0.9518
	0.9530	0.9542	0.9553	0.9565	0.9577
	0.9589	0.9600	0.9612	0.9624	0.9636
	0.9647	0.9659	0.9671	0.9683	0.9694
	0.9706	0.9718	0.9730	0.9741	0.9753
	0.9765	0.9777	0.9788	0.9800	0.9812
	0.9824	0.9835	0.9847	0.9859	0.9871
	0.9882	0.9894	0.9906	0.9918	0.9929
	0.9941	0.9953	0.9965	0.9976	0.9988
	1.0000	1.0000	1.0000	1.0000	1.0000
10_yr_sm		0.1			
	0.0000	0.0012	0.0025	0.0037	0.0049
	0.0061	0.0074	0.0086	0.0098	0.0110
	0.0123	0.0135	0.0147	0.0159	0.0172
	0.0184	0.0196	0.0209	0.0221	0.0233
	0.0245	0.0258	0.0270	0.0282	0.0294
	0.0307	0.0319	0.0331	0.0344	0.0356
	0.0368	0.0380	0.0393	0.0405	0.0417
	0.0429	0.0442	0.0454	0.0466	0.0478
	0.0491	0.0503	0.0515	0.0528	0.0540
	0.0552	0.0564	0.0577	0.0589	0.0601
	0.0613	0.0626	0.0638	0.0650	0.0663
	0.0675	0.0687	0.0699	0.0712	0.0724
	0.0736	0.0765	0.0794	0.0822	0.0851
	0.0880	0.0908	0.0937	0.0966	0.0995
	0.1023	0.1052	0.1081	0.1110	0.1138
	0.1167	0.1196	0.1224	0.1253	0.1282
	0.1311	0.1339	0.1368	0.1397	0.1425
	0.1454	0.1483	0.1512	0.1540	0.1569
	0.1598	0.1642	0.1687	0.1732	0.1777
	0.1821	0.1866	0.1911	0.1956	0.2000
	0.2045	0.2090	0.2134	0.2179	0.2224
	0.2269	0.2311	0.2353	0.2395	0.2438
	0.2480	0.2570	0.2659	0.2749	0.2838
	0.2928	0.3120	0.3312	0.3606	0.4040
	0.5000	0.5960	0.6394	0.6688	0.6880
	0.7072	0.7162	0.7251	0.7341	0.7430
	0.7520	0.7562	0.7605	0.7647	0.7689
	0.7731	0.7776	0.7821	0.7866	0.7910
	0.7955	0.8000	0.8044	0.8089	0.8134
	0.8179	0.8223	0.8268	0.8313	0.8358
	0.8402	0.8431	0.8460	0.8488	0.8517
	0.8546	0.8575	0.8603	0.8632	0.8661
	0.8689	0.8718	0.8747	0.8776	0.8804

	0.8833	0.8862	0.8890	0.8919	0.8948
	0.8977	0.9005	0.9034	0.9063	0.9092
	0.9120	0.9149	0.9178	0.9206	0.9235
	0.9264	0.9276	0.9288	0.9301	0.9313
	0.9325	0.9337	0.9350	0.9362	0.9374
	0.9387	0.9399	0.9411	0.9423	0.9436
	0.9448	0.9460	0.9472	0.9485	0.9497
	0.9509	0.9522	0.9534	0.9546	0.9558
	0.9571	0.9583	0.9595	0.9607	0.9620
	0.9632	0.9644	0.9656	0.9669	0.9681
	0.9693	0.9706	0.9718	0.9730	0.9742
	0.9755	0.9767	0.9779	0.9791	0.9804
	0.9816	0.9828	0.9841	0.9853	0.9865
	0.9877	0.9890	0.9902	0.9914	0.9926
	0.9939	0.9951	0.9963	0.9975	0.9988
	1.0000				
25_yr_sm		0.1			
	0.0000	0.0013	0.0026	0.0039	0.0052
	0.0066	0.0079	0.0092	0.0105	0.0118
	0.0131	0.0144	0.0157	0.0170	0.0184
	0.0197	0.0210	0.0223	0.0236	0.0249
	0.0262	0.0275	0.0289	0.0302	0.0315
	0.0328	0.0341	0.0354	0.0367	0.0380
	0.0393	0.0407	0.0420	0.0433	0.0446
	0.0459	0.0472	0.0485	0.0498	0.0511
	0.0525	0.0538	0.0551	0.0564	0.0577
	0.0590	0.0603	0.0616	0.0630	0.0643
	0.0656	0.0669	0.0682	0.0695	0.0708
	0.0721	0.0734	0.0748	0.0761	0.0774
	0.0787	0.0817	0.0847	0.0877	0.0907
	0.0937	0.0967	0.0997	0.1028	0.1058
	0.1088	0.1118	0.1148	0.1178	0.1208
	0.1238	0.1268	0.1298	0.1328	0.1358
	0.1389	0.1419	0.1449	0.1479	0.1509
	0.1539	0.1569	0.1599	0.1629	0.1659
	0.1689	0.1735	0.1781	0.1826	0.1872
	0.1918	0.1963	0.2009	0.2054	0.2100
	0.2146	0.2191	0.2237	0.2283	0.2328
	0.2374	0.2417	0.2460	0.2503	0.2546
	0.2589	0.2681	0.2774	0.2866	0.2958
	0.3050	0.3245	0.3439	0.3726	0.4137
	0.5000	0.5863	0.6274	0.6561	0.6755
	0.6950	0.7042	0.7134	0.7226	0.7319
	0.7411	0.7454	0.7497	0.7540	0.7583
	0.7626	0.7672	0.7717	0.7763	0.7809
	0.7854	0.7900	0.7946	0.7991	0.8037
	0.8082	0.8128	0.8174	0.8219	0.8265
	0.8311	0.8341	0.8371	0.8401	0.8431
	0.8461	0.8491	0.8521	0.8551	0.8581
	0.8611	0.8642	0.8672	0.8702	0.8732
	0.8762	0.8792	0.8822	0.8852	0.8882
	0.8912	0.8942	0.8972	0.9003	0.9033
	0.9063	0.9093	0.9123	0.9153	0.9183
	0.9213	0.9226	0.9239	0.9252	0.9266
	0.9279	0.9292	0.9305	0.9318	0.9331
	0.9344	0.9357	0.9370	0.9384	0.9397
	0.9410	0.9423	0.9436	0.9449	0.9462
	0.9475	0.9489	0.9502	0.9515	0.9528
	0.9541	0.9554	0.9567	0.9580	0.9593
	0.9607	0.9620	0.9633	0.9646	0.9659
	0.9672	0.9685	0.9698	0.9711	0.9725
	0.9738	0.9751	0.9764	0.9777	0.9790
	0.9803	0.9816	0.9830	0.9843	0.9856

	0.9869	0.9882	0.9895	0.9908	0.9921
	0.9934	0.9948	0.9961	0.9974	0.9987
	1.0000				
50_yr_sm		0.1			
	0.0000	0.0014	0.0027	0.0041	0.0055
	0.0068	0.0082	0.0096	0.0109	0.0123
	0.0137	0.0150	0.0164	0.0178	0.0191
	0.0205	0.0219	0.0232	0.0246	0.0260
	0.0273	0.0287	0.0301	0.0314	0.0328
	0.0342	0.0355	0.0369	0.0383	0.0396
	0.0410	0.0424	0.0437	0.0451	0.0465
	0.0478	0.0492	0.0505	0.0519	0.0533
	0.0546	0.0560	0.0574	0.0587	0.0601
	0.0615	0.0628	0.0642	0.0656	0.0669
	0.0683	0.0697	0.0710	0.0724	0.0738
	0.0751	0.0765	0.0779	0.0792	0.0806
	0.0820	0.0851	0.0882	0.0914	0.0945
	0.0977	0.1008	0.1039	0.1071	0.1102
	0.1134	0.1165	0.1196	0.1228	0.1259
	0.1290	0.1322	0.1353	0.1385	0.1416
	0.1447	0.1479	0.1510	0.1541	0.1573
	0.1604	0.1636	0.1667	0.1698	0.1730
	0.1761	0.1808	0.1854	0.1901	0.1947
	0.1994	0.2040	0.2087	0.2133	0.2180
	0.2227	0.2273	0.2320	0.2366	0.2413
	0.2459	0.2503	0.2546	0.2589	0.2633
	0.2676	0.2771	0.2866	0.2961	0.3056
	0.3151	0.3345	0.3538	0.3819	0.4208
	0.5000	0.5792	0.6181	0.6462	0.6655
	0.6849	0.6944	0.7039	0.7134	0.7229
	0.7324	0.7367	0.7411	0.7454	0.7497
	0.7541	0.7587	0.7634	0.7680	0.7727
	0.7773	0.7820	0.7867	0.7913	0.7960
	0.8006	0.8053	0.8099	0.8146	0.8192
	0.8239	0.8270	0.8302	0.8333	0.8364
	0.8396	0.8427	0.8459	0.8490	0.8521
	0.8553	0.8584	0.8615	0.8647	0.8678
	0.8710	0.8741	0.8772	0.8804	0.8835
	0.8866	0.8898	0.8929	0.8961	0.8992
	0.9023	0.9055	0.9086	0.9118	0.9149
	0.9180	0.9194	0.9208	0.9221	0.9235
	0.9249	0.9262	0.9276	0.9290	0.9303
	0.9317	0.9331	0.9344	0.9358	0.9372
	0.9385	0.9399	0.9413	0.9426	0.9440
	0.9454	0.9467	0.9481	0.9495	0.9508
	0.9522	0.9535	0.9549	0.9563	0.9576
	0.9590	0.9604	0.9617	0.9631	0.9645
	0.9658	0.9672	0.9686	0.9699	0.9713
	0.9727	0.9740	0.9754	0.9768	0.9781
	0.9795	0.9809	0.9822	0.9836	0.9850
	0.9863	0.9877	0.9891	0.9904	0.9918
	0.9932	0.9945	0.9959	0.9973	0.9986
	1.0000				
100_yr_sm		0.1			
	0.0000	0.0014	0.0029	0.0043	0.0057
	0.0071	0.0086	0.0100	0.0114	0.0129
	0.0143	0.0157	0.0171	0.0186	0.0200
	0.0214	0.0229	0.0243	0.0257	0.0271
	0.0286	0.0300	0.0314	0.0329	0.0343
	0.0357	0.0372	0.0386	0.0400	0.0414
	0.0429	0.0443	0.0457	0.0472	0.0486
	0.0500	0.0514	0.0529	0.0543	0.0557
	0.0572	0.0586	0.0600	0.0614	0.0629

	0.0643	0.0657	0.0672	0.0686	0.0700
	0.0714	0.0729	0.0743	0.0757	0.0772
	0.0786	0.0800	0.0814	0.0829	0.0843
	0.0857	0.0890	0.0923	0.0955	0.0988
	0.1021	0.1054	0.1086	0.1119	0.1152
	0.1185	0.1217	0.1250	0.1283	0.1315
	0.1348	0.1381	0.1414	0.1446	0.1479
	0.1512	0.1544	0.1577	0.1610	0.1643
	0.1675	0.1708	0.1741	0.1773	0.1806
	0.1839	0.1886	0.1934	0.1981	0.2029
	0.2076	0.2123	0.2171	0.2218	0.2266
	0.2313	0.2361	0.2408	0.2455	0.2503
	0.2550	0.2594	0.2637	0.2680	0.2723
	0.2767	0.2864	0.2961	0.3058	0.3155
	0.3252	0.3444	0.3635	0.3907	0.4275
	0.5000	0.5725	0.6093	0.6365	0.6556
	0.6748	0.6845	0.6942	0.7039	0.7136
	0.7233	0.7277	0.7320	0.7363	0.7406
	0.7450	0.7497	0.7545	0.7592	0.7639
	0.7687	0.7734	0.7782	0.7829	0.7877
	0.7924	0.7971	0.8019	0.8066	0.8114
	0.8161	0.8194	0.8227	0.8259	0.8292
	0.8325	0.8357	0.8390	0.8423	0.8456
	0.8488	0.8521	0.8554	0.8586	0.8619
	0.8652	0.8685	0.8717	0.8750	0.8783
	0.8815	0.8848	0.8881	0.8914	0.8946
	0.8979	0.9012	0.9045	0.9077	0.9110
	0.9143	0.9157	0.9171	0.9186	0.9200
	0.9214	0.9228	0.9243	0.9257	0.9271
	0.9286	0.9300	0.9314	0.9328	0.9343
	0.9357	0.9371	0.9386	0.9400	0.9414
	0.9428	0.9443	0.9457	0.9471	0.9486
	0.9500	0.9514	0.9528	0.9543	0.9557
	0.9571	0.9586	0.9600	0.9614	0.9628
	0.9643	0.9657	0.9671	0.9686	0.9700
	0.9714	0.9729	0.9743	0.9757	0.9771
	0.9786	0.9800	0.9814	0.9829	0.9843
	0.9857	0.9871	0.9886	0.9900	0.9914
	0.9929	0.9943	0.9957	0.9971	0.9986
	1.0000	1.0000	1.0000	1.0000	1.0000
500_yr_sm		0.1			
	0.0000	0.0016	0.0031	0.0047	0.0063
	0.0079	0.0094	0.0110	0.0126	0.0141
	0.0157	0.0173	0.0189	0.0204	0.0220
	0.0236	0.0252	0.0267	0.0283	0.0299
	0.0314	0.0330	0.0346	0.0362	0.0377
	0.0393	0.0409	0.0424	0.0440	0.0456
	0.0472	0.0487	0.0503	0.0519	0.0535
	0.0550	0.0566	0.0582	0.0597	0.0613
	0.0629	0.0645	0.0660	0.0676	0.0692
	0.0707	0.0723	0.0739	0.0755	0.0770
	0.0786	0.0802	0.0817	0.0833	0.0849
	0.0865	0.0880	0.0896	0.0912	0.0928
	0.0943	0.0979	0.1015	0.1051	0.1087
	0.1123	0.1159	0.1195	0.1231	0.1267
	0.1303	0.1340	0.1376	0.1412	0.1448
	0.1484	0.1520	0.1556	0.1592	0.1628
	0.1664	0.1700	0.1736	0.1772	0.1808
	0.1844	0.1880	0.1916	0.1952	0.1988
	0.2024	0.2073	0.2122	0.2172	0.2221
	0.2270	0.2319	0.2368	0.2418	0.2467
	0.2516	0.2565	0.2615	0.2664	0.2713
	0.2762	0.2806	0.2849	0.2893	0.2936

0.2979	0.3081	0.3182	0.3283	0.3384
0.3486	0.3669	0.3853	0.4101	0.4419
0.5000	0.5581	0.5899	0.6147	0.6331
0.6514	0.6616	0.6717	0.6818	0.6919
0.7021	0.7064	0.7107	0.7151	0.7194
0.7238	0.7287	0.7336	0.7385	0.7435
0.7484	0.7533	0.7582	0.7632	0.7681
0.7730	0.7779	0.7828	0.7878	0.7927
0.7976	0.8012	0.8048	0.8084	0.8120
0.8156	0.8192	0.8228	0.8264	0.8300
0.8336	0.8372	0.8408	0.8444	0.8480
0.8516	0.8552	0.8588	0.8624	0.8660
0.8697	0.8733	0.8769	0.8805	0.8841
0.8877	0.8913	0.8949	0.8985	0.9021
0.9057	0.9072	0.9088	0.9104	0.9120
0.9135	0.9151	0.9167	0.9183	0.9198
0.9214	0.9230	0.9245	0.9261	0.9277
0.9293	0.9308	0.9324	0.9340	0.9355
0.9371	0.9387	0.9403	0.9418	0.9434
0.9450	0.9465	0.9481	0.9497	0.9513
0.9528	0.9544	0.9560	0.9576	0.9591
0.9607	0.9623	0.9638	0.9654	0.9670
0.9686	0.9701	0.9717	0.9733	0.9748
0.9764	0.9780	0.9796	0.9811	0.9827
0.9843	0.9859	0.9874	0.9890	0.9906
0.9921	0.9937	0.9953	0.9969	0.9984
1.0000				

GLOBAL OUTPUT:

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WinTR-20 Printed Page File End of Input Data List

Eccelston Mitigation POI 1-4 Existing

Name of printed page file:
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STORM 1_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA4	0.450		0.770		12.80	97.0	215.53

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.600	0.0	1.2	5.2	21.7	54.2	85.6	96.9
13.000	89.4	72.1	56.5	44.3	35.1	28.8	24.9
14.400	22.7	21.4	20.6	20.2	19.8	19.0	17.4

15.800	15.8	14.4	13.5	13.0	12.6	12.5	12.4
17.200	12.3	12.3	12.3	12.4	12.4	12.3	11.6
18.600	10.3	8.8	7.5	6.6	6.1	5.7	5.5
20.000	5.4	5.3	5.3	5.2	5.2	5.2	5.2
21.400	5.2	5.2	5.2	5.2	5.3	5.2	5.2
22.800	5.3	5.3	5.3	5.3	5.3	5.3	5.3
24.200	5.2	4.7	3.8	2.7	1.7	1.1	0.7
25.600	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA2	1.323		0.636		13.01	192.4	145.41

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.800	0.336E-01	4.1	24.5	69.7	131.5	176.2	192.0
13.200	182.4	155.8	127.4	104.4	87.1	74.4	65.8
14.600	60.4	57.0	54.8	53.2	51.2	48.3	44.7
16.000	41.0	37.9	35.6	34.2	33.3	32.8	32.5
17.400	32.4	32.3	32.3	32.4	32.2	31.2	29.0
18.800	25.9	22.7	19.9	17.8	16.4	15.5	14.9
20.200	14.5	14.2	14.0	13.9	13.8	13.8	13.8
21.600	13.7	13.7	13.8	13.8	13.8	13.8	13.8
23.000	13.9	13.9	13.9	13.9	14.0	14.0	13.8
24.400	13.1	11.4	9.1	6.7	4.7	3.2	2.2
25.800	1.5	1.0	0.7	0.0			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		0.443		12.94	86.3	93.76

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.800	0.0	0.6	8.7	30.1	60.3	80.9	86.2
13.200	79.4	66.5	54.8	45.3	38.3	33.5	30.7
14.600	29.1	28.3	27.8	27.4	26.6	25.0	22.9
16.000	21.0	19.5	18.7	18.2	17.9	17.7	17.7
17.400	17.7	17.7	17.8	17.9	17.8	17.1	15.5
18.800	13.6	11.7	10.3	9.3	8.7	8.3	8.1
20.200	7.9	7.8	7.7	7.7	7.7	7.7	7.7
21.600	7.7	7.7	7.7	7.8	7.8	7.8	7.8
23.000	7.8	7.9	7.9	7.9	7.9	7.9	7.8
24.400	7.3	6.1	4.6	3.1	2.0	1.3	0.9
25.800	0.6	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)

CON-1	2.693	Upstream	0.592	362.79	12.95	369.8	137.30

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.600	0.0	1.3	10.3	55.0	154.8	277.3	353.8
13.000	367.4	333.2	278.9	226.6	184.9	154.2	132.9
14.400	119.3	110.9	105.9	102.8	100.4	96.8	90.7
15.800	83.4	76.4	70.9	67.2	65.0	63.7	62.9
17.200	62.5	62.4	62.4	62.5	62.6	62.2	59.9
18.600	54.9	48.3	41.9	36.8	33.2	30.9	29.4
20.000	28.4	27.7	27.3	27.0	26.8	26.8	26.7
21.400	26.6	26.6	26.7	26.7	26.8	26.8	26.8
22.800	26.9	27.0	27.1	27.1	27.1	27.2	27.2
24.200	26.8	25.0	21.2	16.3	11.6	7.8	5.2
25.600	3.4	2.1	1.0	0.7	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	0.592	362.74	13.23	339.2	125.93

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.800	0.0	2.2	16.3	60.3	142.5	238.7	310.3
13.200	338.2	325.2	287.6	242.7	201.6	168.3	143.8
14.600	126.9	116.0	109.1	104.7	101.3	97.3	91.8
16.000	85.3	78.8	73.3	69.1	66.3	64.5	63.5
17.400	62.9	62.6	62.5	62.5	62.5	61.9	59.6
18.800	55.4	49.8	44.0	38.9	34.9	32.1	30.2
20.200	29.0	28.1	27.5	27.2	26.9	26.8	26.7
21.600	26.7	26.6	26.7	26.7	26.8	26.8	26.8

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Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
23.000	26.9	27.0	27.0	27.1	27.1	27.2	27.1
24.400	26.6	24.9	21.7	17.5	13.2	9.4	6.5
25.800	4.3	2.7	1.6	0.8	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		0.768		12.21	45.3	503.39

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.400	0.0	0.7	2.4	12.4	45.2	26.3	13.9
12.800	7.8	6.8	4.8	3.5	3.4	3.7	3.8
14.200	3.8	3.8	3.9	3.9	4.0	3.1	2.5
15.600	2.4	2.4	2.4	2.4	2.4	2.4	2.5

17.000	2.5	2.5	2.5	2.5	2.5	2.5	1.7
18.400	1.1	1.1	1.0	1.0	1.0	1.0	1.0
19.800	1.0	1.0	1.0	1.0	1.1	1.0	1.0
21.200	1.0	1.0	1.1	1.1	1.0	1.0	1.0
22.600	1.1	1.1	1.1	1.1	1.1	1.1	1.1
24.000	1.1	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		0.597		13.23	343.4	123.38

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.400	0.0	0.7	2.4	14.6	61.5	86.7	156.5
12.800	246.4	317.1	343.0	328.7	291.0	246.4	205.3
14.200	172.1	147.6	130.8	119.9	113.0	107.7	103.7
15.600	99.7	94.2	87.7	81.2	75.7	71.6	68.8
17.000	67.0	65.9	65.3	65.0	65.0	65.0	64.2
18.400	63.0	60.7	56.4	50.9	45.0	39.9	36.0
19.800	33.2	31.3	30.0	29.1	28.6	28.2	28.0
21.200	27.9	27.8	27.8	27.7	27.7	27.8	27.8
22.600	27.9	27.9	28.0	28.0	28.1	28.2	28.2
24.000	28.2	27.5	26.6	24.9	21.7	17.5	13.2
25.400	9.4	6.5	4.3	2.7	1.6	0.8	0.0

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Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA4	0.450		1.141		12.79	151.7	337.08

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.000	0.0	0.9	1.7	3.1	5.7	13.6	40.8
12.400	91.0	136.9	151.5	137.6	109.3	84.6	65.5
13.800	51.3	41.6	35.6	32.1	30.0	28.7	28.0
15.200	27.4	26.1	23.9	21.6	19.7	18.5	17.7
16.600	17.3	17.0	16.9	16.8	16.8	16.8	16.8
18.000	16.8	16.7	15.8	14.0	11.9	10.1	9.0
19.400	8.3	7.8	7.5	7.3	7.2	7.1	7.1
20.800	7.0	7.0	7.0	7.1	7.1	7.1	7.1
22.200	7.1	7.1	7.1	7.1	7.1	7.1	7.1
23.600	7.2	7.2	7.2	7.0	6.3	5.1	3.6
25.000	2.3	1.4	0.9	0.6	0.0		

Area or Reach	Drainage Area	Rain Gage ID or	Runoff Amount	------------ Peak Flow ------------ Elevation	Time	Rate	Rate

Identifier	(sq mi)	Location	(in)	(ft)	(hr)	(cfs)	(csm)
DA2	1.323		0.973		13.01	317.9	240.29

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.400	0.0	1.1	3.9	15.0	54.5	132.9	232.2
12.800	299.2	317.8	295.2	247.8	199.8	161.7	133.1
14.200	112.3	97.9	88.9	82.9	79.0	76.1	73.0
15.600	68.6	63.3	57.9	53.3	49.9	47.9	46.7
17.000	45.9	45.4	45.1	45.0	45.0	45.0	44.7
18.400	43.4	40.2	35.8	31.4	27.5	24.7	22.9
19.800	21.6	20.7	20.1	19.6	19.4	19.2	19.1
21.200	19.0	19.0	19.1	19.1	19.0	19.0	19.0
22.600	19.0	19.0	19.1	19.1	19.2	19.3	19.3
24.000	19.3	19.0	18.0	15.6	12.5	9.2	6.4
25.400	4.4	3.0	2.1	1.4	1.0	0.7	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		0.724		12.95	161.4	175.39

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.800	0.0	3.0	22.7	67.5	122.8	156.0	159.6
13.200	141.7	115.5	93.1	75.4	62.5	53.7	48.4

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
14.600	45.2	43.3	42.2	41.3	39.9	37.3	34.0
16.000	31.1	28.9	27.6	26.8	26.3	26.0	25.9
17.400	25.9	25.9	26.0	26.0	25.9	24.8	22.6
18.800	19.7	16.9	14.8	13.5	12.7	12.1	11.7
20.200	11.4	11.3	11.2	11.1	11.1	11.1	11.1
21.600	11.2	11.2	11.2	11.2	11.2	11.2	11.2
23.000	11.2	11.2	11.3	11.4	11.4	11.4	11.2
24.400	10.4	8.7	6.5	4.5	2.9	1.9	1.3
25.800	0.8	0.5	0.0				

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Upstream	0.916	363.25	12.94	622.8	231.23

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.000	0.0	0.9	1.7	4.3	9.6	31.8	118.3
12.400	292.8	491.7	606.3	614.9	545.4	447.9	358.6

13.800	288.5	237.3	201.6	178.6	164.1	155.0	149.2
15.200	144.8	138.9	129.7	118.9	108.7	100.6	95.3
16.600	92.0	90.0	88.8	88.1	87.8	87.7	87.8
18.000	87.9	87.2	83.9	76.7	67.4	58.4	51.3
19.400	46.5	43.4	41.2	39.7	38.7	38.0	37.6
20.800	37.3	37.2	37.1	37.2	37.3	37.3	37.3
22.200	37.3	37.3	37.3	37.3	37.4	37.5	37.6
23.600	37.8	37.8	37.8	37.2	34.6	29.3	22.6
25.000	16.0	10.8	7.2	4.8	2.9	1.9	1.0
26.400	0.7	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
CON-1	2.693	Downstream	0.916	363.18	13.15	584.9	217.16

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.400	0.0	1.9	5.2	14.7	54.0	155.7	318.1
12.800	478.3	571.2	578.7	523.5	441.5	360.5	293.3
14.200	242.4	206.2	182.1	166.4	156.5	150.0	144.4
15.600	137.5	128.5	118.4	109.0	101.4	96.0	92.5
17.000	90.3	89.0	88.3	87.9	87.8	87.8	87.7
18.400	86.3	82.3	75.4	66.9	58.6	51.9	47.1
19.800	43.7	41.5	39.9	38.8	38.1	37.7	37.4
21.200	37.2	37.2	37.2	37.3	37.3	37.3	37.3
22.600	37.3	37.3	37.3	37.4	37.5	37.6	37.8

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Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
24.000	37.8	37.6	36.5	33.5	28.4	22.2	16.2
25.400	11.2	7.6	5.1	3.2	1.9	1.1	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA1	0.090		1.138		12.19	69.5	772.01

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.000	0.0	0.9	1.5	2.3	5.7	22.6	69.5
12.400	39.3	20.6	11.1	9.6	6.7	4.9	4.8
13.800	5.1	5.2	5.3	5.3	5.3	5.4	5.4
15.200	4.2	3.4	3.3	3.3	3.3	3.3	3.3
16.600	3.3	3.3	3.4	3.3	3.4	3.4	3.4
18.000	3.4	2.3	1.5	1.4	1.4	1.4	1.4
19.400	1.4	1.4	1.4	1.4	1.4	1.4	1.4
20.800	1.4	1.4	1.4	1.4	1.4	1.4	1.4
22.200	1.4	1.4	1.4	1.4	1.4	1.5	1.4
23.600	1.4	1.4	1.4	0.6	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	2.783		0.923		13.08	593.4	213.21

Flow Values @ time increment of 0.200 hr

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.000	0.0	0.9	1.5	4.2	10.9	37.4	123.5
12.400	195.0	338.7	489.3	580.6	585.4	528.4	446.2
13.800	365.7	298.5	247.6	211.5	187.4	171.8	161.9
15.200	154.2	147.8	140.8	131.8	121.7	112.3	104.7
16.600	99.3	95.8	93.7	92.3	91.7	91.3	91.1
18.000	91.2	89.9	87.8	83.7	76.8	68.3	60.1
19.400	53.3	48.5	45.1	42.9	41.3	40.2	39.5
20.800	39.1	38.8	38.6	38.6	38.6	38.7	38.7
22.200	38.7	38.7	38.7	38.7	38.7	38.8	38.9
23.600	39.1	39.2	39.2	38.3	36.5	33.5	28.4
25.000	22.2	16.2	11.2	7.6	5.1	3.3	1.9
26.400	1.2	0.0					

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Eccelston Mitigation POI 1-4 Existing

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA4	0.450		1.825		12.75	243.7	541.36

Flow Values @ time increment of 0.200 hr

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.800	0.4	1.1	1.8	2.7	3.7	4.7	5.6
11.200	6.7	8.6	11.9	18.0	33.7	78.9	157.1
12.600	225.3	243.0	218.2	172.7	133.1	102.4	79.8
14.000	64.1	54.0	48.0	44.4	42.1	40.7	39.6
15.400	37.6	34.6	31.5	28.9	27.2	26.2	25.6
16.800	25.2	25.0	24.9	24.8	24.8	24.9	24.9
18.200	24.6	23.4	20.8	17.9	15.3	13.6	12.5
19.600	11.9	11.5	11.2	11.0	10.9	10.9	10.8
21.000	10.8	10.8	10.8	10.8	10.8	10.8	10.9
22.400	10.9	10.9	10.9	10.9	10.9	10.9	10.9
23.800	10.9	10.9	10.7	9.7	7.8	5.5	3.5
25.200	2.2	1.4	0.9	0.6	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA2	1.323		1.609		12.92	541.1	409.03

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Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	------------ Flow Values @ time increment of 0.200 hr ------------						
10.200	0.0	0.8	1.9	3.4	5.2	7.6	11.0
11.600	16.6	26.7	53.1	126.6	259.7	417.7	518.5
13.000	539.2	493.5	410.6	329.0	264.3	215.4	179.5
14.400	154.4	138.2	127.3	120.0	114.6	109.2	102.4
15.800	94.6	86.9	80.2	75.4	72.6	70.8	69.6
17.200	68.9	68.5	68.3	68.2	68.2	67.7	65.7
18.600	61.1	54.7	48.1	42.4	38.3	35.5	33.6
20.000	32.3	31.4	30.9	30.5	30.2	30.0	29.9
21.400	29.9	29.8	29.8	29.8	29.8	29.9	29.9
22.800	29.9	30.0	30.0	30.0	30.1	30.1	30.1
24.200	29.7	28.1	24.5	19.6	14.5	10.1	6.9
25.600	4.7	3.2	2.2	1.5	1.0	0.7	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA3	0.920		1.276		12.86	306.1	332.62

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Eccelston Mitigation POI 1-4 Existing

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	------------ Flow Values @ time increment of 0.200 hr ------------						
11.200	0.0	0.7	2.2	6.3	19.3	65.7	153.1
12.600	249.6	300.9	298.5	258.8	207.9	165.5	132.1
14.000	107.9	91.0	80.4	73.8	69.7	67.1	65.1
15.400	62.5	58.3	53.4	48.9	45.7	43.7	42.6
16.800	41.8	41.4	41.2	41.1	41.1	41.2	41.3
18.200	41.0	39.4	35.9	31.5	27.3	24.0	21.9
19.600	20.6	19.7	19.1	18.7	18.5	18.4	18.3
21.000	18.2	18.2	18.2	18.2	18.2	18.2	18.3
22.400	18.3	18.3	18.4	18.4	18.4	18.4	18.5
23.800	18.5	18.5	18.2	16.9	14.2	10.7	7.4
25.200	4.8	3.1	2.1	1.4	0.9	0.6	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
CON-1	2.693	Upstream	1.531	363.84	12.89	1079.0	400.62

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	------------ Flow Values @ time increment of 0.200 hr ------------						
9.800	0.4	1.1	1.9	3.6	5.6	8.0	10.8
11.200	14.3	20.3	30.7	51.2	107.3	272.6	570.4
12.600	892.2	1061.3	1053.4	924.7	751.8	596.9	476.8
14.000	387.4	324.8	283.1	256.4	239.1	227.9	219.2
15.400	209.3	195.3	179.5	164.8	153.2	145.3	140.7
16.800	137.8	136.0	135.0	134.5	134.3	134.3	134.4

18.200	133.3	128.4	117.8	104.1	90.8	80.1	72.7
19.600	67.9	64.8	62.6	61.2	60.3	59.7	59.3
21.000	59.1	59.0	58.9	58.9	58.9	58.9	59.0
22.400	59.0	59.1	59.2	59.3	59.3	59.4	59.5
23.800	59.5	59.6	58.6	54.7	46.4	35.8	25.5
25.200	17.2	11.4	7.7	5.2	3.1	2.1	1.0
26.600	0.7	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	1.531	363.78	13.03	1032.3	383.28

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.000	0.0	0.8	2.4	4.2	6.4	8.9	11.9
11.400	16.3	23.9	38.0	71.5	170.5	380.8	675.6
12.800	921.7	1027.2	990.4	861.5	706.6	567.8	457.2
14.200	375.0	317.2	278.8	253.7	237.4	226.2	216.4
15.600	204.7	190.3	175.3	161.9	151.6	144.6	140.3
17.000	137.6	135.9	135.0	134.5	134.3	134.3	133.9

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
18.400	131.4	124.4	113.1	100.1	88.1	78.6	71.9
19.800	67.4	64.4	62.4	61.1	60.2	59.6	59.3
21.200	59.1	58.9	58.9	58.9	58.9	58.9	59.0
22.600	59.1	59.1	59.2	59.3	59.4	59.4	59.5
24.000	59.6	59.2	57.1	51.6	42.8	32.7	23.3
25.400	16.0	10.8	7.2	4.7	3.0	1.9	1.1
26.800	0.7	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		1.823		12.20	107.0	1188.49

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.600	0.0	0.6	0.8	1.0	1.2	1.4	1.5
11.000	1.7	3.1	4.4	6.1	13.5	41.9	106.8
12.400	60.8	32.6	17.2	14.7	10.2	7.4	7.1
13.800	7.4	7.5	7.6	7.6	7.6	7.7	7.7
15.200	6.1	5.0	4.9	4.8	4.9	4.9	4.9
16.600	4.9	4.9	4.9	5.0	5.0	5.0	5.0
18.000	5.0	3.4	2.3	2.2	2.1	2.2	2.1
19.400	2.2	2.1	2.2	2.2	2.2	2.2	2.2
20.800	2.2	2.2	2.2	2.2	2.2	2.2	2.2
22.200	2.2	2.2	2.2	2.2	2.2	2.2	2.2
23.600	2.2	2.2	2.2	1.0	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	2.783		1.540		13.03	1046.7	376.06

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.600	0.0	0.6	0.8	1.8	3.7	5.6	7.9
11.000	10.6	15.0	20.7	30.0	51.5	113.4	277.3
12.400	441.7	708.2	939.0	1041.9	1000.6	868.9	713.7
13.800	575.2	464.7	382.6	324.8	286.5	261.4	245.1
15.200	232.3	221.5	209.6	195.2	180.2	166.8	156.5
16.600	149.6	145.2	142.5	140.9	139.9	139.4	139.3
18.000	139.3	137.3	133.7	126.6	115.2	102.3	90.2
19.400	80.7	74.0	69.6	66.6	64.6	63.2	62.4
20.800	61.8	61.5	61.2	61.1	61.1	61.1	61.1
22.200	61.1	61.2	61.3	61.3	61.4	61.5	61.6
23.600	61.6	61.7	61.7	60.2	57.1	51.6	42.8
25.000	32.7	23.4	16.0	10.8	7.2	4.7	3.0

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Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
26.400	1.9	1.1	0.7	0.0			

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Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA4	0.450		2.473		12.76	322.2	715.80

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.800	0.0	0.8	1.3	2.1	3.2	4.5	5.9
10.200	7.4	8.8	10.1	11.4	12.6	14.1	17.0
11.600	22.3	31.8	54.7	115.0	215.5	299.8	320.3
13.000	286.8	227.2	175.3	135.0	105.0	84.1	70.6
14.400	62.6	57.7	54.6	52.8	51.2	48.7	45.0
15.800	41.1	38.0	35.8	34.6	33.8	33.4	33.1
17.200	33.0	33.0	33.0	33.0	33.0	32.6	31.0
18.600	27.6	23.7	20.3	18.0	16.7	15.8	15.2
20.000	14.9	14.7	14.5	14.5	14.4	14.4	14.4
21.400	14.4	14.4	14.4	14.4	14.4	14.4	14.4
22.800	14.4	14.5	14.5	14.5	14.5	14.5	14.5
24.200	14.2	12.9	10.3	7.3	4.7	2.9	1.9
25.600	1.2	0.7	0.0				

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)

DA2	1.323		2.221		12.91	736.5	556.71

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.400	0.3	1.3	2.8	5.1	7.9	11.0	14.3
10.800	17.7	21.0	24.8	30.4	39.8	57.2	98.1
12.200	201.3	381.0	585.3	711.9	732.1	665.4	552.8
13.600	442.8	355.5	289.0	240.0	206.0	183.5	168.5
15.000	158.4	151.0	143.8	135.0	125.0	115.2	106.8
16.400	100.8	97.2	94.9	93.4	92.5	92.0	91.8
17.800	91.7	91.6	90.9	88.2	81.9	73.4	64.6
19.200	57.1	51.5	47.8	45.3	43.5	42.3	41.5
20.600	41.0	40.7	40.4	40.3	40.2	40.1	40.1
22.000	40.1	40.1	40.2	40.2	40.2	40.3	40.3
23.400	40.4	40.4	40.4	40.4	39.9	37.7	32.9
24.800	26.3	19.4	13.6	9.2	6.3	4.3	3.0
26.200	2.0	1.4	0.9	0.6	0.0		

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Eccelston Mitigation POI 1-4 Existing

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		1.824		12.86	439.0	477.07

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.400	0.3	1.3	2.4	3.9	5.9	8.9	14.0
11.800	23.6	47.2	117.4	240.5	369.7	433.9	424.5
13.200	365.1	292.5	232.0	184.5	150.0	125.8	110.6
14.600	101.0	94.9	91.0	88.1	84.5	79.0	72.6
16.000	66.8	62.7	60.1	58.6	57.6	57.1	56.8
17.400	56.7	56.7	56.8	56.8	56.4	54.1	49.3
18.800	43.3	37.6	33.1	30.3	28.4	27.2	26.4
20.200	25.9	25.5	25.3	25.2	25.1	25.1	25.1
21.600	25.1	25.1	25.1	25.2	25.2	25.2	25.3
23.000	25.3	25.3	25.4	25.4	25.4	25.4	25.0
24.400	23.2	19.4	14.6	10.1	6.6	4.3	2.9
25.800	1.9	1.2	0.8	0.5	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Upstream	2.127	364.30	12.90	1480.9	549.84

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.800	0.0	0.8	1.3	2.4	4.5	7.4	11.0
10.200	15.2	20.1	25.7	31.6	37.6	44.8	56.3
11.600	76.4	112.9	202.0	435.1	837.4	1254.2	1463.3
13.000	1439.9	1257.7	1020.6	810.4	645.8	523.2	436.7
14.400	379.2	342.3	318.1	302.2	290.3	277.1	259.0

15.800	238.7	220.1	205.4	195.5	189.7	186.0	183.7
17.200	182.3	181.7	181.4	181.4	181.5	179.9	173.2
18.600	158.8	140.4	122.5	108.2	98.4	92.0	87.7
20.000	84.8	82.9	81.6	80.9	80.3	80.0	79.7
21.400	79.6	79.5	79.6	79.7	79.7	79.8	79.8
22.800	79.9	80.1	80.2	80.2	80.3	80.3	80.3
24.200	79.0	73.8	62.6	48.2	34.3	23.1	15.4
25.600	10.3	6.9	4.4	2.8	1.8	0.9	0.6
27.000	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
CON-1	2.693	Downstream	2.127	364.23	12.98	1419.2	526.91

Eccelston Mitigation POI 1-4 Existing

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.200	0.563E-01	1.5	3.3	5.6	8.8	12.7	17.1
10.600	22.3	27.9	33.8	40.3	49.5	64.8	91.7
12.000	151.0	304.7	608.4	1002.9	1307.5	1418.7	1343.3
13.400	1155.6	943.5	756.4	608.2	498.0	421.1	370.0
14.800	336.3	314.1	298.9	285.7	269.9	251.1	232.0
16.200	215.2	202.5	194.1	188.8	185.4	183.4	182.2
17.600	181.7	181.5	181.5	180.8	176.9	166.8	151.2
19.000	133.7	117.7	105.3	96.7	90.9	86.9	84.3
20.400	82.6	81.4	80.7	80.2	79.9	79.7	79.6
21.800	79.6	79.6	79.7	79.8	79.8	79.9	80.0
23.200	80.1	80.2	80.2	80.3	80.3	79.7	76.7
24.600	68.8	56.6	43.0	30.5	20.8	14.0	9.4
26.000	6.3	4.0	2.6	1.5	0.9	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA1	0.090		2.470		12.19	136.8	1519.45

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.800	0.0	0.5	0.9	1.3	1.6	1.9	2.2
10.200	2.4	2.7	2.9	3.0	3.2	5.7	7.8
11.600	10.3	21.6	59.5	136.4	78.5	42.9	22.8
13.000	19.4	13.5	9.7	9.2	9.7	9.7	9.8
14.400	9.8	9.9	9.9	10.0	8.0	6.6	6.5
15.800	6.4	6.5	6.5	6.5	6.5	6.5	6.6
17.200	6.5	6.6	6.6	6.6	6.6	4.5	3.1
18.600	2.8	2.9	2.8	2.9	2.8	2.9	2.8
20.000	2.9	2.9	2.8	2.9	2.8	2.9	2.8
21.400	2.9	2.9	2.9	2.9	2.9	2.9	2.9
22.800	2.9	2.9	2.9	2.9	2.9	2.9	3.0
24.200	1.3	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		2.138		12.98	1438.7	516.88

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.800	0.0	0.5	0.9	2.8	4.9	7.5	11.0
10.200	15.1	19.8	25.2	30.9	37.0	46.0	57.3
11.600	75.1	113.3	210.5	441.3	686.9	1045.9	1330.5
13.000	1438.2	1356.7	1165.2	952.6	766.0	617.9	507.8
14.400	431.0	379.9	346.2	324.1	306.9	292.2	276.4

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Eccelston Mitigation POI 1-4 Existing

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
15.800	257.6	238.5	221.7	209.1	200.7	195.3	192.0
17.200	189.9	188.9	188.3	188.1	188.1	185.2	180.0
18.600	169.6	154.1	136.5	120.6	108.2	99.6	93.7
20.000	89.8	87.2	85.4	84.4	83.5	83.1	82.7
21.400	82.6	82.5	82.5	82.5	82.6	82.6	82.7
22.800	82.8	82.9	83.0	83.0	83.2	83.2	83.3
24.200	81.0	76.7	68.8	56.6	43.0	30.5	20.8
25.600	14.0	9.5	6.3	4.0	2.6	1.5	0.9
27.000	0.0						

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Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA4	0.450		3.530		12.76	434.7	965.82

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.600	0.4	1.1	1.9	2.8	3.8	4.8	5.8
9.000	6.8	7.9	9.4	11.7	14.2	16.7	19.0
10.400	21.1	23.0	24.8	26.2	28.3	32.9	41.8
11.800	57.2	91.6	173.6	303.5	408.9	431.7	385.6
13.200	307.1	238.3	184.1	143.6	115.1	96.8	85.9
14.600	79.2	75.0	72.4	70.2	67.0	62.0	56.9
16.000	52.7	49.9	48.3	47.4	46.8	46.4	46.2
17.400	46.1	46.1	46.1	46.2	45.6	43.3	38.6
18.800	33.3	28.7	25.5	23.6	22.4	21.6	21.2
20.200	20.8	20.7	20.6	20.5	20.4	20.4	20.4
21.600	20.5	20.4	20.4	20.5	20.5	20.5	20.5
23.000	20.5	20.6	20.6	20.5	20.5	20.6	20.2
24.400	18.3	14.6	10.3	6.6	4.1	2.6	1.6
25.800	1.0	0.6	0.0				

Area or Drainage Rain Gage Runoff ------------ Peak Flow ------------

Reach Identifier	Area (sq mi)	ID or Location	Amount (in)	Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA2	1.323		3.232		12.89	1024.4	774.30

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.000	0.0	0.9	2.0	3.5	5.5	7.8	10.3
9.400	13.5	17.8	22.9	28.6	34.5	40.2	45.7
10.800	50.8	55.5	60.9	69.8	86.1	115.7	179.2
12.200	328.2	573.1	840.3	1001.0	1014.6	920.3	765.4
13.600	616.1	495.6	402.9	334.8	287.7	256.2	235.0

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
15.000	220.9	210.4	200.5	188.5	175.0	161.8	150.5
16.400	142.5	137.7	134.6	132.6	131.3	130.5	130.1
17.800	130.0	130.0	129.0	124.9	116.3	104.4	92.1
19.200	81.5	73.6	68.4	65.0	62.6	60.9	59.8
20.600	59.1	58.6	58.2	58.0	57.8	57.8	57.7
22.000	57.7	57.7	57.8	57.8	57.9	57.9	58.0
23.400	58.1	58.0	58.1	58.1	57.4	54.2	47.3
24.800	37.7	27.9	19.4	13.1	9.0	6.2	4.2
26.200	2.9	2.0	1.3	0.9	0.6	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		2.750		12.82	640.5	696.00

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.200	0.0	1.2	2.7	4.9	7.5	10.5	13.6
10.600	16.7	19.8	22.7	26.1	31.9	42.3	60.5
12.000	103.0	206.5	382.2	557.2	636.6	616.1	527.6
13.400	423.4	335.9	267.5	216.7	181.9	159.5	145.5
14.800	136.5	130.7	126.3	121.3	113.6	104.6	96.7
16.200	90.9	87.5	85.4	84.0	83.2	82.7	82.5
17.600	82.5	82.6	82.7	82.0	78.8	71.8	63.2
19.000	55.0	48.5	44.4	41.8	40.1	38.9	38.2
20.400	37.7	37.4	37.2	37.1	37.0	37.0	37.0
21.800	37.0	37.0	37.1	37.2	37.2	37.2	37.3
23.200	37.3	37.4	37.4	37.4	37.4	36.8	34.2
24.600	28.6	21.5	14.9	9.7	6.4	4.2	2.8
26.000	1.8	1.2	0.8	0.0			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Upstream	3.117	364.92	12.83	2078.9	771.87

Line Start Time (hr)	------------ Flow (cfs)	Values @ time (cfs)	increment of (cfs)	0.200 hr (cfs)	(cfs)	(cfs)	------------ (cfs)
7.600	0.4	1.1	1.9	3.7	5.7	8.3	11.3
9.000	14.5	18.3	24.2	32.1	42.0	52.9	64.0
10.400	74.9	85.4	95.3	104.4	115.4	134.6	170.5
11.800	234.0	376.3	709.9	1258.9	1804.4	2063.1	2015.4
13.200	1754.3	1427.1	1136.9	906.8	735.7	613.9	533.1
14.600	480.9	446.8	424.0	407.0	388.7	364.0	336.6
16.000	311.3	291.4	278.3	270.5	265.5	262.2	260.2
17.400	259.1	258.7	258.8	258.8	256.5	247.0	226.7

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Line Start Time (hr)	------------ Flow (cfs)	Values @ time (cfs)	increment of (cfs)	0.200 hr (cfs)	(cfs)	(cfs)	------------ (cfs)
18.800	200.8	175.8	155.5	141.5	132.6	126.7	122.7
20.200	119.9	118.2	117.1	116.3	115.7	115.4	115.3
21.600	115.3	115.2	115.2	115.3	115.5	115.6	115.6
23.000	115.7	115.9	116.0	116.0	116.0	116.1	114.3
24.400	106.6	90.4	69.5	49.4	33.3	22.2	14.9
25.800	10.0	6.7	4.4	2.7	1.8	0.9	0.6
27.200	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Elevation (ft)	Flow Time (hr)	Rate (cfs)	------------ Rate (csm)
CON-1	2.693	Downstream	3.117	364.84	12.97	1987.9	738.07

Line Start Time (hr)	------------ Flow (cfs)	Values @ time (cfs)	increment of (cfs)	0.200 hr (cfs)	(cfs)	(cfs)	------------ (cfs)
7.800	0.0	1.1	2.7	4.6	6.9	9.6	12.6
9.200	16.1	21.0	27.8	36.5	46.6	57.4	68.3
10.600	79.0	89.2	98.7	108.8	124.1	151.6	200.4
12.000	302.0	539.4	971.2	1494.0	1868.7	1983.6	1857.6
13.400	1596.1	1308.7	1054.4	851.5	699.2	592.2	520.6
14.800	473.0	441.4	419.4	400.4	378.1	352.4	326.6
16.200	304.2	287.5	276.5	269.4	264.8	261.8	260.0
17.600	259.1	258.9	258.9	257.7	251.7	236.9	214.8
19.000	190.5	168.4	151.2	139.2	131.2	125.7	122.0
20.400	119.5	118.0	116.9	116.1	115.6	115.4	115.3
21.800	115.3	115.2	115.2	115.4	115.5	115.6	115.7
23.200	115.8	115.9	116.0	116.0	116.1	115.2	110.4
24.600	98.6	80.8	61.2	43.6	29.8	20.2	13.7
26.000	9.2	6.1	3.9	2.5	1.4	0.9	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Elevation (ft)	Flow Time (hr)	Rate (cfs)	------------ Rate (csm)
DA1	0.090		3.528		12.19	177.5	1971.10

Line Start Time (hr)	------------ Flow (cfs)	Values @ time (cfs)	increment of (cfs)	0.200 hr (cfs)	(cfs)	(cfs)	------------ (cfs)

7.400	0.0	0.6	0.8	1.0	1.2	1.4	1.6
8.800	1.8	2.0	2.9	3.7	4.1	4.5	4.9
10.200	5.2	5.5	5.8	5.8	6.0	10.5	14.0
11.600	17.9	35.2	85.4	176.8	103.1	58.4	31.7
13.000	27.2	18.7	13.3	12.8	13.2	13.4	13.5
14.400	13.5	13.5	13.6	13.7	11.1	9.3	9.1
15.800	9.1	9.1	9.2	9.1	9.1	9.2	9.2
17.200	9.2	9.3	9.2	9.2	9.2	6.3	4.4
18.600	4.1	4.0	4.0	4.0	4.2	4.1	4.0

Line Start Time (hr)	------------ Flow (cfs)	Values @ time (cfs)	increment of (cfs)	0.200 hr (cfs)	------------ (cfs)	(cfs)	(cfs)
20.000	4.0	4.2	4.1	4.1	4.1	4.1	4.1
21.400	4.1	4.1	4.1	4.2	4.1	4.1	4.1
22.800	4.2	4.1	4.1	4.1	4.1	4.2	4.1
24.200	1.8	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		3.130		12.98	2013.7	723.47

Line Start Time (hr)	------------ Flow (cfs)	Values @ time (cfs)	increment of (cfs)	0.200 hr (cfs)	------------ (cfs)	(cfs)	(cfs)
7.400	0.0	0.6	0.8	2.2	3.9	6.0	8.5
8.800	11.4	14.7	19.0	24.7	31.9	40.9	51.4
10.200	62.5	73.8	84.7	95.0	104.7	119.3	138.2
11.600	169.5	235.6	387.4	716.3	1075.0	1552.5	1900.5
13.000	2010.8	1876.2	1609.2	1321.4	1067.5	864.9	712.7
14.400	605.9	534.1	486.7	455.1	430.5	409.7	387.2
15.800	361.5	335.7	313.5	296.7	285.6	278.5	273.9
17.200	271.0	269.3	268.4	268.1	268.1	264.0	256.0
18.600	241.0	218.8	194.5	172.4	155.3	143.3	135.2
20.000	129.7	126.2	123.6	122.0	121.0	120.2	119.8
21.400	119.5	119.4	119.3	119.4	119.3	119.4	119.6
22.800	119.8	119.8	119.9	120.0	120.1	120.1	120.2
24.200	117.0	110.4	98.6	80.8	61.2	43.6	29.8
25.600	20.2	13.7	9.2	6.1	3.9	2.5	1.4
27.000	0.9	0.0					

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Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA4	0.450		4.512		12.75	526.7	1170.14

Line Start Time (hr)	------------ Flow (cfs)	Values @ time (cfs)	increment of (cfs)	0.200 hr (cfs)	------------ (cfs)	(cfs)	(cfs)
6.800	0.0	1.0	1.9	3.2	4.5	6.0	7.5

8.200	8.9	10.4	11.8	13.2	14.5	16.0	18.2
9.600	21.4	25.0	28.6	31.7	34.4	36.8	38.8
11.000	40.4	42.9	49.1	61.6	82.8	127.3	226.8
12.400	378.3	499.3	522.8	466.8	374.3	292.6	226.9
13.800	177.5	142.6	120.3	107.0	98.9	93.8	90.5
15.200	87.9	83.9	78.0	71.9	66.9	63.6	61.6
16.600	60.3	59.6	59.2	59.0	58.8	58.8	58.8
18.000	58.9	58.2	55.2	49.2	42.4	36.5	32.5

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
19.400	30.1	28.5	27.5	26.9	26.5	26.3	26.1
20.800	26.0	25.9	25.9	25.9	25.9	26.0	26.0
22.200	26.0	26.0	26.0	26.1	26.1	26.1	26.1
23.600	26.1	26.1	26.1	25.6	23.2	18.5	13.1
25.000	8.4	5.3	3.3	2.1	1.3	0.8	0.5
26.400	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA2	1.323		4.181		12.91	1269.6	959.64

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.200	0.0	1.1	2.6	4.8	7.6	10.9	14.4
8.600	18.1	21.7	25.4	29.4	34.3	40.8	48.7
10.000	57.2	65.7	73.6	80.8	87.2	92.9	99.6
11.400	111.6	134.5	176.2	261.8	446.1	740.1	1054.6
12.800	1239.4	1255.6	1137.3	950.2	767.2	618.8	504.2
14.200	419.4	360.7	322.1	296.1	278.5	265.5	253.2
15.600	238.5	222.0	206.1	192.4	182.6	176.7	172.9
17.000	170.4	168.9	168.0	167.5	167.2	167.1	165.8
18.400	160.7	149.5	134.2	118.3	104.7	94.6	87.9
19.800	83.4	80.3	78.1	76.7	75.7	75.0	74.5
21.200	74.2	74.0	73.9	73.9	73.9	73.9	74.0
22.600	74.0	74.1	74.1	74.2	74.2	74.3	74.3
24.000	74.4	73.3	69.3	60.4	48.3	35.7	24.9
25.400	16.9	11.6	8.0	5.4	3.7	2.5	1.7
26.800	1.1	0.8	0.0				

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		3.637		12.88	812.6	883.04

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.200	0.2	1.3	2.5	4.1	6.0	8.2	11.0
9.600	14.7	19.1	23.9	28.7	33.2	37.5	41.6
11.000	45.1	49.5	57.8	73.6	101.1	159.2	294.9

12.400	509.9	717.3	811.1	778.8	668.2	538.9	429.1
13.800	341.9	277.7	232.8	204.6	186.8	175.4	167.9
15.200	162.4	155.9	146.3	135.3	125.6	118.5	114.1
16.600	111.4	109.7	108.8	108.2	108.0	107.9	107.9
18.000	108.0	107.2	102.8	93.9	82.4	71.7	63.3
19.400	57.9	54.5	52.2	50.7	49.7	49.1	48.7

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
20.800	48.4	48.2	48.1	48.0	48.1	48.1	48.2
22.200	48.2	48.3	48.3	48.4	48.4	48.5	48.5
23.600	48.5	48.6	48.6	47.8	44.4	37.1	27.9
25.000	19.3	12.5	8.2	5.4	3.6	2.3	1.5
26.400	1.0	0.6	0.0				

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Upstream	4.050	365.26	12.82	2584.3	959.50

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.800	0.0	1.0	1.9	4.3	7.1	10.8	15.1
8.200	20.1	26.1	32.3	39.0	46.0	53.6	63.5
9.600	76.9	92.9	109.7	126.0	141.2	155.1	167.6
11.000	178.5	192.0	218.6	269.8	361.1	550.2	970.5
12.400	1628.2	2269.9	2569.8	2496.6	2179.5	1782.0	1423.6
13.800	1139.0	924.7	773.6	672.4	607.9	565.3	537.2
15.200	515.7	492.9	462.8	429.3	398.6	374.5	358.2
16.600	348.5	342.3	338.5	336.1	334.8	334.1	334.0
18.000	334.0	331.0	318.8	292.6	259.0	226.6	200.6
19.400	182.6	170.9	163.1	157.9	154.4	152.0	150.5
20.800	149.4	148.6	148.2	148.0	147.9	148.0	148.0
22.200	148.1	148.3	148.4	148.5	148.6	148.7	148.8
23.600	148.9	149.0	149.1	146.6	136.8	116.0	89.3
25.000	63.5	42.8	28.5	19.1	12.8	8.6	5.8
26.400	3.5	2.3	1.2	0.8	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	4.050	365.20	12.96	2482.1	921.56

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.000	0.0	1.2	3.1	5.7	8.9	12.9	17.5
8.400	23.0	29.0	35.5	42.2	49.5	58.4	70.2
9.800	84.7	100.8	117.1	132.8	147.3	160.5	172.2
11.200	184.7	205.7	245.5	317.4	460.0	774.5	1312.4
12.600	1938.3	2367.1	2472.9	2298.3	1969.4	1614.5	1302.8
14.000	1053.7	868.2	738.0	651.4	594.2	556.3	529.6

15.400	506.0	478.4	446.7	415.4	388.5	368.4	355.1
16.800	346.6	341.2	337.8	335.8	334.7	334.2	334.1
18.200	332.3	324.2	304.7	275.5	243.8	215.4	193.7
19.600	178.5	168.3	161.4	156.7	153.6	151.5	150.1

Eccelston Mitigation POI 1-4 Existing

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
21.000	149.1	148.5	148.1	148.0	148.0	148.0	148.1
22.400	148.2	148.3	148.5	148.6	148.7	148.8	148.9
23.800	149.0	149.0	147.7	141.2	125.6	102.4	77.1
25.200	54.6	37.3	25.2	17.0	11.4	7.7	4.9
26.600	3.2	1.9	1.1	0.7	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		4.511		12.18	209.2	2323.11

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.600	0.0	0.6	1.0	1.3	1.6	1.9	2.2
8.000	2.5	2.8	3.0	3.3	3.5	3.8	5.1
9.400	6.3	6.8	7.3	7.7	8.1	8.4	8.7
10.800	8.6	8.8	15.4	20.5	25.5	47.9	106.9
12.200	208.2	123.0	71.5	40.0	34.5	23.5	16.6
13.600	15.9	16.6	16.8	16.9	16.9	17.0	17.0
15.000	17.1	14.0	11.9	11.7	11.7	11.6	11.6
16.400	11.7	11.8	11.7	11.7	11.8	11.8	11.7
17.800	11.8	11.8	8.1	5.5	5.2	5.2	5.1
19.200	5.2	5.2	5.1	5.2	5.2	5.1	5.2
20.600	5.2	5.2	5.1	5.2	5.2	5.2	5.2
22.000	5.2	5.2	5.3	5.2	5.2	5.3	5.2
23.400	5.2	5.3	5.3	5.2	2.3	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		4.065		12.97	2514.9	903.53

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.600	0.0	0.6	1.0	2.4	4.7	7.6	11.1
8.000	15.4	20.2	26.0	32.3	39.0	46.0	54.7
9.400	64.7	77.0	92.0	108.5	125.2	141.2	156.0
10.800	169.1	181.1	200.1	226.1	271.0	365.3	566.9
12.200	982.9	1435.5	2009.5	2407.1	2507.3	2321.7	1985.8
13.600	1630.4	1319.3	1070.5	885.1	754.9	668.4	611.2
15.000	573.4	543.6	517.9	490.1	458.4	427.0	400.1
16.400	380.1	366.9	358.2	352.9	349.5	347.6	346.4
17.800	346.0	345.9	340.4	329.7	309.9	280.7	248.9
19.200	220.6	198.9	183.7	173.5	166.6	161.9	158.8

20.600	156.7	155.3	154.3	153.7	153.3	153.1	153.2
22.000	153.2	153.3	153.5	153.6	153.6	153.8	153.9

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Eccelston Mitigation POI 1-4 Existing

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
23.400	154.0	154.1	154.2	154.2	150.0	141.2	125.6
24.800	102.4	77.2	54.6	37.3	25.2	17.0	11.4
26.200	7.7	4.9	3.2	1.9	1.1	0.7	0.0

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Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA4	0.450		5.658		12.72	622.1	1382.12

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.200	0.3	1.1	2.2	3.9	5.9	8.0	10.1
7.600	12.2	14.3	16.3	18.3	20.1	21.9	23.7
9.000	25.3	27.2	30.2	34.5	39.4	44.1	48.1
10.400	51.4	54.3	56.6	58.2	60.9	69.0	85.6
11.800	113.1	168.3	285.8	457.6	592.4	618.7	552.5
13.200	446.0	351.2	273.6	214.3	172.6	146.3	130.7
14.600	121.1	115.1	111.3	108.2	103.5	96.6	89.4
16.000	83.5	79.6	77.2	75.8	75.0	74.5	74.2
17.400	74.0	74.0	74.0	74.0	73.2	69.4	61.9
18.800	53.3	45.9	40.9	37.8	35.8	34.6	33.9
20.200	33.4	33.1	32.9	32.8	32.7	32.7	32.7
21.600	32.7	32.7	32.7	32.8	32.8	32.8	32.8
23.000	32.8	32.8	32.8	32.8	32.8	32.9	32.2
24.400	29.2	23.2	16.4	10.5	6.6	4.2	2.6
25.800	1.7	1.0	0.6	0.0			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA2	1.323		5.296		12.90	1526.6	1153.92

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.600	0.4	1.7	4.0	7.4	11.6	16.4	21.5
8.000	26.8	32.1	37.4	42.5	47.6	52.5	57.7
9.400	64.4	73.4	84.6	96.3	107.7	118.0	127.0
10.800	134.8	141.2	148.9	164.3	194.9	250.7	359.5
12.200	581.9	926.8	1287.1	1495.7	1507.4	1366.7	1146.7
13.600	930.5	753.1	614.9	512.7	442.3	396.1	365.2
15.000	344.2	328.7	314.0	296.5	276.9	257.9	241.7
16.400	230.1	223.1	218.6	215.7	213.8	212.7	212.0
17.800	211.7	211.6	210.0	203.5	189.3	169.9	149.8
19.200	132.6	119.8	111.3	105.7	101.7	99.0	97.1

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Eccelston Mitigation POI 1-4 Existing

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
20.600	95.9	95.1	94.5	94.1	93.9	93.8	93.6
22.000	93.6	93.7	93.8	93.8	93.8	93.9	93.9
23.400	93.9	94.0	94.0	94.1	92.8	87.6	76.4
24.800	61.0	45.2	31.5	21.3	14.6	10.1	6.9
26.200	4.7	3.2	2.2	1.4	1.0	0.6	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		4.691		12.80	998.8	1085.30

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.200	0.0	0.6	1.7	3.4	5.8	8.5	11.5
8.600	14.5	17.6	20.7	24.0	28.3	34.1	40.8
10.000	47.8	54.5	60.6	66.1	71.1	75.1	80.3
11.400	91.3	113.8	152.0	229.1	395.9	652.3	893.3
12.800	997.5	954.7	820.5	665.0	531.5	424.6	345.2
14.200	290.1	255.6	234.0	220.1	211.0	204.2	196.4
15.600	184.8	171.5	159.8	151.2	146.0	142.7	140.7
17.000	139.5	138.8	138.5	138.4	138.4	138.6	137.4
18.400	131.9	120.3	105.7	91.9	81.2	74.3	69.9
19.800	66.9	65.0	63.7	62.9	62.4	62.1	61.9
21.200	61.8	61.7	61.7	61.7	61.7	61.8	61.9
22.600	62.0	62.0	62.0	62.0	62.1	62.1	62.2
24.000	62.2	61.1	56.8	47.4	35.7	24.7	16.0
25.400	10.6	7.0	4.6	3.0	1.9	1.3	0.8
26.800	0.5	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Upstream	5.150	365.63	12.87	3120.0	1158.38

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.200	0.3	1.1	2.6	5.6	9.9	15.3	22.3
7.600	30.3	39.3	48.9	58.9	69.0	79.0	88.9
9.000	98.5	109.1	122.9	142.1	164.8	188.2	210.2
10.400	230.0	247.4	262.5	274.5	290.2	325.2	395.0
11.800	515.8	757.1	1268.5	2036.9	2771.2	3109.6	3011.6
13.200	2632.0	2163.5	1736.9	1392.1	1133.1	950.0	829.2
14.600	751.5	700.5	666.6	641.1	613.8	577.8	537.8
16.000	501.2	472.6	453.5	441.7	434.2	429.7	426.8
17.400	425.2	424.4	424.2	424.2	420.4	404.6	371.4
18.800	328.8	287.5	254.7	232.0	217.1	207.2	200.5

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
20.200	196.1	193.1	191.2	190.0	189.1	188.6	188.3
21.600	188.1	188.0	188.1	188.3	188.4	188.6	188.6
23.000	188.7	188.8	188.8	188.9	189.1	189.1	186.0
24.400	173.3	147.0	113.1	80.4	54.2	36.1	24.3
25.800	16.3	10.9	7.3	4.6	3.0	1.9	1.0
27.200	0.6	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	5.150	365.55	12.94	3008.1	1116.84

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.400	0.0	1.5	4.2	7.9	12.8	19.0	26.5
7.800	35.0	44.2	54.0	64.0	74.0	83.9	93.7
9.200	103.8	116.4	133.2	154.1	176.8	199.2	219.8
10.600	238.3	254.6	268.0	282.4	309.7	364.5	462.2
12.000	650.2	1048.5	1696.0	2419.9	2902.3	2994.8	2765.5
13.400	2367.8	1945.1	1572.4	1275.2	1054.7	901.0	799.1
14.800	731.8	687.4	656.2	628.1	595.0	557.0	519.5
16.200	487.9	464.4	448.9	438.9	432.6	428.6	426.3
17.600	425.0	424.4	424.3	422.0	411.1	385.5	348.1
19.000	307.6	271.9	244.8	226.0	213.2	204.6	198.8
20.400	194.9	192.4	190.7	189.6	188.9	188.5	188.2
21.800	188.1	188.1	188.2	188.4	188.5	188.5	188.6
23.200	188.7	188.8	188.9	189.0	189.1	187.2	178.5
24.600	158.2	128.5	96.3	67.9	46.3	31.3	21.1
26.000	14.1	9.5	6.2	4.0	2.5	1.4	0.9
27.400	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		5.657		12.19	240.2	2667.58

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.000	0.0	0.6	1.2	1.7	2.2	2.7	3.0
7.400	3.5	3.8	4.2	4.6	4.9	5.3	5.5
8.800	5.9	6.1	8.1	9.7	10.3	10.8	11.3
10.200	11.8	12.1	12.4	12.0	12.1	21.4	28.2
11.600	34.4	62.2	129.6	238.7	143.5	85.7	49.1
13.000	42.7	29.0	20.1	19.4	20.5	20.7	20.9
14.400	20.9	20.9	21.0	21.1	17.4	14.9	14.7
15.800	14.6	14.7	14.7	14.6	14.8	14.7	14.8

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
17.200	14.8	14.8	14.8	14.9	14.9	10.1	7.1
18.600	6.5	6.6	6.5	6.5	6.5	6.5	6.6
20.000	6.4	6.6	6.5	6.5	6.5	6.5	6.6
21.400	6.5	6.6	6.5	6.6	6.6	6.5	6.6
22.800	6.5	6.6	6.5	6.6	6.7	6.5	6.6
24.200	2.8	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		5.166		12.94	3050.4	1095.92

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.000	0.0	0.6	1.2	3.3	6.4	10.6	15.9
7.400	22.5	30.3	39.2	48.8	58.9	69.2	79.5
8.800	89.8	99.8	111.9	126.0	143.5	165.0	188.2
10.200	211.0	231.9	250.7	266.5	280.1	303.7	337.9
11.600	398.9	524.7	779.9	1287.4	1839.7	2505.8	2951.4
13.000	3037.6	2794.5	2387.8	1964.4	1592.8	1295.9	1075.5
14.400	921.9	820.0	752.8	708.5	673.6	643.0	609.6
15.800	571.6	534.2	502.5	479.0	463.7	453.5	447.4
17.200	443.4	441.1	439.8	439.3	439.1	432.0	418.2
18.600	392.0	354.7	314.1	278.4	251.3	232.5	219.8
20.000	211.0	205.4	201.5	198.9	197.2	196.1	195.5
21.400	194.9	194.9	194.6	194.6	194.8	194.8	195.1
22.800	195.1	195.2	195.2	195.4	195.5	195.5	195.7
24.200	190.1	178.7	158.2	128.5	96.4	68.0	46.3
25.600	31.3	21.1	14.1	9.5	6.2	4.0	2.6
27.000	1.4	0.9	0.0				

STORM 500_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA4	0.450		9.089		12.71	853.7	1896.50

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.000	0.0	0.7	1.4	2.3	3.3	4.4	5.4
5.400	6.5	7.5	8.5	9.5	10.9	13.7	18.5
6.800	24.3	30.3	35.6	40.3	44.5	48.3	51.7
8.200	54.9	57.9	60.6	63.3	65.7	68.6	73.4
9.600	80.8	89.1	96.7	102.8	107.6	111.5	114.2
11.000	115.1	117.8	131.2	160.4	206.9	288.7	444.1

Line

Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	Flow Values @ time increment of 0.200 hr						
12.400	658.1	819.9	848.0	764.7	629.7	506.1	399.9
13.800	316.4	256.8	219.9	198.7	185.6	177.3	172.1
15.200	167.8	161.4	152.0	142.4	134.3	129.0	125.8
16.600	123.9	122.7	122.1	121.7	121.7	121.7	121.6
18.000	121.5	120.0	113.7	101.3	87.2	75.1	66.9
19.400	61.9	58.7	56.7	55.4	54.6	54.1	53.8
20.800	53.6	53.4	53.4	53.4	53.4	53.4	53.4
22.200	53.4	53.4	53.4	53.4	53.5	53.5	53.6
23.600	53.5	53.5	53.5	52.4	47.5	37.9	26.8
25.000	17.2	10.7	6.8	4.3	2.7	1.7	1.0
26.400	0.6	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA2	1.323		8.661		12.88	2165.1	1636.52

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	Flow Values @ time increment of 0.200 hr						
4.600	0.5	1.4	2.7	4.6	6.8	9.2	11.8
6.000	14.5	17.7	22.7	30.9	42.2	55.1	68.5
7.400	81.5	93.5	104.8	115.3	125.2	134.5	143.3
8.800	151.7	159.6	168.2	179.4	195.4	215.0	235.2
10.200	254.2	270.5	284.0	294.6	301.8	311.1	335.1
11.600	390.0	486.0	653.8	970.6	1421.9	1878.6	2132.8
13.000	2135.7	1950.5	1658.5	1366.9	1117.0	918.8	773.5
14.400	673.1	607.6	564.4	535.0	512.9	492.3	467.9
15.800	440.9	414.8	392.7	376.9	367.1	360.8	356.7
17.200	354.2	353.0	352.3	351.8	351.5	348.4	337.3
18.600	313.7	281.3	248.0	219.4	198.0	184.2	174.7
20.000	168.1	163.6	160.5	158.5	157.0	156.0	155.4
21.400	155.1	154.8	154.7	154.6	154.5	154.5	154.5
22.800	154.6	154.7	154.8	154.9	155.0	155.0	154.9
24.200	152.8	144.3	126.0	100.5	74.3	51.7	34.9
25.600	24.0	16.5	11.3	7.7	5.2	3.5	2.4
27.000	1.6	1.0	0.6	0.0			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA3	0.920		7.928		12.83	1471.9	1599.37

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	Flow Values @ time increment of 0.200 hr						
5.600	0.0	0.7	1.5	2.8	5.1	9.2	14.7
7.000	21.4	28.5	35.7	42.8	49.7	56.3	62.7

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Line
Start Time ------------ Flow Values @ time increment of 0.200 hr ------------
(hr) (cfs) (cfs) (cfs) (cfs) (cfs) (cfs) (cfs)

8.400	68.8	74.7	80.3	85.7	91.6	99.6	111.0
9.800	124.2	137.4	149.3	159.4	168.0	174.8	179.3
11.200	185.8	205.4	247.7	318.3	445.5	684.0	1029.0
12.600	1344.5	1467.2	1406.1	1220.0	1005.4	813.7	655.2
14.000	535.8	453.9	402.9	371.9	351.5	338.1	328.1
15.400	316.6	300.2	281.5	265.2	253.0	245.7	241.0
16.800	238.1	236.5	235.6	235.4	235.3	235.3	235.2
18.200	232.8	223.6	203.5	178.7	155.4	137.3	125.6
19.600	118.0	113.0	109.7	107.5	106.1	105.3	104.7
21.000	104.3	104.1	104.0	104.0	104.0	104.0	104.0
22.400	104.1	104.1	104.1	104.2	104.3	104.4	104.5
23.800	104.5	104.4	102.7	95.1	79.6	59.9	41.4
25.200	27.0	17.7	11.7	7.7	5.0	3.3	2.1
26.600	1.4	0.8	0.5	0.0			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Upstream	8.482	366.39	12.85	4458.7	1655.42

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.000	0.0	0.7	1.4	2.8	4.7	7.1	10.0
5.400	13.3	16.7	21.1	25.5	31.5	41.6	58.6
6.800	81.3	106.8	132.7	157.5	180.8	202.7	223.4
8.200	242.8	261.2	278.6	295.2	311.1	328.4	352.7
9.600	387.2	428.3	469.4	506.3	537.5	563.4	583.5
11.000	596.1	614.9	672.8	798.6	1013.1	1389.4	2101.5
12.400	3109.1	4030.9	4443.1	4306.2	3800.2	3171.1	2581.4
13.800	2089.2	1712.3	1448.1	1275.3	1165.6	1093.5	1045.2
15.200	1008.8	970.2	920.1	864.9	814.3	774.8	748.4
16.600	732.1	721.7	715.2	711.6	710.0	709.3	708.7
18.000	708.1	701.2	674.3	618.4	547.3	478.6	423.5
19.400	385.7	361.0	344.5	333.2	325.7	320.7	317.5
20.800	315.2	313.7	312.9	312.4	312.3	312.1	311.9
22.200	311.9	312.1	312.1	312.2	312.4	312.6	312.9
23.600	313.0	313.0	312.9	308.0	286.9	243.2	187.2
25.000	133.0	89.5	59.6	40.1	26.9	18.0	12.0
26.400	8.0	5.1	3.2	2.0	1.0	0.6	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	8.482	366.32	12.92	4326.3	1606.27

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Eccelston Mitigation POI 1-4 Existing

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.200	0.0	0.8	2.1	3.9	6.1	8.8	11.9

5.600	15.3	19.3	23.6	29.0	37.6	52.1	72.4
7.000	96.4	121.8	146.8	170.6	193.1	214.3	234.3
8.400	253.1	271.0	288.0	304.2	321.0	342.9	373.6
9.800	411.8	452.1	490.1	523.4	551.5	574.1	589.7
11.200	606.7	651.4	752.1	931.7	1244.3	1834.3	2720.6
12.600	3646.6	4220.7	4295.2	3956.2	3407.5	2827.8	2308.2
14.000	1887.7	1577.4	1363.9	1223.8	1131.7	1070.6	1027.2
15.400	987.6	940.6	887.7	836.1	792.9	761.5	740.7
16.800	727.3	718.7	713.7	711.1	709.8	709.0	708.4
18.200	703.7	683.8	638.8	575.0	507.3	448.3	404.1
19.600	373.6	353.0	339.0	329.6	323.3	319.2	316.4
21.000	314.5	313.4	312.7	312.4	312.2	312.0	311.9
22.400	312.0	312.1	312.1	312.3	312.5	312.8	312.9
23.800	313.0	312.9	309.7	294.4	259.1	209.0	155.6
25.200	109.0	74.1	50.1	33.7	22.6	15.1	10.1
26.600	6.6	4.2	2.7	1.5	0.9	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		9.087		12.18	308.6	3427.49

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.000	0.0	0.7	0.9	1.1	1.4	1.6	1.8
5.400	2.0	2.2	2.4	2.6	4.9	6.9	7.9
6.800	8.7	9.4	10.2	10.8	11.4	11.9	12.4
8.200	12.9	13.4	13.9	14.3	14.7	18.2	21.0
9.600	21.8	22.4	23.0	23.5	24.0	24.0	22.4
11.000	22.3	39.9	52.3	61.7	101.6	184.0	306.4
12.400	192.8	123.0	75.6	67.2	44.9	30.7	29.4
13.800	31.7	32.6	32.5	32.8	32.6	32.7	32.8
15.200	27.8	24.5	24.1	24.1	24.1	24.1	24.1
16.600	24.2	24.2	24.3	24.4	24.3	24.3	24.3
18.000	24.3	16.4	11.5	10.6	10.8	10.5	10.7
19.400	10.6	10.7	10.7	10.5	10.8	10.6	10.7
20.800	10.7	10.7	10.7	10.8	10.7	10.6	10.8
22.200	10.6	10.7	10.7	10.8	10.7	10.8	10.7
23.600	10.6	10.8	10.6	4.7	0.6	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		8.502		12.92	4394.6	1578.84

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.000	0.0	0.7	1.7	3.3	5.3	7.7	10.6
5.400	13.9	17.5	21.7	26.2	33.9	44.6	60.0
6.800	81.1	105.8	132.0	157.5	182.0	205.0	226.7

8.200	247.2	266.5	284.8	302.3	318.8	339.2	364.0
9.600	395.4	434.2	475.2	513.6	547.4	575.6	596.5
11.000	612.0	646.6	703.7	813.8	1033.3	1429.4	2140.8
12.400	2913.4	3769.7	4296.3	4360.7	4001.0	3438.2	2857.1
13.800	2339.8	1920.6	1609.8	1396.6	1256.4	1164.4	1103.4
15.200	1055.0	1012.1	964.7	911.7	860.2	817.0	785.6
16.600	764.9	751.5	743.0	738.1	735.4	734.1	733.3
18.000	732.7	720.0	695.4	649.4	585.8	517.9	459.0
19.400	414.7	384.4	363.7	349.6	340.4	333.9	329.9
20.800	327.0	325.3	324.0	323.5	323.1	322.7	322.8
22.200	322.5	322.7	322.8	322.9	323.0	323.3	323.5
23.600	323.5	323.8	323.5	314.4	295.0	259.2	209.0
25.000	155.7	109.1	74.2	50.2	33.8	22.6	15.1
26.400	10.1	6.6	4.2	2.7	1.5	0.9	0.0

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Eccelston Mitigation POI 1-4 Existing

Area or Reach Identifier	Drainage Area (sq mi)	----------- Peak Flow by Storm ----------- 1_yr_sm (cfs)	2_yr_sm (cfs)	5_yr_sm (cfs)	10_yr_sm (cfs)	25_yr_sm (cfs)
DA1	0.090	45.3	69.5	107.0	136.8	177.5
DA4	0.450	97.0	151.7	243.7	322.2	434.7
DA2	1.323	192.4	317.9	541.1	736.5	1024.4
DA3	0.920	86.3	161.4	306.1	439.0	640.5
CON-1	2.693	369.8	622.8	1079.0	1480.9	2078.9

DOWNSTREAM		339.2	584.9	1032.3	1419.2	1987.9
OUTLET	2.783	343.4	593.4	1046.7	1438.7	2013.7

Area or Reach Identifier	Drainage Area (sq mi)	----------- Peak Flow by Storm -----------				
		50_yr_sm (cfs)	100_yr_sm (cfs)	500_yr_sm (cfs)	(cfs)	(cfs)
DA1	0.090	209.2	240.2	308.6		
DA4	0.450	526.7	622.1	853.7		
DA2	1.323	1269.6	1526.6	2165.1		
DA3	0.920	812.6	998.8	1471.9		
CON-1	2.693	2584.3	3120.0	4458.7		
DOWNSTREAM		2482.1	3008.1	4326.3		
OUTLET	2.783	2514.9	3050.4	4394.6		

WinTR-20 Printed Page File Beginning of Input Data List
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Eccelston Mitigation POI 5 Existing

SUB-AREA:

DA5	OUTLET	0.13929843	73.	.609	YY

STORM ANALYSIS:

1_yr_sm	2.71	1_yr_sm	2	3.28
2_yr_sm	3.28	2_yr_sm	2	3.28
5_yr_sm	4.22	5_yr_sm	2	3.28
10_yr_sm	5.04	10_yr_sm	2	3.28
25_yr_sm	6.31	25_yr_sm	2	3.28
50_yr_sm	7.43	50_yr_sm	2	3.28
100_yr_sm	8.71	100_yr_sm	2	3.28
500_yr_sm	12.39	500_yr_sm	2	3.28

RAINFALL DISTRIBUTION:

1_yr_sm 0.1

0.0000	0.0011	0.0022	0.0033	0.0044
0.0056	0.0067	0.0078	0.0089	0.0100
0.0111	0.0122	0.0133	0.0144	0.0155
0.0167	0.0178	0.0189	0.0200	0.0211
0.0222	0.0233	0.0244	0.0255	0.0267
0.0278	0.0289	0.0300	0.0311	0.0322
0.0333	0.0344	0.0355	0.0366	0.0378
0.0389	0.0400	0.0411	0.0422	0.0433
0.0444	0.0455	0.0466	0.0478	0.0489
0.0500	0.0511	0.0522	0.0533	0.0544
0.0555	0.0566	0.0578	0.0589	0.0600
0.0611	0.0622	0.0633	0.0644	0.0655
0.0666	0.0694	0.0721	0.0749	0.0776
0.0804	0.0831	0.0859	0.0886	0.0914
0.0941	0.0969	0.0996	0.1024	0.1051
0.1079	0.1106	0.1134	0.1161	0.1189
0.1216	0.1244	0.1271	0.1299	0.1326
0.1354	0.1381	0.1409	0.1436	0.1464
0.1491	0.1537	0.1584	0.1630	0.1677
0.1723	0.1770	0.1816	0.1863	0.1909
0.1956	0.2002	0.2049	0.2095	0.2142
0.2188	0.2230	0.2271	0.2312	0.2353
0.2394	0.2480	0.2566	0.2652	0.2738

	0.2824	0.2996	0.3169	0.3444	0.3880
	0.5000	0.6120	0.6556	0.6831	0.7004
	0.7176	0.7262	0.7348	0.7434	0.7520
	0.7606	0.7647	0.7688	0.7729	0.7770
	0.7812	0.7858	0.7905	0.7951	0.7998
	0.8044	0.8091	0.8137	0.8184	0.8230
	0.8277	0.8323	0.8370	0.8416	0.8463
	0.8509	0.8536	0.8564	0.8591	0.8619
	0.8646	0.8674	0.8701	0.8729	0.8756
	0.8784	0.8811	0.8839	0.8866	0.8894
	0.8921	0.8949	0.8976	0.9004	0.9031
	0.9059	0.9086	0.9114	0.9141	0.9169
	0.9196	0.9224	0.9251	0.9279	0.9306
	0.9334	0.9345	0.9356	0.9367	0.9378
	0.9389	0.9400	0.9411	0.9422	0.9434
	0.9445	0.9456	0.9467	0.9478	0.9489
	0.9500	0.9511	0.9522	0.9534	0.9545
	0.9556	0.9567	0.9578	0.9589	0.9600
	0.9611	0.9622	0.9634	0.9645	0.9656
	0.9667	0.9678	0.9689	0.9700	0.9711
	0.9722	0.9733	0.9745	0.9756	0.9767
	0.9778	0.9789	0.9800	0.9811	0.9822
	0.9833	0.9845	0.9856	0.9867	0.9878
	0.9889	0.9900	0.9911	0.9922	0.9933
	0.9944	0.9956	0.9967	0.9978	0.9989
	1.0000				
2_yr_sm		0.1			
	0.0000	0.0011	0.0022	0.0033	0.0044
	0.0055	0.0066	0.0077	0.0088	0.0099
	0.0110	0.0121	0.0132	0.0143	0.0154
	0.0166	0.0177	0.0188	0.0199	0.0210
	0.0221	0.0232	0.0243	0.0254	0.0265
	0.0276	0.0287	0.0298	0.0309	0.0320
	0.0331	0.0342	0.0353	0.0364	0.0375
	0.0386	0.0397	0.0408	0.0419	0.0430
	0.0441	0.0452	0.0463	0.0474	0.0486
	0.0497	0.0508	0.0519	0.0530	0.0541
	0.0552	0.0563	0.0574	0.0585	0.0596
	0.0607	0.0618	0.0629	0.0640	0.0651
	0.0662	0.0689	0.0717	0.0744	0.0771
	0.0799	0.0826	0.0853	0.0880	0.0908
	0.0935	0.0962	0.0990	0.1017	0.1044
	0.1072	0.1099	0.1126	0.1153	0.1181
	0.1208	0.1235	0.1263	0.1290	0.1317
	0.1344	0.1372	0.1399	0.1426	0.1454
	0.1481	0.1527	0.1573	0.1619	0.1665
	0.1711	0.1757	0.1802	0.1848	0.1894
	0.1940	0.1986	0.2032	0.2078	0.2124
	0.2170	0.2211	0.2252	0.2293	0.2334
	0.2375	0.2461	0.2547	0.2632	0.2718
	0.2803	0.2982	0.3160	0.3443	0.3888
	0.5000	0.6112	0.6557	0.6840	0.7018
	0.7197	0.7282	0.7368	0.7453	0.7539
	0.7625	0.7666	0.7707	0.7748	0.7789
	0.7830	0.7876	0.7922	0.7968	0.8014
	0.8060	0.8106	0.8152	0.8198	0.8243
	0.8289	0.8335	0.8381	0.8427	0.8473
	0.8519	0.8546	0.8574	0.8601	0.8628
	0.8656	0.8683	0.8710	0.8737	0.8765
	0.8792	0.8819	0.8847	0.8874	0.8901
	0.8928	0.8956	0.8983	0.9010	0.9038
	0.9065	0.9092	0.9120	0.9147	0.9174
	0.9201	0.9229	0.9256	0.9283	0.9311

	0.9338	0.9349	0.9360	0.9371	0.9382
	0.9393	0.9404	0.9415	0.9426	0.9437
	0.9448	0.9459	0.9470	0.9481	0.9492
	0.9503	0.9514	0.9526	0.9537	0.9548
	0.9559	0.9570	0.9581	0.9592	0.9603
	0.9614	0.9625	0.9636	0.9647	0.9658
	0.9669	0.9680	0.9691	0.9702	0.9713
	0.9724	0.9735	0.9746	0.9757	0.9768
	0.9779	0.9790	0.9801	0.9812	0.9823
	0.9834	0.9846	0.9857	0.9868	0.9879
	0.9890	0.9901	0.9912	0.9923	0.9934
	0.9945	0.9956	0.9967	0.9978	0.9989
	1.0000				
5_yr_sm		0.1			
	0.0000	0.0012	0.0023	0.0035	0.0047
	0.0059	0.0070	0.0082	0.0094	0.0106
	0.0117	0.0129	0.0141	0.0153	0.0164
	0.0176	0.0188	0.0200	0.0211	0.0223
	0.0235	0.0246	0.0258	0.0270	0.0282
	0.0293	0.0305	0.0317	0.0329	0.0340
	0.0352	0.0364	0.0376	0.0387	0.0399
	0.0411	0.0422	0.0434	0.0446	0.0458
	0.0469	0.0481	0.0493	0.0505	0.0516
	0.0528	0.0540	0.0552	0.0563	0.0575
	0.0587	0.0599	0.0610	0.0622	0.0634
	0.0645	0.0657	0.0669	0.0681	0.0692
	0.0704	0.0732	0.0760	0.0787	0.0815
	0.0843	0.0871	0.0898	0.0926	0.0954
	0.0982	0.1009	0.1037	0.1065	0.1093
	0.1120	0.1148	0.1176	0.1204	0.1232
	0.1259	0.1287	0.1315	0.1343	0.1370
	0.1398	0.1426	0.1454	0.1481	0.1509
	0.1537	0.1582	0.1626	0.1671	0.1716
	0.1760	0.1805	0.1850	0.1894	0.1939
	0.1984	0.2029	0.2073	0.2118	0.2163
	0.2207	0.2249	0.2291	0.2333	0.2375
	0.2416	0.2504	0.2592	0.2679	0.2767
	0.2854	0.3043	0.3232	0.3524	0.3970
	0.5000	0.6030	0.6476	0.6768	0.6957
	0.7146	0.7233	0.7321	0.7408	0.7496
	0.7584	0.7625	0.7667	0.7709	0.7751
	0.7793	0.7837	0.7882	0.7927	0.7971
	0.8016	0.8061	0.8106	0.8150	0.8195
	0.8240	0.8284	0.8329	0.8374	0.8418
	0.8463	0.8491	0.8519	0.8546	0.8574
	0.8602	0.8630	0.8657	0.8685	0.8713
	0.8741	0.8768	0.8796	0.8824	0.8852
	0.8880	0.8907	0.8935	0.8963	0.8991
	0.9018	0.9046	0.9074	0.9102	0.9129
	0.9157	0.9185	0.9213	0.9240	0.9268
	0.9296	0.9308	0.9319	0.9331	0.9343
	0.9355	0.9366	0.9378	0.9390	0.9401
	0.9413	0.9425	0.9437	0.9448	0.9460
	0.9472	0.9484	0.9495	0.9507	0.9519
	0.9531	0.9542	0.9554	0.9566	0.9578
	0.9589	0.9601	0.9613	0.9624	0.9636
	0.9648	0.9660	0.9671	0.9683	0.9695
	0.9707	0.9718	0.9730	0.9742	0.9754
	0.9765	0.9777	0.9789	0.9800	0.9812
	0.9824	0.9836	0.9847	0.9859	0.9871
	0.9883	0.9894	0.9906	0.9918	0.9930
	0.9941	0.9953	0.9965	0.9977	0.9988
	1.0000				

10_yr_sm 0.1

0.0000	0.0012	0.0025	0.0037	0.0049
0.0061	0.0074	0.0086	0.0098	0.0110
0.0123	0.0135	0.0147	0.0159	0.0172
0.0184	0.0196	0.0208	0.0221	0.0233
0.0245	0.0257	0.0270	0.0282	0.0294
0.0306	0.0319	0.0331	0.0343	0.0355
0.0368	0.0380	0.0392	0.0404	0.0417
0.0429	0.0441	0.0453	0.0466	0.0478
0.0490	0.0502	0.0515	0.0527	0.0539
0.0552	0.0564	0.0576	0.0588	0.0601
0.0613	0.0625	0.0637	0.0650	0.0662
0.0674	0.0686	0.0699	0.0711	0.0723
0.0735	0.0764	0.0793	0.0822	0.0851
0.0879	0.0908	0.0937	0.0966	0.0995
0.1023	0.1052	0.1081	0.1110	0.1139
0.1167	0.1196	0.1225	0.1254	0.1283
0.1311	0.1340	0.1369	0.1398	0.1427
0.1455	0.1484	0.1513	0.1542	0.1570
0.1599	0.1644	0.1689	0.1734	0.1779
0.1824	0.1869	0.1914	0.1958	0.2003
0.2048	0.2093	0.2138	0.2183	0.2228
0.2273	0.2315	0.2357	0.2399	0.2441
0.2483	0.2573	0.2663	0.2752	0.2842
0.2931	0.3123	0.3315	0.3608	0.4041
0.5000	0.5959	0.6392	0.6685	0.6877
0.7069	0.7158	0.7248	0.7337	0.7427
0.7517	0.7559	0.7601	0.7643	0.7685
0.7727	0.7772	0.7817	0.7862	0.7907
0.7952	0.7997	0.8042	0.8086	0.8131
0.8176	0.8221	0.8266	0.8311	0.8356
0.8401	0.8430	0.8458	0.8487	0.8516
0.8545	0.8573	0.8602	0.8631	0.8660
0.8689	0.8717	0.8746	0.8775	0.8804
0.8833	0.8861	0.8890	0.8919	0.8948
0.8977	0.9005	0.9034	0.9063	0.9092
0.9121	0.9149	0.9178	0.9207	0.9236
0.9265	0.9277	0.9289	0.9301	0.9314
0.9326	0.9338	0.9350	0.9363	0.9375
0.9387	0.9399	0.9412	0.9424	0.9436
0.9448	0.9461	0.9473	0.9485	0.9498
0.9510	0.9522	0.9534	0.9547	0.9559
0.9571	0.9583	0.9596	0.9608	0.9620
0.9632	0.9645	0.9657	0.9669	0.9681
0.9694	0.9706	0.9718	0.9730	0.9743
0.9755	0.9767	0.9779	0.9792	0.9804
0.9816	0.9828	0.9841	0.9853	0.9865
0.9877	0.9890	0.9902	0.9914	0.9926
0.9939	0.9951	0.9963	0.9975	0.9988
1.0000				

25_yr_sm 0.1

0.0000	0.0013	0.0026	0.0039	0.0052
0.0065	0.0079	0.0092	0.0105	0.0118
0.0131	0.0144	0.0157	0.0170	0.0183
0.0196	0.0210	0.0223	0.0236	0.0249
0.0262	0.0275	0.0288	0.0301	0.0314
0.0327	0.0340	0.0354	0.0367	0.0380
0.0393	0.0406	0.0419	0.0432	0.0445
0.0458	0.0471	0.0485	0.0498	0.0511
0.0524	0.0537	0.0550	0.0563	0.0576
0.0589	0.0602	0.0616	0.0629	0.0642
0.0655	0.0668	0.0681	0.0694	0.0707
0.0720	0.0733	0.0746	0.0760	0.0773

	0.0786	0.0816	0.0846	0.0876	0.0906
	0.0937	0.0967	0.0997	0.1027	0.1057
	0.1087	0.1118	0.1148	0.1178	0.1208
	0.1238	0.1268	0.1299	0.1329	0.1359
	0.1389	0.1419	0.1449	0.1480	0.1510
	0.1540	0.1570	0.1600	0.1630	0.1661
	0.1691	0.1737	0.1782	0.1828	0.1874
	0.1920	0.1966	0.2011	0.2057	0.2103
	0.2149	0.2195	0.2241	0.2286	0.2332
	0.2378	0.2421	0.2464	0.2507	0.2549
	0.2592	0.2685	0.2777	0.2869	0.2961
	0.3054	0.3248	0.3441	0.3728	0.4138
	0.5000	0.5862	0.6272	0.6559	0.6752
	0.6946	0.7039	0.7131	0.7223	0.7315
	0.7408	0.7451	0.7493	0.7536	0.7579
	0.7622	0.7668	0.7714	0.7759	0.7805
	0.7851	0.7897	0.7943	0.7989	0.8034
	0.8080	0.8126	0.8172	0.8218	0.8263
	0.8309	0.8339	0.8370	0.8400	0.8430
	0.8460	0.8490	0.8520	0.8551	0.8581
	0.8611	0.8641	0.8671	0.8701	0.8732
	0.8762	0.8792	0.8822	0.8852	0.8882
	0.8913	0.8943	0.8973	0.9003	0.9033
	0.9063	0.9094	0.9124	0.9154	0.9184
	0.9214	0.9227	0.9240	0.9254	0.9267
	0.9280	0.9293	0.9306	0.9319	0.9332
	0.9345	0.9358	0.9371	0.9384	0.9398
	0.9411	0.9424	0.9437	0.9450	0.9463
	0.9476	0.9489	0.9502	0.9515	0.9529
	0.9542	0.9555	0.9568	0.9581	0.9594
	0.9607	0.9620	0.9633	0.9646	0.9660
	0.9673	0.9686	0.9699	0.9712	0.9725
	0.9738	0.9751	0.9764	0.9777	0.9790
	0.9804	0.9817	0.9830	0.9843	0.9856
	0.9869	0.9882	0.9895	0.9908	0.9921
	0.9935	0.9948	0.9961	0.9974	0.9987
	1.0000				
50_yr_sm		0.1			
	0.0000	0.0014	0.0027	0.0041	0.0055
	0.0068	0.0082	0.0095	0.0109	0.0123
	0.0136	0.0150	0.0164	0.0177	0.0191
	0.0205	0.0218	0.0232	0.0246	0.0259
	0.0273	0.0286	0.0300	0.0314	0.0327
	0.0341	0.0355	0.0368	0.0382	0.0396
	0.0409	0.0423	0.0436	0.0450	0.0464
	0.0477	0.0491	0.0505	0.0518	0.0532
	0.0546	0.0559	0.0573	0.0587	0.0600
	0.0614	0.0627	0.0641	0.0655	0.0668
	0.0682	0.0696	0.0709	0.0723	0.0737
	0.0750	0.0764	0.0777	0.0791	0.0805
	0.0818	0.0850	0.0881	0.0913	0.0944
	0.0976	0.1007	0.1039	0.1070	0.1102
	0.1133	0.1165	0.1196	0.1227	0.1259
	0.1290	0.1322	0.1353	0.1385	0.1416
	0.1448	0.1479	0.1511	0.1542	0.1574
	0.1605	0.1636	0.1668	0.1699	0.1731
	0.1762	0.1809	0.1856	0.1903	0.1949
	0.1996	0.2043	0.2089	0.2136	0.2183
	0.2230	0.2276	0.2323	0.2370	0.2417
	0.2463	0.2507	0.2550	0.2593	0.2636
	0.2679	0.2774	0.2869	0.2964	0.3059
	0.3154	0.3348	0.3541	0.3821	0.4210
	0.5000	0.5790	0.6179	0.6459	0.6652

	0.6846	0.6941	0.7036	0.7131	0.7226
	0.7321	0.7364	0.7407	0.7450	0.7493
	0.7537	0.7583	0.7630	0.7677	0.7724
	0.7770	0.7817	0.7864	0.7911	0.7957
	0.8004	0.8051	0.8097	0.8144	0.8191
	0.8238	0.8269	0.8301	0.8332	0.8364
	0.8395	0.8426	0.8458	0.8489	0.8521
	0.8552	0.8584	0.8615	0.8647	0.8678
	0.8710	0.8741	0.8773	0.8804	0.8835
	0.8867	0.8898	0.8930	0.8961	0.8993
	0.9024	0.9056	0.9087	0.9119	0.9150
	0.9182	0.9195	0.9209	0.9223	0.9236
	0.9250	0.9263	0.9277	0.9291	0.9304
	0.9318	0.9332	0.9345	0.9359	0.9373
	0.9386	0.9400	0.9413	0.9427	0.9441
	0.9454	0.9468	0.9482	0.9495	0.9509
	0.9523	0.9536	0.9550	0.9564	0.9577
	0.9591	0.9604	0.9618	0.9632	0.9645
	0.9659	0.9673	0.9686	0.9700	0.9714
	0.9727	0.9741	0.9754	0.9768	0.9782
	0.9795	0.9809	0.9823	0.9836	0.9850
	0.9864	0.9877	0.9891	0.9905	0.9918
	0.9932	0.9945	0.9959	0.9973	0.9986
	1.0000				
100_yr_sm		0.1			
	0.0000	0.0014	0.0029	0.0043	0.0057
	0.0071	0.0086	0.0100	0.0114	0.0128
	0.0143	0.0157	0.0171	0.0185	0.0200
	0.0214	0.0228	0.0243	0.0257	0.0271
	0.0285	0.0300	0.0314	0.0328	0.0342
	0.0357	0.0371	0.0385	0.0399	0.0414
	0.0428	0.0442	0.0457	0.0471	0.0485
	0.0499	0.0514	0.0528	0.0542	0.0556
	0.0571	0.0585	0.0599	0.0613	0.0628
	0.0642	0.0656	0.0671	0.0685	0.0699
	0.0713	0.0728	0.0742	0.0756	0.0770
	0.0785	0.0799	0.0813	0.0827	0.0842
	0.0856	0.0889	0.0922	0.0954	0.0987
	0.1020	0.1053	0.1086	0.1118	0.1151
	0.1184	0.1217	0.1250	0.1282	0.1315
	0.1348	0.1381	0.1414	0.1447	0.1479
	0.1512	0.1545	0.1578	0.1611	0.1643
	0.1676	0.1709	0.1742	0.1775	0.1807
	0.1840	0.1888	0.1935	0.1983	0.2031
	0.2078	0.2126	0.2174	0.2221	0.2269
	0.2317	0.2364	0.2412	0.2459	0.2507
	0.2555	0.2598	0.2641	0.2684	0.2727
	0.2770	0.2867	0.2964	0.3062	0.3159
	0.3256	0.3447	0.3638	0.3910	0.4277
	0.5000	0.5723	0.6090	0.6362	0.6553
	0.6744	0.6841	0.6938	0.7036	0.7133
	0.7230	0.7273	0.7316	0.7359	0.7402
	0.7445	0.7493	0.7541	0.7588	0.7636
	0.7683	0.7731	0.7779	0.7826	0.7874
	0.7922	0.7969	0.8017	0.8065	0.8112
	0.8160	0.8193	0.8225	0.8258	0.8291
	0.8324	0.8357	0.8389	0.8422	0.8455
	0.8488	0.8521	0.8553	0.8586	0.8619
	0.8652	0.8685	0.8718	0.8750	0.8783
	0.8816	0.8849	0.8882	0.8914	0.8947
	0.8980	0.9013	0.9046	0.9078	0.9111
	0.9144	0.9158	0.9173	0.9187	0.9201
	0.9215	0.9230	0.9244	0.9258	0.9272

	0.9287	0.9301	0.9315	0.9329	0.9344
	0.9358	0.9372	0.9387	0.9401	0.9415
	0.9429	0.9444	0.9458	0.9472	0.9486
	0.9501	0.9515	0.9529	0.9543	0.9558
	0.9572	0.9586	0.9601	0.9615	0.9629
	0.9643	0.9658	0.9672	0.9686	0.9700
	0.9715	0.9729	0.9743	0.9757	0.9772
	0.9786	0.9800	0.9815	0.9829	0.9843
	0.9857	0.9872	0.9886	0.9900	0.9914
	0.9929	0.9943	0.9957	0.9971	0.9986
	1.0000				
500_yr_sm		0.1			
	0.0000	0.0016	0.0031	0.0047	0.0063
	0.0078	0.0094	0.0110	0.0126	0.0141
	0.0157	0.0173	0.0188	0.0204	0.0220
	0.0235	0.0251	0.0267	0.0283	0.0298
	0.0314	0.0330	0.0345	0.0361	0.0377
	0.0392	0.0408	0.0424	0.0439	0.0455
	0.0471	0.0487	0.0502	0.0518	0.0534
	0.0549	0.0565	0.0581	0.0596	0.0612
	0.0628	0.0643	0.0659	0.0675	0.0691
	0.0706	0.0722	0.0738	0.0753	0.0769
	0.0785	0.0800	0.0816	0.0832	0.0848
	0.0863	0.0879	0.0895	0.0910	0.0926
	0.0942	0.0978	0.1014	0.1050	0.1086
	0.1122	0.1158	0.1195	0.1231	0.1267
	0.1303	0.1339	0.1375	0.1411	0.1447
	0.1483	0.1520	0.1556	0.1592	0.1628
	0.1664	0.1700	0.1736	0.1772	0.1809
	0.1845	0.1881	0.1917	0.1953	0.1989
	0.2025	0.2075	0.2124	0.2174	0.2223
	0.2272	0.2322	0.2371	0.2421	0.2470
	0.2520	0.2569	0.2618	0.2668	0.2717
	0.2767	0.2810	0.2853	0.2896	0.2940
	0.2983	0.3084	0.3185	0.3287	0.3388
	0.3489	0.3673	0.3856	0.4104	0.4420
	0.5000	0.5580	0.5896	0.6144	0.6327
	0.6511	0.6612	0.6713	0.6815	0.6916
	0.7017	0.7060	0.7104	0.7147	0.7190
	0.7233	0.7283	0.7332	0.7382	0.7431
	0.7480	0.7530	0.7579	0.7629	0.7678
	0.7728	0.7777	0.7826	0.7876	0.7925
	0.7975	0.8011	0.8047	0.8083	0.8119
	0.8155	0.8191	0.8228	0.8264	0.8300
	0.8336	0.8372	0.8408	0.8444	0.8480
	0.8517	0.8553	0.8589	0.8625	0.8661
	0.8697	0.8733	0.8769	0.8805	0.8842
	0.8878	0.8914	0.8950	0.8986	0.9022
	0.9058	0.9074	0.9090	0.9105	0.9121
	0.9137	0.9152	0.9168	0.9184	0.9200
	0.9215	0.9231	0.9247	0.9262	0.9278
	0.9294	0.9309	0.9325	0.9341	0.9357
	0.9372	0.9388	0.9404	0.9419	0.9435
	0.9451	0.9466	0.9482	0.9498	0.9513
	0.9529	0.9545	0.9561	0.9576	0.9592
	0.9608	0.9623	0.9639	0.9655	0.9670
	0.9686	0.9702	0.9717	0.9733	0.9749
	0.9765	0.9780	0.9796	0.9812	0.9827
	0.9843	0.9859	0.9874	0.9890	0.9906
	0.9922	0.9937	0.9953	0.9969	0.9984
	1.0000				

GLOBAL OUTPUT:
.2 NN N NN N

WinTR-20 Printed Page File End of Input Data List

Eccelston Mitigation POI 5 Existing

Name of printed page file:
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STORM 1_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.139		0.683		12.47	38.6	277.15

STORM 2_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.139		1.032		12.44	62.2	446.25

STORM 5_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.139		1.685		12.45	101.1	725.51

STORM 10_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.139		2.310		12.43	133.9	960.95

STORM 25_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.139		3.345		12.44	180.4	1295.19

STORM 50_yr_sm

Area or Reach	Drainage Area	Rain Gage ID or	Runoff Amount	Peak Flow Elevation	Peak Flow Time	Peak Flow Rate	Peak Flow Rate

Identifier	(sq mi)	Location	(in)	(ft)	(hr)	(cfs)	(csm)
OUTLET	0.139		4.306		12.41	217.8	1563.43

STORM 100_yr_sm

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Eccelston Mitigation POI 5 Existing

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	0.139		5.442		12.41	256.2	1839.31

STORM 500_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	0.139		8.841		12.42	344.5	2473.35

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Eccelston Mitigation POI 5 Existing

Area or Reach Identifier	Drainage Area (sq mi)	Peak Flow by Storm 1_yr_sm (cfs)	2_yr_sm (cfs)	5_yr_sm (cfs)	10_yr_sm (cfs)	25_yr_sm (cfs)
DA5	0.139	38.6	62.2	101.1	133.9	180.4
OUTLET	0.139	38.6	62.2	101.1	133.9	180.4

Area or Reach Identifier	Drainage Area (sq mi)	Peak Flow by Storm 50_yr_sm (cfs)	100_yr_sm (cfs)	500_yr_sm (cfs)	(cfs)	(cfs)
DA5	0.139	217.8	256.2	344.5		
OUTLET	0.139	217.8	256.2	344.5		

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WinTR-20: version 3.20                    0         0                   0
Eccelston Mitigation POI 1-4 Ultimate

SUB-AREA:
          DA1       OUTLET                0.0900312 77.       .260       YY
          DA4       CON-1                 0.4501281 75.       1.13       YY
          DA2       CON-1                 1.3229781 74.       1.377      YY
          DA3       CON-1                 0.9202734 68.       1.241      YY


STREAM REACH:
          CON-1     OUTLET    XS1                   1547.3143           YY   Y


STORM ANALYSIS:
          1_yr_sm                         2.7       1_yr_sm   2         3.27
          2_yr_sm                         3.27      2_yr_sm   2         3.27
          5_yr_sm                         4.21      5_yr_sm   2         3.27
          10_yr_sm                        5.03      10_yr_sm  2         3.27
          25_yr_sm                        6.29      25_yr_sm  2         3.27
          50_yr_sm                        7.41      50_yr_sm  2         3.27
          100_yr_sm                       8.68      100_yr_sm 2         3.27
          500_yr_sm                       12.35     500_yr_sm 2         3.27


STREAM CROSS SECTION:
          XS1       361.8
                    360.16    0.00      0.00      2.        .1
                    360.57    1.92      1.80      2.
                    360.98    11.84     6.44      2.
                    361.39    31.78     12.95     2.
                    361.80    63.07     21.08     2.
                    362.57    246.03    172.72    2.
                    363.35    678.76    348.03    2.
                    364.12    1313.55   539.74    2.
                    364.89    2034.29   766.67    2.
                    365.67    3178.49   1025.20   2.
                    366.44    4545.31   1296.17   2.
                    367.21    6128.84   1579.56   2.
                    367.99    7541.79   1894.24   2.
                    368.76    9145.25   2251.86   2.
                    369.53    11751.18  2644.71   2.
                    370.31    14631.71  3047.25   2.
                    371.08    17781.04  3459.48   2.
                    371.85    21194.89  3881.38   2.
                    372.63    24870.16  4312.97   2.
                    373.40    28804.62  4754.24   2.
```

RAINFALL DISTRIBUTION:

1_yr_sm 0.1

0.0000	0.0011	0.0022	0.0033	0.0044
0.0055	0.0067	0.0078	0.0089	0.0100
0.0111	0.0122	0.0133	0.0144	0.0155
0.0166	0.0178	0.0189	0.0200	0.0211
0.0222	0.0233	0.0244	0.0255	0.0266
0.0277	0.0289	0.0300	0.0311	0.0322
0.0333	0.0344	0.0355	0.0366	0.0377
0.0388	0.0399	0.0411	0.0422	0.0433
0.0444	0.0455	0.0466	0.0477	0.0488
0.0499	0.0510	0.0522	0.0533	0.0544
0.0555	0.0566	0.0577	0.0588	0.0599
0.0610	0.0621	0.0633	0.0644	0.0655
0.0666	0.0693	0.0721	0.0748	0.0776
0.0803	0.0830	0.0858	0.0885	0.0913
0.0940	0.0967	0.0995	0.1022	0.1050
0.1077	0.1105	0.1132	0.1159	0.1187
0.1214	0.1242	0.1269	0.1297	0.1324
0.1351	0.1379	0.1406	0.1434	0.1461
0.1488	0.1535	0.1581	0.1627	0.1674
0.1720	0.1766	0.1813	0.1859	0.1905
0.1951	0.1998	0.2044	0.2090	0.2137
0.2183	0.2224	0.2266	0.2307	0.2348
0.2390	0.2476	0.2562	0.2648	0.2734
0.2820	0.2992	0.3165	0.3440	0.3877
0.5000	0.6123	0.6560	0.6835	0.7008
0.7180	0.7266	0.7352	0.7438	0.7524
0.7610	0.7652	0.7693	0.7734	0.7776
0.7817	0.7863	0.7910	0.7956	0.8002
0.8049	0.8095	0.8141	0.8187	0.8234
0.8280	0.8326	0.8373	0.8419	0.8465
0.8512	0.8539	0.8566	0.8594	0.8621
0.8649	0.8676	0.8703	0.8731	0.8758
0.8786	0.8813	0.8841	0.8868	0.8895
0.8923	0.8950	0.8978	0.9005	0.9033
0.9060	0.9087	0.9115	0.9142	0.9170
0.9197	0.9224	0.9252	0.9279	0.9307
0.9334	0.9345	0.9356	0.9367	0.9379
0.9390	0.9401	0.9412	0.9423	0.9434
0.9445	0.9456	0.9467	0.9478	0.9490
0.9501	0.9512	0.9523	0.9534	0.9545
0.9556	0.9567	0.9578	0.9589	0.9601
0.9612	0.9623	0.9634	0.9645	0.9656
0.9667	0.9678	0.9689	0.9700	0.9711
0.9723	0.9734	0.9745	0.9756	0.9767
0.9778	0.9789	0.9800	0.9811	0.9822
0.9834	0.9845	0.9856	0.9867	0.9878
0.9889	0.9900	0.9911	0.9922	0.9933
0.9945	0.9956	0.9967	0.9978	0.9989
1.0000				

2_yr_sm 0.1

0.0000	0.0011	0.0022	0.0033	0.0044
0.0055	0.0066	0.0077	0.0088	0.0099
0.0110	0.0122	0.0133	0.0144	0.0155
0.0166	0.0177	0.0188	0.0199	0.0210
0.0221	0.0232	0.0243	0.0254	0.0265
0.0276	0.0287	0.0298	0.0309	0.0320
0.0331	0.0343	0.0354	0.0365	0.0376

	0.0387	0.0398	0.0409	0.0420	0.0431
	0.0442	0.0453	0.0464	0.0475	0.0486
	0.0497	0.0508	0.0519	0.0530	0.0541
	0.0552	0.0564	0.0575	0.0586	0.0597
	0.0608	0.0619	0.0630	0.0641	0.0652
	0.0663	0.0690	0.0717	0.0745	0.0772
	0.0799	0.0826	0.0853	0.0881	0.0908
	0.0935	0.0962	0.0989	0.1017	0.1044
	0.1071	0.1098	0.1125	0.1153	0.1180
	0.1207	0.1234	0.1261	0.1289	0.1316
	0.1343	0.1370	0.1397	0.1425	0.1452
	0.1479	0.1525	0.1571	0.1616	0.1662
	0.1708	0.1754	0.1799	0.1845	0.1891
	0.1937	0.1982	0.2028	0.2074	0.2120
	0.2165	0.2207	0.2248	0.2289	0.2330
	0.2372	0.2457	0.2543	0.2629	0.2714
	0.2800	0.2979	0.3158	0.3440	0.3886
	0.5000	0.6114	0.6560	0.6842	0.7021
	0.7200	0.7286	0.7371	0.7457	0.7543
	0.7628	0.7670	0.7711	0.7752	0.7793
	0.7835	0.7880	0.7926	0.7972	0.8018
	0.8063	0.8109	0.8155	0.8201	0.8246
	0.8292	0.8338	0.8384	0.8429	0.8475
	0.8521	0.8548	0.8575	0.8603	0.8630
	0.8657	0.8684	0.8711	0.8739	0.8766
	0.8793	0.8820	0.8847	0.8875	0.8902
	0.8929	0.8956	0.8983	0.9011	0.9038
	0.9065	0.9092	0.9119	0.9147	0.9174
	0.9201	0.9228	0.9255	0.9283	0.9310
	0.9337	0.9348	0.9359	0.9370	0.9381
	0.9392	0.9403	0.9414	0.9425	0.9436
	0.9448	0.9459	0.9470	0.9481	0.9492
	0.9503	0.9514	0.9525	0.9536	0.9547
	0.9558	0.9569	0.9580	0.9591	0.9602
	0.9613	0.9624	0.9635	0.9646	0.9657
	0.9669	0.9680	0.9691	0.9702	0.9713
	0.9724	0.9735	0.9746	0.9757	0.9768
	0.9779	0.9790	0.9801	0.9812	0.9823
	0.9834	0.9845	0.9856	0.9867	0.9878
	0.9890	0.9901	0.9912	0.9923	0.9934
	0.9945	0.9956	0.9967	0.9978	0.9989
	1.0000				
5_yr_sm		0.1			
	0.0000	0.0012	0.0024	0.0035	0.0047
	0.0059	0.0071	0.0082	0.0094	0.0106
	0.0118	0.0129	0.0141	0.0153	0.0165
	0.0176	0.0188	0.0200	0.0212	0.0223
	0.0235	0.0247	0.0259	0.0270	0.0282
	0.0294	0.0306	0.0317	0.0329	0.0341
	0.0353	0.0364	0.0376	0.0388	0.0400
	0.0411	0.0423	0.0435	0.0447	0.0458
	0.0470	0.0482	0.0494	0.0505	0.0517
	0.0529	0.0541	0.0552	0.0564	0.0576
	0.0588	0.0599	0.0611	0.0623	0.0635
	0.0646	0.0658	0.0670	0.0682	0.0693
	0.0705	0.0733	0.0761	0.0788	0.0816
	0.0844	0.0871	0.0899	0.0927	0.0954
	0.0982	0.1010	0.1037	0.1065	0.1093
	0.1120	0.1148	0.1176	0.1203	0.1231
	0.1259	0.1286	0.1314	0.1342	0.1369
	0.1397	0.1425	0.1452	0.1480	0.1508
	0.1535	0.1580	0.1624	0.1669	0.1713
	0.1758	0.1802	0.1847	0.1891	0.1936

	0.1981	0.2025	0.2070	0.2114	0.2159
	0.2203	0.2245	0.2287	0.2329	0.2371
	0.2413	0.2501	0.2588	0.2676	0.2763
	0.2851	0.3040	0.3229	0.3522	0.3968
	0.5000	0.6032	0.6478	0.6771	0.6960
	0.7149	0.7237	0.7324	0.7412	0.7499
	0.7587	0.7629	0.7671	0.7713	0.7755
	0.7797	0.7841	0.7886	0.7930	0.7975
	0.8019	0.8064	0.8109	0.8153	0.8198
	0.8242	0.8287	0.8331	0.8376	0.8420
	0.8465	0.8492	0.8520	0.8548	0.8575
	0.8603	0.8631	0.8658	0.8686	0.8714
	0.8741	0.8769	0.8797	0.8824	0.8852
	0.8880	0.8907	0.8935	0.8963	0.8990
	0.9018	0.9046	0.9073	0.9101	0.9129
	0.9156	0.9184	0.9212	0.9239	0.9267
	0.9295	0.9307	0.9318	0.9330	0.9342
	0.9354	0.9365	0.9377	0.9389	0.9401
	0.9412	0.9424	0.9436	0.9448	0.9459
	0.9471	0.9483	0.9495	0.9506	0.9518
	0.9530	0.9542	0.9553	0.9565	0.9577
	0.9589	0.9600	0.9612	0.9624	0.9636
	0.9647	0.9659	0.9671	0.9683	0.9694
	0.9706	0.9718	0.9730	0.9741	0.9753
	0.9765	0.9777	0.9788	0.9800	0.9812
	0.9824	0.9835	0.9847	0.9859	0.9871
	0.9882	0.9894	0.9906	0.9918	0.9929
	0.9941	0.9953	0.9965	0.9976	0.9988
	1.0000	1.0000	1.0000	1.0000	1.0000
10_yr_sm		0.1			
	0.0000	0.0012	0.0025	0.0037	0.0049
	0.0061	0.0074	0.0086	0.0098	0.0110
	0.0123	0.0135	0.0147	0.0159	0.0172
	0.0184	0.0196	0.0209	0.0221	0.0233
	0.0245	0.0258	0.0270	0.0282	0.0294
	0.0307	0.0319	0.0331	0.0344	0.0356
	0.0368	0.0380	0.0393	0.0405	0.0417
	0.0429	0.0442	0.0454	0.0466	0.0478
	0.0491	0.0503	0.0515	0.0528	0.0540
	0.0552	0.0564	0.0577	0.0589	0.0601
	0.0613	0.0626	0.0638	0.0650	0.0663
	0.0675	0.0687	0.0699	0.0712	0.0724
	0.0736	0.0765	0.0794	0.0822	0.0851
	0.0880	0.0908	0.0937	0.0966	0.0995
	0.1023	0.1052	0.1081	0.1110	0.1138
	0.1167	0.1196	0.1224	0.1253	0.1282
	0.1311	0.1339	0.1368	0.1397	0.1425
	0.1454	0.1483	0.1512	0.1540	0.1569
	0.1598	0.1642	0.1687	0.1732	0.1777
	0.1821	0.1866	0.1911	0.1956	0.2000
	0.2045	0.2090	0.2134	0.2179	0.2224
	0.2269	0.2311	0.2353	0.2395	0.2438
	0.2480	0.2570	0.2659	0.2749	0.2838
	0.2928	0.3120	0.3312	0.3606	0.4040
	0.5000	0.5960	0.6394	0.6688	0.6880
	0.7072	0.7162	0.7251	0.7341	0.7430
	0.7520	0.7562	0.7605	0.7647	0.7689
	0.7731	0.7776	0.7821	0.7866	0.7910
	0.7955	0.8000	0.8044	0.8089	0.8134
	0.8179	0.8223	0.8268	0.8313	0.8358
	0.8402	0.8431	0.8460	0.8488	0.8517
	0.8546	0.8575	0.8603	0.8632	0.8661
	0.8689	0.8718	0.8747	0.8776	0.8804

	0.8833	0.8862	0.8890	0.8919	0.8948
	0.8977	0.9005	0.9034	0.9063	0.9092
	0.9120	0.9149	0.9178	0.9206	0.9235
	0.9264	0.9276	0.9288	0.9301	0.9313
	0.9325	0.9337	0.9350	0.9362	0.9374
	0.9387	0.9399	0.9411	0.9423	0.9436
	0.9448	0.9460	0.9472	0.9485	0.9497
	0.9509	0.9522	0.9534	0.9546	0.9558
	0.9571	0.9583	0.9595	0.9607	0.9620
	0.9632	0.9644	0.9656	0.9669	0.9681
	0.9693	0.9706	0.9718	0.9730	0.9742
	0.9755	0.9767	0.9779	0.9791	0.9804
	0.9816	0.9828	0.9841	0.9853	0.9865
	0.9877	0.9890	0.9902	0.9914	0.9926
	0.9939	0.9951	0.9963	0.9975	0.9988
	1.0000				
25_yr_sm		0.1			
	0.0000	0.0013	0.0026	0.0039	0.0052
	0.0066	0.0079	0.0092	0.0105	0.0118
	0.0131	0.0144	0.0157	0.0170	0.0184
	0.0197	0.0210	0.0223	0.0236	0.0249
	0.0262	0.0275	0.0289	0.0302	0.0315
	0.0328	0.0341	0.0354	0.0367	0.0380
	0.0393	0.0407	0.0420	0.0433	0.0446
	0.0459	0.0472	0.0485	0.0498	0.0511
	0.0525	0.0538	0.0551	0.0564	0.0577
	0.0590	0.0603	0.0616	0.0630	0.0643
	0.0656	0.0669	0.0682	0.0695	0.0708
	0.0721	0.0734	0.0748	0.0761	0.0774
	0.0787	0.0817	0.0847	0.0877	0.0907
	0.0937	0.0967	0.0997	0.1028	0.1058
	0.1088	0.1118	0.1148	0.1178	0.1208
	0.1238	0.1268	0.1298	0.1328	0.1358
	0.1389	0.1419	0.1449	0.1479	0.1509
	0.1539	0.1569	0.1599	0.1629	0.1659
	0.1689	0.1735	0.1781	0.1826	0.1872
	0.1918	0.1963	0.2009	0.2054	0.2100
	0.2146	0.2191	0.2237	0.2283	0.2328
	0.2374	0.2417	0.2460	0.2503	0.2546
	0.2589	0.2681	0.2774	0.2866	0.2958
	0.3050	0.3245	0.3439	0.3726	0.4137
	0.5000	0.5863	0.6274	0.6561	0.6755
	0.6950	0.7042	0.7134	0.7226	0.7319
	0.7411	0.7454	0.7497	0.7540	0.7583
	0.7626	0.7672	0.7717	0.7763	0.7809
	0.7854	0.7900	0.7946	0.7991	0.8037
	0.8082	0.8128	0.8174	0.8219	0.8265
	0.8311	0.8341	0.8371	0.8401	0.8431
	0.8461	0.8491	0.8521	0.8551	0.8581
	0.8611	0.8642	0.8672	0.8702	0.8732
	0.8762	0.8792	0.8822	0.8852	0.8882
	0.8912	0.8942	0.8972	0.9003	0.9033
	0.9063	0.9093	0.9123	0.9153	0.9183
	0.9213	0.9226	0.9239	0.9252	0.9266
	0.9279	0.9292	0.9305	0.9318	0.9331
	0.9344	0.9357	0.9370	0.9384	0.9397
	0.9410	0.9423	0.9436	0.9449	0.9462
	0.9475	0.9489	0.9502	0.9515	0.9528
	0.9541	0.9554	0.9567	0.9580	0.9593
	0.9607	0.9620	0.9633	0.9646	0.9659
	0.9672	0.9685	0.9698	0.9711	0.9725
	0.9738	0.9751	0.9764	0.9777	0.9790
	0.9803	0.9816	0.9830	0.9843	0.9856

	0.9869	0.9882	0.9895	0.9908	0.9921
	0.9934	0.9948	0.9961	0.9974	0.9987
	1.0000				
50_yr_sm		0.1			
	0.0000	0.0014	0.0027	0.0041	0.0055
	0.0068	0.0082	0.0096	0.0109	0.0123
	0.0137	0.0150	0.0164	0.0178	0.0191
	0.0205	0.0219	0.0232	0.0246	0.0260
	0.0273	0.0287	0.0301	0.0314	0.0328
	0.0342	0.0355	0.0369	0.0383	0.0396
	0.0410	0.0424	0.0437	0.0451	0.0465
	0.0478	0.0492	0.0505	0.0519	0.0533
	0.0546	0.0560	0.0574	0.0587	0.0601
	0.0615	0.0628	0.0642	0.0656	0.0669
	0.0683	0.0697	0.0710	0.0724	0.0738
	0.0751	0.0765	0.0779	0.0792	0.0806
	0.0820	0.0851	0.0882	0.0914	0.0945
	0.0977	0.1008	0.1039	0.1071	0.1102
	0.1134	0.1165	0.1196	0.1228	0.1259
	0.1290	0.1322	0.1353	0.1385	0.1416
	0.1447	0.1479	0.1510	0.1541	0.1573
	0.1604	0.1636	0.1667	0.1698	0.1730
	0.1761	0.1808	0.1854	0.1901	0.1947
	0.1994	0.2040	0.2087	0.2133	0.2180
	0.2227	0.2273	0.2320	0.2366	0.2413
	0.2459	0.2503	0.2546	0.2589	0.2633
	0.2676	0.2771	0.2866	0.2961	0.3056
	0.3151	0.3345	0.3538	0.3819	0.4208
	0.5000	0.5792	0.6181	0.6462	0.6655
	0.6849	0.6944	0.7039	0.7134	0.7229
	0.7324	0.7367	0.7411	0.7454	0.7497
	0.7541	0.7587	0.7634	0.7680	0.7727
	0.7773	0.7820	0.7867	0.7913	0.7960
	0.8006	0.8053	0.8099	0.8146	0.8192
	0.8239	0.8270	0.8302	0.8333	0.8364
	0.8396	0.8427	0.8459	0.8490	0.8521
	0.8553	0.8584	0.8615	0.8647	0.8678
	0.8710	0.8741	0.8772	0.8804	0.8835
	0.8866	0.8898	0.8929	0.8961	0.8992
	0.9023	0.9055	0.9086	0.9118	0.9149
	0.9180	0.9194	0.9208	0.9221	0.9235
	0.9249	0.9262	0.9276	0.9290	0.9303
	0.9317	0.9331	0.9344	0.9358	0.9372
	0.9385	0.9399	0.9413	0.9426	0.9440
	0.9454	0.9467	0.9481	0.9495	0.9508
	0.9522	0.9535	0.9549	0.9563	0.9576
	0.9590	0.9604	0.9617	0.9631	0.9645
	0.9658	0.9672	0.9686	0.9699	0.9713
	0.9727	0.9740	0.9754	0.9768	0.9781
	0.9795	0.9809	0.9822	0.9836	0.9850
	0.9863	0.9877	0.9891	0.9904	0.9918
	0.9932	0.9945	0.9959	0.9973	0.9986
	1.0000				
100_yr_sm		0.1			
	0.0000	0.0014	0.0029	0.0043	0.0057
	0.0071	0.0086	0.0100	0.0114	0.0129
	0.0143	0.0157	0.0171	0.0186	0.0200
	0.0214	0.0229	0.0243	0.0257	0.0271
	0.0286	0.0300	0.0314	0.0329	0.0343
	0.0357	0.0372	0.0386	0.0400	0.0414
	0.0429	0.0443	0.0457	0.0472	0.0486
	0.0500	0.0514	0.0529	0.0543	0.0557
	0.0572	0.0586	0.0600	0.0614	0.0629

	0.0643	0.0657	0.0672	0.0686	0.0700
	0.0714	0.0729	0.0743	0.0757	0.0772
	0.0786	0.0800	0.0814	0.0829	0.0843
	0.0857	0.0890	0.0923	0.0955	0.0988
	0.1021	0.1054	0.1086	0.1119	0.1152
	0.1185	0.1217	0.1250	0.1283	0.1315
	0.1348	0.1381	0.1414	0.1446	0.1479
	0.1512	0.1544	0.1577	0.1610	0.1643
	0.1675	0.1708	0.1741	0.1773	0.1806
	0.1839	0.1886	0.1934	0.1981	0.2029
	0.2076	0.2123	0.2171	0.2218	0.2266
	0.2313	0.2361	0.2408	0.2455	0.2503
	0.2550	0.2594	0.2637	0.2680	0.2723
	0.2767	0.2864	0.2961	0.3058	0.3155
	0.3252	0.3444	0.3635	0.3907	0.4275
	0.5000	0.5725	0.6093	0.6365	0.6556
	0.6748	0.6845	0.6942	0.7039	0.7136
	0.7233	0.7277	0.7320	0.7363	0.7406
	0.7450	0.7497	0.7545	0.7592	0.7639
	0.7687	0.7734	0.7782	0.7829	0.7877
	0.7924	0.7971	0.8019	0.8066	0.8114
	0.8161	0.8194	0.8227	0.8259	0.8292
	0.8325	0.8357	0.8390	0.8423	0.8456
	0.8488	0.8521	0.8554	0.8586	0.8619
	0.8652	0.8685	0.8717	0.8750	0.8783
	0.8815	0.8848	0.8881	0.8914	0.8946
	0.8979	0.9012	0.9045	0.9077	0.9110
	0.9143	0.9157	0.9171	0.9186	0.9200
	0.9214	0.9228	0.9243	0.9257	0.9271
	0.9286	0.9300	0.9314	0.9328	0.9343
	0.9357	0.9371	0.9386	0.9400	0.9414
	0.9428	0.9443	0.9457	0.9471	0.9486
	0.9500	0.9514	0.9528	0.9543	0.9557
	0.9571	0.9586	0.9600	0.9614	0.9628
	0.9643	0.9657	0.9671	0.9686	0.9700
	0.9714	0.9729	0.9743	0.9757	0.9771
	0.9786	0.9800	0.9814	0.9829	0.9843
	0.9857	0.9871	0.9886	0.9900	0.9914
	0.9929	0.9943	0.9957	0.9971	0.9986
	1.0000	1.0000	1.0000	1.0000	1.0000
500_yr_sm		0.1			
	0.0000	0.0016	0.0031	0.0047	0.0063
	0.0079	0.0094	0.0110	0.0126	0.0141
	0.0157	0.0173	0.0189	0.0204	0.0220
	0.0236	0.0252	0.0267	0.0283	0.0299
	0.0314	0.0330	0.0346	0.0362	0.0377
	0.0393	0.0409	0.0424	0.0440	0.0456
	0.0472	0.0487	0.0503	0.0519	0.0535
	0.0550	0.0566	0.0582	0.0597	0.0613
	0.0629	0.0645	0.0660	0.0676	0.0692
	0.0707	0.0723	0.0739	0.0755	0.0770
	0.0786	0.0802	0.0817	0.0833	0.0849
	0.0865	0.0880	0.0896	0.0912	0.0928
	0.0943	0.0979	0.1015	0.1051	0.1087
	0.1123	0.1159	0.1195	0.1231	0.1267
	0.1303	0.1340	0.1376	0.1412	0.1448
	0.1484	0.1520	0.1556	0.1592	0.1628
	0.1664	0.1700	0.1736	0.1772	0.1808
	0.1844	0.1880	0.1916	0.1952	0.1988
	0.2024	0.2073	0.2122	0.2172	0.2221
	0.2270	0.2319	0.2368	0.2418	0.2467
	0.2516	0.2565	0.2615	0.2664	0.2713
	0.2762	0.2806	0.2849	0.2893	0.2936

0.2979	0.3081	0.3182	0.3283	0.3384
0.3486	0.3669	0.3853	0.4101	0.4419
0.5000	0.5581	0.5899	0.6147	0.6331
0.6514	0.6616	0.6717	0.6818	0.6919
0.7021	0.7064	0.7107	0.7151	0.7194
0.7238	0.7287	0.7336	0.7385	0.7435
0.7484	0.7533	0.7582	0.7632	0.7681
0.7730	0.7779	0.7828	0.7878	0.7927
0.7976	0.8012	0.8048	0.8084	0.8120
0.8156	0.8192	0.8228	0.8264	0.8300
0.8336	0.8372	0.8408	0.8444	0.8480
0.8516	0.8552	0.8588	0.8624	0.8660
0.8697	0.8733	0.8769	0.8805	0.8841
0.8877	0.8913	0.8949	0.8985	0.9021
0.9057	0.9072	0.9088	0.9104	0.9120
0.9135	0.9151	0.9167	0.9183	0.9198
0.9214	0.9230	0.9245	0.9261	0.9277
0.9293	0.9308	0.9324	0.9340	0.9355
0.9371	0.9387	0.9403	0.9418	0.9434
0.9450	0.9465	0.9481	0.9497	0.9513
0.9528	0.9544	0.9560	0.9576	0.9591
0.9607	0.9623	0.9638	0.9654	0.9670
0.9686	0.9701	0.9717	0.9733	0.9748
0.9764	0.9780	0.9796	0.9811	0.9827
0.9843	0.9859	0.9874	0.9890	0.9906
0.9921	0.9937	0.9953	0.9969	0.9984
1.0000				

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WinTR-20 Printed Page File End of Input Data List

Eccelston Mitigation POI 1-4 Ultimate

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STORM 1_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA4	0.450		0.770		12.80	97.0	215.53

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.600	0.0	1.2	5.2	21.7	54.2	85.6	96.9
13.000	89.4	72.1	56.5	44.3	35.1	28.8	24.9
14.400	22.7	21.4	20.6	20.2	19.8	19.0	17.4

15.800	15.8	14.4	13.5	13.0	12.6	12.5	12.4
17.200	12.3	12.3	12.3	12.4	12.4	12.3	11.6
18.600	10.3	8.8	7.5	6.6	6.1	5.7	5.5
20.000	5.4	5.3	5.3	5.2	5.2	5.2	5.2
21.400	5.2	5.2	5.2	5.2	5.3	5.2	5.2
22.800	5.3	5.3	5.3	5.3	5.3	5.3	5.3
24.200	5.2	4.7	3.8	2.7	1.7	1.1	0.7
25.600	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA2	1.323		0.724		12.99	228.3	172.56

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.600	0.0	1.3	7.6	34.2	90.7	163.0	213.2
13.000	227.9	213.1	180.2	146.3	119.4	98.8	83.9
14.400	73.8	67.4	63.3	60.6	58.6	56.3	53.0
15.800	49.0	44.9	41.3	38.8	37.3	36.3	35.7
17.200	35.4	35.2	35.1	35.1	35.1	34.9	33.8
18.600	31.4	28.0	24.5	21.5	19.2	17.8	16.8
20.000	16.1	15.7	15.3	15.1	15.0	14.9	14.9
21.400	14.8	14.8	14.8	14.8	14.9	14.9	14.9
22.800	14.9	15.0	15.0	15.0	15.0	15.0	15.1
24.200	14.9	14.1	12.3	9.8	7.2	5.0	3.4
25.600	2.3	1.6	1.1	0.8	0.5	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		0.478		12.99	96.7	105.07

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.800	0.0	0.8	10.3	35.6	69.5	91.3	96.4
13.200	87.7	72.9	59.8	49.2	41.3	36.1	32.9
14.600	31.1	30.1	29.5	29.1	28.2	26.4	24.2
16.000	22.1	20.6	19.7	19.2	18.8	18.7	18.6
17.400	18.6	18.6	18.7	18.8	18.7	18.0	16.3
18.800	14.3	12.3	10.7	9.8	9.1	8.7	8.5
20.200	8.3	8.2	8.1	8.1	8.1	8.1	8.1
21.600	8.0	8.1	8.1	8.1	8.1	8.1	8.2
23.000	8.2	8.2	8.2	8.2	8.3	8.3	8.2
24.400	7.6	6.3	4.8	3.3	2.1	1.4	0.9
25.800	0.6	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)

CON-1	2.693	Upstream	0.647	362.88	12.95	416.3	154.55

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.600	0.0	2.5	13.7	67.8	180.6	317.8	401.4
13.000	412.7	372.9	309.7	250.4	203.7	169.0	145.0
14.400	129.5	119.9	114.0	110.4	107.5	103.4	96.9
15.800	89.0	81.4	75.5	71.5	69.1	67.6	66.8
17.200	66.3	66.1	66.1	66.2	66.3	65.8	63.4
18.600	58.0	51.1	44.4	38.9	35.1	32.6	31.0
20.000	30.0	29.3	28.8	28.5	28.3	28.2	28.2
21.400	28.1	28.1	28.1	28.2	28.2	28.3	28.3
22.800	28.3	28.4	28.5	28.5	28.5	28.6	28.7
24.200	28.2	26.3	22.3	17.2	12.2	8.3	5.5
25.600	3.6	2.2	1.1	0.8	0.5	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	0.647	362.81	13.23	381.8	141.77

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.800	0.0	3.7	22.2	75.9	172.1	280.0	356.0
13.200	381.6	362.3	317.2	266.0	220.0	183.2	156.1
14.600	137.4	125.2	117.4	112.4	108.4	103.8	97.7
16.000	90.6	83.7	77.7	73.3	70.4	68.5	67.3
17.400	66.6	66.3	66.2	66.2	66.2	65.4	62.9
18.800	58.4	52.4	46.2	40.9	36.8	33.8	31.9
20.200	30.5	29.6	29.0	28.6	28.4	28.3	28.2
21.600	28.1	28.1	28.1	28.2	28.2	28.2	28.3

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Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
23.000	28.3	28.4	28.5	28.5	28.5	28.6	28.5
24.400	27.9	26.0	22.6	18.2	13.6	9.7	6.7
25.800	4.4	2.8	1.7	1.0	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		0.866		12.20	52.5	582.75

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.200	0.0	0.8	1.4	3.7	15.8	52.4	29.6
12.600	15.4	8.5	7.4	5.2	3.8	3.7	4.0
14.000	4.1	4.1	4.2	4.2	4.3	4.3	3.3
15.400	2.7	2.6	2.6	2.6	2.6	2.6	2.6

16.800	2.7	2.7	2.6	2.7	2.7	2.7	2.7
18.200	1.8	1.2	1.1	1.1	1.1	1.1	1.1
19.600	1.1	1.1	1.1	1.1	1.1	1.1	1.1
21.000	1.1	1.1	1.1	1.2	1.1	1.1	1.1
22.400	1.1	1.2	1.1	1.1	1.1	1.1	1.2
23.800	1.1	1.1	0.0				

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		0.654		13.17	387.2	139.11

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.200	0.0	0.8	1.4	3.7	19.5	74.6	105.5
12.600	187.5	288.6	363.4	386.9	366.1	320.9	270.0
14.000	224.1	187.3	160.2	141.6	129.5	121.7	115.7
15.400	111.1	106.4	100.3	93.2	86.3	80.3	76.0
16.800	73.0	71.1	70.0	69.3	69.0	68.9	68.9
18.200	67.9	66.6	64.1	59.5	53.5	47.3	42.0
19.600	37.9	34.9	33.0	31.6	30.8	30.2	29.7
21.000	29.5	29.4	29.3	29.3	29.2	29.2	29.3
22.400	29.3	29.4	29.4	29.5	29.5	29.6	29.7
23.800	29.7	29.7	29.0	27.9	26.0	22.6	18.2
25.200	13.6	9.7	6.7	4.4	2.8	1.7	1.0
26.600	0.0						

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Eccelston Mitigation POI 1-4 Ultimate

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA4	0.450		1.141		12.79	151.7	337.08

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.000	0.0	0.9	1.7	3.1	5.7	13.6	40.8
12.400	91.0	136.9	151.5	137.6	109.3	84.6	65.5
13.800	51.3	41.6	35.6	32.1	30.0	28.7	28.0
15.200	27.4	26.1	23.9	21.6	19.7	18.5	17.7
16.600	17.3	17.0	16.9	16.8	16.8	16.8	16.8
18.000	16.8	16.7	15.8	14.0	11.9	10.1	9.0
19.400	8.3	7.8	7.5	7.3	7.2	7.1	7.1
20.800	7.0	7.0	7.0	7.1	7.1	7.1	7.1
22.200	7.1	7.1	7.1	7.1	7.1	7.1	7.1
23.600	7.2	7.2	7.2	7.0	6.3	5.1	3.6
25.000	2.3	1.4	0.9	0.6	0.0		

Area or Reach	Drainage Area	Rain Gage ID or	Runoff Amount	------------ Peak Flow ------------ Elevation	Time	Rate	Rate

Identifier	(sq mi)	Location	(in)	(ft)	(hr)	(cfs)	(csm)
DA2	1.323		1.084		12.99	363.3	274.58

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.000	0.0	0.7	1.8	4.1	9.0	23.8	70.8
12.400	162.3	273.3	346.0	362.1	333.0	277.5	222.6
13.800	179.7	147.1	123.4	107.4	97.0	90.2	85.7
15.200	82.3	78.7	73.9	68.0	62.2	57.2	53.5
16.600	51.4	50.0	49.1	48.6	48.3	48.1	48.1
18.000	48.1	47.7	46.2	42.9	38.2	33.4	29.3
19.400	26.3	24.3	23.0	22.0	21.4	20.9	20.6
20.800	20.4	20.3	20.2	20.2	20.2	20.2	20.2
22.200	20.2	20.2	20.2	20.2	20.2	20.3	20.4
23.600	20.4	20.5	20.5	20.2	19.0	16.6	13.2
25.000	9.8	6.8	4.6	3.2	2.2	1.5	1.0
26.400	0.7	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		0.771		12.88	175.5	190.74

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Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.800	0.2	4.1	26.8	76.4	136.0	170.9	173.2
13.200	152.7	123.8	99.4	80.3	66.4	56.9	51.1
14.600	47.6	45.5	44.2	43.2	41.7	38.9	35.5
16.000	32.4	30.1	28.7	27.9	27.4	27.1	27.0
17.400	26.9	26.9	27.0	27.1	26.9	25.8	23.5
18.800	20.4	17.6	15.4	14.0	13.2	12.6	12.1
20.200	11.9	11.7	11.6	11.5	11.5	11.5	11.5
21.600	11.6	11.6	11.6	11.6	11.6	11.6	11.6
23.000	11.6	11.7	11.7	11.8	11.8	11.8	11.6
24.400	10.7	9.0	6.7	4.7	3.0	2.0	1.3
25.800	0.9	0.6	0.0				

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Upstream	0.986	363.35	12.94	682.1	253.25

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)

11.000	0.0	1.5	3.5	7.2	14.9	41.5	139.9
12.400	330.6	545.7	667.5	672.3	594.6	486.1	387.8
13.800	311.4	255.1	216.1	190.7	174.7	164.5	158.0
15.200	152.9	146.4	136.7	125.2	114.4	105.8	100.0
16.600	96.5	94.4	93.1	92.3	92.0	91.8	91.9
18.000	92.0	91.2	87.8	80.3	70.6	61.2	53.7
19.400	48.6	45.3	43.1	41.5	40.4	39.7	39.2
20.800	38.9	38.8	38.7	38.8	38.9	38.9	38.9
22.200	38.9	38.8	38.9	38.9	38.9	39.0	39.2
23.600	39.4	39.4	39.4	38.7	36.1	30.6	23.6
25.000	16.8	11.3	7.5	5.1	3.0	2.1	1.0
26.400	0.7	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	0.986	363.29	13.08	645.7	239.72

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.200	0.0	1.7	4.3	8.9	21.5	69.1	186.0
12.600	367.3	540.6	634.6	634.6	567.7	474.3	385.1
14.000	312.1	257.3	218.5	192.8	176.0	165.4	158.3
15.400	152.2	144.7	134.9	124.1	114.1	106.1	100.5
16.800	96.9	94.6	93.2	92.4	92.0	91.9	91.9
18.200	91.7	90.2	85.9	78.4	69.5	60.8	53.9
19.600	48.9	45.5	43.2	41.6	40.5	39.8	39.3

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
21.000	39.0	38.8	38.8	38.8	38.9	38.9	38.9
22.400	38.9	38.9	38.9	38.9	39.0	39.1	39.2
23.800	39.3	39.4	39.2	38.0	34.7	29.3	22.8
25.200	16.5	11.4	7.8	5.1	3.3	2.0	1.2
26.600	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		1.259		12.19	77.9	865.40

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.400	0.0	0.5	0.6	0.7	1.5	2.2	3.2
11.800	7.4	26.9	77.9	43.1	22.4	12.0	10.3
13.200	7.2	5.2	5.1	5.5	5.6	5.6	5.7
14.600	5.7	5.7	5.8	4.5	3.6	3.5	3.5
16.000	3.5	3.5	3.5	3.5	3.5	3.6	3.5
17.400	3.6	3.6	3.6	3.6	2.4	1.6	1.5
18.800	1.5	1.5	1.5	1.5	1.5	1.5	1.5
20.200	1.5	1.5	1.5	1.5	1.5	1.5	1.5

21.600	1.5	1.5	1.5	1.5	1.5	1.5	1.5
23.000	1.5	1.5	1.5	1.5	1.5	1.5	0.7
24.400	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		0.995		13.08	655.4	235.47

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.400	0.0	0.5	0.6	0.7	1.5	4.0	7.5
11.800	16.4	48.5	147.0	229.2	389.7	552.6	644.6
13.200	641.8	572.9	479.4	390.5	317.7	262.9	224.2
14.600	198.4	181.8	171.1	162.7	155.8	148.1	138.4
16.000	127.6	117.5	109.6	104.0	100.4	98.2	96.8
17.400	96.0	95.6	95.5	95.5	94.1	91.8	87.3
18.800	79.9	70.9	62.3	55.4	50.4	47.0	44.7
20.200	43.1	42.0	41.2	40.8	40.5	40.3	40.3
21.600	40.3	40.4	40.4	40.4	40.4	40.3	40.4
23.000	40.4	40.5	40.6	40.7	40.9	40.9	39.8
24.400	38.0	34.7	29.3	22.8	16.5	11.4	7.8
25.800	5.1	3.3	2.0	1.2	0.0		

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Eccelston Mitigation POI 1-4 Ultimate

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA4	0.450		1.825		12.75	243.7	541.36

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.800	0.4	1.1	1.8	2.7	3.7	4.7	5.6
11.200	6.7	8.6	11.9	18.0	33.7	78.9	157.1
12.600	225.3	243.0	218.2	172.7	133.1	102.4	79.8
14.000	64.1	54.0	48.0	44.4	42.1	40.7	39.6
15.400	37.6	34.6	31.5	28.9	27.2	26.2	25.6
16.800	25.2	25.0	24.9	24.8	24.8	24.9	24.9
18.200	24.6	23.4	20.8	17.9	15.3	13.6	12.5
19.600	11.9	11.5	11.2	11.0	10.9	10.9	10.8
21.000	10.8	10.8	10.8	10.8	10.8	10.8	10.9
22.400	10.9	10.9	10.9	10.9	10.9	10.9	10.9
23.800	10.9	10.9	10.7	9.7	7.8	5.5	3.5
25.200	2.2	1.4	0.9	0.6	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA2	1.323		1.752		12.95	597.5	451.60

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Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	Flow Values @ time increment of 0.200 hr						
9.800	0.0	0.9	2.1	3.8	5.9	8.3	10.7
11.200	13.6	17.7	24.5	36.7	66.0	150.0	297.3
12.600	469.5	575.1	592.2	540.3	446.9	357.3	286.2
14.000	232.1	193.1	165.8	147.6	135.6	127.6	121.6
15.400	115.7	108.3	100.0	91.7	84.6	79.5	76.4
16.800	74.5	73.3	72.5	72.0	71.8	71.7	71.7
18.200	71.1	69.0	64.2	57.4	50.5	44.5	40.0
19.600	37.2	35.2	33.9	32.9	32.3	31.9	31.6
21.000	31.4	31.3	31.3	31.2	31.2	31.2	31.2
22.400	31.2	31.3	31.3	31.3	31.4	31.4	31.4
23.800	31.5	31.5	31.1	29.4	25.7	20.5	15.2
25.200	10.5	7.1	4.9	3.4	2.3	1.6	1.1
26.600	0.7	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA3	0.920		1.339		12.85	325.1	353.25

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Eccelston Mitigation POI 1-4 Ultimate

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	Flow Values @ time increment of 0.200 hr						
11.200	0.0	1.5	3.7	8.8	23.8	73.2	166.3
12.600	268.1	320.2	316.8	273.2	218.7	173.7	138.4
14.000	112.7	94.9	83.7	76.7	72.3	69.5	67.4
15.400	64.6	60.3	55.2	50.6	47.2	45.2	43.9
16.800	43.1	42.7	42.5	42.4	42.4	42.4	42.5
18.200	42.2	40.6	37.0	32.4	28.1	24.7	22.6
19.600	21.2	20.3	19.7	19.3	19.0	18.9	18.8
21.000	18.7	18.7	18.7	18.7	18.7	18.8	18.8
22.400	18.8	18.8	18.9	18.9	18.9	18.9	19.0
23.800	19.0	19.0	18.7	17.4	14.5	11.0	7.6
25.200	4.9	3.2	2.1	1.4	0.9	0.6	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
CON-1	2.693	Upstream	1.623	363.93	12.89	1154.4	428.62

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	Flow Values @ time increment of 0.200 hr						
9.800	0.4	2.0	3.9	6.5	9.6	12.9	16.3
11.200	20.4	27.8	40.2	63.4	126.3	302.8	620.9
12.600	962.8	1135.9	1126.2	985.2	798.9	633.5	504.6
14.000	409.5	342.1	297.6	268.7	250.2	237.8	228.5
15.400	217.9	203.2	186.6	171.2	159.1	150.9	145.9
16.800	142.8	140.9	139.8	139.3	139.0	139.0	139.0

18.200	137.9	132.8	121.9	107.7	93.9	82.9	75.2
19.600	70.2	66.9	64.7	63.3	62.3	61.7	61.3
21.000	61.0	60.9	60.8	60.8	60.8	60.8	60.9
22.400	60.9	61.0	61.1	61.1	61.2	61.3	61.3
23.800	61.4	61.4	60.5	56.5	48.0	36.9	26.3
25.200	17.7	11.8	7.9	5.3	3.2	2.2	1.1
26.600	0.7	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	1.623	363.87	13.03	1106.3	410.76

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.800	0.0	0.9	2.6	4.8	7.6	10.7	14.0
11.200	17.6	23.2	32.3	48.8	87.3	196.2	424.2
12.600	739.2	996.0	1102.0	1056.0	914.3	747.3	599.0
14.000	481.4	394.0	332.8	292.0	265.3	247.8	235.8
15.400	225.3	212.8	197.6	181.9	167.9	157.2	149.9
16.800	145.4	142.5	140.8	139.8	139.2	139.0	139.0

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
18.200	138.6	135.9	128.6	116.8	103.3	90.8	81.0
19.600	74.2	69.6	66.5	64.4	63.1	62.2	61.6
21.000	61.2	61.0	60.9	60.8	60.8	60.8	60.8
22.400	60.9	61.0	61.0	61.1	61.1	61.2	61.3
23.800	61.4	61.4	61.0	58.8	53.1	44.0	33.5
25.200	23.9	16.3	11.0	7.4	4.8	3.1	1.9
26.600	1.1	0.7	0.0				

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		1.975		12.19	116.5	1293.98

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.200	0.0	0.6	0.8	1.1	1.3	1.5	1.7
10.600	1.9	2.0	2.2	3.9	5.5	7.3	15.8
12.000	47.4	116.2	65.3	34.7	18.3	15.5	10.8
13.400	7.8	7.5	7.8	7.9	8.0	8.0	8.0
14.800	8.1	8.1	6.4	5.3	5.1	5.1	5.1
16.200	5.1	5.1	5.2	5.2	5.2	5.2	5.2
17.600	5.2	5.2	5.2	3.6	2.4	2.3	2.2
19.000	2.3	2.2	2.3	2.2	2.3	2.2	2.3
20.400	2.2	2.3	2.2	2.3	2.3	2.3	2.3
21.800	2.3	2.3	2.3	2.3	2.3	2.3	2.3
23.200	2.3	2.3	2.3	2.3	2.3	1.0	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	2.783		1.634		13.03	1121.1	402.77

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.200	0.0	0.6	0.8	1.1	2.2	4.2	6.6
10.600	9.5	12.7	16.2	21.6	28.7	39.7	64.7
12.000	134.7	312.4	489.6	774.0	1014.3	1117.5	1066.8
13.400	922.1	754.8	606.7	489.3	402.0	340.8	300.0
14.800	273.4	255.9	242.1	230.6	217.9	202.7	187.0
16.200	173.0	162.3	155.1	150.6	147.7	146.0	145.0
17.600	144.4	144.3	144.3	142.2	138.3	130.8	119.0
19.000	105.5	93.1	83.3	76.4	71.8	68.7	66.7
20.400	65.3	64.4	63.8	63.5	63.2	63.1	63.0
21.800	63.1	63.1	63.1	63.1	63.2	63.3	63.4
23.200	63.4	63.5	63.6	63.7	63.7	62.0	58.8
24.600	53.1	44.0	33.6	23.9	16.3	11.0	7.4

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Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
26.000	4.8	3.1	1.9	1.1	0.7	0.0	

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Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA4	0.450		2.473		12.76	322.2	715.80

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.800	0.0	0.8	1.3	2.1	3.2	4.5	5.9
10.200	7.4	8.8	10.1	11.4	12.6	14.1	17.0
11.600	22.3	31.8	54.7	115.0	215.5	299.8	320.3
13.000	286.8	227.2	175.3	135.0	105.0	84.1	70.6
14.400	62.6	57.7	54.6	52.8	51.2	48.7	45.0
15.800	41.1	38.0	35.8	34.6	33.8	33.4	33.1
17.200	33.0	33.0	33.0	33.0	33.0	32.6	31.0
18.600	27.6	23.7	20.3	18.0	16.7	15.8	15.2
20.000	14.9	14.7	14.5	14.5	14.4	14.4	14.4
21.400	14.4	14.4	14.4	14.4	14.4	14.4	14.4
22.800	14.4	14.5	14.5	14.5	14.5	14.5	14.5
24.200	14.2	12.9	10.3	7.3	4.7	2.9	1.9
25.600	1.2	0.7	0.0				

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)

DA2	1.323		2.388		12.91	798.4	603.48

Line Start Time (hr)	------------ Flow (cfs)	Values @ (cfs)	time (cfs)	increment (cfs)	of 0.200 (cfs)	hr (cfs)	------------ (cfs)
8.800	0.0	0.5	1.3	2.6	4.7	7.4	10.7
10.200	14.4	18.1	21.9	25.6	29.2	33.2	39.4
11.600	50.1	69.7	115.5	228.7	423.2	641.6	774.2
13.000	791.7	716.4	592.9	473.5	379.2	307.5	254.7
14.400	218.0	193.8	177.5	166.5	158.5	150.8	141.4
15.800	130.8	120.5	111.6	105.2	101.4	99.0	97.4
17.200	96.4	95.9	95.6	95.5	95.4	94.6	91.7
18.600	85.2	76.4	67.2	59.3	53.5	49.6	47.0
20.000	45.2	44.0	43.1	42.6	42.2	42.0	41.8
21.400	41.7	41.6	41.6	41.6	41.6	41.7	41.7
22.800	41.7	41.8	41.8	41.8	41.9	41.9	41.9
24.200	41.3	39.1	34.1	27.2	20.1	14.1	9.5
25.600	6.5	4.5	3.1	2.1	1.4	1.0	0.6
27.000	0.0						

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Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Elevation (ft)	Peak Time (hr)	Flow Rate (cfs)	------------ Rate (csm)
DA3	0.920		1.901		12.82	459.7	499.57

Line Start Time (hr)	------------ Flow (cfs)	Values @ (cfs)	time (cfs)	increment (cfs)	of 0.200 (cfs)	hr (cfs)	------------ (cfs)
10.200	0.3	1.3	2.5	4.1	5.9	8.1	11.4
11.600	17.1	27.3	53.8	126.0	256.7	391.8	456.1
13.000	444.9	381.1	304.6	241.0	191.7	155.2	130.2
14.400	114.2	104.2	97.8	93.7	90.6	86.9	81.2
15.800	74.6	68.7	64.3	61.7	60.1	59.1	58.6
17.200	58.2	58.1	58.1	58.2	58.3	57.8	55.5
18.600	50.6	44.3	38.4	33.9	31.0	29.1	27.8
20.000	27.0	26.5	26.1	25.9	25.8	25.7	25.7
21.400	25.6	25.6	25.7	25.7	25.7	25.8	25.8
22.800	25.8	25.9	25.9	25.9	26.0	26.0	26.0
24.200	25.5	23.7	19.8	14.9	10.3	6.7	4.4
25.600	2.9	1.9	1.3	0.8	0.5	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Elevation (ft)	Peak Time (hr)	Flow Rate (cfs)	------------ Rate (csm)
CON-1	2.693	Upstream	2.236	364.39	12.90	1565.7	581.33

Line Start Time (hr)	------------ Flow (cfs)	Values @ (cfs)	time (cfs)	increment (cfs)	of 0.200 (cfs)	hr (cfs)	------------ (cfs)
8.800	0.0	1.3	2.6	4.7	7.8	11.9	16.7
10.200	22.0	28.2	34.6	41.2	47.7	55.4	67.8
11.600	89.8	129.6	224.8	471.5	895.8	1330.9	1548.5
13.000	1520.2	1324.6	1072.8	850.1	676.4	547.2	455.9
14.400	394.9	355.8	330.0	313.1	300.3	286.4	267.6

15.800	246.5	227.1	211.8	201.5	195.4	191.5	189.1
17.200	187.7	187.0	186.7	186.6	186.6	184.9	178.2
18.600	163.3	144.3	126.0	111.2	101.1	94.5	90.1
20.000	87.0	85.1	83.8	83.0	82.4	82.1	81.8
21.400	81.7	81.6	81.7	81.7	81.8	81.9	81.9
22.800	82.0	82.1	82.2	82.3	82.3	82.3	82.3
24.200	81.0	75.6	64.2	49.4	35.2	23.7	15.8
25.600	10.6	7.1	4.6	2.9	1.9	1.0	0.6
27.000	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
CON-1	2.693	Downstream	2.235	364.32	12.98	1500.7	557.16

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Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.000	0.2	1.7	3.4	6.0	9.5	13.8	18.7
10.400	24.5	30.7	37.1	43.6	50.6	60.5	77.2
11.800	106.8	170.8	334.9	657.9	1072.8	1388.8	1499.3
13.200	1413.7	1212.8	988.5	791.7	636.2	520.4	439.3
14.600	385.2	349.5	325.9	309.6	295.5	278.8	259.2
16.000	239.4	221.9	208.8	200.1	194.5	191.0	188.8
17.400	187.6	187.0	186.7	186.6	185.9	181.8	171.4
18.800	155.3	137.3	120.9	108.2	99.4	93.4	89.3
20.200	86.6	84.8	83.6	82.9	82.3	82.0	81.8
21.600	81.7	81.7	81.7	81.8	81.8	81.9	81.9
23.000	82.0	82.1	82.2	82.3	82.3	82.3	81.7
24.400	78.5	70.4	57.9	44.0	31.2	21.3	14.4
25.800	9.7	6.5	4.1	2.7	1.5	0.9	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA1	0.090		2.645		12.19	146.8	1630.38

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.400	0.0	0.6	0.8	0.9	1.4	1.9	2.2
9.800	2.5	2.8	3.1	3.3	3.6	3.6	3.8
11.200	6.7	9.1	11.8	24.3	65.4	146.4	83.1
12.600	45.1	24.0	20.3	14.1	10.1	9.7	10.1
14.000	10.1	10.2	10.3	10.3	10.3	10.4	8.3
15.400	6.9	6.8	6.7	6.7	6.8	6.8	6.8
16.800	6.8	6.9	6.8	6.9	6.8	6.9	6.9
18.200	4.6	3.2	2.9	3.0	2.9	3.0	2.9
19.600	3.0	2.9	3.0	3.0	2.9	3.0	2.9
21.000	3.0	2.9	3.0	3.0	3.0	3.0	3.0
22.400	3.0	3.0	3.0	3.0	3.0	3.0	3.0
23.800	3.0	3.0	1.3	0.0			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	2.783		2.249		12.97	1520.5	546.28

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	Flow Values @ time increment of 0.200 hr						
8.400	0.0	0.6	0.8	1.1	3.1	5.4	8.3
9.800	12.1	16.6	21.8	27.8	34.2	40.7	47.5
11.200	57.3	69.6	89.1	131.1	236.2	481.6	741.3
12.600	1118.0	1412.9	1519.7	1427.5	1222.8	998.0	801.7
14.000	646.2	530.6	449.5	395.5	359.8	336.2	317.9

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	Flow Values @ time increment of 0.200 hr						
15.400	302.4	285.6	265.9	246.1	228.7	215.6	206.9
16.800	201.3	197.8	195.6	194.5	193.8	193.6	193.5
18.200	190.5	185.0	174.3	158.3	140.2	123.9	111.1
19.600	102.3	96.3	92.2	89.6	87.7	86.6	85.8
21.000	85.4	84.9	84.8	84.6	84.6	84.7	84.8
22.400	84.8	84.9	85.0	85.0	85.2	85.2	85.3
23.800	85.3	85.4	83.0	78.5	70.4	58.0	44.0
25.200	31.3	21.4	14.4	9.7	6.5	4.1	2.7
26.600	1.5	0.9	0.0				

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Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA4	0.450		3.530		12.76	434.7	965.82

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	Flow Values @ time increment of 0.200 hr						
7.600	0.4	1.1	1.9	2.8	3.8	4.8	5.8
9.000	6.8	7.9	9.4	11.7	14.2	16.7	19.0
10.400	21.1	23.0	24.8	26.2	28.3	32.9	41.8
11.800	57.2	91.6	173.6	303.5	408.9	431.7	385.6
13.200	307.1	238.3	184.1	143.6	115.1	96.8	85.9
14.600	79.2	75.0	72.4	70.2	67.0	62.0	56.9
16.000	52.7	49.9	48.3	47.4	46.8	46.4	46.2
17.400	46.1	46.1	46.1	46.2	45.6	43.3	38.6
18.800	33.3	28.7	25.5	23.6	22.4	21.6	21.2
20.200	20.8	20.7	20.6	20.5	20.4	20.4	20.4
21.600	20.5	20.4	20.4	20.5	20.5	20.5	20.5
23.000	20.5	20.6	20.6	20.5	20.5	20.6	20.2
24.400	18.3	14.6	10.3	6.6	4.1	2.6	1.6
25.800	1.0	0.6	0.0				

Area or Drainage Rain Gage Runoff ------------ Peak Flow ------------

Reach Identifier	Area (sq mi)	ID or Location	Amount (in)	Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA2	1.323		3.430		12.92	1093.4	826.46

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.600	0.0	0.9	2.1	3.9	6.0	8.5	11.1
9.000	13.8	16.8	20.5	25.4	31.3	37.8	44.3
10.400	50.6	56.4	61.7	66.5	72.1	81.8	99.6
11.800	131.5	201.3	359.8	617.5	899.5	1064.6	1080.5
13.200	977.4	810.7	650.3	521.2	423.3	351.2	300.5

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
14.600	267.3	244.9	229.7	218.5	208.0	195.4	181.2
16.000	167.4	155.6	147.2	142.3	139.1	136.9	135.5
17.400	134.7	134.2	134.1	134.0	132.9	128.8	119.8
18.800	107.5	94.9	83.9	75.8	70.5	66.9	64.4
20.200	62.7	61.5	60.8	60.3	59.9	59.6	59.5
21.600	59.4	59.4	59.3	59.3	59.4	59.5	59.5
23.000	59.5	59.6	59.6	59.6	59.7	59.7	58.9
24.400	55.7	48.6	38.7	28.6	19.9	13.5	9.3
25.800	6.4	4.4	3.0	2.0	1.4	0.9	0.6
27.200	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		2.845		12.83	665.3	722.99

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.000	0.1	1.2	2.5	4.4	7.0	10.1	13.3
10.400	16.6	19.9	23.1	26.0	29.6	35.6	46.6
11.800	65.9	110.6	218.3	400.6	581.0	661.3	638.5
13.200	545.6	437.1	346.4	275.4	222.9	186.8	163.6
14.600	149.2	139.8	133.7	129.2	123.9	116.0	106.8
16.000	98.7	92.8	89.2	87.1	85.7	84.9	84.4
17.400	84.1	84.1	84.2	84.3	83.6	80.3	73.2
18.800	64.3	56.0	49.4	45.2	42.5	40.8	39.6
20.200	38.8	38.4	38.1	37.9	37.7	37.7	37.7
21.600	37.7	37.7	37.7	37.7	37.8	37.8	37.9
23.000	37.9	38.0	38.0	38.0	38.0	38.1	37.5
24.400	34.7	29.0	21.8	15.1	9.8	6.5	4.3
25.800	2.8	1.8	1.2	0.8	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Upstream	3.247	364.98	12.83	2173.2	806.86

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.600	0.4	2.1	4.0	6.7	9.8	13.3	16.9
9.000	20.8	25.9	32.4	41.5	52.6	64.6	76.7
10.400	88.3	99.3	109.5	118.8	129.9	150.3	188.0
11.800	256.1	403.6	754.2	1321.6	1885.4	2157.1	2100.7
13.200	1829.9	1486.1	1181.0	941.3	761.9	635.2	550.0
14.600	495.9	459.8	435.9	417.9	398.9	373.4	345.1
16.000	318.9	298.4	284.8	276.8	271.6	268.2	266.0

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Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
17.400	264.8	264.4	264.4	264.5	262.0	252.4	231.5
18.800	205.1	179.6	158.8	144.6	135.4	129.4	125.2
20.200	122.4	120.6	119.5	118.7	118.0	117.7	117.6
21.600	117.6	117.5	117.4	117.5	117.7	117.8	117.9
23.000	118.0	118.2	118.2	118.2	118.2	118.3	116.5
24.400	108.7	92.1	70.9	50.4	34.0	22.6	15.2
25.800	10.2	6.8	4.5	2.8	1.9	0.9	0.6
27.200	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	3.247	364.92	12.97	2076.7	771.04

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.600	0.0	1.0	2.9	5.2	8.0	11.3	14.8
9.000	18.5	23.1	28.8	36.6	46.5	57.8	69.6
10.400	81.4	92.6	103.3	113.1	123.4	139.5	168.6
11.800	220.9	327.8	579.0	1029.1	1571.2	1959.4	2071.6
13.200	1936.6	1659.9	1357.6	1092.1	880.3	722.1	610.5
14.600	536.3	486.7	453.7	430.7	410.8	387.7	361.1
16.000	334.4	311.4	294.1	282.8	275.5	270.8	267.7
17.400	265.8	264.9	264.6	264.5	263.2	257.0	241.8
18.800	219.1	194.3	171.7	154.2	142.0	133.8	128.2
20.200	124.4	121.9	120.3	119.3	118.5	118.0	117.7
21.600	117.6	117.5	117.5	117.5	117.6	117.7	117.8
23.000	117.9	118.1	118.2	118.2	118.2	118.3	117.3
24.400	112.4	100.3	82.1	62.2	44.2	30.3	20.5
25.800	13.9	9.3	6.2	3.9	2.6	1.5	0.9
27.200	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		3.731		12.19	187.5	2082.06

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Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.000	0.0	0.6	0.9	1.1	1.3	1.6	1.8
8.400	2.0	2.2	2.4	2.6	3.6	4.5	5.0
9.800	5.3	5.7	6.0	6.4	6.6	6.6	6.8
11.200	11.7	15.6	19.7	38.5	91.8	186.5	107.9
12.600	60.8	32.9	28.2	19.3	13.8	13.2	13.7
14.000	13.9	13.9	13.9	13.9	14.1	14.1	11.4
15.400	9.6	9.3	9.3	9.3	9.5	9.4	9.4

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Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.800	9.4	9.4	9.4	9.6	9.5	9.5	9.5
18.200	6.4	4.5	4.2	4.1	4.1	4.1	4.3
19.600	4.2	4.1	4.1	4.3	4.2	4.2	4.2
21.000	4.2	4.2	4.2	4.2	4.2	4.3	4.2
22.400	4.2	4.2	4.3	4.2	4.2	4.2	4.2
23.800	4.3	4.2	1.8	0.0			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	2.783		3.262		12.98	2103.7	755.80

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.000	0.0	0.6	0.9	1.1	2.3	4.4	7.0
8.400	10.0	13.5	17.2	21.1	26.7	33.3	41.5
9.800	51.8	63.5	75.6	87.7	99.3	109.9	119.9
11.200	135.2	155.1	188.3	259.4	419.7	765.6	1137.5
12.600	1632.2	1992.4	2099.8	1955.9	1673.4	1370.7	1105.7
14.000	894.1	736.0	624.7	550.2	500.7	467.8	442.1
15.400	420.4	397.0	370.4	343.7	320.9	303.6	292.2
16.800	284.9	280.2	277.1	275.4	274.4	274.0	274.0
18.200	269.6	261.5	246.0	223.3	198.4	175.8	158.5
19.600	146.2	138.0	132.4	128.7	126.1	124.5	123.4
21.000	122.7	122.2	121.9	121.8	121.7	121.8	121.7
22.400	121.8	121.9	122.1	122.1	122.3	122.4	122.4
23.800	122.5	122.5	119.2	112.4	100.3	82.2	62.2
25.200	44.2	30.3	20.5	13.9	9.3	6.2	4.0
26.600	2.6	1.5	0.9	0.0			

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Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA4	0.450		4.512		12.75	526.7	1170.14

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)

6.800	0.0	1.0	1.9	3.2	4.5	6.0	7.5
8.200	8.9	10.4	11.8	13.2	14.5	16.0	18.2
9.600	21.4	25.0	28.6	31.7	34.4	36.8	38.8
11.000	40.4	42.9	49.1	61.6	82.8	127.3	226.8
12.400	378.3	499.3	522.8	466.8	374.3	292.6	226.9
13.800	177.5	142.6	120.3	107.0	98.9	93.8	90.5
15.200	87.9	83.9	78.0	71.9	66.9	63.6	61.6

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.600	60.3	59.6	59.2	59.0	58.8	58.8	58.8
18.000	58.9	58.2	55.2	49.2	42.4	36.5	32.5
19.400	30.1	28.5	27.5	26.9	26.5	26.3	26.1
20.800	26.0	25.9	25.9	25.9	25.9	26.0	26.0
22.200	26.0	26.0	26.0	26.1	26.1	26.1	26.1
23.600	26.1	26.1	26.1	25.6	23.2	18.5	13.1
25.000	8.4	5.3	3.3	2.1	1.3	0.8	0.5
26.400	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA2	1.323		4.401		12.93	1337.3	1010.82

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.800	0.0	0.8	2.1	4.3	7.1	10.5	14.3
8.200	18.3	22.3	26.3	30.2	34.1	38.3	43.6
9.600	50.7	59.4	68.8	77.9	86.3	93.8	100.5
11.000	106.2	113.0	125.9	150.7	194.6	285.5	481.3
12.400	788.6	1118.2	1306.8	1320.1	1196.0	995.4	802.5
13.800	644.9	525.0	436.5	374.3	333.6	306.4	287.7
15.200	273.9	260.9	245.6	228.5	212.0	197.9	187.6
16.600	181.5	177.6	175.0	173.3	172.4	171.8	171.5
18.000	171.3	170.0	164.8	153.3	137.5	121.2	107.1
19.400	96.8	90.0	85.4	82.2	80.0	78.5	77.5
20.800	76.7	76.2	75.9	75.7	75.6	75.6	75.6
22.200	75.6	75.6	75.7	75.8	75.8	75.8	75.9
23.600	75.9	76.0	76.0	74.9	70.8	61.8	49.3
25.000	36.5	25.4	17.2	11.8	8.1	5.5	3.8
26.400	2.6	1.7	1.2	0.8	0.5	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		3.744		12.84	840.4	913.21

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.000	0.1	1.3	2.5	4.2	6.2	8.3	10.7

9.400	13.6	17.7	22.4	27.5	32.5	37.2	41.6
10.800	45.7	49.3	53.8	62.5	78.8	107.6	168.1
12.200	306.6	527.9	743.4	835.6	804.7	688.0	554.0
13.600	440.8	350.6	284.3	238.2	209.0	190.8	178.9
15.000	171.2	165.4	158.7	148.9	137.7	127.8	120.5
16.400	116.1	113.3	111.6	110.6	110.0	109.7	109.6

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
17.800	109.6	109.7	108.8	104.5	95.3	83.7	72.8
19.200	64.3	58.8	55.3	52.9	51.4	50.4	49.8
20.600	49.4	49.1	48.9	48.8	48.7	48.7	48.8
22.000	48.9	48.9	49.0	49.0	49.0	49.1	49.1
23.400	49.2	49.2	49.2	49.3	48.4	44.9	37.6
24.800	28.3	19.5	12.8	8.4	5.5	3.6	2.4
26.200	1.5	1.0	0.6	0.0			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Upstream	4.195	365.33	12.82	2676.1	993.58

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.800	0.0	1.8	4.1	7.4	11.7	16.6	22.0
8.200	28.5	35.2	42.3	49.5	56.9	65.0	75.4
9.600	89.8	106.9	124.8	142.0	157.9	172.2	185.0
11.000	196.0	209.8	237.6	291.2	386.2	583.6	1017.3
12.400	1694.9	2359.2	2662.8	2586.7	2256.3	1842.0	1470.4
13.800	1174.5	952.6	795.1	690.8	623.4	579.1	549.5
15.200	527.2	503.4	472.5	438.1	406.8	382.1	365.3
16.600	355.1	348.8	344.8	342.3	340.9	340.2	340.0
18.000	339.9	336.9	324.3	297.8	263.6	230.5	204.1
19.400	185.7	173.8	165.9	160.5	156.9	154.6	153.0
20.800	151.8	151.0	150.6	150.4	150.3	150.4	150.4
22.200	150.5	150.6	150.7	150.8	151.0	151.1	151.2
23.600	151.3	151.4	151.3	148.8	138.8	117.8	90.7
25.000	64.5	43.5	28.9	19.5	13.1	8.8	5.8
26.400	3.6	2.4	1.2	0.8	0.5	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	4.195	365.26	12.96	2574.1	955.72

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.800	0.0	0.9	2.9	5.8	9.6	14.1	19.2
8.200	25.2	31.7	38.5	45.7	53.0	60.7	70.1
9.600	82.7	98.3	115.5	132.8	149.2	164.3	177.9
11.000	189.8	202.5	224.3	266.0	341.4	490.5	818.0

12.400	1374.1	2021.3	2459.9	2563.9	2379.1	2034.6	1665.3
13.800	1341.9	1084.1	891.9	757.4	667.8	608.6	569.2
15.200	541.4	516.8	488.3	455.8	423.7	396.2	375.6
16.600	361.9	353.1	347.6	344.0	341.9	340.7	340.2

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
18.000	340.0	338.3	329.9	309.8	280.1	247.7	218.9
19.400	196.8	181.4	171.1	164.0	159.3	156.1	154.0
20.800	152.6	151.5	150.9	150.5	150.4	150.4	150.4
22.200	150.5	150.6	150.7	150.8	150.9	151.0	151.1
23.600	151.2	151.3	151.3	149.9	143.2	127.4	103.8
25.000	78.2	55.3	37.8	25.5	17.2	11.6	7.8
26.400	4.9	3.2	1.9	1.1	0.7	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		4.734		12.19	218.5	2427.19

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.400	0.2	0.9	1.2	1.6	1.9	2.3	2.6
7.800	2.9	3.2	3.5	3.7	4.0	4.2	4.5
9.200	6.0	7.3	7.8	8.3	8.7	9.1	9.4
10.600	9.7	9.5	9.7	16.8	22.3	27.5	51.4
12.000	113.4	217.3	127.7	73.9	41.2	35.5	24.2
13.400	17.1	16.4	17.1	17.3	17.4	17.4	17.4
14.800	17.4	17.5	14.3	12.2	11.9	12.0	11.9
16.200	11.9	12.0	12.0	11.9	12.0	12.0	12.1
17.600	12.0	12.1	12.0	8.2	5.6	5.3	5.3
19.000	5.2	5.3	5.3	5.2	5.3	5.3	5.2
20.400	5.3	5.3	5.3	5.2	5.3	5.3	5.3
21.800	5.3	5.3	5.3	5.4	5.3	5.3	5.4
23.200	5.3	5.3	5.4	5.4	5.3	2.3	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		4.213		12.96	2609.6	937.56

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.400	0.2	0.9	1.2	2.5	4.8	8.1	12.1
7.800	17.0	22.3	28.7	35.4	42.5	49.9	57.4
9.200	66.7	77.4	90.5	106.6	124.2	141.9	158.6
10.600	174.0	187.4	199.5	219.3	246.6	293.6	392.8
12.000	604.0	1035.4	1502.2	2095.3	2501.2	2599.4	2403.2
13.400	2051.5	1681.6	1358.9	1101.2	909.2	774.8	685.2
14.800	626.0	586.6	555.7	528.9	500.2	467.7	435.5
16.200	408.1	387.5	373.9	365.0	359.5	356.1	354.0

17.600	352.7	352.3	352.1	346.5	335.5	315.1	285.4
19.000	253.0	224.2	202.1	186.7	176.4	169.3	164.5

Eccelston Mitigation POI 1-4 Ultimate

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
20.400	161.5	159.3	157.9	156.8	156.2	155.8	155.6
21.800	155.7	155.7	155.7	155.9	156.0	156.0	156.3
23.200	156.3	156.4	156.6	156.7	156.6	152.3	143.2
24.600	127.4	103.8	78.2	55.3	37.8	25.6	17.2
26.000	11.6	7.8	4.9	3.2	1.9	1.1	0.7
27.400	0.0						

STORM 100_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA4	0.450		5.658		12.72	622.1	1382.12

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.200	0.3	1.1	2.2	3.9	5.9	8.0	10.1
7.600	12.2	14.3	16.3	18.3	20.1	21.9	23.7
9.000	25.3	27.2	30.2	34.5	39.4	44.1	48.1
10.400	51.4	54.3	56.6	58.2	60.9	69.0	85.6
11.800	113.1	168.3	285.8	457.6	592.4	618.7	552.5
13.200	446.0	351.2	273.6	214.3	172.6	146.3	130.7
14.600	121.1	115.1	111.3	108.2	103.5	96.6	89.4
16.000	83.5	79.6	77.2	75.8	75.0	74.5	74.2
17.400	74.0	74.0	74.0	74.0	73.2	69.4	61.9
18.800	53.3	45.9	40.9	37.8	35.8	34.6	33.9
20.200	33.4	33.1	32.9	32.8	32.7	32.7	32.7
21.600	32.7	32.7	32.7	32.8	32.8	32.8	32.8
23.000	32.8	32.8	32.8	32.8	32.8	32.9	32.2
24.400	29.2	23.2	16.4	10.5	6.6	4.2	2.6
25.800	1.7	1.0	0.6	0.0			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA2	1.323		5.538		12.89	1593.4	1204.38

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.200	0.0	1.0	2.6	5.4	9.5	14.3	19.7
7.600	25.4	31.2	36.9	42.5	48.1	53.4	58.6
9.000	63.6	69.0	76.0	85.8	97.7	110.2	122.3
10.400	133.1	142.4	150.3	156.7	164.5	180.3	213.1
11.800	272.0	385.7	621.0	980.4	1353.7	1567.3	1570.2
13.200	1421.4	1189.4	964.7	779.5	635.3	529.3	456.1
14.600	407.7	375.3	353.5	337.2	321.9	303.7	283.6

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Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	------------ Flow Values @ time increment of 0.200 hr ------------						
16.000	264.0	247.3	235.4	228.1	223.4	220.4	218.4
17.400	217.2	216.5	216.1	216.0	214.3	207.6	193.1
18.800	173.3	152.7	135.1	122.0	113.5	107.7	103.6
20.200	100.9	99.0	97.7	96.9	96.3	95.9	95.6
21.600	95.5	95.4	95.3	95.4	95.5	95.5	95.5
23.000	95.6	95.6	95.6	95.7	95.7	95.7	94.4
24.400	89.2	77.8	62.1	46.0	32.0	21.6	14.9
25.800	10.2	7.0	4.8	3.2	2.2	1.5	1.0
27.200	0.6	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DA3	0.920		4.812		12.81	1025.9	1114.81

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	------------ Flow Values @ time increment of 0.200 hr ------------						
7.200	0.3	1.4	3.1	5.4	8.2	11.3	14.4
8.600	17.7	20.9	24.0	27.4	31.9	37.9	45.0
10.000	52.3	59.2	65.4	71.1	76.1	80.1	85.4
11.400	96.7	120.0	159.5	239.4	410.4	673.2	919.4
12.800	1024.0	978.8	840.0	680.0	542.8	433.3	352.0
14.200	295.6	260.2	238.1	223.8	214.4	207.4	199.4
15.600	187.6	174.0	162.1	153.4	148.0	144.7	142.6
17.000	141.4	140.7	140.4	140.2	140.3	140.4	139.1
18.400	133.6	121.8	107.0	93.0	82.2	75.2	70.7
19.800	67.7	65.8	64.5	63.7	63.2	62.8	62.6
21.200	62.5	62.4	62.4	62.4	62.5	62.5	62.6
22.600	62.7	62.7	62.7	62.8	62.8	62.8	62.9
24.000	62.9	61.8	57.4	47.9	36.1	25.0	16.2
25.400	10.7	7.0	4.6	3.0	2.0	1.3	0.8
26.800	0.5	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
CON-1	2.693	Upstream	5.310	365.69	12.87	3215.2	1193.73

Line Start Time (hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	------------ Flow Values @ time increment of 0.200 hr ------------						
6.200	0.3	2.0	4.9	9.3	15.3	22.6	31.3
7.600	40.8	50.9	61.5	72.1	82.6	93.0	103.1
9.000	113.0	123.7	138.1	158.2	182.1	206.6	229.6
10.400	249.9	267.8	283.0	295.0	310.7	346.9	418.8
11.800	544.7	793.5	1322.7	2110.6	2862.3	3207.4	3099.1
13.200	2706.9	2221.4	1781.6	1427.4	1160.2	972.2	847.2

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   Line
Start Time   ------------ Flow Values @ time increment of  0.200 hr ------------
      (hr)     (cfs)      (cfs)      (cfs)      (cfs)      (cfs)      (cfs)      (cfs)

    14.600     767.3      714.3      679.3      652.8      624.6      587.9      547.0
    16.000     509.5      480.4      460.7      448.7      441.0      436.3      433.3
    17.400     431.6      430.7      430.4      430.3      426.4      410.5      376.8
    18.800     333.5      291.6      258.2      235.3      220.1      210.0      203.3
    20.200     198.8      195.7      193.8      192.5      191.6      191.1      190.7
    21.600     190.6      190.5      190.5      190.7      190.8      191.0      191.0
    23.000     191.1      191.2      191.2      191.3      191.4      191.5      188.2
    24.400     175.5      148.9      114.6       81.5       54.9       36.6       24.6
    25.800      16.5       11.0        7.4        4.7        3.0        1.9        1.0
    27.200       0.6        0.0

Area or    Drainage  Rain Gage     Runoff   ------------ Peak Flow ------------
 Reach       Area     ID or        Amount   Elevation   Time        Rate       Rate
Identifier  (sq mi)   Location      (in)       (ft)     (hr)       (cfs)      (csm)

CON-1         2.693 Downstream     5.310    365.62     12.94     3101.4    1151.47

   Line
Start Time   ------------ Flow Values @ time increment of  0.200 hr ------------
      (hr)     (cfs)      (cfs)      (cfs)      (cfs)      (cfs)      (cfs)      (cfs)

     6.200       0.0        1.0        3.5        7.3       12.6       19.2       27.3
     7.600      36.3       46.0       56.3       66.9       77.4       87.9       98.1
     9.000     108.1      118.5      131.4      149.1      171.0      194.9      218.2
    10.400     239.6      258.6      275.1      288.6      303.0      331.2      387.8
    11.800     489.7      684.9     1098.2     1765.3     2507.7     2998.1     3085.1
    13.200    2843.9     2430.4     1993.9     1610.4     1304.7     1078.3      920.4
    14.600     815.7      746.3      700.5      668.2      639.2      605.2      566.3
    16.000     528.1      495.8      471.8      456.0      445.7      439.2      435.1
    17.400     432.7      431.3      430.7      430.4      428.0      417.0      390.9
    18.800     352.9      311.7      275.5      248.1      229.0      216.0      207.3
    20.200     201.5      197.5      195.0      193.3      192.1      191.4      190.9
    21.600     190.7      190.5      190.5      190.6      190.8      190.9      190.9
    23.000     191.0      191.1      191.2      191.3      191.4      191.4      189.5
    24.400     180.7      160.0      129.9       97.4       68.6       46.8       31.6
    25.800      21.3       14.3        9.6        6.3        4.0        2.6        1.4
    27.200       0.9        0.0

Area or    Drainage  Rain Gage     Runoff   ------------ Peak Flow ------------
 Reach       Area     ID or        Amount   Elevation   Time        Rate       Rate
Identifier  (sq mi)   Location      (in)       (ft)     (hr)       (cfs)      (csm)

DA1           0.090                5.897               12.19      249.3    2768.55

   Line
Start Time   ------------ Flow Values @ time increment of  0.200 hr ------------
      (hr)     (cfs)      (cfs)      (cfs)      (cfs)      (cfs)      (cfs)      (cfs)

     5.800       0.0        0.6        1.2        2.0        2.5        3.0        3.5
     7.200       3.9        4.3        4.7        5.1        5.4        5.7        6.1
     8.600       6.3        6.7        7.0        9.1       10.8       11.5       12.0
    10.000      12.5       12.9       13.2       13.5       13.0       13.1       23.0
```

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.400	30.2	36.7	65.9	135.9	247.6	148.0	88.1
12.800	50.4	43.8	29.7	20.6	19.8	21.0	21.2
14.200	21.3	21.4	21.4	21.5	21.5	17.8	15.2
15.600	15.0	14.9	15.0	15.0	14.9	15.1	14.9
17.000	15.0	15.0	15.1	15.1	15.1	15.1	10.2
18.400	7.2	6.6	6.7	6.6	6.6	6.6	6.6
19.800	6.7	6.5	6.7	6.6	6.6	6.6	6.6
21.200	6.7	6.6	6.7	6.6	6.7	6.7	6.6
22.600	6.7	6.6	6.7	6.6	6.7	6.8	6.6
24.000	6.7	2.9	0.0				

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		5.329		12.94	3144.3	1129.65

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
5.800	0.0	0.6	1.2	3.0	6.1	10.3	16.1
7.200	23.1	31.6	41.0	51.1	61.8	72.6	83.5
8.600	94.2	104.8	115.0	127.6	142.3	160.5	183.0
10.000	207.3	231.1	252.8	272.1	288.0	301.6	326.0
11.400	361.4	424.5	555.7	820.8	1346.0	1913.5	2595.9
12.800	3048.5	3128.9	2873.5	2450.8	2013.5	1631.3	1325.9
14.200	1099.6	941.7	837.0	767.8	722.1	686.0	654.4
15.600	620.1	581.2	543.0	510.7	486.7	471.0	460.6
17.000	454.3	450.2	447.8	446.4	445.8	445.5	438.3
18.400	424.2	397.4	359.5	318.3	282.1	254.6	235.6
19.800	222.7	213.9	208.2	204.2	201.6	199.8	198.8
21.200	198.1	197.5	197.4	197.2	197.2	197.4	197.3
22.600	197.6	197.6	197.7	197.7	197.8	198.0	198.0
24.000	198.2	192.4	180.9	160.1	129.9	97.4	68.6
25.400	46.8	31.6	21.3	14.3	9.6	6.3	4.0
26.800	2.6	1.4	0.9	0.0			

STORM 500_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA4	0.450		9.089		12.71	853.7	1896.50

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.000	0.0	0.7	1.4	2.3	3.3	4.4	5.4
5.400	6.5	7.5	8.5	9.5	10.9	13.7	18.5

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Line

Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.800	24.3	30.3	35.6	40.3	44.5	48.3	51.7
8.200	54.9	57.9	60.6	63.3	65.7	68.6	73.4
9.600	80.8	89.1	96.7	102.8	107.6	111.5	114.2
11.000	115.1	117.8	131.2	160.4	206.9	288.7	444.1
12.400	658.1	819.9	848.0	764.7	629.7	506.1	399.9
13.800	316.4	256.8	219.9	198.7	185.6	177.3	172.1
15.200	167.8	161.4	152.0	142.4	134.3	129.0	125.8
16.600	123.9	122.7	122.1	121.7	121.7	121.7	121.6
18.000	121.5	120.0	113.7	101.3	87.2	75.1	66.9
19.400	61.9	58.7	56.7	55.4	54.6	54.1	53.8
20.800	53.6	53.4	53.4	53.4	53.4	53.4	53.4
22.200	53.4	53.4	53.4	53.4	53.5	53.5	53.6
23.600	53.5	53.5	53.5	52.4	47.5	37.9	26.8
25.000	17.2	10.7	6.8	4.3	2.7	1.7	1.0
26.400	0.6	0.0					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA2	1.323		8.948		12.92	2229.0	1684.87

Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.200	0.4	1.4	2.9	4.9	7.3	10.0	12.8
5.600	15.6	18.5	21.4	25.0	30.6	40.2	53.2
7.000	67.9	82.8	96.9	109.7	121.5	132.3	142.4
8.400	151.8	160.6	168.8	176.7	185.2	196.6	213.1
9.800	233.4	254.4	273.9	290.6	304.1	314.5	321.2
11.200	330.1	355.0	411.2	509.9	686.6	1008.7	1470.5
12.600	1936.0	2193.8	2199.4	2004.5	1702.1	1399.9	1141.5
14.000	939.6	789.6	685.3	619.0	574.6	544.0	521.4
15.400	500.1	475.2	447.5	420.9	398.3	382.0	372.2
16.800	365.7	361.5	359.0	357.6	356.9	356.4	355.8
18.200	352.6	341.6	317.4	284.7	251.0	222.0	200.7
19.600	186.5	176.8	170.1	165.5	162.3	160.3	158.8
21.000	157.8	157.2	156.8	156.6	156.4	156.3	156.2
22.400	156.2	156.2	156.3	156.3	156.4	156.5	156.6
23.800	156.6	156.5	154.3	145.9	127.2	101.5	75.1
25.200	52.3	35.5	24.3	16.7	11.4	7.8	5.3
26.600	3.6	2.4	1.6	1.0	0.6	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA3	0.920		8.077		12.84	1497.0	1626.71

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Line Start Time (hr)	Flow Values @ time increment of 0.200 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)

5.400	0.0	0.8	1.7	2.9	4.5	7.3	11.9
6.800	18.1	25.4	33.0	40.5	47.9	54.9	61.7
8.200	68.1	74.3	80.2	85.8	91.2	97.2	105.2
9.600	116.9	130.5	144.0	156.2	166.3	174.9	181.8
11.000	186.1	192.5	212.5	255.6	328.4	457.3	700.8
12.400	1049.8	1368.9	1493.1	1430.6	1239.6	1020.8	825.7
13.800	664.1	543.0	459.4	407.8	376.1	355.2	341.7
15.200	331.4	319.7	303.1	284.2	267.6	255.4	247.9
16.600	243.2	240.2	238.5	237.7	237.4	237.3	237.2
18.000	237.1	234.7	225.3	205.1	180.1	156.7	138.3
19.400	126.6	118.9	113.9	110.5	108.3	106.9	106.0
20.800	105.4	105.0	104.9	104.8	104.8	104.7	104.7
22.200	104.8	104.8	104.9	104.9	105.0	105.1	105.2
23.600	105.2	105.2	105.2	103.4	95.8	80.2	60.3
25.000	41.7	27.2	17.8	11.8	7.7	5.0	3.3
26.400	2.1	1.4	0.9	0.5	0.0		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Upstream	8.674	366.44	12.85	4550.9	1689.65

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.000	0.0	1.2	2.9	5.2	8.2	11.7	15.4
5.400	19.2	24.0	28.8	33.9	40.5	51.8	70.6
6.800	95.7	123.5	151.4	177.7	202.0	224.6	245.7
8.200	265.4	283.9	301.4	317.9	333.7	351.0	375.4
9.600	410.9	453.0	495.1	532.9	564.4	590.5	610.3
11.000	622.4	640.8	698.8	828.7	1047.2	1432.9	2153.6
12.400	3178.8	4116.4	4531.6	4392.5	3871.9	3229.7	2626.7
13.800	2123.4	1739.8	1469.3	1293.2	1180.9	1107.5	1057.9
15.200	1020.6	981.3	930.3	874.2	822.9	782.8	756.0
16.600	739.4	728.7	722.1	718.4	716.7	715.8	715.2
18.000	714.5	707.3	680.0	623.7	552.1	482.9	427.4
19.400	389.2	364.2	347.4	336.0	328.4	323.4	320.1
20.800	317.8	316.3	315.4	314.9	314.7	314.5	314.4
22.200	314.3	314.5	314.5	314.6	314.8	315.0	315.3
23.600	315.4	315.4	315.2	310.2	289.0	244.9	188.6
25.000	134.1	90.3	60.2	40.5	27.2	18.2	12.1
26.400	8.1	5.1	3.3	2.0	1.0	0.7	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
CON-1	2.693	Downstream	8.674	366.37	12.92	4417.7	1640.22

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.200	0.5	2.2	4.3	7.0	10.3	13.9	17.6

5.600	22.1	26.8	31.7	37.8	47.4	63.4	85.9
7.000	112.2	139.7	166.4	191.4	214.8	236.5	256.8
8.400	275.8	293.8	310.7	326.8	343.7	365.7	397.1
9.800	436.2	477.6	516.5	550.3	578.6	601.0	616.3
11.200	632.8	677.6	781.4	964.8	1285.8	1884.3	2787.5
12.600	3728.9	4307.8	4382.5	4030.7	3469.6	2876.7	2345.3
14.000	1917.4	1600.3	1383.1	1240.0	1146.2	1083.7	1039.4
15.400	998.9	951.0	897.2	844.9	801.0	769.1	748.0
16.800	734.4	725.7	720.5	717.8	716.4	715.5	714.8
18.200	709.9	689.6	644.1	579.8	511.6	452.1	407.6
19.600	376.9	356.0	341.9	332.3	326.0	321.8	319.0
21.000	317.1	315.9	315.2	314.9	314.6	314.5	314.4
22.400	314.5	314.5	314.6	314.7	314.9	315.2	315.3
23.800	315.3	315.3	312.0	296.4	260.8	210.3	156.7
25.200	109.7	74.7	50.5	34.0	22.8	15.2	10.2
26.600	6.6	4.2	2.7	1.5	0.9	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
DA1	0.090		9.368		12.18	315.9	3508.55

Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
3.600	0.0	0.7	1.0	1.2	1.5	1.7	2.0
5.000	2.1	2.4	2.6	2.8	3.0	3.2	5.8
6.400	8.2	9.2	10.0	10.7	11.5	12.1	12.6
7.800	13.2	13.7	14.2	14.6	15.0	15.4	15.8
9.200	19.6	22.5	23.2	23.9	24.4	24.9	25.4
10.600	25.3	23.5	23.4	41.7	54.5	64.0	105.1
12.000	189.5	313.3	196.7	125.2	76.8	68.2	45.6
13.400	31.2	29.9	32.2	33.0	32.9	33.2	33.0
14.800	33.1	33.2	28.1	24.8	24.4	24.4	24.4
16.200	24.4	24.4	24.4	24.5	24.6	24.7	24.5
17.600	24.5	24.5	24.6	16.5	11.7	10.7	10.9
19.000	10.6	10.8	10.7	10.8	10.8	10.6	10.9
20.400	10.7	10.8	10.8	10.8	10.8	10.9	10.8
21.800	10.7	10.9	10.7	10.8	10.8	10.9	10.8
23.200	10.9	10.8	10.7	10.9	10.7	4.7	0.6
24.600	0.0						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	2.783		8.696		12.93	4484.3	1611.09

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Line Start Time (hr)	------------ Flow Values @ time increment of 0.200 hr ------------ (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
3.600	0.0	0.7	1.0	1.7	3.6	6.0	9.0
5.000	12.4	16.2	20.2	24.8	29.7	34.9	43.6
6.400	55.6	72.7	95.9	123.0	151.2	178.4	204.0

7.800	227.9	250.2	270.9	290.4	308.8	326.2	342.6
9.200	363.2	388.2	420.3	460.0	502.0	541.3	575.6
10.600	603.9	624.6	639.6	674.6	732.1	845.5	1069.9
12.000	1475.9	2197.7	2984.3	3854.2	4384.7	4450.7	4076.1
13.400	3500.6	2906.4	2377.4	1950.4	1633.3	1416.2	1272.9
14.800	1179.3	1116.9	1067.5	1023.7	975.4	921.5	869.2
16.200	825.4	793.5	772.5	758.8	750.2	745.2	742.3
17.600	740.9	740.1	739.4	726.4	701.2	654.9	590.7
19.000	522.3	462.9	418.3	387.7	366.8	352.5	343.2
20.400	336.7	332.6	329.7	327.9	326.7	326.1	325.7
21.800	325.3	325.4	325.0	325.3	325.3	325.4	325.5
23.200	325.8	326.0	326.0	326.3	326.0	316.6	297.0
24.600	260.9	210.4	156.8	109.9	74.8	50.5	34.0
26.000	22.8	15.3	10.2	6.6	4.2	2.7	1.5
27.400	0.9	0.0					

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Eccelston Mitigation POI 1-4 Ultimate

Area or Reach Identifier	Drainage Area (sq mi)	----------- Peak Flow by Storm ----------- 1_yr_sm (cfs)	2_yr_sm (cfs)	5_yr_sm (cfs)	10_yr_sm (cfs)	25_yr_sm (cfs)
DA1	0.090	52.5	77.9	116.5	146.8	187.5
DA4	0.450	97.0	151.7	243.7	322.2	434.7
DA2	1.323	228.3	363.3	597.5	798.4	1093.4
DA3	0.920	96.7	175.5	325.1	459.7	665.3
CON-1	2.693	416.3	682.1	1154.4	1565.7	2173.2

DOWNSTREAM		381.8	645.7	1106.3	1500.7	2076.7
OUTLET	2.783	387.2	655.4	1121.1	1520.5	2103.7

Area or Reach Identifier	Drainage Area (sq mi)	----------- Peak Flow by Storm ----------- 50_yr_sm (cfs)	100_yr_sm (cfs)	500_yr_sm (cfs)	(cfs)	(cfs)
DA1	0.090	218.5	249.3	315.9		
DA4	0.450	526.7	622.1	853.7		
DA2	1.323	1337.3	1593.4	2229.0		
DA3	0.920	840.4	1025.9	1497.0		
CON-1	2.693	2676.1	3215.2	4550.9		
DOWNSTREAM		2574.1	3101.4	4417.7		
OUTLET	2.783	2609.6	3144.3	4484.3		

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Eccelston Mitigation POI 5

SUB-AREA:
          DA5       OUTLET              0.1392984374.       .609          Y


STORM ANALYSIS:
          1_yr_sm                       2.71      1_yr_sm   2         3.28
          2_yr_sm                       3.28      2_yr_sm   2         3.28
          5_yr_sm                       4.22      5_yr_sm   2         3.28
          10_yr_sm                      5.04      10_yr_sm  2         3.28
          25_yr_sm                      6.31      25_yr_sm  2         3.28
          50_yr_sm                      7.43      50_yr_sm  2         3.28
          100_yr_sm                     8.71      100_yr_sm 2         3.28
          500_yr_sm                     12.39     500_yr_sm 2         3.28


RAINFALL DISTRIBUTION:
          1_yr_sm             0.1
                    0.0000    0.0011    0.0022    0.0033    0.0044
                    0.0056    0.0067    0.0078    0.0089    0.0100
                    0.0111    0.0122    0.0133    0.0144    0.0155
                    0.0167    0.0178    0.0189    0.0200    0.0211
                    0.0222    0.0233    0.0244    0.0255    0.0267
                    0.0278    0.0289    0.0300    0.0311    0.0322
                    0.0333    0.0344    0.0355    0.0366    0.0378
                    0.0389    0.0400    0.0411    0.0422    0.0433
                    0.0444    0.0455    0.0466    0.0478    0.0489
                    0.0500    0.0511    0.0522    0.0533    0.0544
                    0.0555    0.0566    0.0578    0.0589    0.0600
                    0.0611    0.0622    0.0633    0.0644    0.0655
                    0.0666    0.0694    0.0721    0.0749    0.0776
                    0.0804    0.0831    0.0859    0.0886    0.0914
                    0.0941    0.0969    0.0996    0.1024    0.1051
                    0.1079    0.1106    0.1134    0.1161    0.1189
                    0.1216    0.1244    0.1271    0.1299    0.1326
                    0.1354    0.1381    0.1409    0.1436    0.1464
                    0.1491    0.1537    0.1584    0.1630    0.1677
                    0.1723    0.1770    0.1816    0.1863    0.1909
                    0.1956    0.2002    0.2049    0.2095    0.2142
                    0.2188    0.2230    0.2271    0.2312    0.2353
                    0.2394    0.2480    0.2566    0.2652    0.2738
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	0.2824	0.2996	0.3169	0.3444	0.3880
	0.5000	0.6120	0.6556	0.6831	0.7004
	0.7176	0.7262	0.7348	0.7434	0.7520
	0.7606	0.7647	0.7688	0.7729	0.7770
	0.7812	0.7858	0.7905	0.7951	0.7998
	0.8044	0.8091	0.8137	0.8184	0.8230
	0.8277	0.8323	0.8370	0.8416	0.8463
	0.8509	0.8536	0.8564	0.8591	0.8619
	0.8646	0.8674	0.8701	0.8729	0.8756
	0.8784	0.8811	0.8839	0.8866	0.8894
	0.8921	0.8949	0.8976	0.9004	0.9031
	0.9059	0.9086	0.9114	0.9141	0.9169
	0.9196	0.9224	0.9251	0.9279	0.9306
	0.9334	0.9345	0.9356	0.9367	0.9378
	0.9389	0.9400	0.9411	0.9422	0.9434
	0.9445	0.9456	0.9467	0.9478	0.9489
	0.9500	0.9511	0.9522	0.9534	0.9545
	0.9556	0.9567	0.9578	0.9589	0.9600
	0.9611	0.9622	0.9634	0.9645	0.9656
	0.9667	0.9678	0.9689	0.9700	0.9711
	0.9722	0.9733	0.9745	0.9756	0.9767
	0.9778	0.9789	0.9800	0.9811	0.9822
	0.9833	0.9845	0.9856	0.9867	0.9878
	0.9889	0.9900	0.9911	0.9922	0.9933
	0.9944	0.9956	0.9967	0.9978	0.9989
	1.0000				
2_yr_sm		0.1			
	0.0000	0.0011	0.0022	0.0033	0.0044
	0.0055	0.0066	0.0077	0.0088	0.0099
	0.0110	0.0121	0.0132	0.0143	0.0154
	0.0166	0.0177	0.0188	0.0199	0.0210
	0.0221	0.0232	0.0243	0.0254	0.0265
	0.0276	0.0287	0.0298	0.0309	0.0320
	0.0331	0.0342	0.0353	0.0364	0.0375
	0.0386	0.0397	0.0408	0.0419	0.0430
	0.0441	0.0452	0.0463	0.0474	0.0486
	0.0497	0.0508	0.0519	0.0530	0.0541
	0.0552	0.0563	0.0574	0.0585	0.0596
	0.0607	0.0618	0.0629	0.0640	0.0651
	0.0662	0.0689	0.0717	0.0744	0.0771
	0.0799	0.0826	0.0853	0.0880	0.0908
	0.0935	0.0962	0.0990	0.1017	0.1044
	0.1072	0.1099	0.1126	0.1153	0.1181
	0.1208	0.1235	0.1263	0.1290	0.1317
	0.1344	0.1372	0.1399	0.1426	0.1454
	0.1481	0.1527	0.1573	0.1619	0.1665
	0.1711	0.1757	0.1802	0.1848	0.1894
	0.1940	0.1986	0.2032	0.2078	0.2124
	0.2170	0.2211	0.2252	0.2293	0.2334
	0.2375	0.2461	0.2547	0.2632	0.2718
	0.2803	0.2982	0.3160	0.3443	0.3888
	0.5000	0.6112	0.6557	0.6840	0.7018
	0.7197	0.7282	0.7368	0.7453	0.7539
	0.7625	0.7666	0.7707	0.7748	0.7789
	0.7830	0.7876	0.7922	0.7968	0.8014
	0.8060	0.8106	0.8152	0.8198	0.8243
	0.8289	0.8335	0.8381	0.8427	0.8473
	0.8519	0.8546	0.8574	0.8601	0.8628
	0.8656	0.8683	0.8710	0.8737	0.8765
	0.8792	0.8819	0.8847	0.8874	0.8901
	0.8928	0.8956	0.8983	0.9010	0.9038
	0.9065	0.9092	0.9120	0.9147	0.9174
	0.9201	0.9229	0.9256	0.9283	0.9311

	0.9338	0.9349	0.9360	0.9371	0.9382
	0.9393	0.9404	0.9415	0.9426	0.9437
	0.9448	0.9459	0.9470	0.9481	0.9492
	0.9503	0.9514	0.9526	0.9537	0.9548
	0.9559	0.9570	0.9581	0.9592	0.9603
	0.9614	0.9625	0.9636	0.9647	0.9658
	0.9669	0.9680	0.9691	0.9702	0.9713
	0.9724	0.9735	0.9746	0.9757	0.9768
	0.9779	0.9790	0.9801	0.9812	0.9823
	0.9834	0.9846	0.9857	0.9868	0.9879
	0.9890	0.9901	0.9912	0.9923	0.9934
	0.9945	0.9956	0.9967	0.9978	0.9989
	1.0000				
5_yr_sm		0.1			
	0.0000	0.0012	0.0023	0.0035	0.0047
	0.0059	0.0070	0.0082	0.0094	0.0106
	0.0117	0.0129	0.0141	0.0153	0.0164
	0.0176	0.0188	0.0200	0.0211	0.0223
	0.0235	0.0246	0.0258	0.0270	0.0282
	0.0293	0.0305	0.0317	0.0329	0.0340
	0.0352	0.0364	0.0376	0.0387	0.0399
	0.0411	0.0422	0.0434	0.0446	0.0458
	0.0469	0.0481	0.0493	0.0505	0.0516
	0.0528	0.0540	0.0552	0.0563	0.0575
	0.0587	0.0599	0.0610	0.0622	0.0634
	0.0645	0.0657	0.0669	0.0681	0.0692
	0.0704	0.0732	0.0760	0.0787	0.0815
	0.0843	0.0871	0.0898	0.0926	0.0954
	0.0982	0.1009	0.1037	0.1065	0.1093
	0.1120	0.1148	0.1176	0.1204	0.1232
	0.1259	0.1287	0.1315	0.1343	0.1370
	0.1398	0.1426	0.1454	0.1481	0.1509
	0.1537	0.1582	0.1626	0.1671	0.1716
	0.1760	0.1805	0.1850	0.1894	0.1939
	0.1984	0.2029	0.2073	0.2118	0.2163
	0.2207	0.2249	0.2291	0.2333	0.2375
	0.2416	0.2504	0.2592	0.2679	0.2767
	0.2854	0.3043	0.3232	0.3524	0.3970
	0.5000	0.6030	0.6476	0.6768	0.6957
	0.7146	0.7233	0.7321	0.7408	0.7496
	0.7584	0.7625	0.7667	0.7709	0.7751
	0.7793	0.7837	0.7882	0.7927	0.7971
	0.8016	0.8061	0.8106	0.8150	0.8195
	0.8240	0.8284	0.8329	0.8374	0.8418
	0.8463	0.8491	0.8519	0.8546	0.8574
	0.8602	0.8630	0.8657	0.8685	0.8713
	0.8741	0.8768	0.8796	0.8824	0.8852
	0.8880	0.8907	0.8935	0.8963	0.8991
	0.9018	0.9046	0.9074	0.9102	0.9129
	0.9157	0.9185	0.9213	0.9240	0.9268
	0.9296	0.9308	0.9319	0.9331	0.9343
	0.9355	0.9366	0.9378	0.9390	0.9401
	0.9413	0.9425	0.9437	0.9448	0.9460
	0.9472	0.9484	0.9495	0.9507	0.9519
	0.9531	0.9542	0.9554	0.9566	0.9578
	0.9589	0.9601	0.9613	0.9624	0.9636
	0.9648	0.9660	0.9671	0.9683	0.9695
	0.9707	0.9718	0.9730	0.9742	0.9754
	0.9765	0.9777	0.9789	0.9800	0.9812
	0.9824	0.9836	0.9847	0.9859	0.9871
	0.9883	0.9894	0.9906	0.9918	0.9930
	0.9941	0.9953	0.9965	0.9977	0.9988
	1.0000				

10_yr_sm 0.1

0.0000	0.0012	0.0025	0.0037	0.0049
0.0061	0.0074	0.0086	0.0098	0.0110
0.0123	0.0135	0.0147	0.0159	0.0172
0.0184	0.0196	0.0208	0.0221	0.0233
0.0245	0.0257	0.0270	0.0282	0.0294
0.0306	0.0319	0.0331	0.0343	0.0355
0.0368	0.0380	0.0392	0.0404	0.0417
0.0429	0.0441	0.0453	0.0466	0.0478
0.0490	0.0502	0.0515	0.0527	0.0539
0.0552	0.0564	0.0576	0.0588	0.0601
0.0613	0.0625	0.0637	0.0650	0.0662
0.0674	0.0686	0.0699	0.0711	0.0723
0.0735	0.0764	0.0793	0.0822	0.0851
0.0879	0.0908	0.0937	0.0966	0.0995
0.1023	0.1052	0.1081	0.1110	0.1139
0.1167	0.1196	0.1225	0.1254	0.1283
0.1311	0.1340	0.1369	0.1398	0.1427
0.1455	0.1484	0.1513	0.1542	0.1570
0.1599	0.1644	0.1689	0.1734	0.1779
0.1824	0.1869	0.1914	0.1958	0.2003
0.2048	0.2093	0.2138	0.2183	0.2228
0.2273	0.2315	0.2357	0.2399	0.2441
0.2483	0.2573	0.2663	0.2752	0.2842
0.2931	0.3123	0.3315	0.3608	0.4041
0.5000	0.5959	0.6392	0.6685	0.6877
0.7069	0.7158	0.7248	0.7337	0.7427
0.7517	0.7559	0.7601	0.7643	0.7685
0.7727	0.7772	0.7817	0.7862	0.7907
0.7952	0.7997	0.8042	0.8086	0.8131
0.8176	0.8221	0.8266	0.8311	0.8356
0.8401	0.8430	0.8458	0.8487	0.8516
0.8545	0.8573	0.8602	0.8631	0.8660
0.8689	0.8717	0.8746	0.8775	0.8804
0.8833	0.8861	0.8890	0.8919	0.8948
0.8977	0.9005	0.9034	0.9063	0.9092
0.9121	0.9149	0.9178	0.9207	0.9236
0.9265	0.9277	0.9289	0.9301	0.9314
0.9326	0.9338	0.9350	0.9363	0.9375
0.9387	0.9399	0.9412	0.9424	0.9436
0.9448	0.9461	0.9473	0.9485	0.9498
0.9510	0.9522	0.9534	0.9547	0.9559
0.9571	0.9583	0.9596	0.9608	0.9620
0.9632	0.9645	0.9657	0.9669	0.9681
0.9694	0.9706	0.9718	0.9730	0.9743
0.9755	0.9767	0.9779	0.9792	0.9804
0.9816	0.9828	0.9841	0.9853	0.9865
0.9877	0.9890	0.9902	0.9914	0.9926
0.9939	0.9951	0.9963	0.9975	0.9988
1.0000				

25_yr_sm 0.1

0.0000	0.0013	0.0026	0.0039	0.0052
0.0065	0.0079	0.0092	0.0105	0.0118
0.0131	0.0144	0.0157	0.0170	0.0183
0.0196	0.0210	0.0223	0.0236	0.0249
0.0262	0.0275	0.0288	0.0301	0.0314
0.0327	0.0340	0.0354	0.0367	0.0380
0.0393	0.0406	0.0419	0.0432	0.0445
0.0458	0.0471	0.0485	0.0498	0.0511
0.0524	0.0537	0.0550	0.0563	0.0576
0.0589	0.0602	0.0616	0.0629	0.0642
0.0655	0.0668	0.0681	0.0694	0.0707
0.0720	0.0733	0.0746	0.0760	0.0773

	0.0786	0.0816	0.0846	0.0876	0.0906
	0.0937	0.0967	0.0997	0.1027	0.1057
	0.1087	0.1118	0.1148	0.1178	0.1208
	0.1238	0.1268	0.1299	0.1329	0.1359
	0.1389	0.1419	0.1449	0.1480	0.1510
	0.1540	0.1570	0.1600	0.1630	0.1661
	0.1691	0.1737	0.1782	0.1828	0.1874
	0.1920	0.1966	0.2011	0.2057	0.2103
	0.2149	0.2195	0.2241	0.2286	0.2332
	0.2378	0.2421	0.2464	0.2507	0.2549
	0.2592	0.2685	0.2777	0.2869	0.2961
	0.3054	0.3248	0.3441	0.3728	0.4138
	0.5000	0.5862	0.6272	0.6559	0.6752
	0.6946	0.7039	0.7131	0.7223	0.7315
	0.7408	0.7451	0.7493	0.7536	0.7579
	0.7622	0.7668	0.7714	0.7759	0.7805
	0.7851	0.7897	0.7943	0.7989	0.8034
	0.8080	0.8126	0.8172	0.8218	0.8263
	0.8309	0.8339	0.8370	0.8400	0.8430
	0.8460	0.8490	0.8520	0.8551	0.8581
	0.8611	0.8641	0.8671	0.8701	0.8732
	0.8762	0.8792	0.8822	0.8852	0.8882
	0.8913	0.8943	0.8973	0.9003	0.9033
	0.9063	0.9094	0.9124	0.9154	0.9184
	0.9214	0.9227	0.9240	0.9254	0.9267
	0.9280	0.9293	0.9306	0.9319	0.9332
	0.9345	0.9358	0.9371	0.9384	0.9398
	0.9411	0.9424	0.9437	0.9450	0.9463
	0.9476	0.9489	0.9502	0.9515	0.9529
	0.9542	0.9555	0.9568	0.9581	0.9594
	0.9607	0.9620	0.9633	0.9646	0.9660
	0.9673	0.9686	0.9699	0.9712	0.9725
	0.9738	0.9751	0.9764	0.9777	0.9790
	0.9804	0.9817	0.9830	0.9843	0.9856
	0.9869	0.9882	0.9895	0.9908	0.9921
	0.9935	0.9948	0.9961	0.9974	0.9987
	1.0000				
50_yr_sm		0.1			
	0.0000	0.0014	0.0027	0.0041	0.0055
	0.0068	0.0082	0.0095	0.0109	0.0123
	0.0136	0.0150	0.0164	0.0177	0.0191
	0.0205	0.0218	0.0232	0.0246	0.0259
	0.0273	0.0286	0.0300	0.0314	0.0327
	0.0341	0.0355	0.0368	0.0382	0.0396
	0.0409	0.0423	0.0436	0.0450	0.0464
	0.0477	0.0491	0.0505	0.0518	0.0532
	0.0546	0.0559	0.0573	0.0587	0.0600
	0.0614	0.0627	0.0641	0.0655	0.0668
	0.0682	0.0696	0.0709	0.0723	0.0737
	0.0750	0.0764	0.0777	0.0791	0.0805
	0.0818	0.0850	0.0881	0.0913	0.0944
	0.0976	0.1007	0.1039	0.1070	0.1102
	0.1133	0.1165	0.1196	0.1227	0.1259
	0.1290	0.1322	0.1353	0.1385	0.1416
	0.1448	0.1479	0.1511	0.1542	0.1574
	0.1605	0.1636	0.1668	0.1699	0.1731
	0.1762	0.1809	0.1856	0.1903	0.1949
	0.1996	0.2043	0.2089	0.2136	0.2183
	0.2230	0.2276	0.2323	0.2370	0.2417
	0.2463	0.2507	0.2550	0.2593	0.2636
	0.2679	0.2774	0.2869	0.2964	0.3059
	0.3154	0.3348	0.3541	0.3821	0.4210
	0.5000	0.5790	0.6179	0.6459	0.6652

	0.6846	0.6941	0.7036	0.7131	0.7226
	0.7321	0.7364	0.7407	0.7450	0.7493
	0.7537	0.7583	0.7630	0.7677	0.7724
	0.7770	0.7817	0.7864	0.7911	0.7957
	0.8004	0.8051	0.8097	0.8144	0.8191
	0.8238	0.8269	0.8301	0.8332	0.8364
	0.8395	0.8426	0.8458	0.8489	0.8521
	0.8552	0.8584	0.8615	0.8647	0.8678
	0.8710	0.8741	0.8773	0.8804	0.8835
	0.8867	0.8898	0.8930	0.8961	0.8993
	0.9024	0.9056	0.9087	0.9119	0.9150
	0.9182	0.9195	0.9209	0.9223	0.9236
	0.9250	0.9263	0.9277	0.9291	0.9304
	0.9318	0.9332	0.9345	0.9359	0.9373
	0.9386	0.9400	0.9413	0.9427	0.9441
	0.9454	0.9468	0.9482	0.9495	0.9509
	0.9523	0.9536	0.9550	0.9564	0.9577
	0.9591	0.9604	0.9618	0.9632	0.9645
	0.9659	0.9673	0.9686	0.9700	0.9714
	0.9727	0.9741	0.9754	0.9768	0.9782
	0.9795	0.9809	0.9823	0.9836	0.9850
	0.9864	0.9877	0.9891	0.9905	0.9918
	0.9932	0.9945	0.9959	0.9973	0.9986
	1.0000				
100_yr_sm		0.1			
	0.0000	0.0014	0.0029	0.0043	0.0057
	0.0071	0.0086	0.0100	0.0114	0.0128
	0.0143	0.0157	0.0171	0.0185	0.0200
	0.0214	0.0228	0.0243	0.0257	0.0271
	0.0285	0.0300	0.0314	0.0328	0.0342
	0.0357	0.0371	0.0385	0.0399	0.0414
	0.0428	0.0442	0.0457	0.0471	0.0485
	0.0499	0.0514	0.0528	0.0542	0.0556
	0.0571	0.0585	0.0599	0.0613	0.0628
	0.0642	0.0656	0.0671	0.0685	0.0699
	0.0713	0.0728	0.0742	0.0756	0.0770
	0.0785	0.0799	0.0813	0.0827	0.0842
	0.0856	0.0889	0.0922	0.0954	0.0987
	0.1020	0.1053	0.1086	0.1118	0.1151
	0.1184	0.1217	0.1250	0.1282	0.1315
	0.1348	0.1381	0.1414	0.1447	0.1479
	0.1512	0.1545	0.1578	0.1611	0.1643
	0.1676	0.1709	0.1742	0.1775	0.1807
	0.1840	0.1888	0.1935	0.1983	0.2031
	0.2078	0.2126	0.2174	0.2221	0.2269
	0.2317	0.2364	0.2412	0.2459	0.2507
	0.2555	0.2598	0.2641	0.2684	0.2727
	0.2770	0.2867	0.2964	0.3062	0.3159
	0.3256	0.3447	0.3638	0.3910	0.4277
	0.5000	0.5723	0.6090	0.6362	0.6553
	0.6744	0.6841	0.6938	0.7036	0.7133
	0.7230	0.7273	0.7316	0.7359	0.7402
	0.7445	0.7493	0.7541	0.7588	0.7636
	0.7683	0.7731	0.7779	0.7826	0.7874
	0.7922	0.7969	0.8017	0.8065	0.8112
	0.8160	0.8193	0.8225	0.8258	0.8291
	0.8324	0.8357	0.8389	0.8422	0.8455
	0.8488	0.8521	0.8553	0.8586	0.8619
	0.8652	0.8685	0.8718	0.8750	0.8783
	0.8816	0.8849	0.8882	0.8914	0.8947
	0.8980	0.9013	0.9046	0.9078	0.9111
	0.9144	0.9158	0.9173	0.9187	0.9201
	0.9215	0.9230	0.9244	0.9258	0.9272

	0.9287	0.9301	0.9315	0.9329	0.9344
	0.9358	0.9372	0.9387	0.9401	0.9415
	0.9429	0.9444	0.9458	0.9472	0.9486
	0.9501	0.9515	0.9529	0.9543	0.9558
	0.9572	0.9586	0.9601	0.9615	0.9629
	0.9643	0.9658	0.9672	0.9686	0.9700
	0.9715	0.9729	0.9743	0.9757	0.9772
	0.9786	0.9800	0.9815	0.9829	0.9843
	0.9857	0.9872	0.9886	0.9900	0.9914
	0.9929	0.9943	0.9957	0.9971	0.9986
	1.0000				
500_yr_sm		0.1			
	0.0000	0.0016	0.0031	0.0047	0.0063
	0.0078	0.0094	0.0110	0.0126	0.0141
	0.0157	0.0173	0.0188	0.0204	0.0220
	0.0235	0.0251	0.0267	0.0283	0.0298
	0.0314	0.0330	0.0345	0.0361	0.0377
	0.0392	0.0408	0.0424	0.0439	0.0455
	0.0471	0.0487	0.0502	0.0518	0.0534
	0.0549	0.0565	0.0581	0.0596	0.0612
	0.0628	0.0643	0.0659	0.0675	0.0691
	0.0706	0.0722	0.0738	0.0753	0.0769
	0.0785	0.0800	0.0816	0.0832	0.0848
	0.0863	0.0879	0.0895	0.0910	0.0926
	0.0942	0.0978	0.1014	0.1050	0.1086
	0.1122	0.1158	0.1195	0.1231	0.1267
	0.1303	0.1339	0.1375	0.1411	0.1447
	0.1483	0.1520	0.1556	0.1592	0.1628
	0.1664	0.1700	0.1736	0.1772	0.1809
	0.1845	0.1881	0.1917	0.1953	0.1989
	0.2025	0.2075	0.2124	0.2174	0.2223
	0.2272	0.2322	0.2371	0.2421	0.2470
	0.2520	0.2569	0.2618	0.2668	0.2717
	0.2767	0.2810	0.2853	0.2896	0.2940
	0.2983	0.3084	0.3185	0.3287	0.3388
	0.3489	0.3673	0.3856	0.4104	0.4420
	0.5000	0.5580	0.5896	0.6144	0.6327
	0.6511	0.6612	0.6713	0.6815	0.6916
	0.7017	0.7060	0.7104	0.7147	0.7190
	0.7233	0.7283	0.7332	0.7382	0.7431
	0.7480	0.7530	0.7579	0.7629	0.7678
	0.7728	0.7777	0.7826	0.7876	0.7925
	0.7975	0.8011	0.8047	0.8083	0.8119
	0.8155	0.8191	0.8228	0.8264	0.8300
	0.8336	0.8372	0.8408	0.8444	0.8480
	0.8517	0.8553	0.8589	0.8625	0.8661
	0.8697	0.8733	0.8769	0.8805	0.8842
	0.8878	0.8914	0.8950	0.8986	0.9022
	0.9058	0.9074	0.9090	0.9105	0.9121
	0.9137	0.9152	0.9168	0.9184	0.9200
	0.9215	0.9231	0.9247	0.9262	0.9278
	0.9294	0.9309	0.9325	0.9341	0.9357
	0.9372	0.9388	0.9404	0.9419	0.9435
	0.9451	0.9466	0.9482	0.9498	0.9513
	0.9529	0.9545	0.9561	0.9576	0.9592
	0.9608	0.9623	0.9639	0.9655	0.9670
	0.9686	0.9702	0.9717	0.9733	0.9749
	0.9765	0.9780	0.9796	0.9812	0.9827
	0.9843	0.9859	0.9874	0.9890	0.9906
	0.9922	0.9937	0.9953	0.9969	0.9984
	1.0000				

GLOBAL OUTPUT:
.2 NN N NN N

WinTR-20 Printed Page File End of Input Data List

Eccelston Mitigation POI 5

Name of printed page file:
C:\Users\cwagner\Desktop\Eccelston POI 5 Ultimate.out

STORM 1_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.139		0.728		12.46	42.0	301.19

STORM 2_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.139		1.088		12.44	66.3	475.87

STORM 5_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.139		1.757		12.44	106.0	761.04

STORM 10_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.139		2.393		12.44	138.9	997.17

STORM 25_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.139		3.445		12.43	186.0	1335.10

STORM 50_yr_sm

Area or Reach	Drainage Area	Rain Gage ID or	Runoff Amount	Peak Flow Elevation	Peak Flow Time	Peak Flow Rate	Peak Flow Rate

Identifier	(sq mi)	Location	(in)	(ft)	(hr)	(cfs)	(csm)
OUTLET	0.139		4.417		12.41	223.3	1603.02

STORM 100_yr_sm

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♀
Eccelston Mitigation POI 5

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	0.139		5.563		12.43	261.2	1875.46

STORM 500_yr_sm

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	------------ Peak Flow ------------ Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	0.139		8.984		12.42	349.2	2507.02

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♀

Eccelston Mitigation POI 5

Area or Reach Identifier	Drainage Area (sq mi)	----------- Peak Flow by Storm ----------- 1_yr_sm (cfs)	2_yr_sm (cfs)	5_yr_sm (cfs)	10_yr_sm (cfs)	25_yr_sm (cfs)
DA5	0.139	42.0	66.3	106.0	138.9	186.0
OUTLET	0.139	42.0	66.3	106.0	138.9	186.0

Area or Reach Identifier	Drainage Area (sq mi)	----------- Peak Flow by Storm ----------- 50_yr_sm (cfs)	100_yr_sm (cfs)	500_yr_sm (cfs)	(cfs)	(cfs)
DA5	0.139	223.3	261.2	349.2		
OUTLET	0.139	223.3	261.2	349.2		

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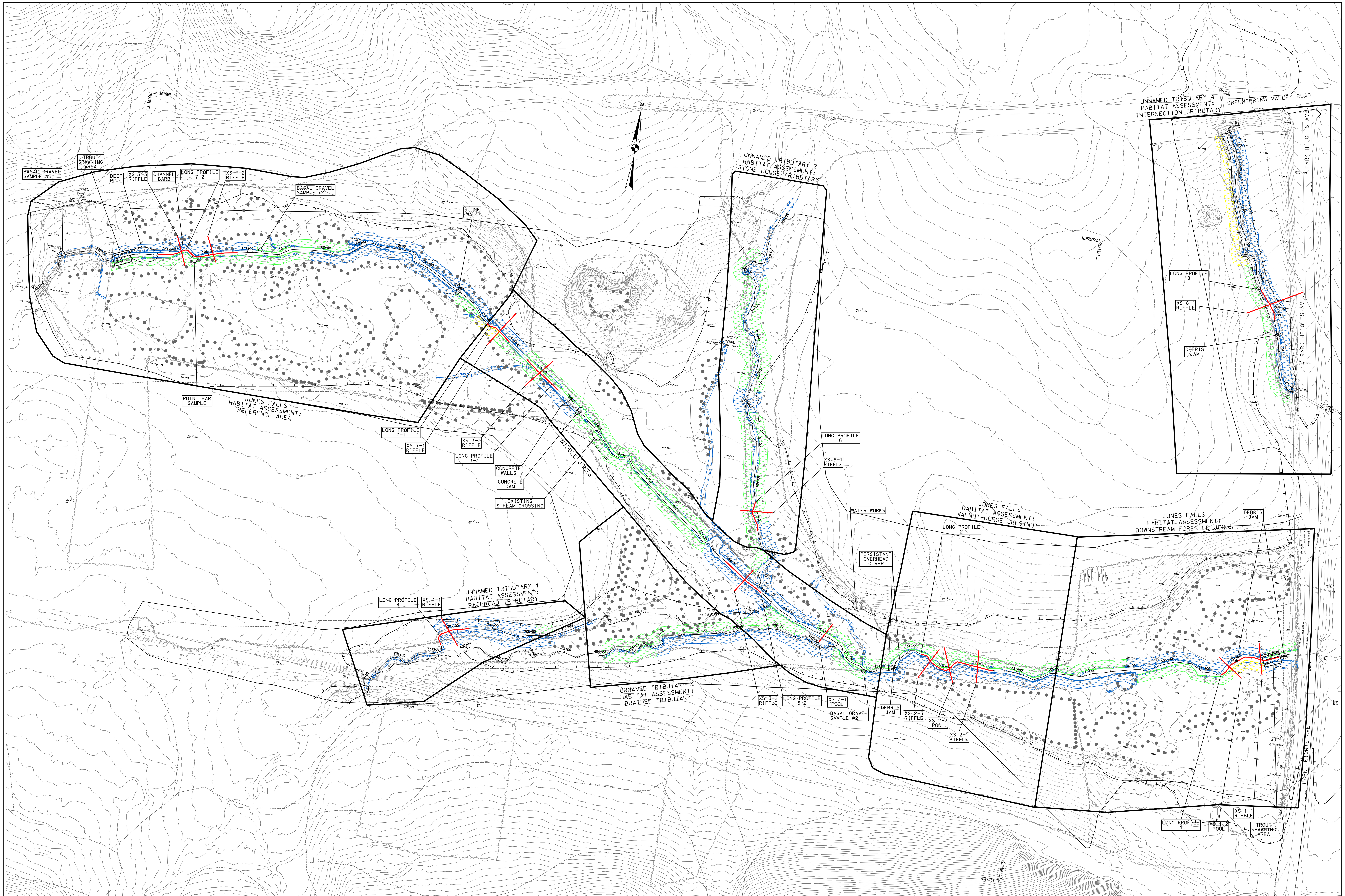
♀

APPENDIX D
Existing Conditions Geomorphic Data



STREAM BANK EROSION RATES (TON/YEAR/FT)

- 0.00 – 0.09
- 0.10 – 0.49
- 0.50 – 0.99
- 1.00 – 1.50

80' 0 80' 160'

SCALE: 1" = 80'

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future®

BY: RBucci

ECCLESTON MITIGATION SITE

REVISIONS

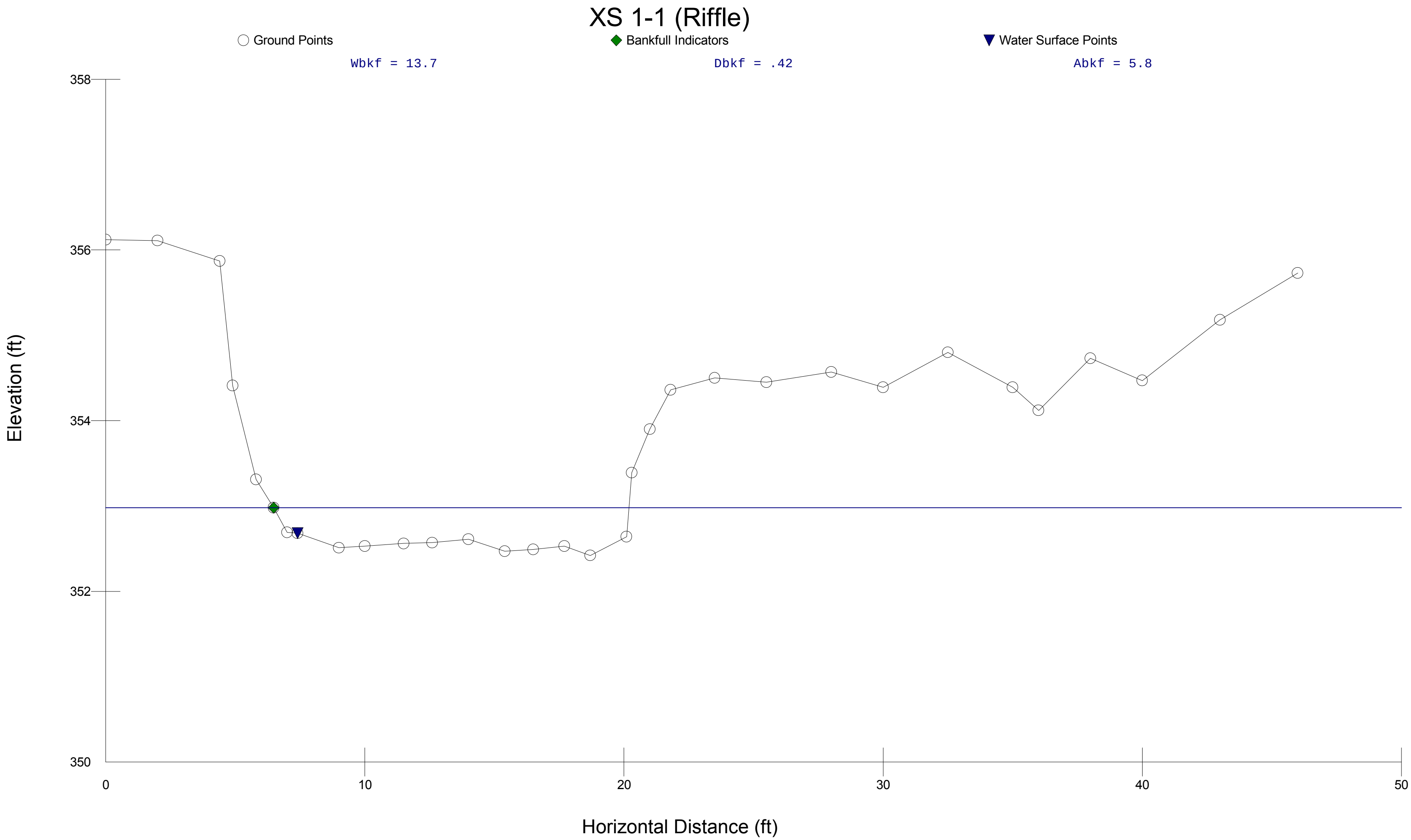
CONCEPT SUBMISSION

NOT FOR CONSTRUCTION

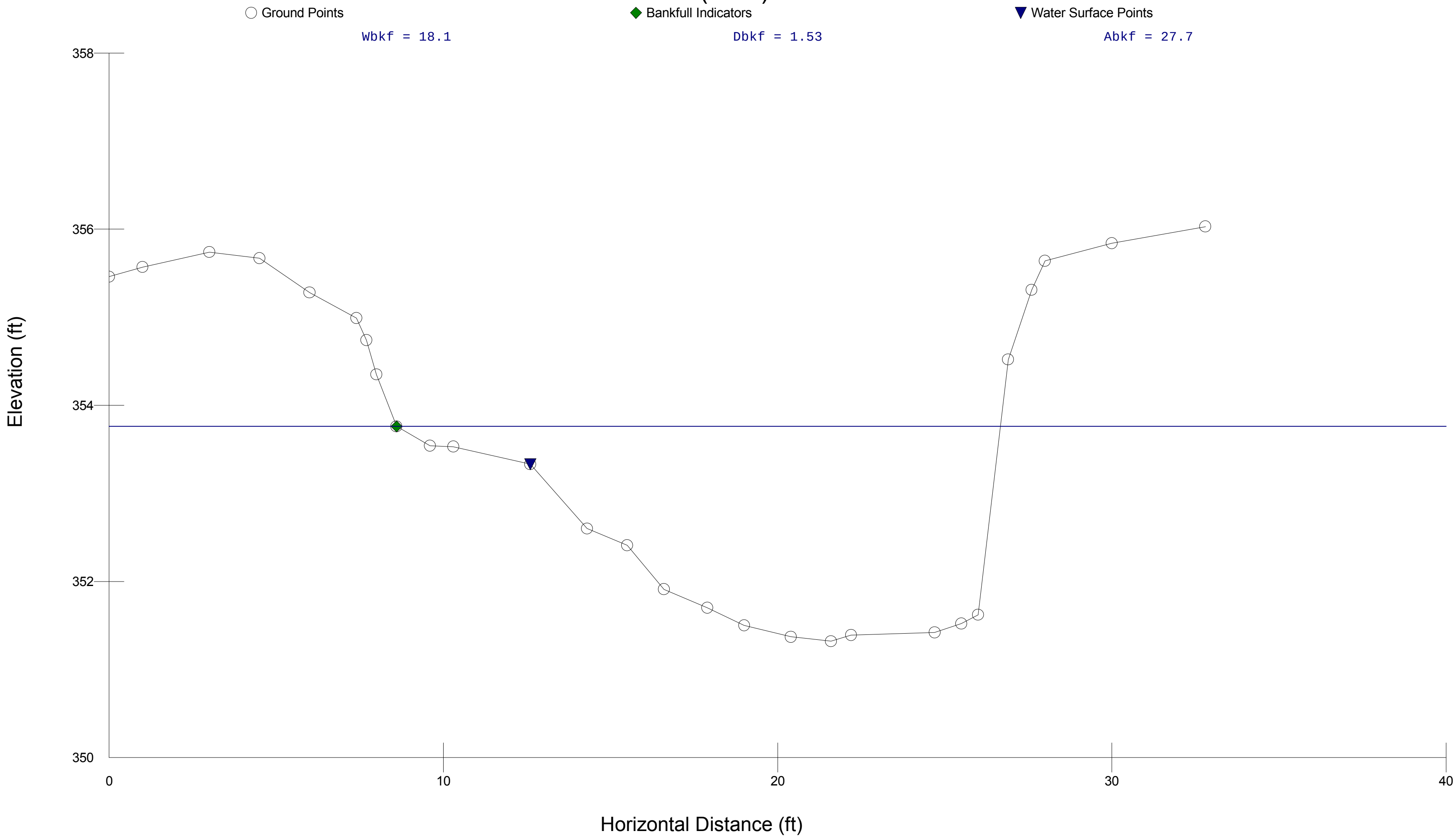
SITE ASSESSMENT MAP

SCALE	AS SHOWN	DATE	MAY 2018
CONTRACT NO.			
DESIGNED BY	MRG	COUNTY	
DRAWN BY	MRG	LOGMILE	
CHECKED BY	FAB	HORIZONTAL SCALE	N/A
F.A.P. NO.	SEE TITLE SHEET	VERTICAL SCALE	N/A
DRAWING NO.	SAM - 1 OF 1	SHEET NO.	OF XX

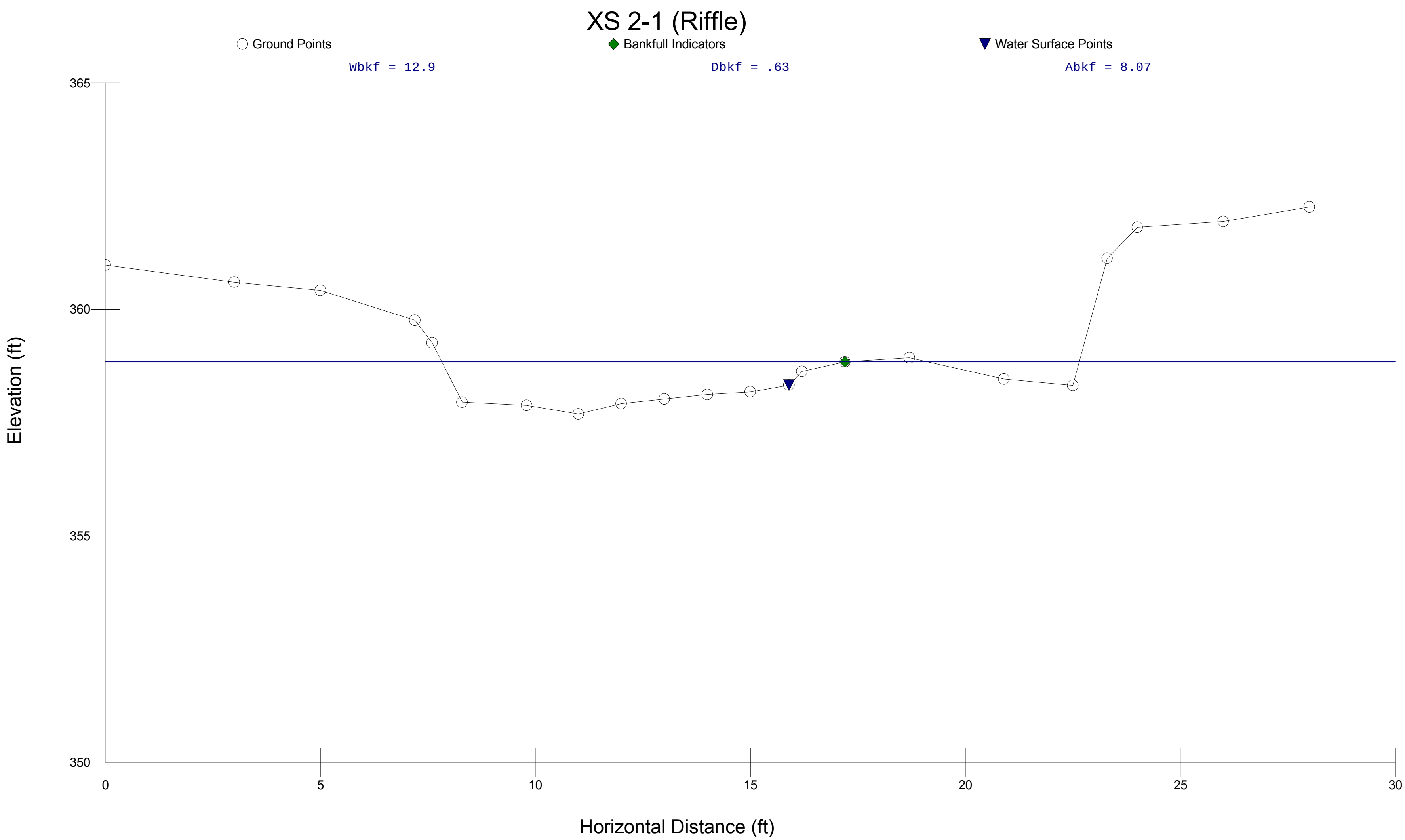
PLOTTED: Wednesday, November 07, 2018 AT 02:57 PM


XS 1-1 (Riffle)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 13.7
Dbkf = .42
Abkf = 5.8
Elevation (ft)
358
356
354
352
350
0
10
20
30
40
50
Horizontal Distance (ft)

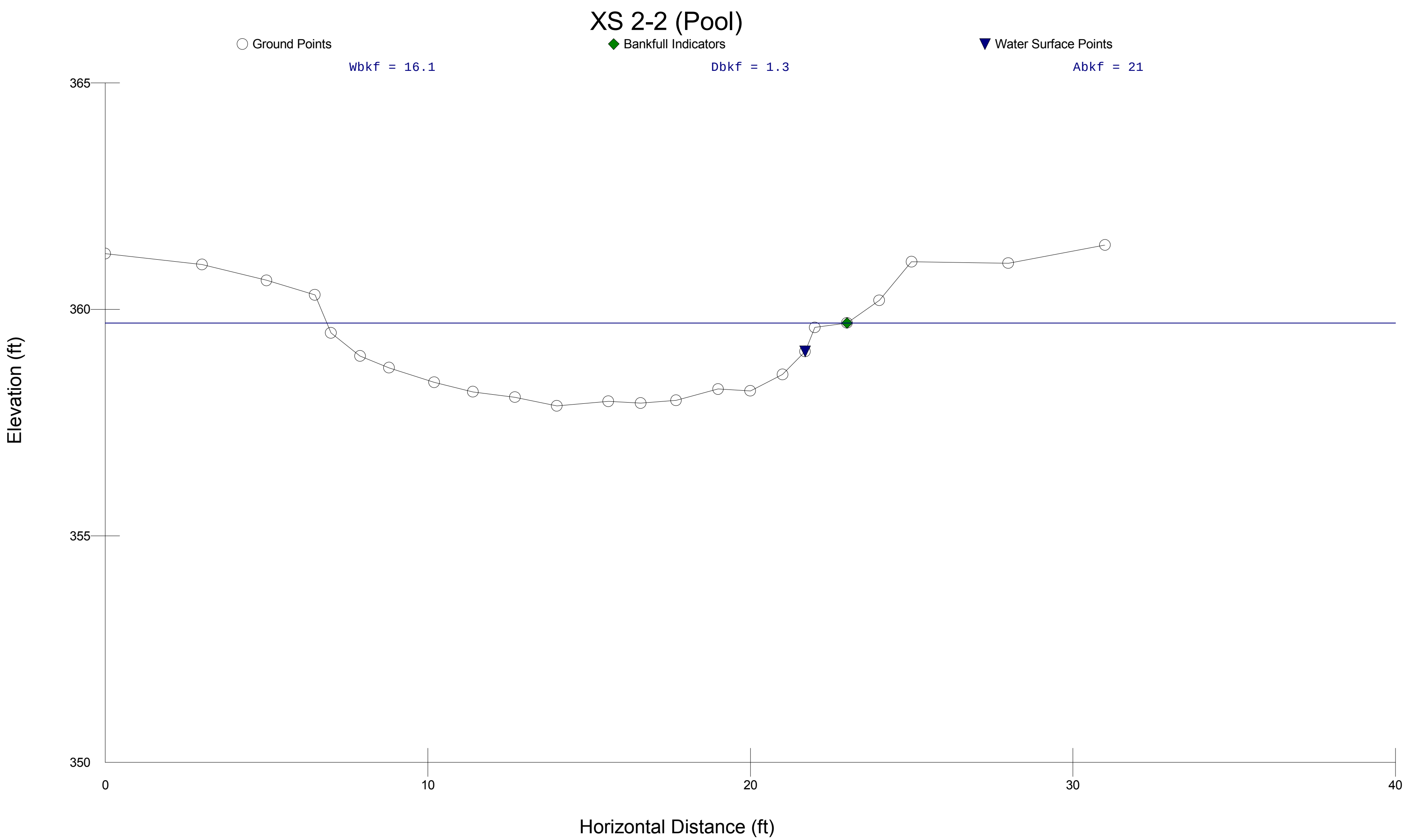
XS 1-2 (Pool)

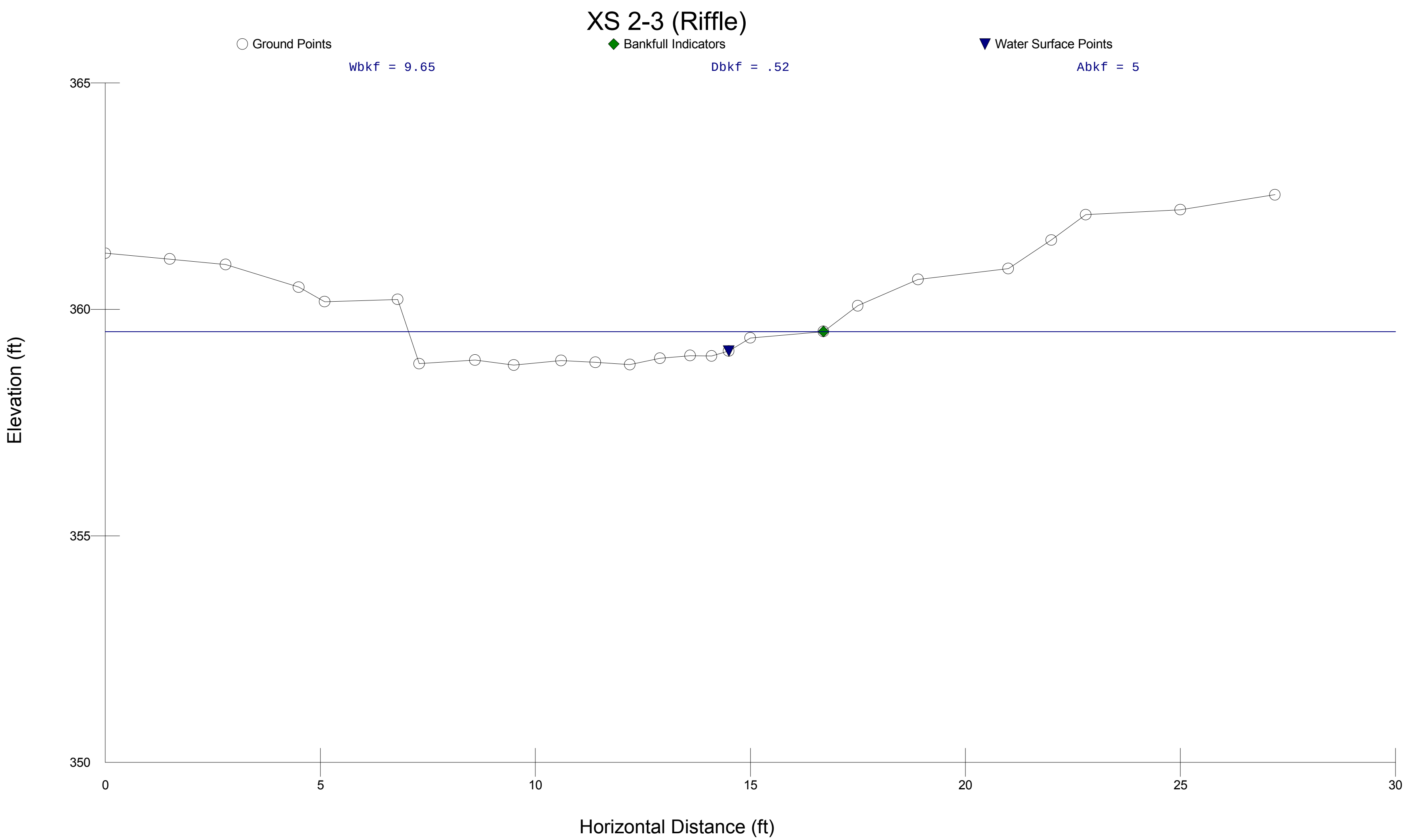


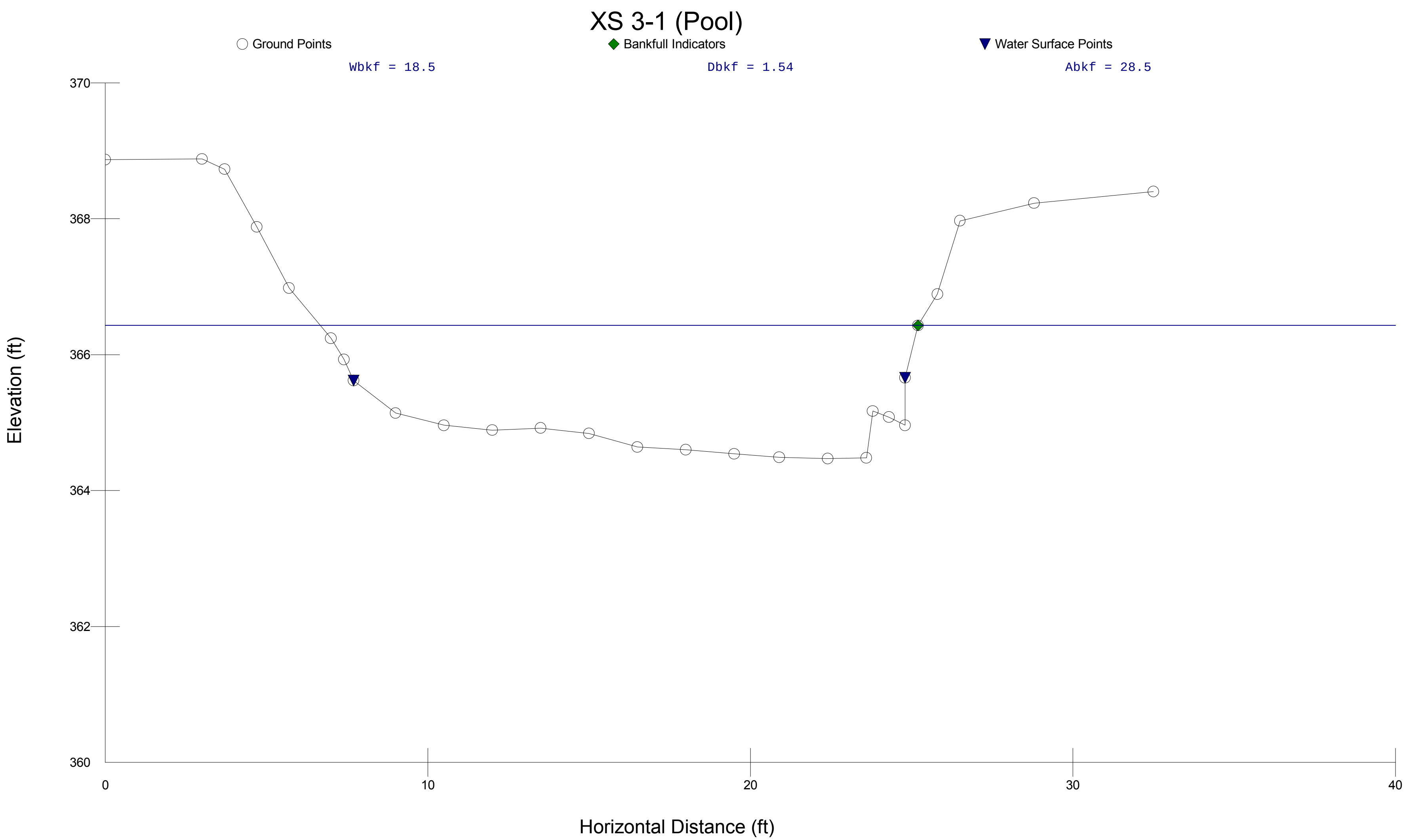
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 18.1
Dbkf = 1.53
Abkf = 27.7
358
356
354
352
350
0
10
20
30
40
Elevation (ft)
Horizontal Distance (ft)

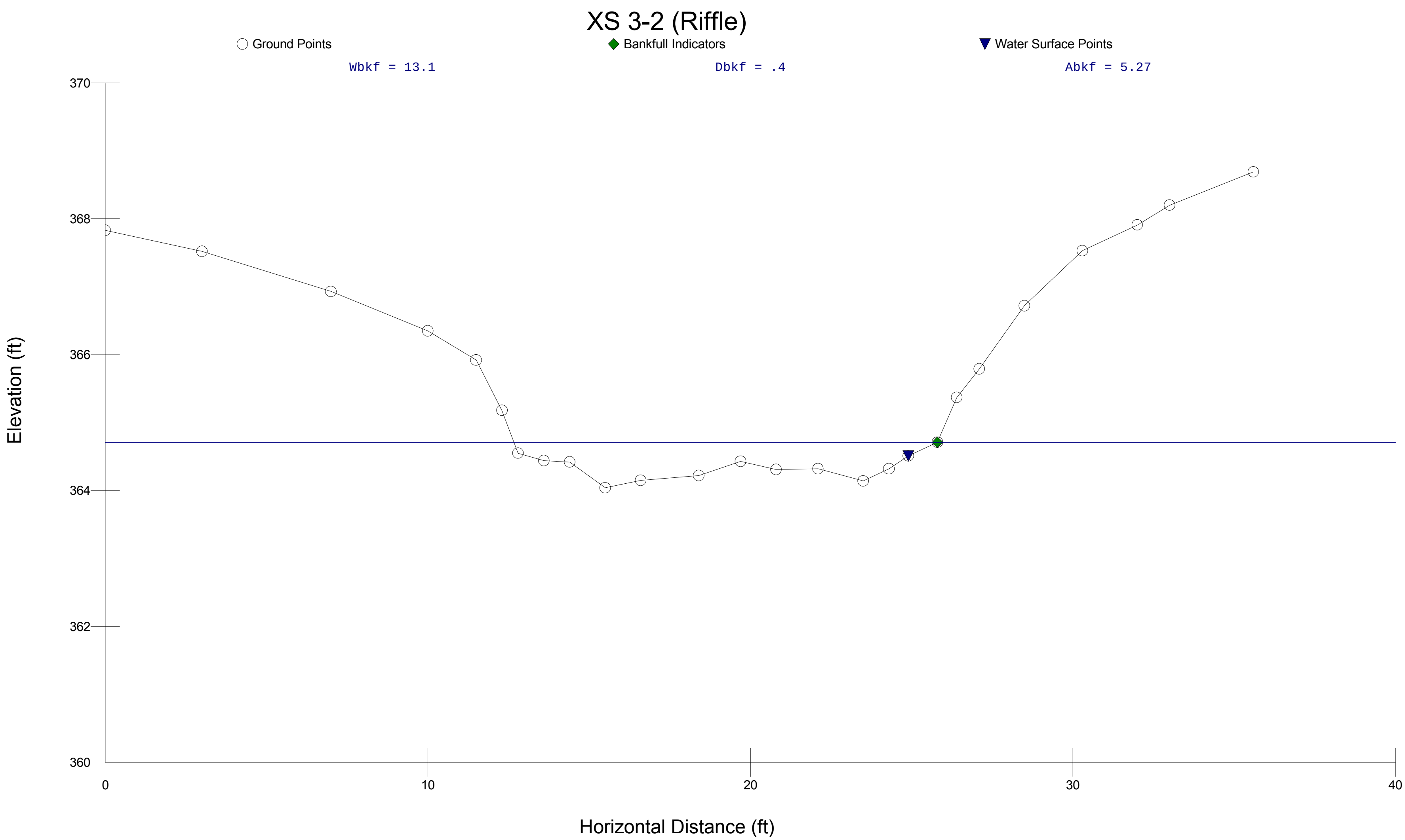


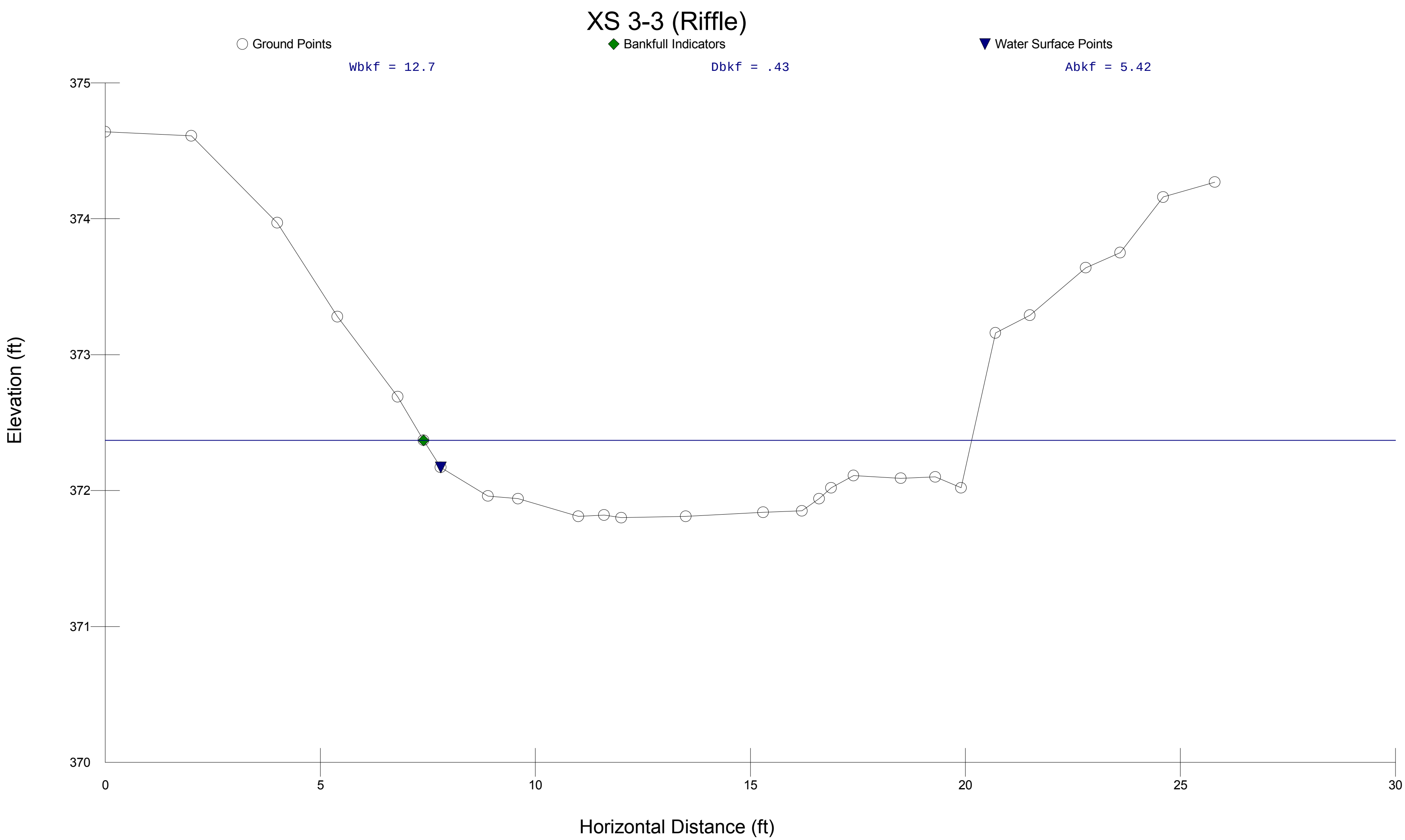
XS 2-1 (Riffle)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 12.9
Dbkf = .63
Abkf = 8.07
365
360
355
350
0
5
10
15
20
25
30
Elevation (ft)
Horizontal Distance (ft)


XS 2-2 (Pool)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 16.1
Dbkf = 1.3
Abkf = 21
365
360
355
350
Elevation (ft)
0
10
20
30
40
Horizontal Distance (ft)

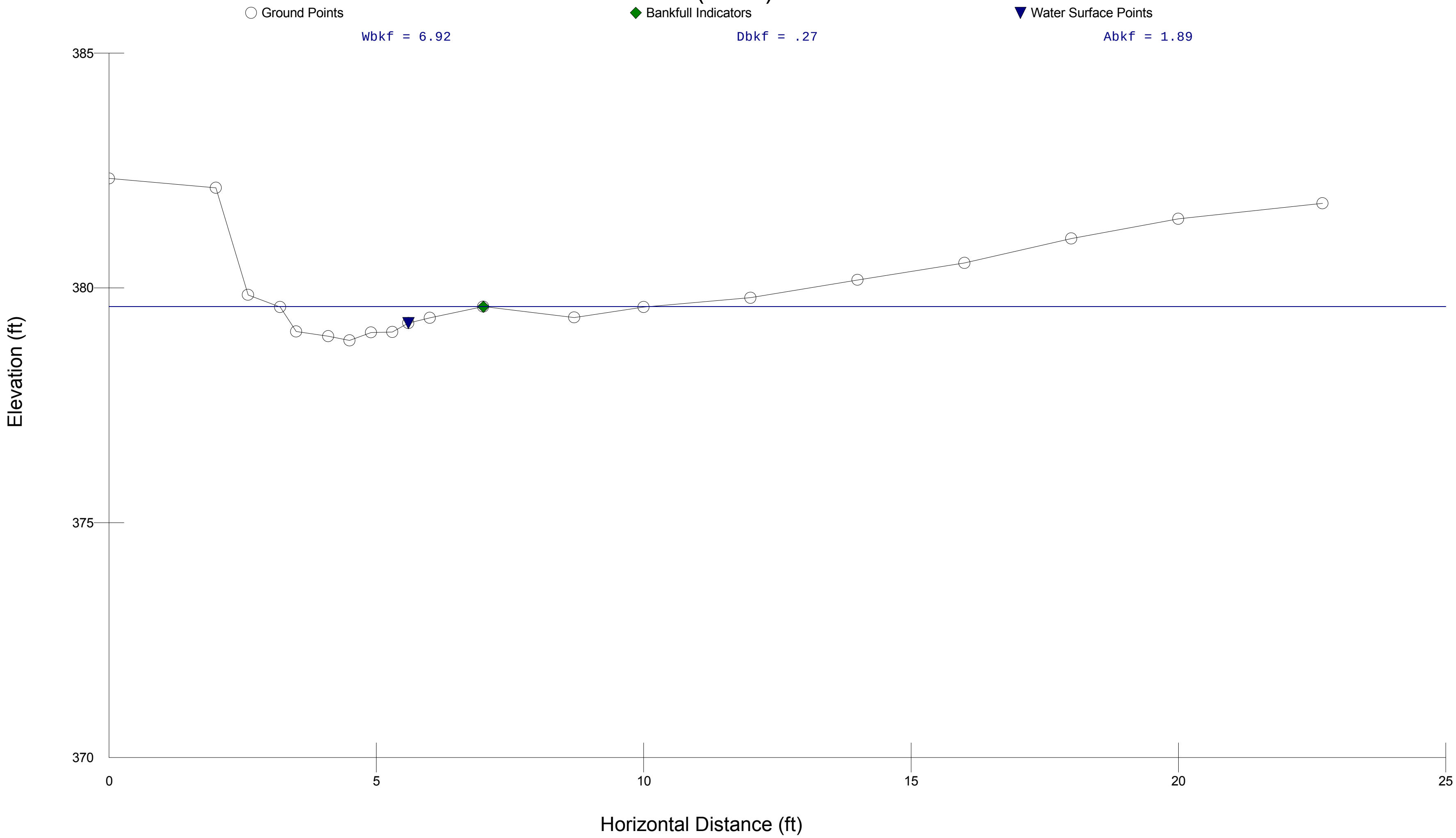

XS 2-3 (Riffle)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 9.65
Dbkf = .52
Abkf = 5
Elevation (ft)
365
360
355
350
0
5
10
15
20
25
30
Horizontal Distance (ft)


XS 3-1 (Pool)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 18.5
Dbkf = 1.54
Abkf = 28.5
370
368
366
364
362
360
0
10
20
30
40
Elevation (ft)
Horizontal Distance (ft)

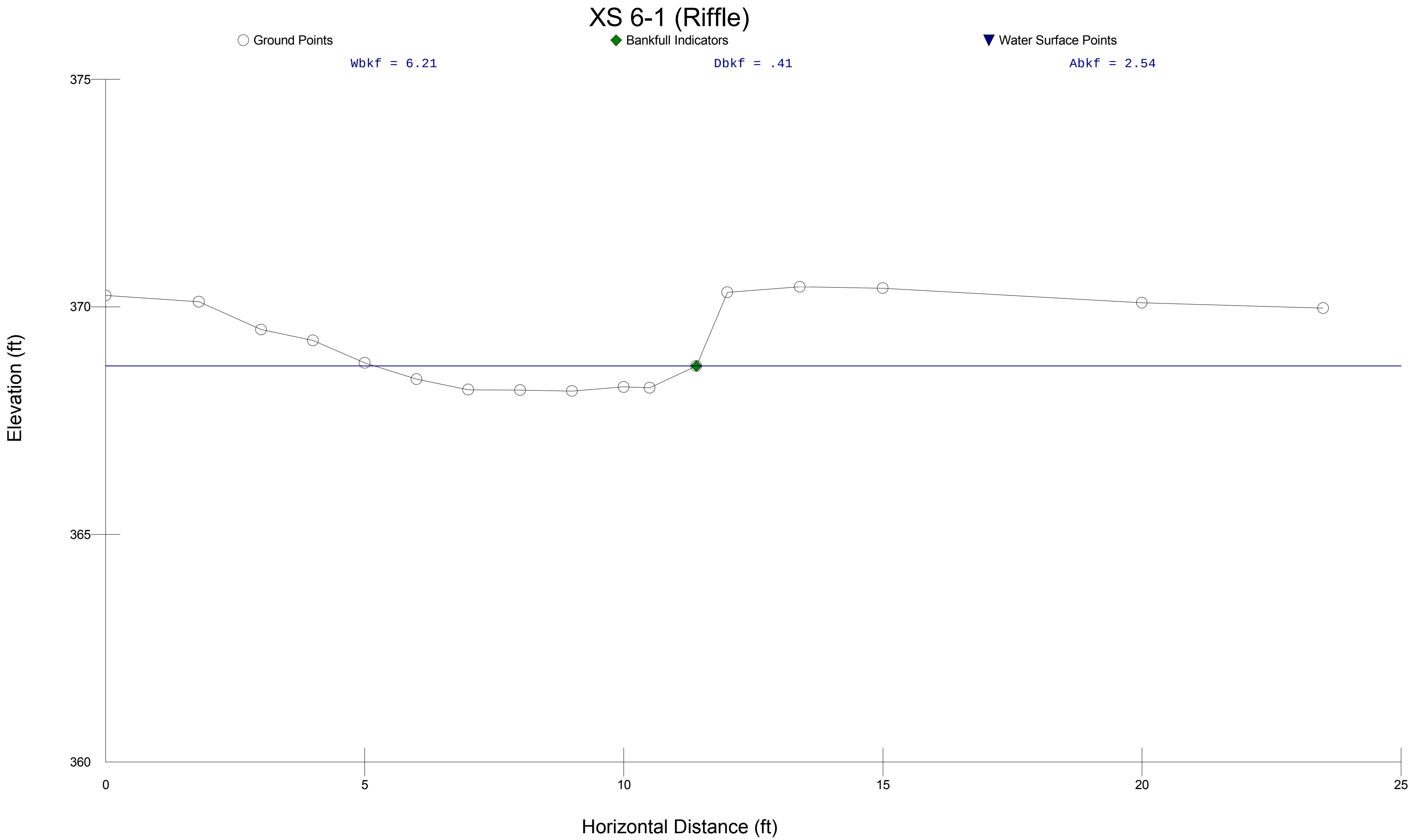

XS 3-2 (Riffle)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 13.1
Dbkf = .4
Abkf = 5.27
Elevation (ft)
Horizontal Distance (ft)
370
368
366
364
362
360
0
10
20
30
40

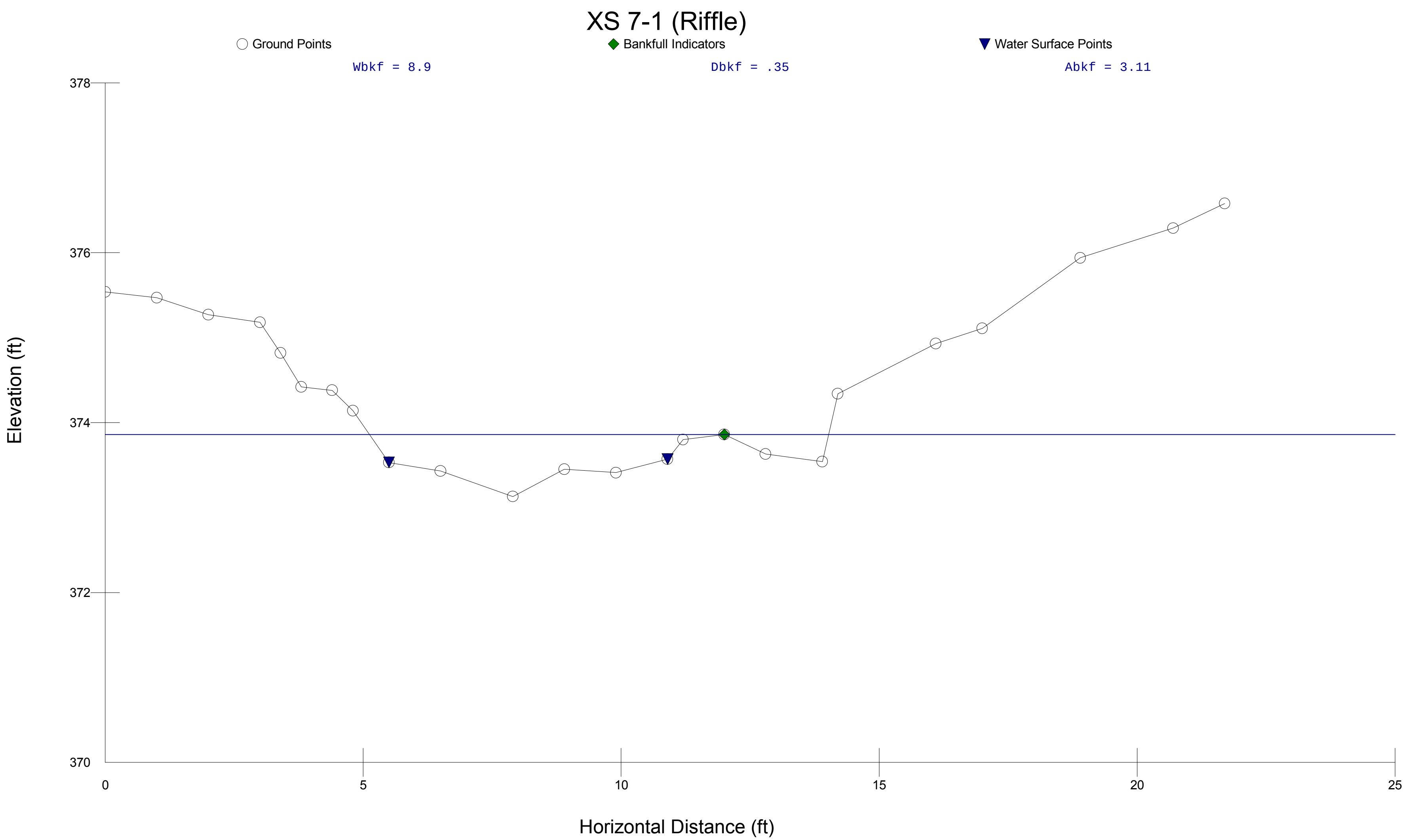

XS 3-3 (Riffle)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 12.7
Dbkf = .43
Abkf = 5.42
Elevation (ft)
375
374
373
372
371
370
0
5
10
15
20
25
30
Horizontal Distance (ft)

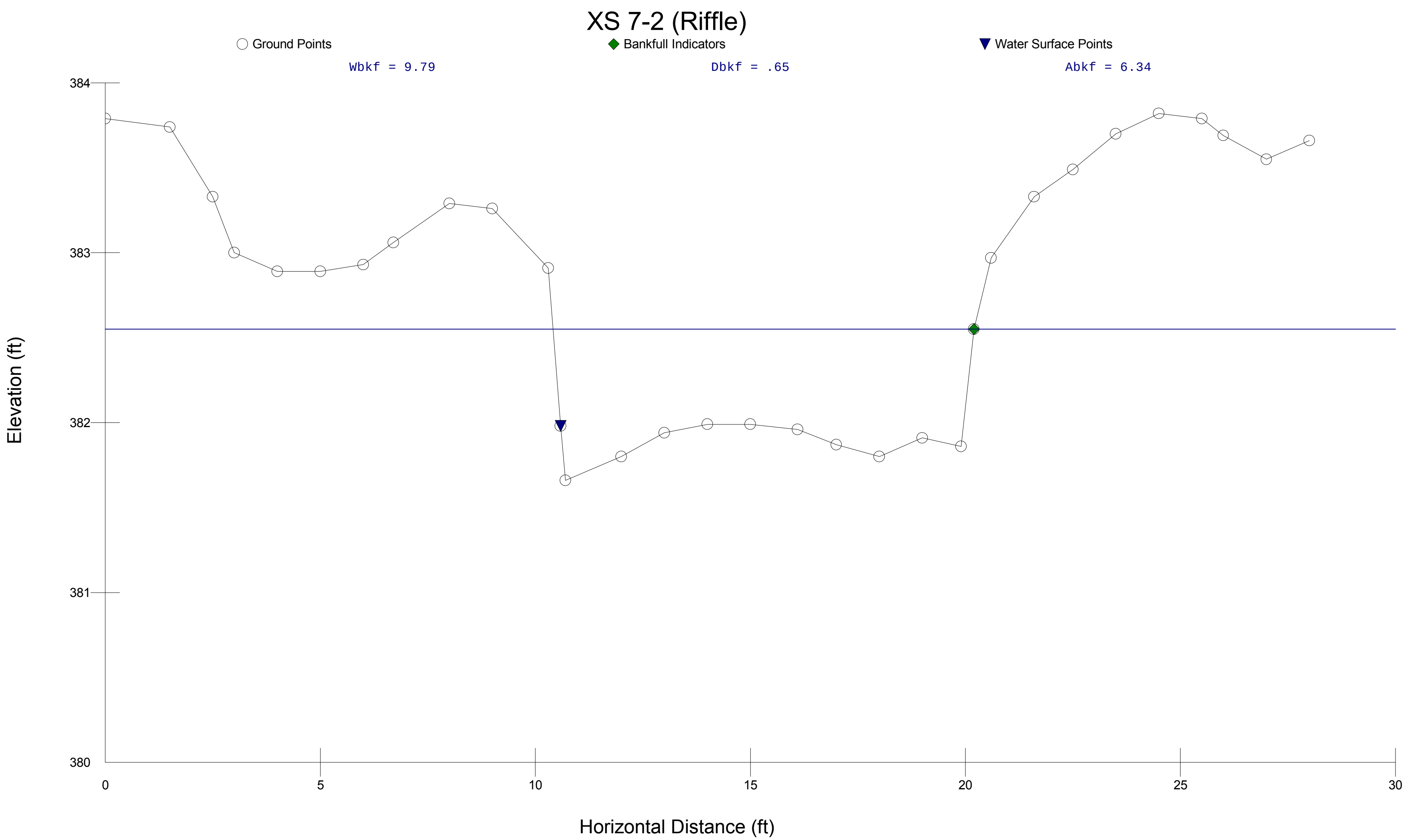
XS 4-1 (Riffle)

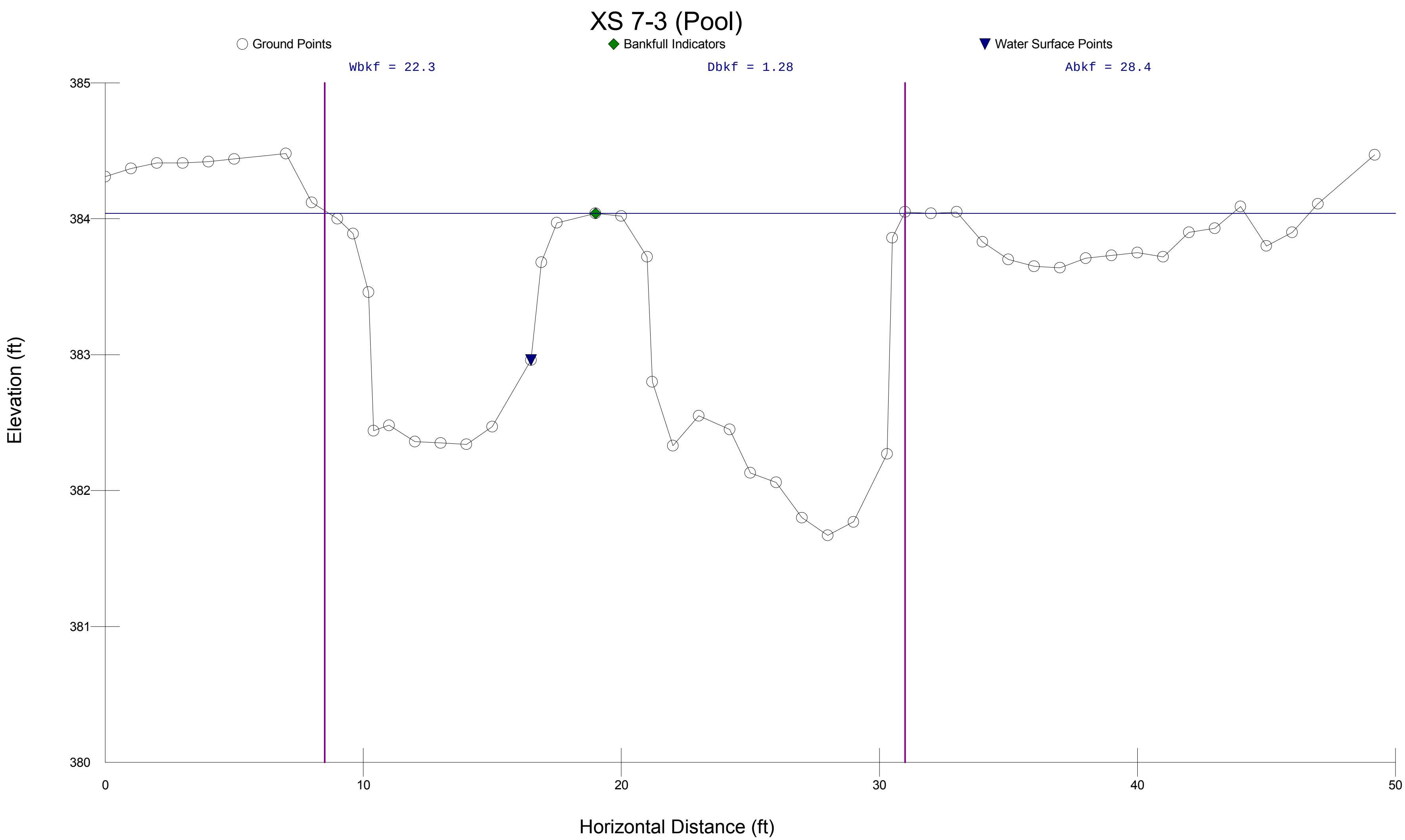


Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 6.92
Dbkf = .27
Abkf = 1.89
385
380
375
370
Elevation (ft)
0
5
10
15
20
25
Horizontal Distance (ft)

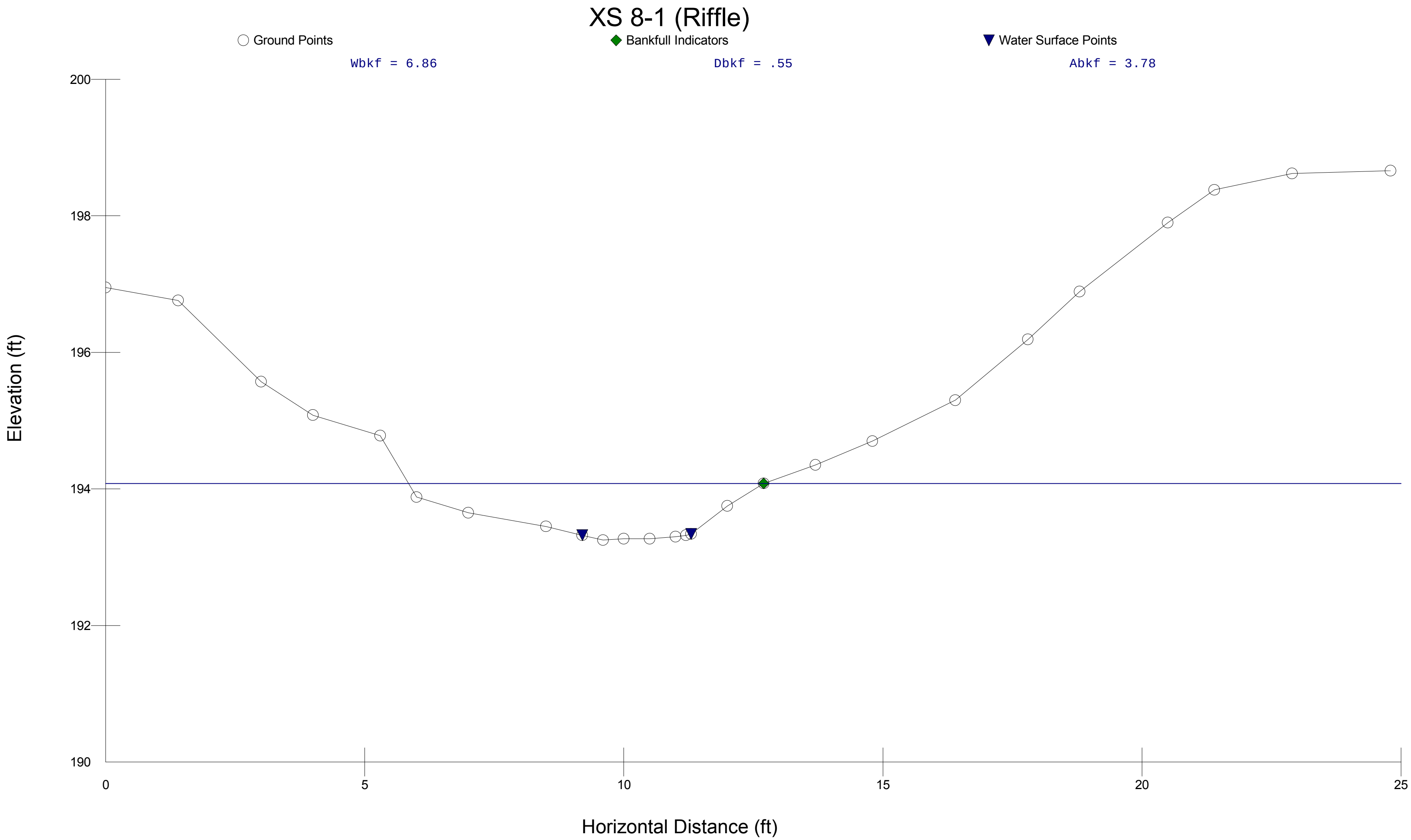

XS 6-1 (Riffle)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 6.21
Dbkf = .41
Abkf = 2.54
375
370
365
360
Elevation (ft)
0
5
10
15
20
25
Horizontal Distance (ft)


XS 7-1 (Riffle)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 8.9
Dbkf = .35
Abkf = 3.11
378
376
374
372
370
0
5
10
15
20
25
Elevation (ft)
Horizontal Distance (ft)


XS 7-2 (Riffle)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 9.79
Dbkf = .65
Abkf = 6.34
Elevation (ft)
384
383
382
381
380
0
5
10
15
20
25
30
Horizontal Distance (ft)

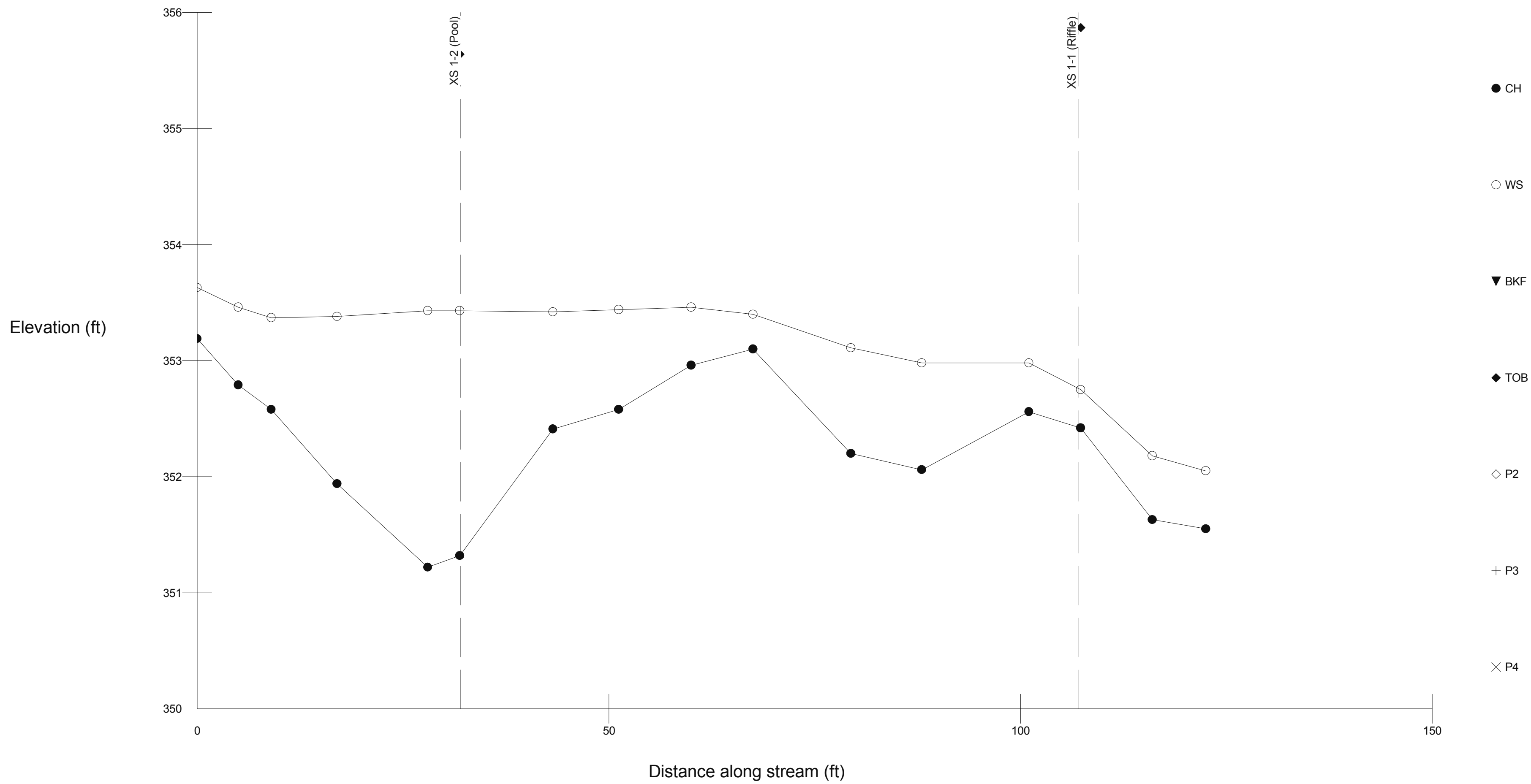


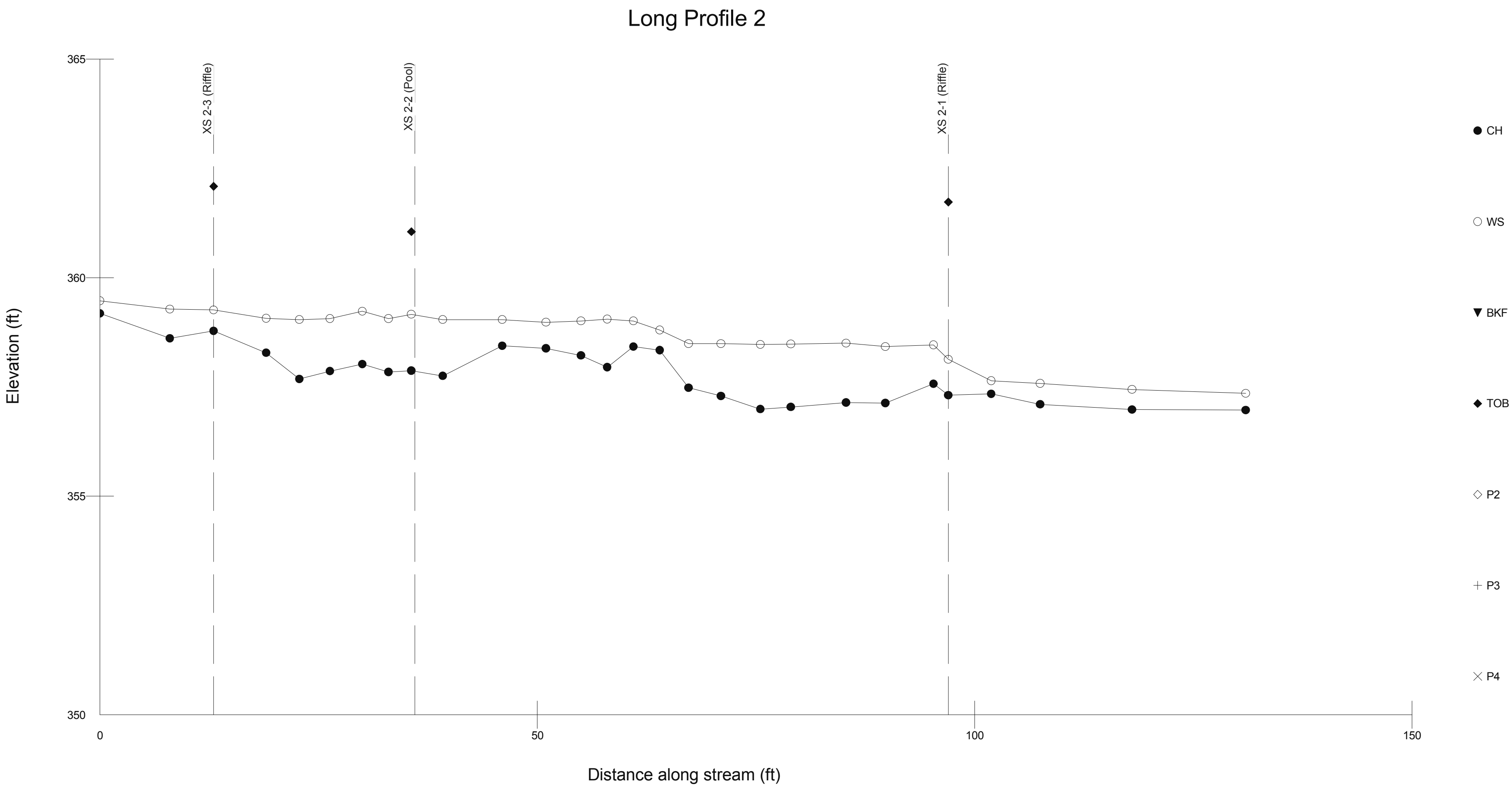
XS 7-3 (Pool)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 22.3
Dbkf = 1.28
Abkf = 28.4
Elevation (ft)
385
384
383
382
381
380
0
10
20
30
40
50
Horizontal Distance (ft)



XS 8-1 (Riffle)
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 6.86
Dbkf = .55
Abkf = 3.78
Elevation (ft)
Horizontal Distance (ft)
200
198
196
194
192
190
0
5
10
15
20
25

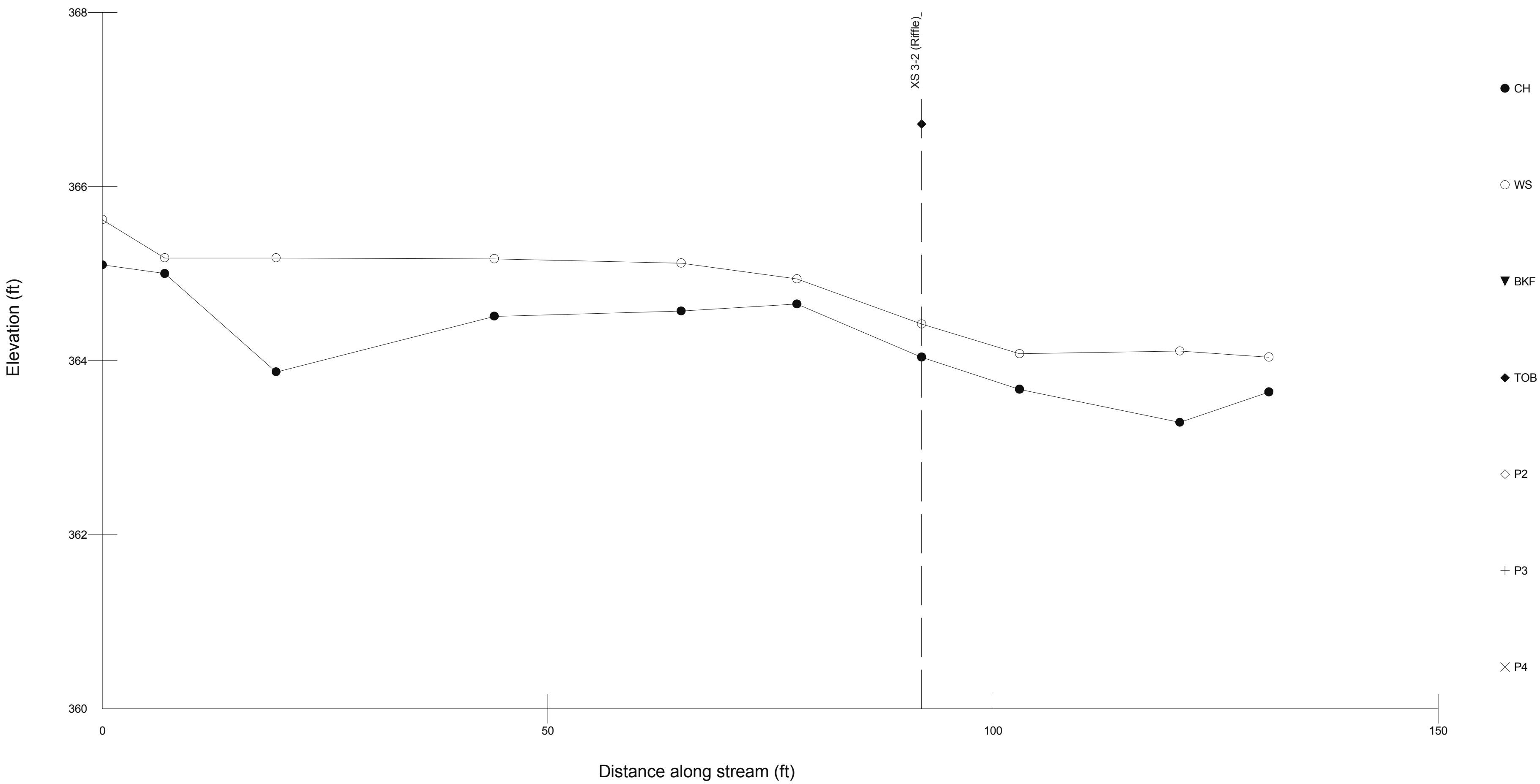
Long Profile 1

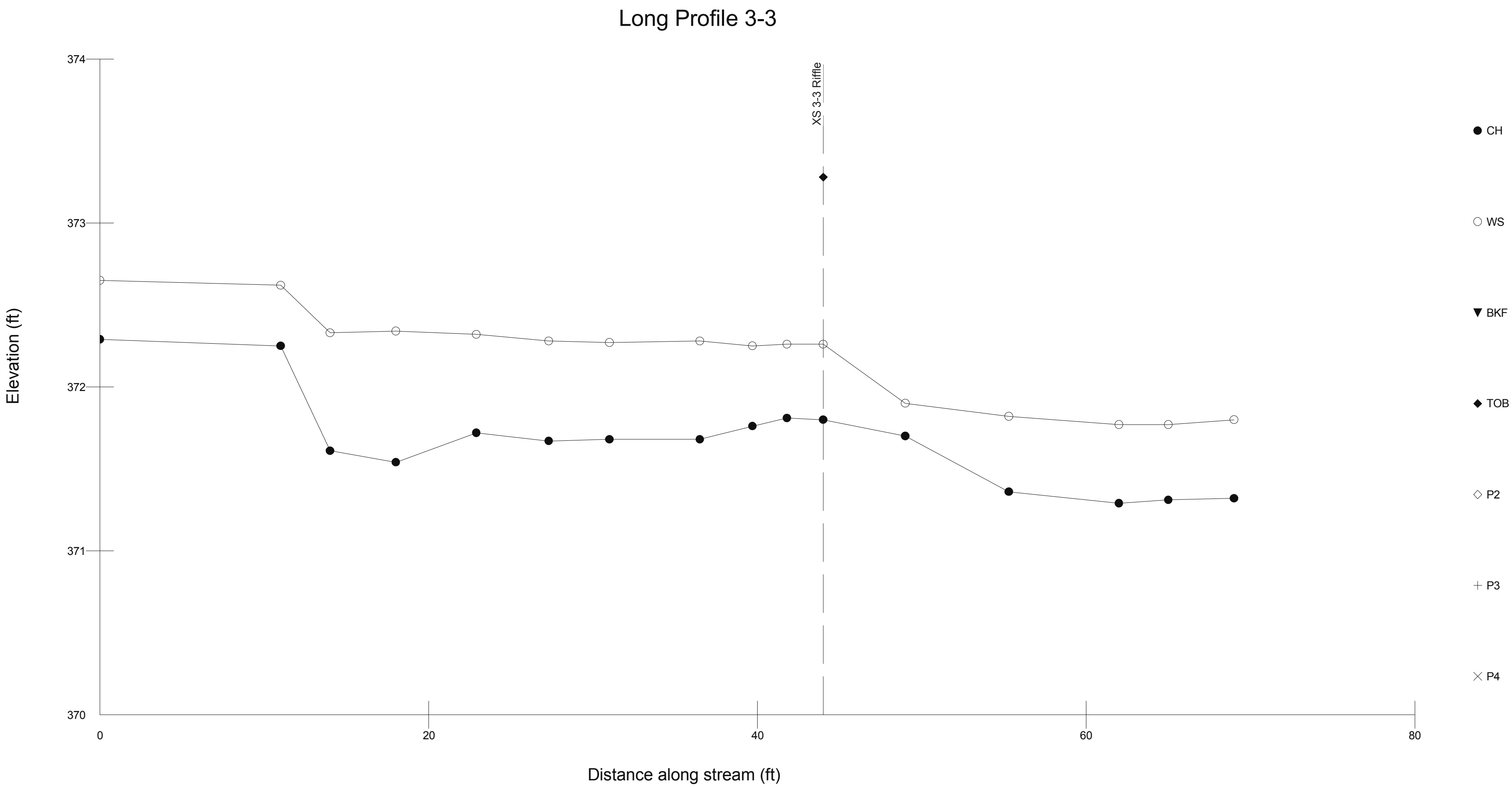




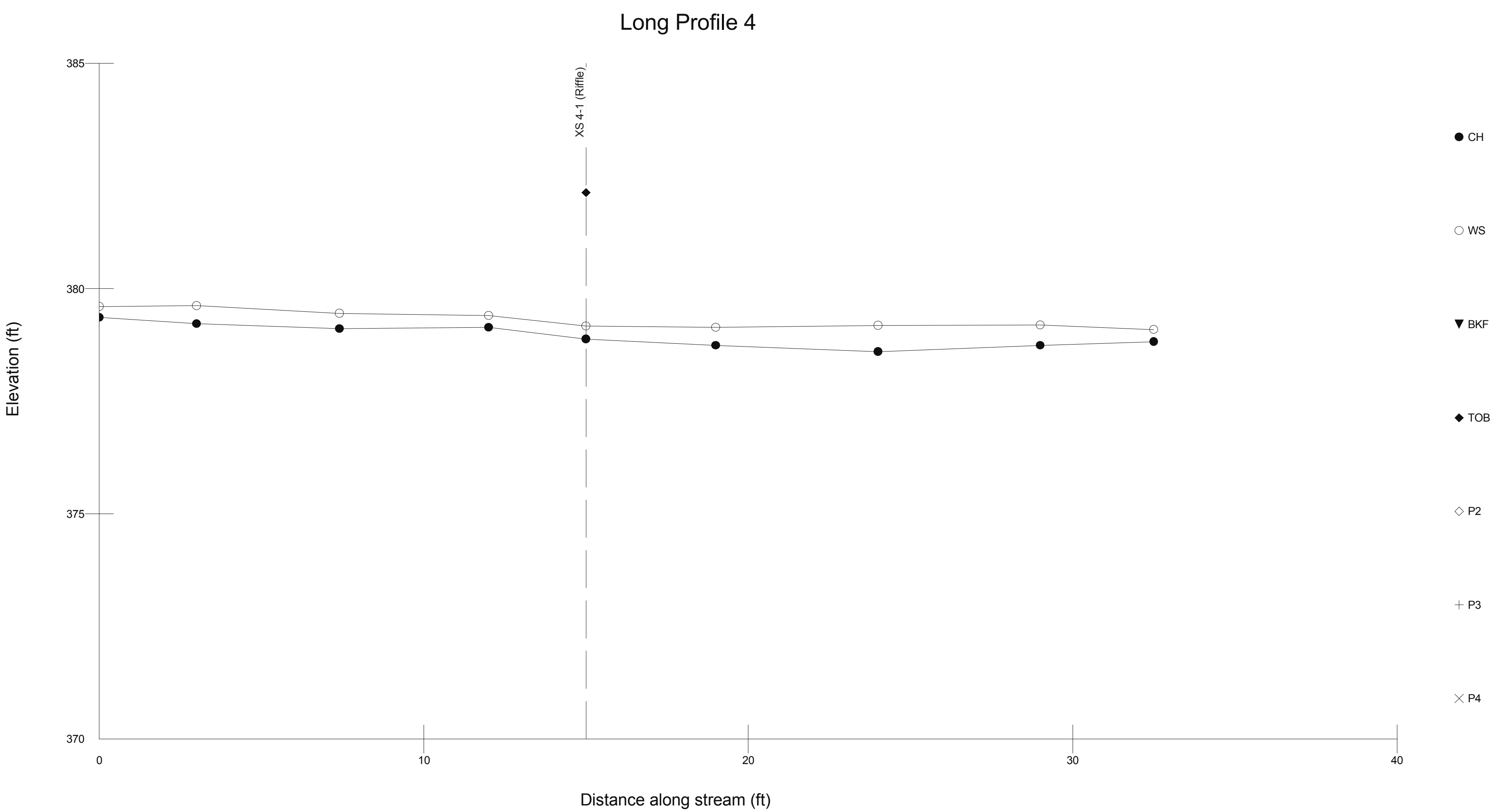
Long Profile 2
Elevation (ft)
Distance along stream (ft)
365
360
355
350
0
50
100
150
XS 2-3 (Riffle)
XS 2-2 (Pool)
XS 2-1 (Riffle)
CH
WS
BKF
TOB
P2
P3
P4

Long Profile 3-2

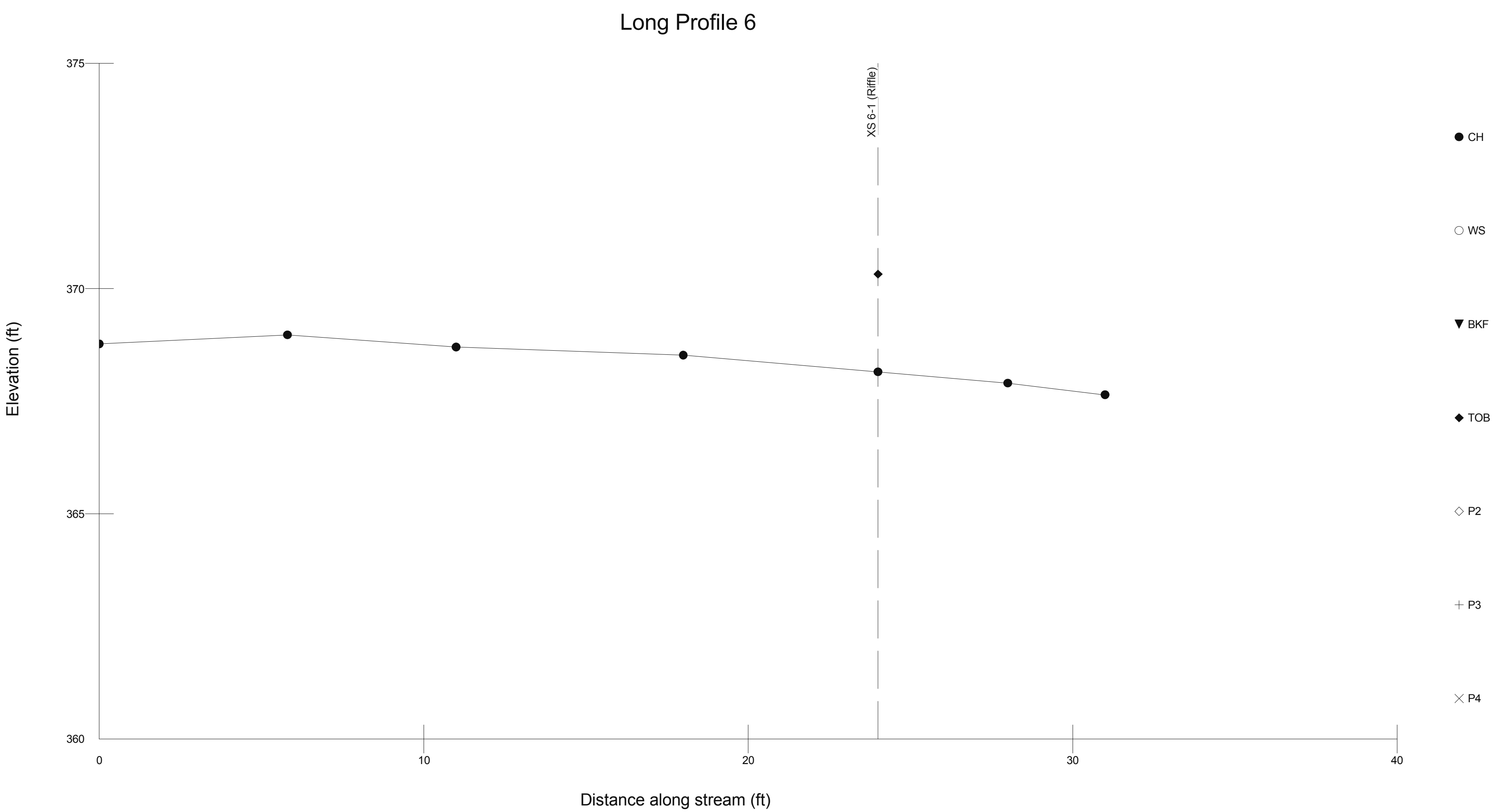


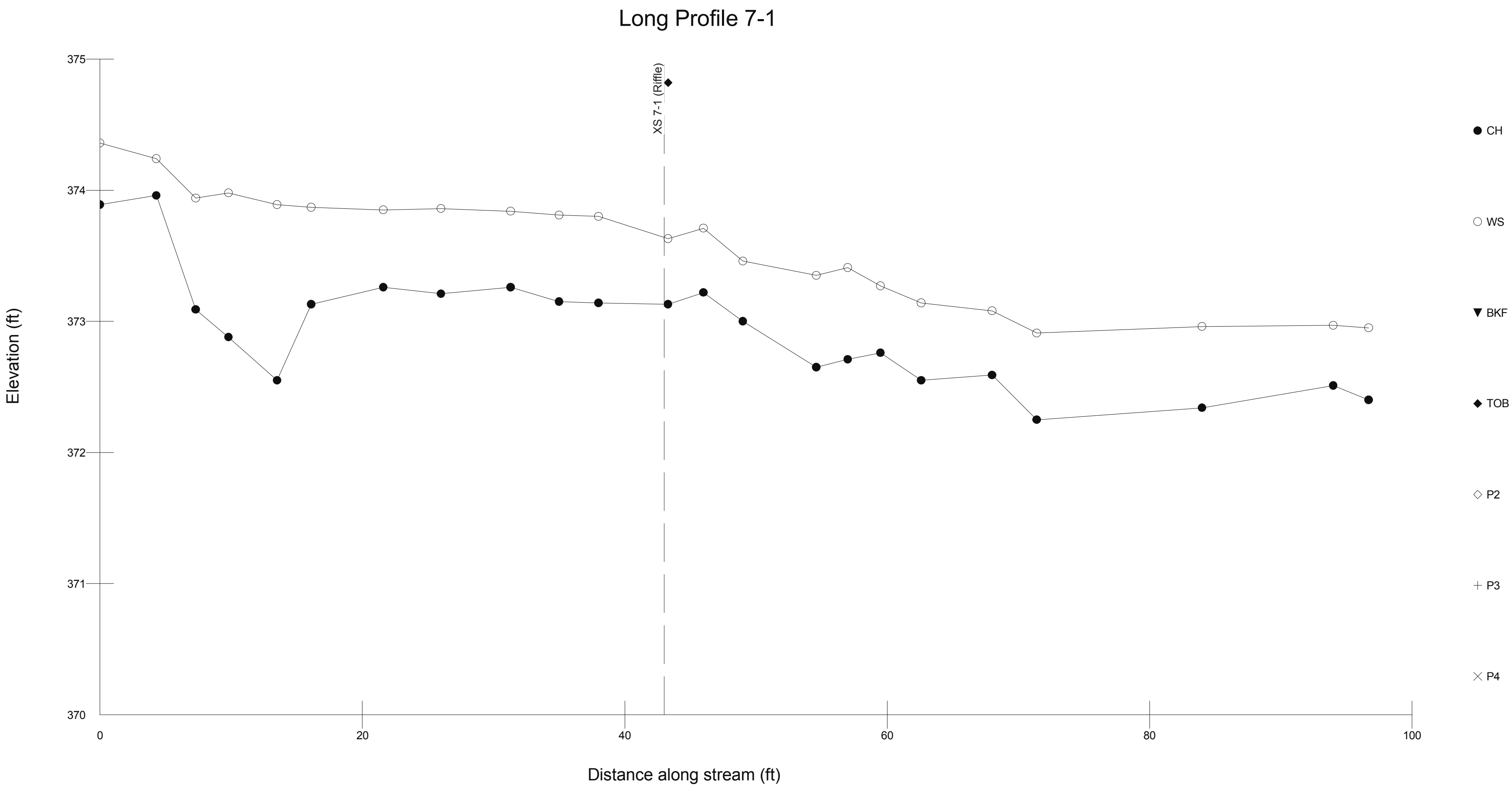


Long Profile 3-3
374
373
372
371
370
Elevation (ft)
XS 3-3 Riffle
0
20
40
60
80
Distance along stream (ft)
CH
WS
BKF
TOB
P2
P3
P4

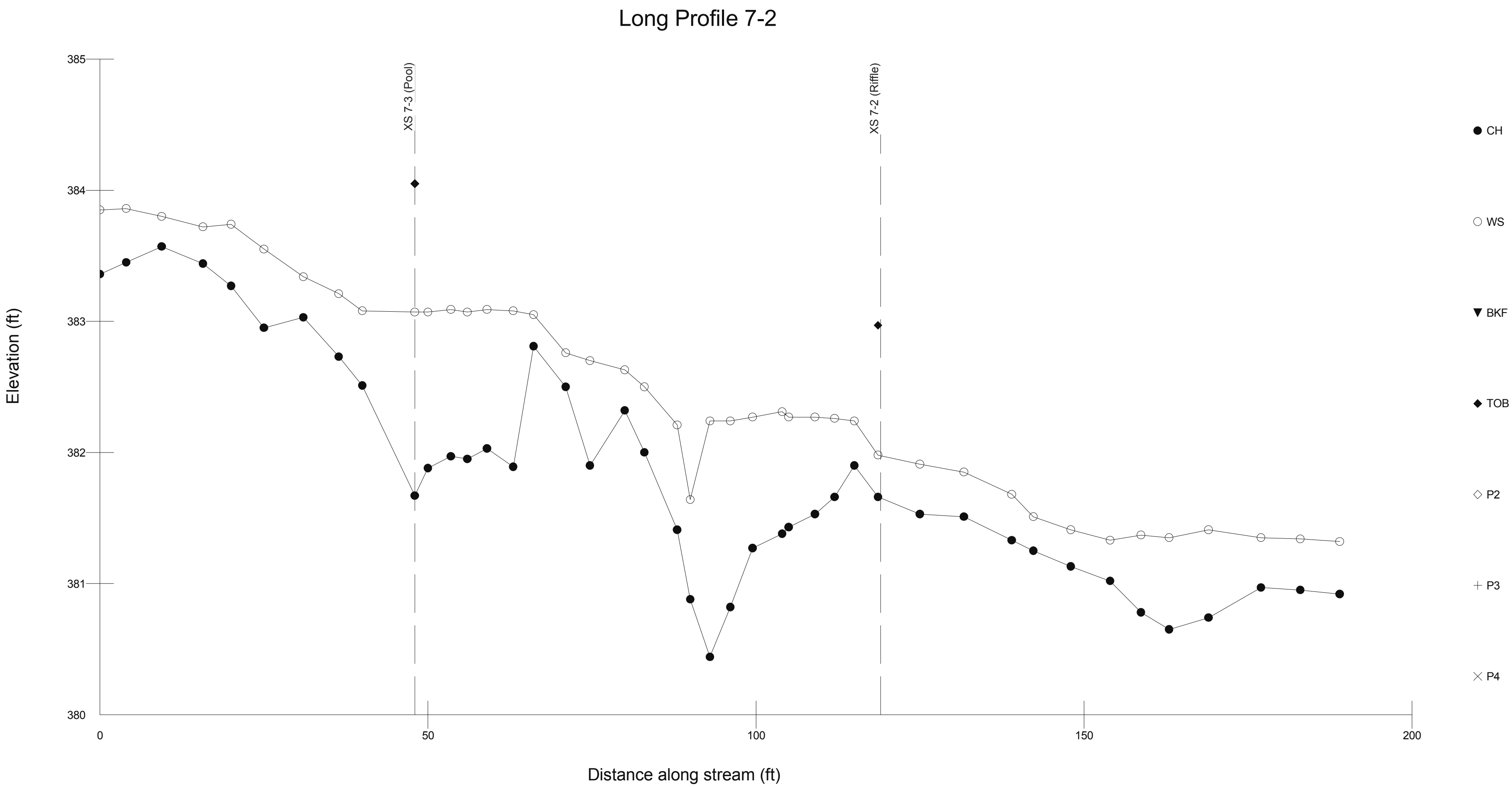


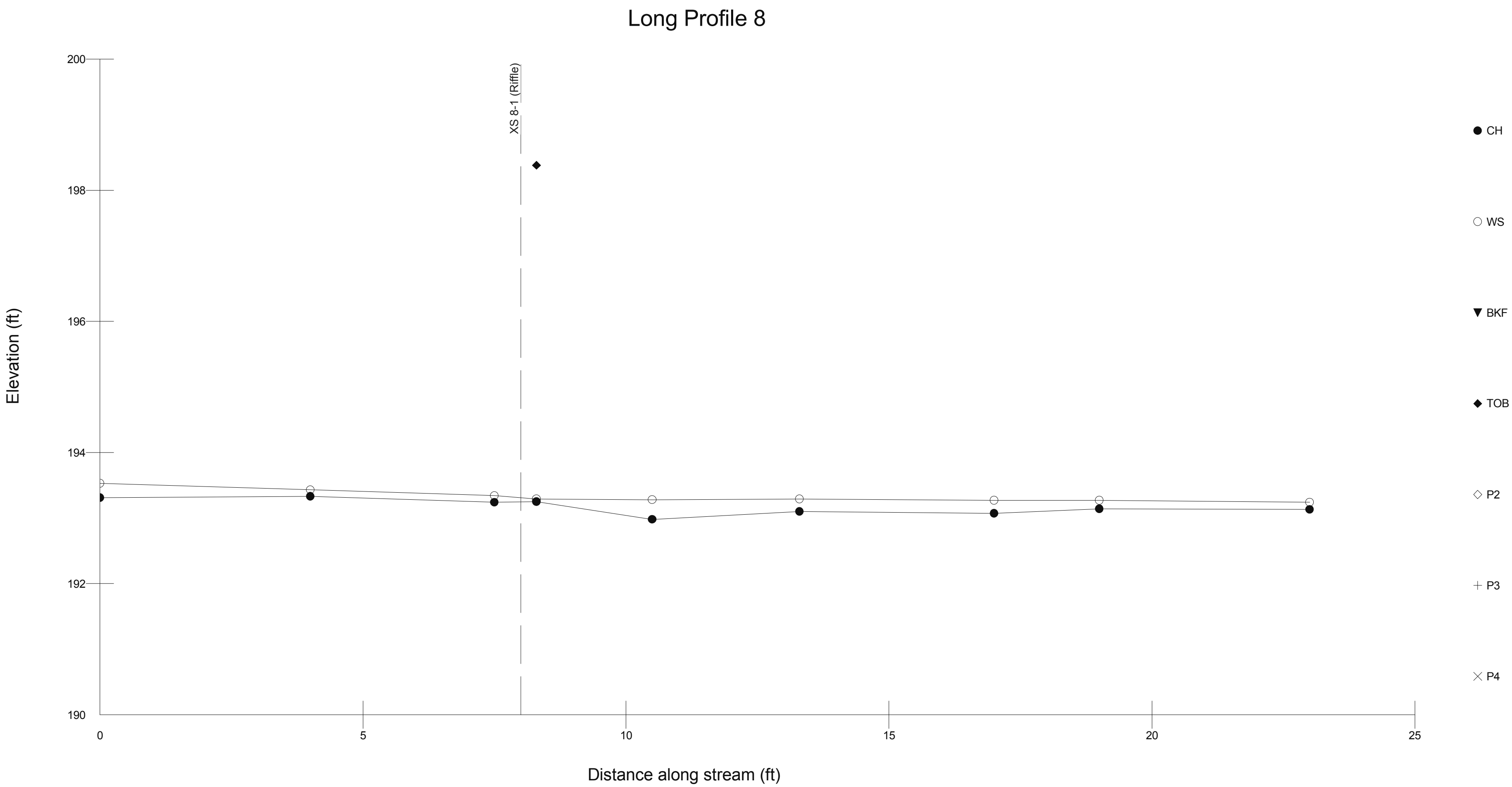
Long Profile 4
XS 4-1 (Riffle)
Elevation (ft)
385
380
375
370
0
10
20
30
40
Distance along stream (ft)
CH
WS
BKF
TOB
P2
P3
P4


Long Profile 6
XS 6-1 (Riffle)
375
370
365
360
0
10
20
30
40
Elevation (ft)
Distance along stream (ft)
CH
WS
BKF
TOB
P2
P3
P4

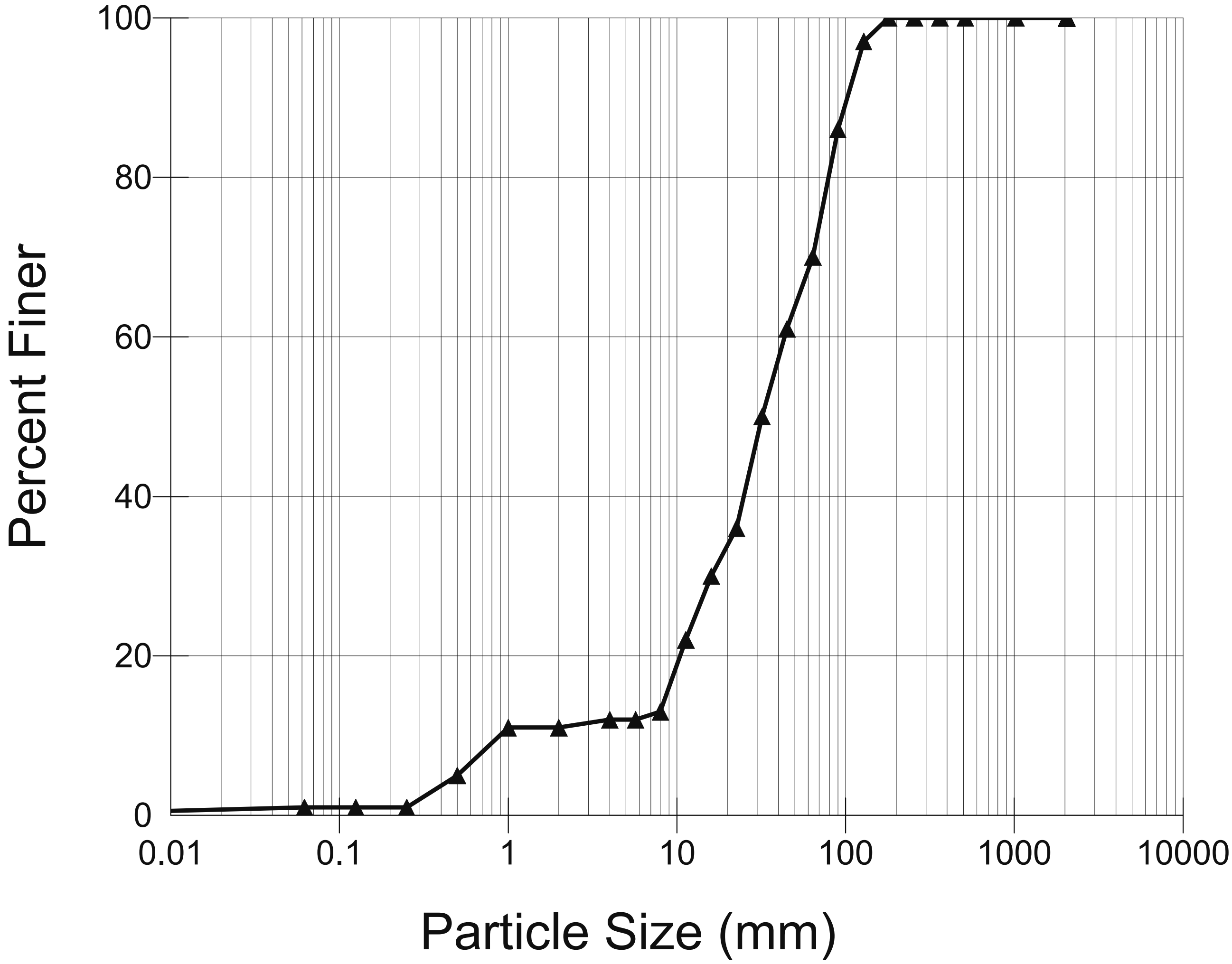


Long Profile 7-1
375
374
373
372
371
370
Elevation (ft)
0
20
40
60
80
100
Distance along stream (ft)
XS 7-1 (Riffle)
CH
WS
BKF
TOB
P2
P3
P4


Long Profile 7-2
Elevation (ft)
Distance along stream (ft)
XS 7-3 (Pool)
XS 7-2 (Riffle)
385
384
383
382
381
380
0
50
100
150
200
CH
WS
BKF
TOB
P2
P3
P4


Long Profile 8
XS 8-1 (Riffle)
Elevation (ft)
200
198
196
194
192
190
0
5
10
15
20
25
Distance along stream (ft)
CH
WS
BKF
TOB
P2
P3
P4

XS 1-1 (Riffle)

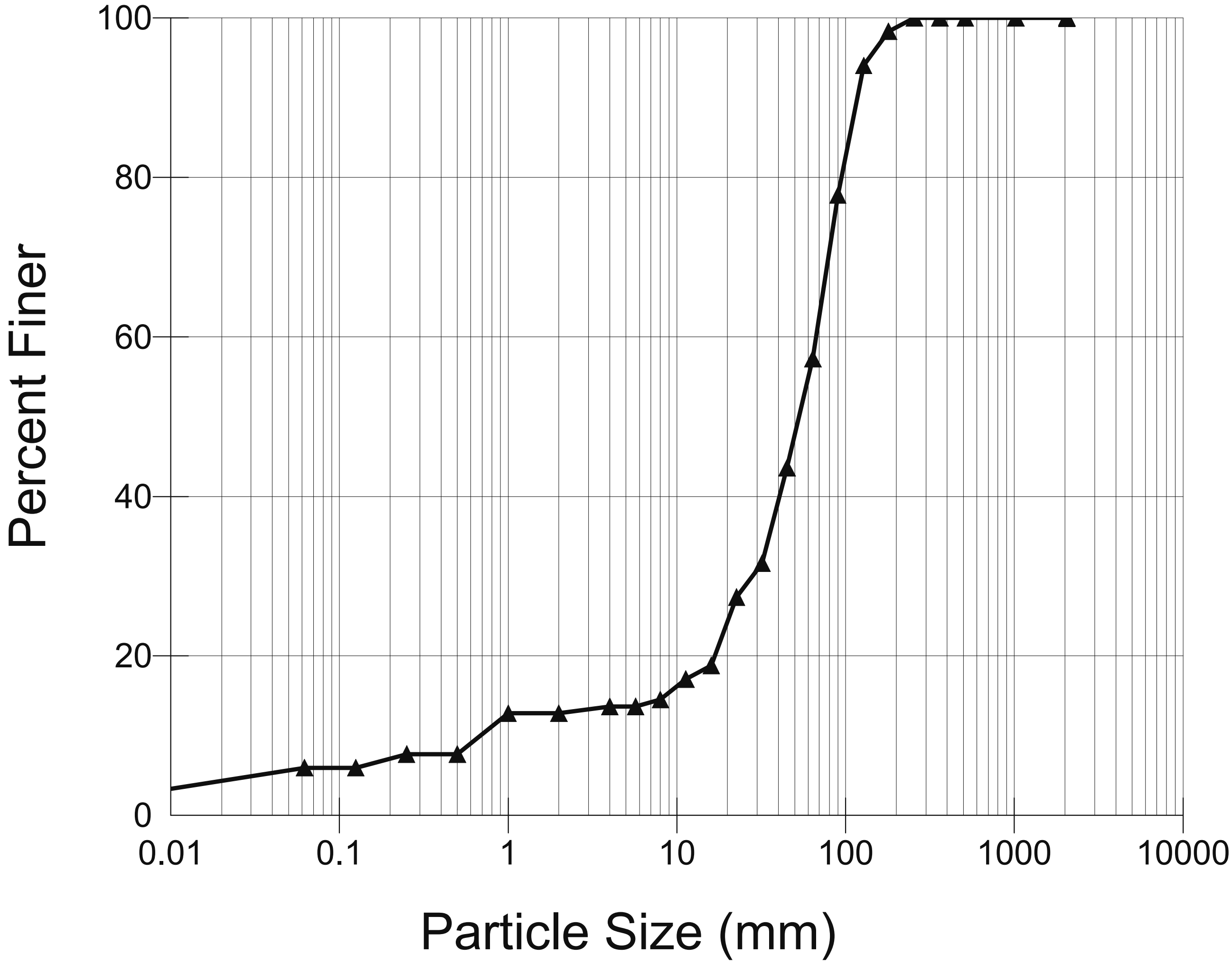


Particle Size Analysis

D16 (mm)	9.1
D35 (mm)	21.5
D50 (mm)	32
D84 (mm)	86.75
D95 (mm)	121.09
D100 (mm)	180
Silt/Clay (%)	1
Sand (%)	10
Gravel (%)	59
Cobble (%)	30
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100

XS 3-2 (Riffle)

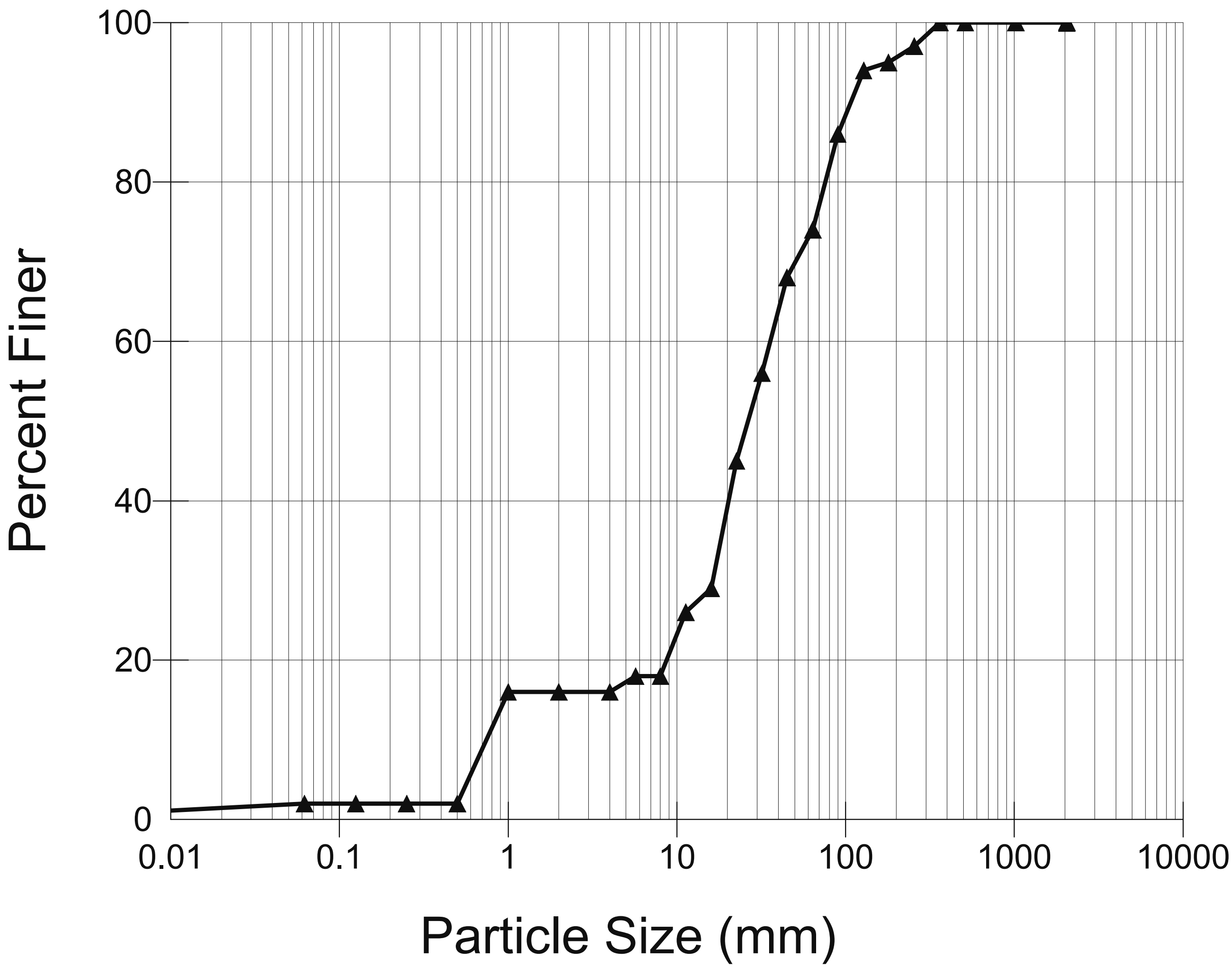


Particle Size Analysis

D16 (mm)	9.89
D35 (mm)	35.67
D50 (mm)	53.91
D84 (mm)	104.55
D95 (mm)	139.93
D100 (mm)	256
Silt/Clay (%)	5.98
Sand (%)	6.84
Gravel (%)	44.44
Cobble (%)	42.74
Boulder (%)	0
Bedrock (%)	0

Total Particles = 117

XS 3-3 (Riffle)

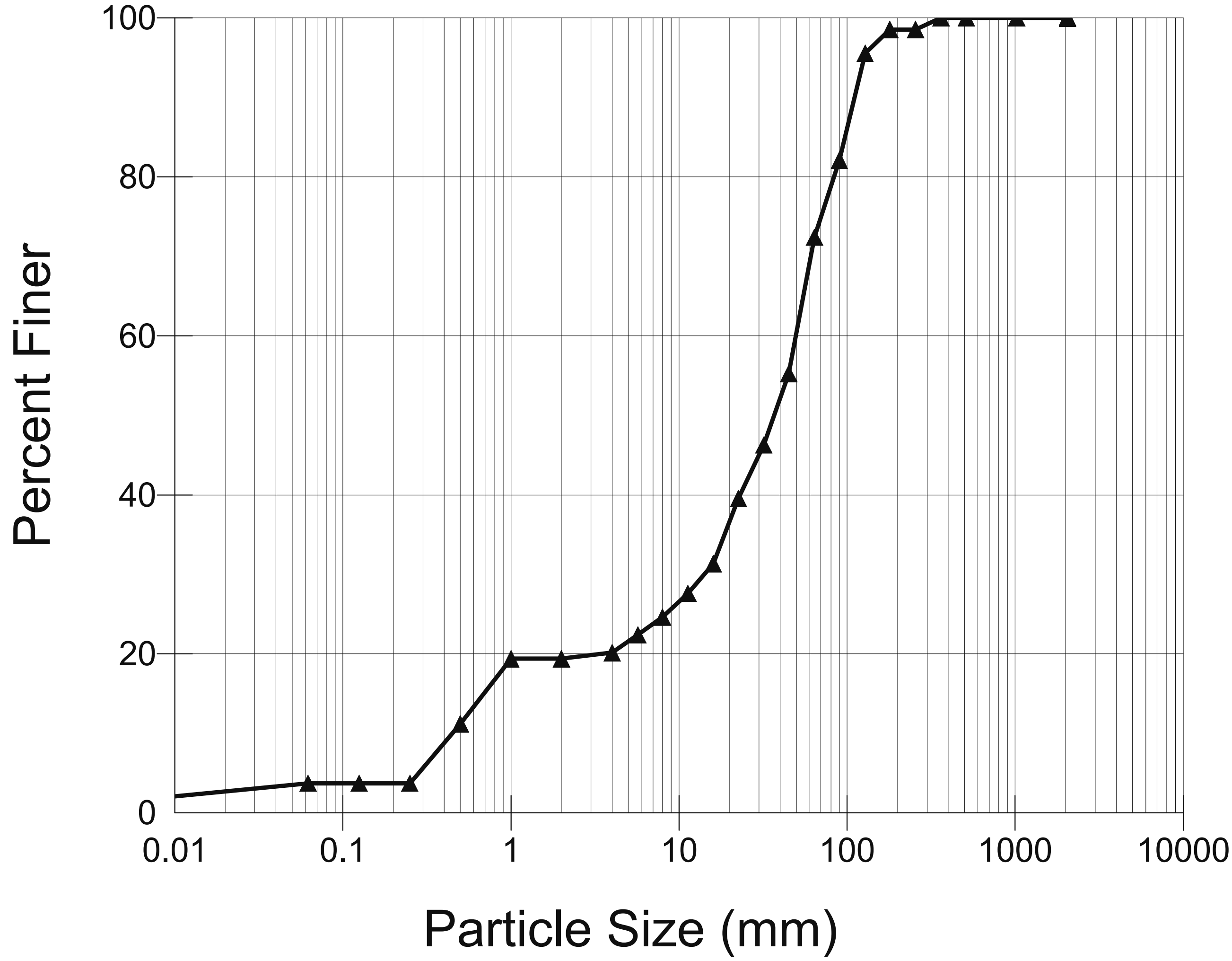


Particle Size Analysis

D16 (mm)	1
D35 (mm)	18.48
D50 (mm)	26.87
D84 (mm)	85.67
D95 (mm)	180
D100 (mm)	362
Silt/Clay (%)	2
Sand (%)	14
Gravel (%)	58
Cobble (%)	23
Boulder (%)	3
Bedrock (%)	0

Total Particles = 100

XS 4-1 (Riffle)

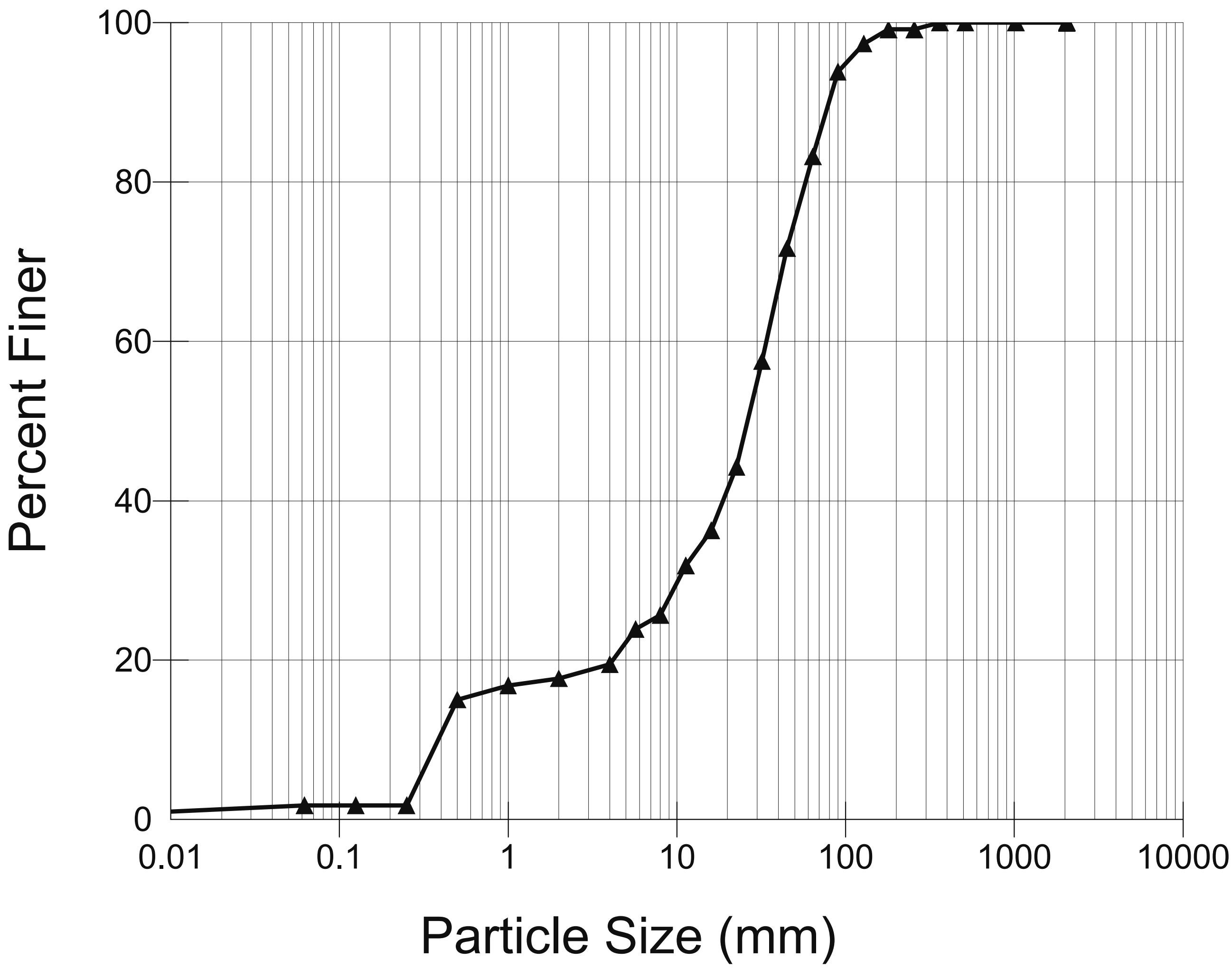


Particle Size Analysis

D16 (mm)	0.79
D35 (mm)	18.94
D50 (mm)	37.42
D84 (mm)	95.4
D95 (mm)	126.53
D100 (mm)	361.99
Silt/Clay (%)	3.73
Sand (%)	15.67
Gravel (%)	52.99
Cobble (%)	26.12
Boulder (%)	1.49
Bedrock (%)	0

Total Particles = 134

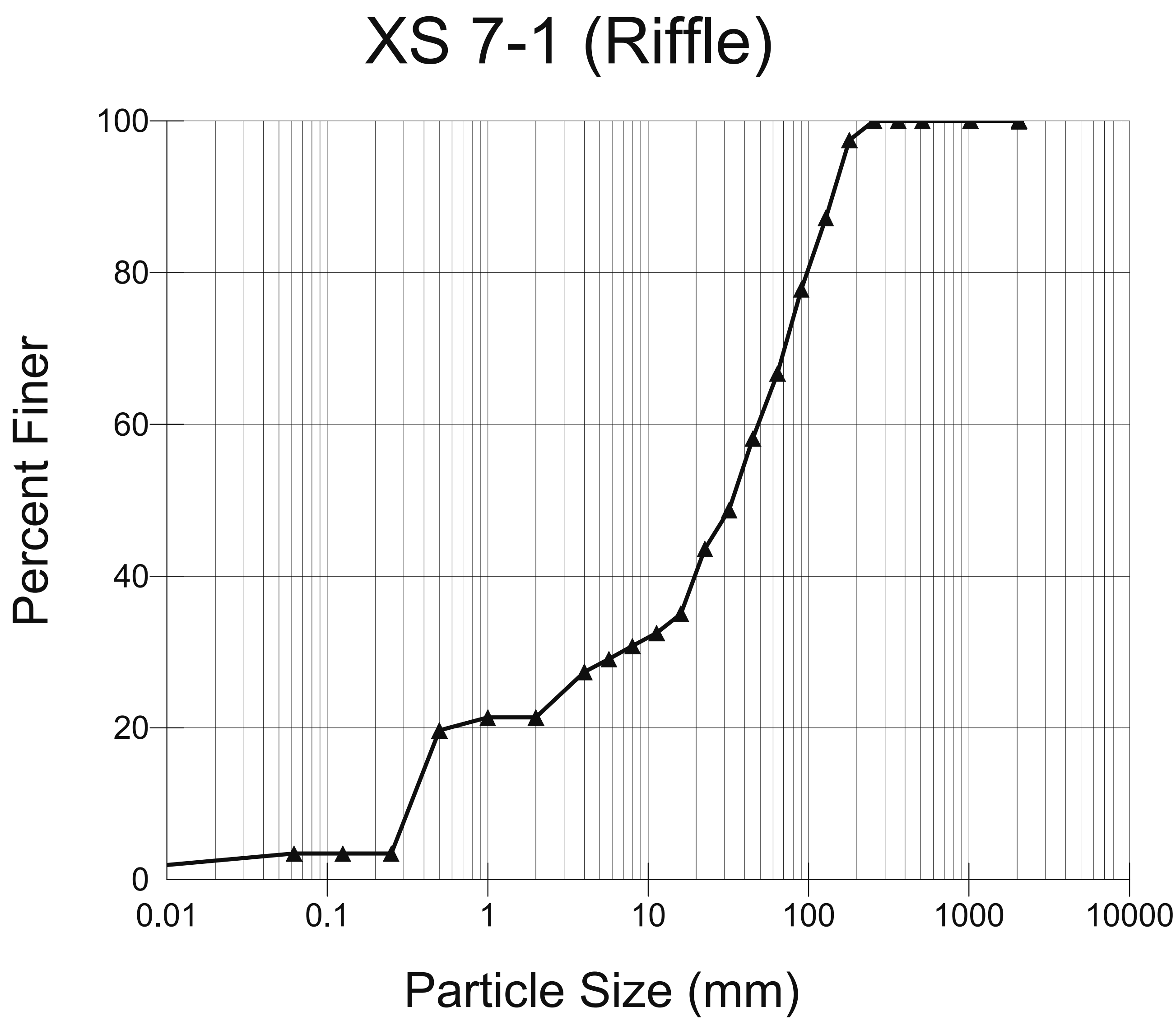
XS 6-1 (Riffle)



Particle Size Analysis

D16 (mm)	0.77
D35 (mm)	14.64
D50 (mm)	26.67
D84 (mm)	65.98
D95 (mm)	102.77
D100 (mm)	361.99
Silt/Clay (%)	1.77
Sand (%)	15.93
Gravel (%)	65.49
Cobble (%)	15.93
Boulder (%)	0.88
Bedrock (%)	0

Total Particles = 113

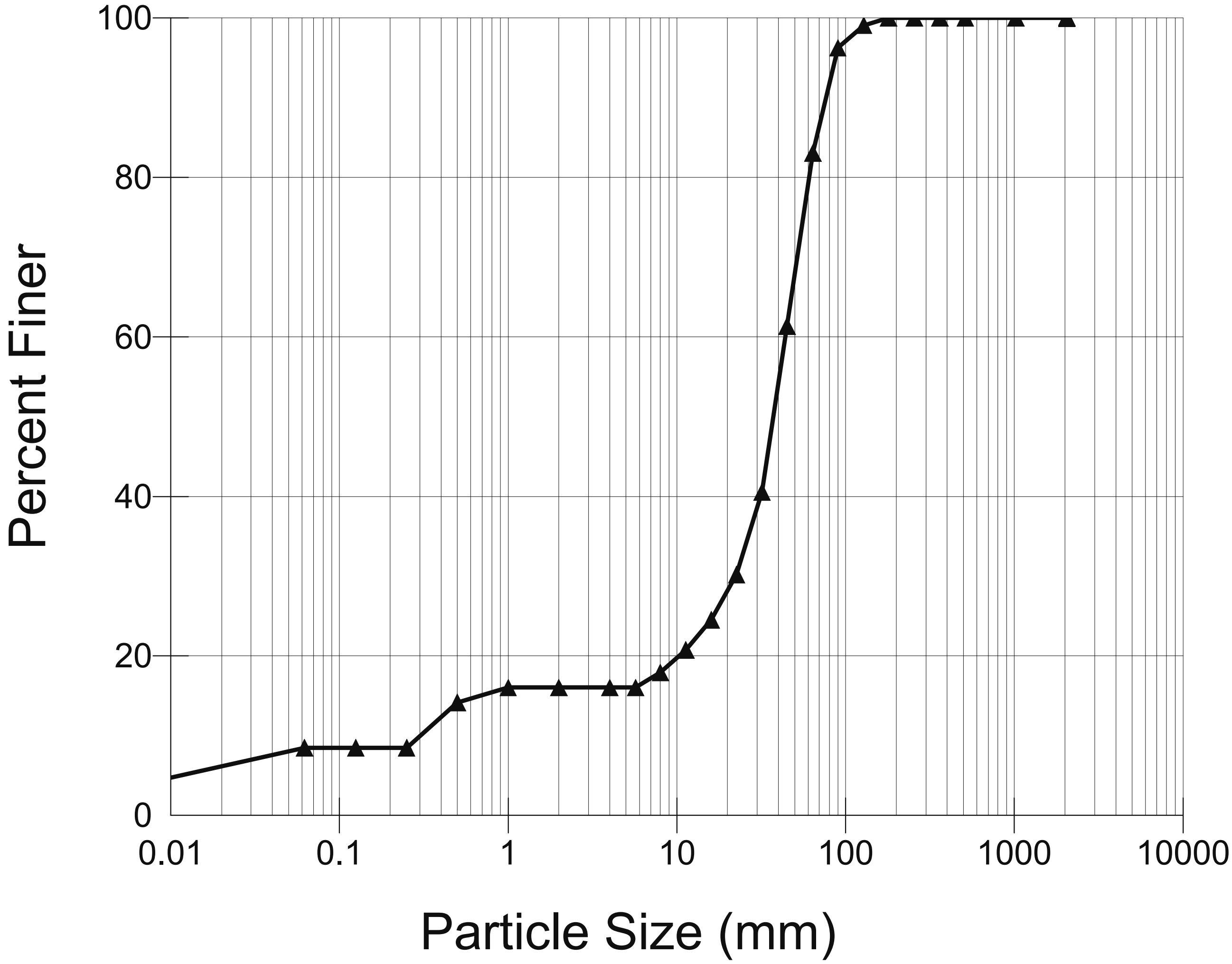


Particle Size Analysis

D16 (mm)	0.44
D35 (mm)	15.93
D50 (mm)	33.77
D84 (mm)	115.14
D95 (mm)	167.63
D100 (mm)	256
Silt/Clay (%)	3.42
Sand (%)	17.95
Gravel (%)	45.3
Cobble (%)	33.33
Boulder (%)	0
Bedrock (%)	0

Total Particles = 117

XS 7-2 (Riffle)

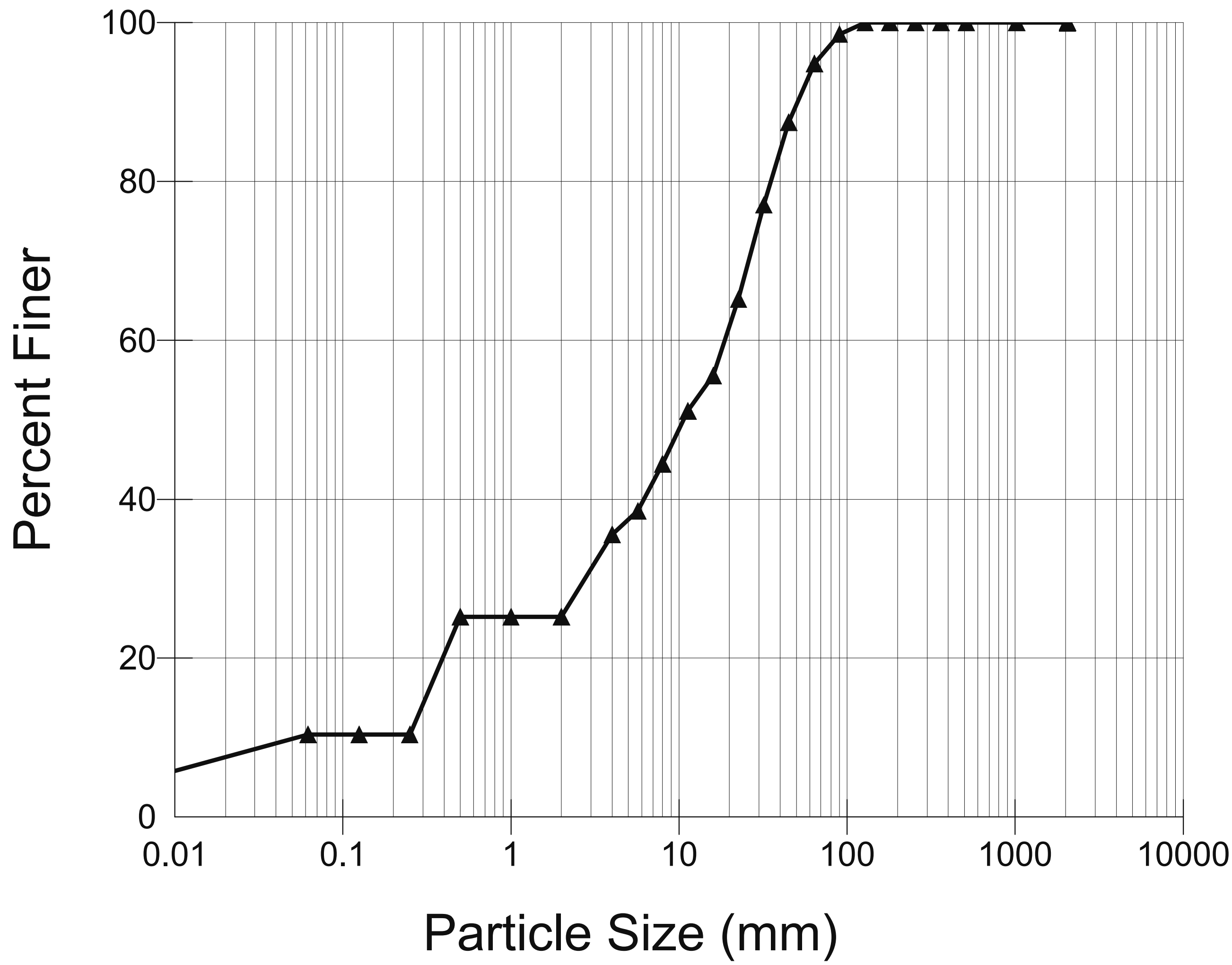


Particle Size Analysis

D16 (mm)	0.99
D35 (mm)	26.96
D50 (mm)	37.91
D84 (mm)	65.93
D95 (mm)	87.58
D100 (mm)	179.99
Silt/Clay (%)	8.49
Sand (%)	7.55
Gravel (%)	66.98
Cobble (%)	16.98
Boulder (%)	0
Bedrock (%)	0

Total Particles = 106

XS 8-1 (Riffle)

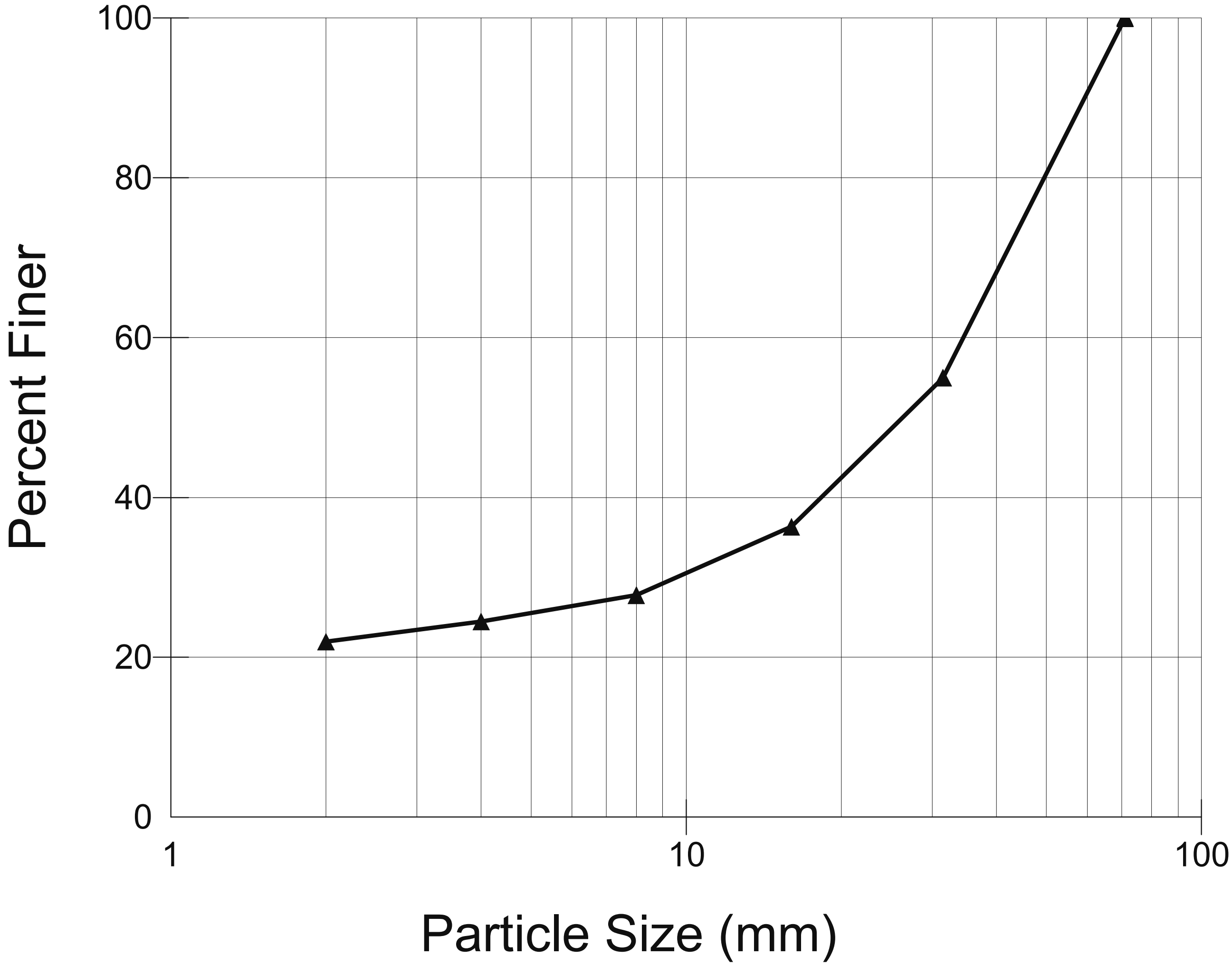


Particle Size Analysis

D16 (mm)	0.34
D35 (mm)	3.89
D50 (mm)	10.75
D84 (mm)	40.73
D95 (mm)	65.33
D100 (mm)	128
Silt/Clay (%)	10.37
Sand (%)	14.82
Gravel (%)	69.62
Cobble (%)	5.19
Boulder (%)	0
Bedrock (%)	0

Total Particles = 135

Basal Gravel 2

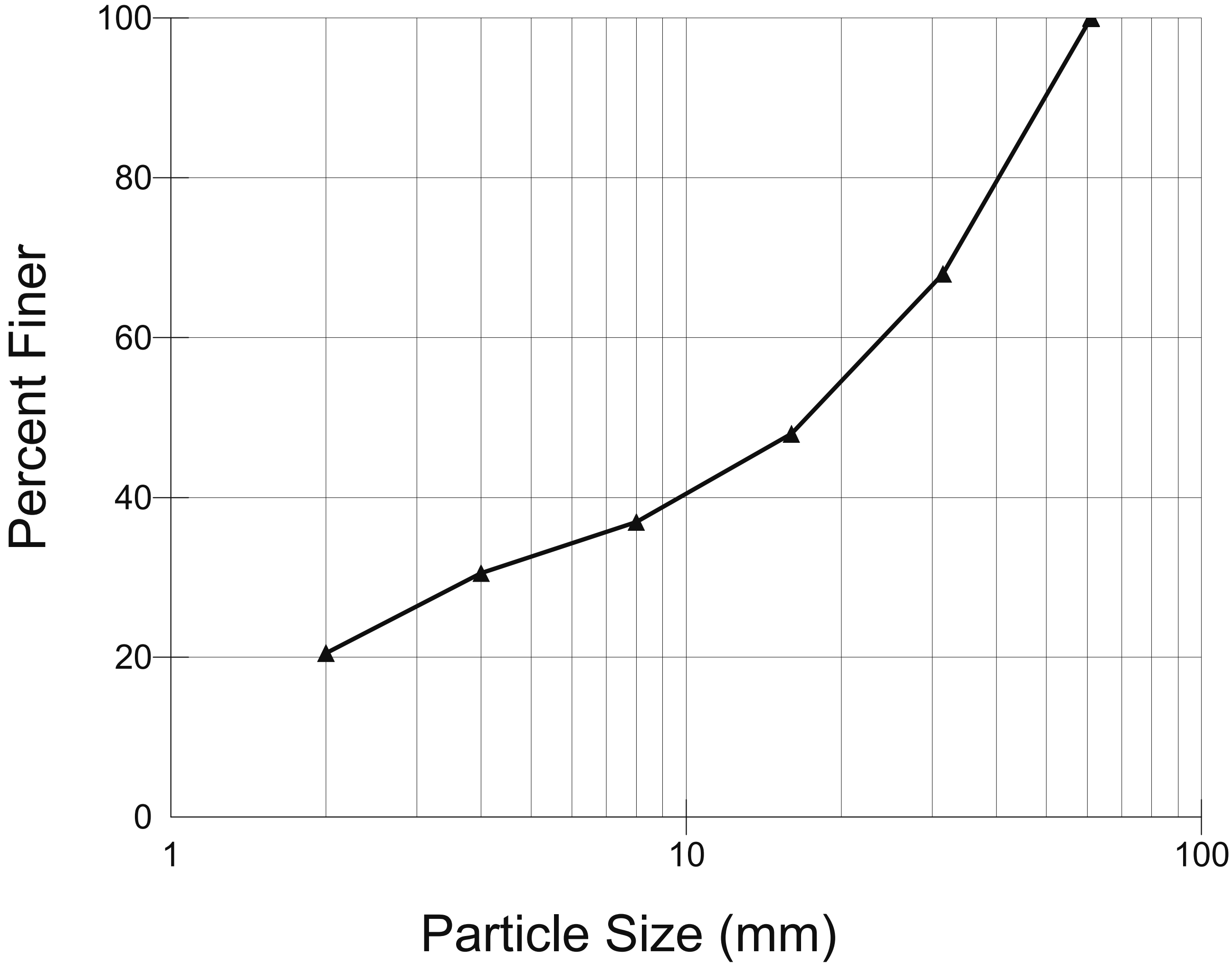


Particle Size Analysis

D16 (mm)	0
D35 (mm)	14.77
D50 (mm)	27.38
D84 (mm)	56.97
D95 (mm)	66.62
D100 (mm)	71
Silt/Clay (%)	0
Sand (%)	21.94
Gravel (%)	72.3
Cobble (%)	5.75
Boulder (%)	0
Bedrock (%)	0

Total Weight = 10.30

Basal Gravel 4

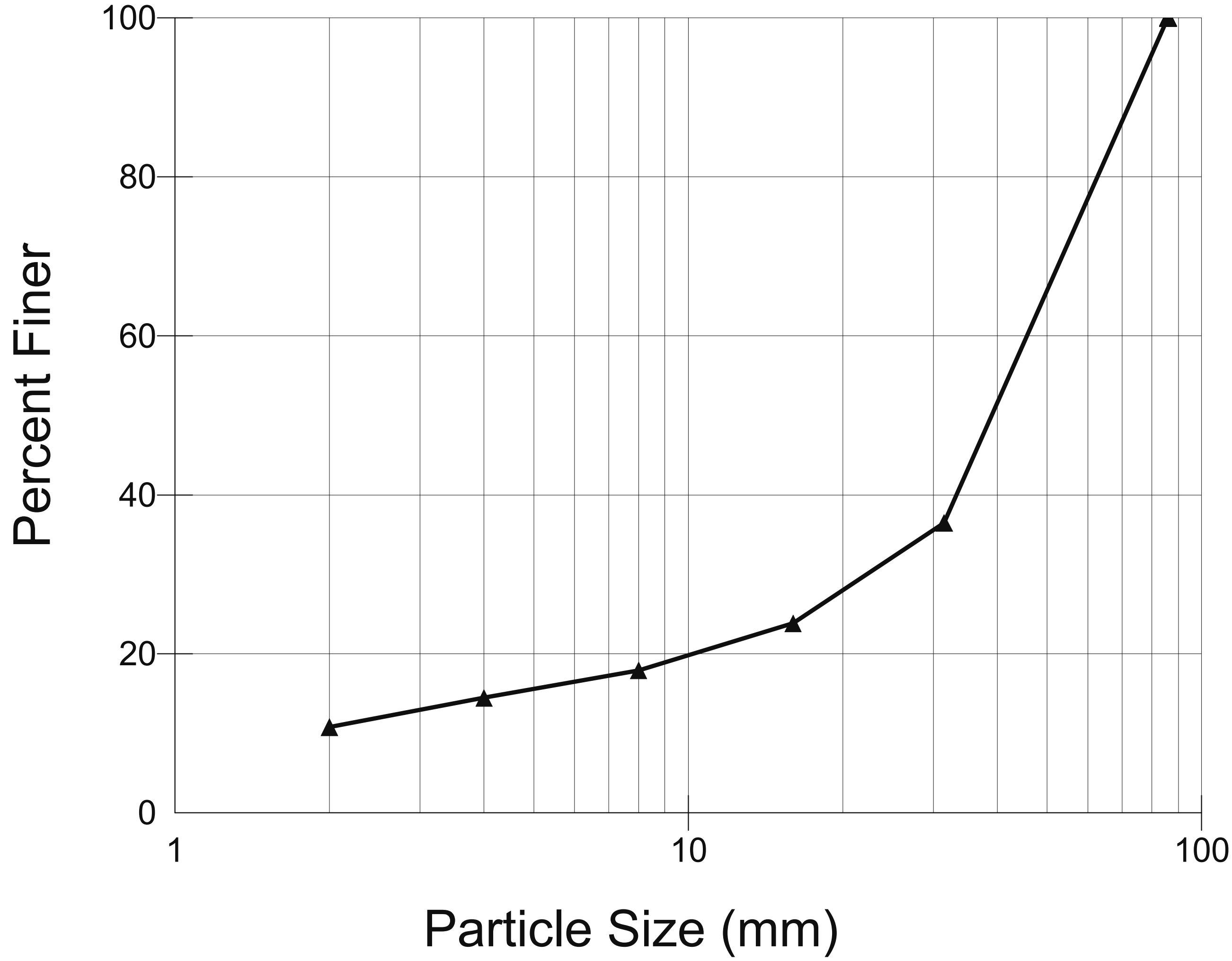


Particle Size Analysis

D16 (mm)	0
D35 (mm)	6.8
D50 (mm)	17.59
D84 (mm)	46.27
D95 (mm)	56.4
D100 (mm)	64
Silt/Clay (%)	0
Sand (%)	20.51
Gravel (%)	79.49
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

Total Weight = 7.80

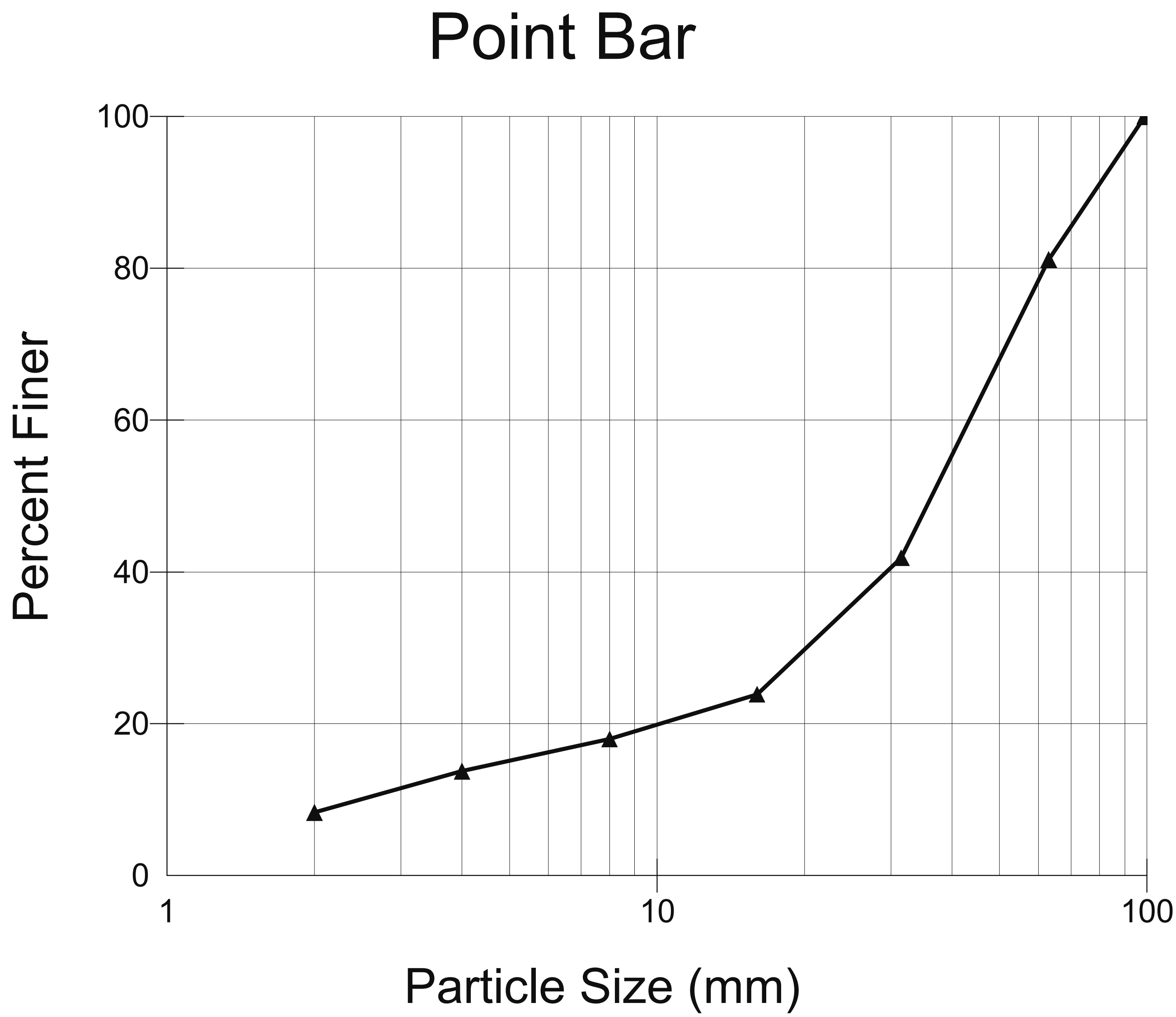
Basal Gravel 5



Particle Size Analysis

D16 (mm)	5.78
D35 (mm)	29.71
D50 (mm)	43.12
D84 (mm)	72.28
D95 (mm)	81.71
D100 (mm)	86
Silt/Clay (%)	0
Sand (%)	10.79
Gravel (%)	70.51
Cobble (%)	18.69
Boulder (%)	0
Bedrock (%)	0

Total Weight = 9.82



Particle Size Analysis

D16 (mm)	6.13
D35 (mm)	25.6
D50 (mm)	38.04
D84 (mm)	68.5
D95 (mm)	89.47
D100 (mm)	99
Silt/Clay (%)	0
Sand (%)	8.31
Gravel (%)	73.47
Cobble (%)	18.22
Boulder (%)	0
Bedrock (%)	0

Total Weight = 13.24

RIVERMORPH PARTICLE SUMMARY

River Name: Eccleston Mitigation Bank
Reach Name: Basal Gravel Samples
Sample Name: Combined Basal Gravel
Survey Date: 11/06/2018

SIEVE (mm)	NET WT
31.5	10.18
16	4.72
8	2.32
4	1.18
2	1.4
PAN	4.92

D16 (mm)	0
D35 (mm)	13.81
D50 (mm)	26.84
D84 (mm)	66.44
D95 (mm)	79.89
D100 (mm)	86
Silt/Clay (%)	0
Sand (%)	18.75
Gravel (%)	68.13
Cobble (%)	13.12
Boulder (%)	0
Bedrock (%)	0

Total Weight = 26.2400.

Largest Surface Particles:

	Size(mm)	Weight
Particle 1:	86	0.52
Particle 2:	74	1

RIVERMORPH PARTICLE SUMMARY

River Name: Eccleston Mitigation Bank
Reach Name: Combined MainStem
Sample Name: Combined Riffle Pebble Count
Survey Date: 11/07/2018

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	23	4.26	4.26
0.062 - 0.125	0	0.00	4.26
0.125 - 0.25	2	0.37	4.63
0.25 - 0.50	29	5.37	10.00
0.50 - 1.0	30	5.56	15.56
1.0 - 2.0	0	0.00	15.56
2.0 - 4.0	9	1.67	17.22
4.0 - 5.7	4	0.74	17.96
5.7 - 8.0	6	1.11	19.07
8.0 - 11.3	25	4.63	23.70
11.3 - 16.0	20	3.70	27.41
16.0 - 22.6	48	8.89	36.30
22.6 - 32.0	47	8.70	45.00
32 - 45	70	12.96	57.96
45 - 64	64	11.85	69.81
64 - 90	79	14.63	84.44
90 - 128	52	9.63	94.07
128 - 180	22	4.07	98.15
180 - 256	7	1.30	99.44
256 - 362	3	0.56	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	2.53
D35 (mm)	21.63
D50 (mm)	37.02
D84 (mm)	89.22
D95 (mm)	139.85
D100 (mm)	361.98
Silt/Clay (%)	4.26
Sand (%)	11.3
Gravel (%)	54.25
Cobble (%)	29.63
Boulder (%)	0.56
Bedrock (%)	0

Total Particles = 540.

APPENDIX E
TMDL and NPDES Credit Calculations

Only enter data in the green cells. All other cells are either linked to other worksheets or have equations.

Project Name	Eccleston Mitigation Bank											
Feature	Lat/Long		Length, ft (Bank or deposition)	Height, ft (Bank or Headcut)	BEHI Rating	NBS Rating	Predicted Rate of Bank Erosion (ft/year)	Predicted Erosion Amount (ft^3/year)	Predicted Erosion Amount (tons/year)	Predicted Erosion Rate (tons/year/ft)	Comments
Feature I.D. (Bank., Headcut or Deposition I.D.)	Start: Headcut Location or Start of Bank/Deposition	End: For Banks or Deposition only									
Left Bank, LB1	137+81.38 to 138+57.64		79	5.00	High	Low	0.40	158.00	7.61	0.096	Jones Falls - Main Stem
Right Bank, RB1	137+75.04 to 138+58.10		81	5.00	Very High	Very High	1.75	708.75	34.13	0.421	Jones Falls - Main Stem
Left Bank, LB2	136+80.59 to 137+81.38		109	4.00	High	Extreme	2.50	1090.00	52.48	0.481	Jones Falls - Main Stem
Right Bank, RB2	136+68.35 to 137+75.04		101	3.00	Extreme	Extreme	4.50	1363.50	65.65	0.650	Jones Falls - Main Stem
Left Bank, LB3	135+84.96 to 136+80.59		90	2.70	Very High	High	1.00	243.00	11.70	0.130	Jones Falls - Main Stem
Right Bank, RB3	135+92.67 to 136+68.35		87	4.30	High	Low	0.40	149.64	7.20	0.083	Jones Falls - Main Stem
Left Bank, LB4	135+2.07 to 135+84.96		87	3.20	Extreme	High	2.50	696.00	33.51	0.385	Jones Falls - Main Stem
Right Bank, RB4	135+7.97 to 135+92.67		83	2.20	High	Low	0.40	73.04	3.52	0.042	Jones Falls - Main Stem
Left Bank, LB5	133+88.95 to 135+2.07		133	4.00	Very High	Very High	1.75	931.00	44.83	0.337	Jones Falls - Main Stem
Right Bank, RB5	134+20.79 to 135+7.97		88	2.50	High	Low	0.40	88.00	4.24	0.048	Jones Falls - Main Stem
Right Bank, RB6	133+33.43 to 134+20.79		92	4.00	Very High	High	1.00	368.00	17.72	0.193	Jones Falls - Main Stem
Left Bank, LB6	132+65.40 to 133+88.95		124	4.00	High	Low	0.40	198.40	9.55	0.077	Jones Falls - Main Stem
Right Bank, RB7	126+61.74 to 133+33.43		686	3.50	Extreme	High	2.50	6002.50	289.01	0.421	Jones Falls - Main Stem
Left Bank, LB7	126+57.48 to 132+65.40		621	4.50	High	Low	0.40	1117.80	53.82	0.087	Jones Falls - Main Stem
Right Bank, RB8	123+57.45 to 126+61.74		301	3.50	Very High	Low	0.40	421.40	20.29	0.067	Jones Falls - Main Stem
Left Bank, LB8	124+88.11 to 126+57.48		194	3.00	High	Low	0.40	232.80	11.21	0.058	Jones Falls - Main Stem
Right Bank, RB9	121+21.11 to 123+57.45		239	5.00	High	Moderate	0.64	764.80	36.82	0.154	Jones Falls - Main Stem
Left Bank, LB9	121+23.56 to 124+88.11		409	3.50	Very High	Moderate	0.64	916.16	44.11	0.108	Jones Falls - Main Stem
Right Bank, RB10	119+64.19 to 121+21.11		160	2.50	High	Moderate	0.64	256.00	12.33	0.077	Jones Falls - Main Stem

Feature I.D. (Bank., Headcut or Deposition I.D.)	Lat/Long Start: Headcut Location or Start of Bank/Deposition	Lat/Long End: For Banks or Deposition only	Length, ft (Bank or deposition)	Height, ft (Bank or Headcut)	BEHI Rating	NBS Rating	Predicted Rate of Bank Erosion (ft/year)	Predicted Erosion Amount (ft^3/year)	Predicted Erosion Amount (tons/year)	Predicted Erosion Rate (tons/year/ft)	Comments
Left Bank, LB10	120+25.66 to 121+23.56		97	3.00	Very High	Moderate	0.64	186.24	8.97	0.092	Jones Falls - Main Stem
Right Bank, RB11	116+39.48 to 119+64.19		325	4.50	High	Low	0.40	585.00	28.17	0.087	Jones Falls - Main Stem
Left Bank, LB11	114+61.16 to 120+25.66		595	4.50	High	Low	0.40	1071.00	51.57	0.087	Jones Falls - Main Stem
Right Bank, RB12	115+14.22 to 116+39.48		124	5.50	High	Low	0.40	272.80	13.13	0.106	Jones Falls - Main Stem
Left Bank, LB12	111+99.76 to 114+61.16		246	3.00	High	Extreme	2.50	1845.00	88.83	0.361	Jones Falls - Main Stem
Right Bank, RB13	113+44.63 to 115+14.22		160	2.20	Very High	Moderate	0.64	225.28	10.85	0.068	Jones Falls - Main Stem
Left Bank, LB13	110+41.23 to 111+99.76		147	3.50	High	Moderate	0.64	329.28	15.85	0.108	Jones Falls - Main Stem
Right Bank, RB14	112+84.76 to 113+44.63		76	2.50	Extreme	Extreme	4.50	855.00	41.17	0.542	Jones Falls - Main Stem
Left Bank, LB14	108+67.52 to 110+41.23		188	3.00	Extreme	Moderate	1.75	987.00	47.52	0.253	Jones Falls - Main Stem
Right Bank, RB15	112+3.47 to 112+84.76		79	3.00	Very High	Moderate	0.64	151.68	7.30	0.092	Jones Falls - Main Stem
Left Bank, LB15	107+61.02 to 108+67.52		103	2.50	Very High	Low	0.40	103.00	4.96	0.048	Jones Falls - Main Stem
Right Bank, RB16	110+65.05 to 112+3.47		140	3.50	High	Moderate	0.64	313.60	15.10	0.108	Jones Falls - Main Stem
Left Bank, LB16	106+23.76 to 107+61.02		138	2.50	Very High	Low	0.40	138.00	6.64	0.048	Jones Falls - Main Stem
Right Bank, RB17	107+61.59 to 110+65.05		298	2.00	Very High	Very High	1.75	1043.00	50.22	0.169	Jones Falls - Main Stem
Left Bank, LB17	102+41.73 to 106+23.76		419	2.50	High	High	1.00	1047.50	50.44	0.120	Jones Falls - Main Stem
Right Bank, RB18	106+3.93 to 107+61.59		157	2.50	High	Low	0.40	157.00	7.56	0.048	Jones Falls - Main Stem
Right Bank, RB19	102+40.18 to 106+3.93		362	2.50	Very High	Low	0.40	362.00	17.43	0.048	Jones Falls - Main Stem
Left Bank, LB18	202+64.02 to 205+15.89		279	3.50	Extreme	Low	1.30	1269.45	61.12	0.219	Rail Road Tributary
Left Bank, LB19	205+15.89 to 205+62.34		43	2.00	Very High	Low	0.40	34.40	1.66	0.039	Rail Road Tributary
Right Bank, RB20	202+64.58 to 205+11.94		244	3.00	Very High	Extreme	2.50	1830.00	88.11	0.361	Rail Road Tributary
Right Bank, RB21	205+11.94 to 205+58.48		47	2.00	Very High	Extreme	2.50	235.00	11.31	0.241	Rail Road Tributary

Feature Feature I.D. (Bank., Headcut or Deposition I.D.)	Lat/Long Start Headcut Location or Start of Bank/Deposition	 End For Banks or Deposition only	Length, ft (Bank or deposition)	Height, ft (Bank or Headcut)	BEHI Rating	NBS Rating	Predicted Rate of Bank Erosion (ft/year)	Predicted Erosion Amount (ft^3/year)	Predicted Erosion Amount (tons/year)	Predicted Erosion Rate (tons/year/ft)	Comments
Left Bank, LB20	404+4.57 to 405+60.53		155	0.50	High	Low	0.40	31.00	1.49	0.010	Braided Tributary
Left Bank, LB21	405+60.53 to 410+65.09		517	2.80	High	Low	0.40	579.04	27.88	0.054	Braided Tributary
Right Bank, RB22	404+7.41 to 405+56.34		147	0.50	High	Extreme	2.50	183.75	8.85	0.060	Braided Tributary
Right Bank, RB23	405+56.34 to 410+65.81		516	2.00	High	Extreme	2.50	2580.00	124.22	0.241	Braided Tributary
Left Bank, LB22	309+20.39 to 311+1.38		178	2.50	Extreme	Low	1.30	578.50	27.85	0.156	Stone House Tributary
Left Bank, LB23	307+55.25 to 309+20.39		163	2.50	Very High	Low	0.40	163.00	7.85	0.048	Stone House Tributary
Right Bank, RB24	306+16.05 to 310+97.33		486	2.50	High	Low	0.40	486.00	23.40	0.048	Stone House Tributary
Left Bank, LB24	306+18.16 to 307+55.25		137	2.50	High	Low	0.40	137.00	6.60	0.048	Stone House Tributary
Right Bank, RB25	305+52.82 to 306+16.05		62	2.50	Extreme	Low	1.30	201.50	9.70	0.156	Stone House Tributary
Left Bank, LB25	305+51.43 to 306+18.16		65	2.50	Extreme	Low	1.30	211.25	10.17	0.156	Stone House Tributary
Right Bank, RB26	302+31.22 to 305+52.82		335	2.50	High	Low	0.40	335.00	16.13	0.048	Stone House Tributary
Left Bank, LB26	302+30.62 to 305+51.43		322	2.50	High	Low	0.40	322.00	15.50	0.048	Stone House Tributary
Right Bank, RB27	301+33.97 to 302+31.22		111	4.00	High	Low	0.40	177.60	8.55	0.077	Stone House Tributary
Left Bank, LB27	301+25.14 to 302+30.62		107	2.00	Very High	Very High	1.75	374.50	18.03	0.169	Stone House Tributary
Right Bank, RB28	500+3.19 to 503+63.08		345	6.00	Very High	Very High	1.75	3622.50	174.42	0.506	Intersection Tributary
Left Bank, LB28	500+2.38 to 503+65.54		367	6.00	Very High	Moderate	0.64	1409.28	67.85	0.185	Intersection Tributary
Right Bank, RB29	503+63.08 to 507+15.6		358	5.00	Very High	Low	0.40	716.00	34.47	0.096	Intersection Tributary
Left Bank, LB29	503+65.54 to 507+20.72		352	5.00	Very High	Moderate	0.64	1126.40	54.23	0.154	Intersection Tributary
TOTAL OF ALL GRIDS			**12754.0**	**N/A**	**N/A**	**N/A**	**64.1**	**42054.3**	**2024.8**	**9.4**	

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	39.88
Reach:	137+81.38 to 138+57.64	**Comments:**							High
Location:	Left Bank 1	**Bank Length**	79						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
5.00	1.50	3.33	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.25	5.00	0.05	9.00	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
70.00	0.05	3.50	10.00	Extreme	
Bank Angle					
Bank Angle ($^\circ$)			Index	Bank Erosion Potental	Notes
45.00			3.17	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
70.00			2.71	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**39.88**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

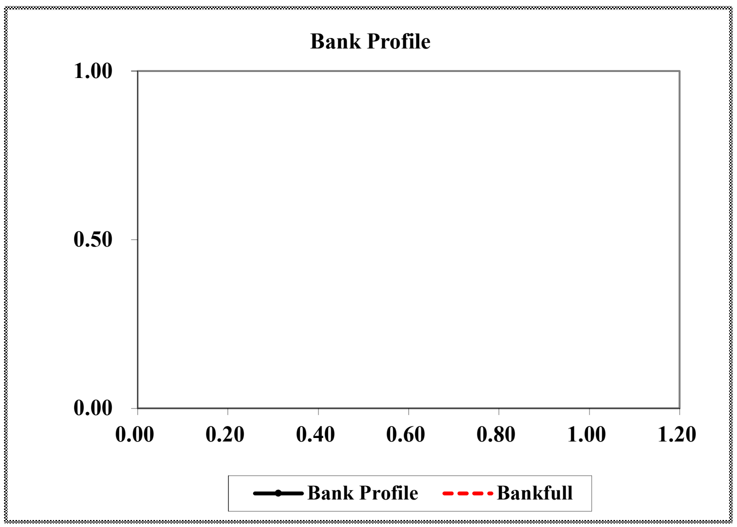
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** | Location: **Left Bank 1**

Station: **137+81.38 to 138+57.64** | Stream Type: | Valley Type:

Observers: | Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous……………………………NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………………………………………NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………………NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
0.47	**0.39**	**1.2051282**	**Low**

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**44.04**
Reach:	137+75.04 to 138+58.10	**Comments:**							**Very High**
Location:	Right Bank 1	**Bank Length**	81						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
5.00	1.50	3.33	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.33	5.00	0.07	8.82	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
60.00	0.07	3.96	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
50.00			4.32	Moderate	rip rap
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**44.04**		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

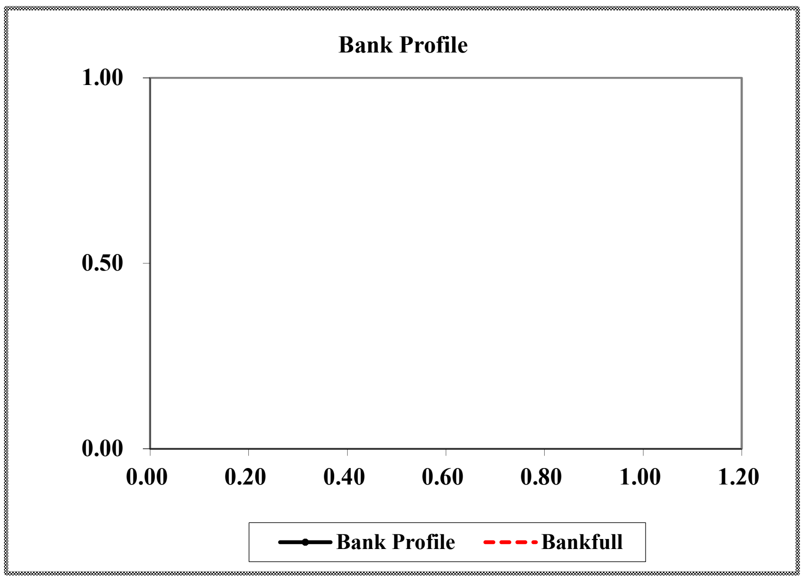
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** | Location: **Right Bank 1**

Station: **137+75.04 to 138+58.10** | Stream Type: | Valley Type:

Observers: | Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… …………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………..……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	1
Dominant Near-Bank Stress	
Very High	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating: Very High

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	Observer(s):	PVC	Data:	SH	QA/QC:		Total Score:	39.85				
Reach:	136+80.59 to 137+81.38	Comments:							High				
Location:	Left Bank 2	Bank Length	109					Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
4.00	1.50	2.67	8.81	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.33	4.00	0.08	8.64	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
50.00	0.08	4.13	10.00	Extreme	
Bank Angle					
Bank Angle (º)			Index	Bank Erosion Potental	Notes
60.00			3.90	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
60.00			3.50	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**39.85**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

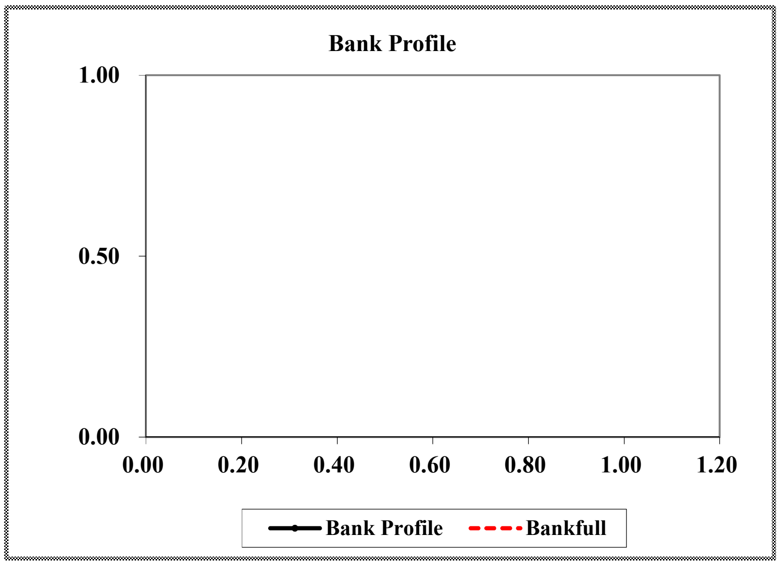
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Left Bank 2**	
Station: **136+80.59 to 137+81.38**	Stream Type:	Valley Type:
Observers:		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………..……. ………….....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ………..….NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
	0.36	**6.83**	**0.0527086**	**Extreme**
(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	**2**
Dominant Near-Bank Stress	
Extreme	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Extreme**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	48.00				
Reach:	136+68.35 to 137+75.04	**Comments:**							Extreme				
Location:	Right Bank 2	**Bank Length**	101					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.00	1.00	3.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.17	3.00	0.06	8.93	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
30.00	0.06	1.70	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
45.00			3.17	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
30.00			5.90	Moderate	
			Adjustment		Notes
Bank Materials			10.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	48.00		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material		
	Bedrock	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

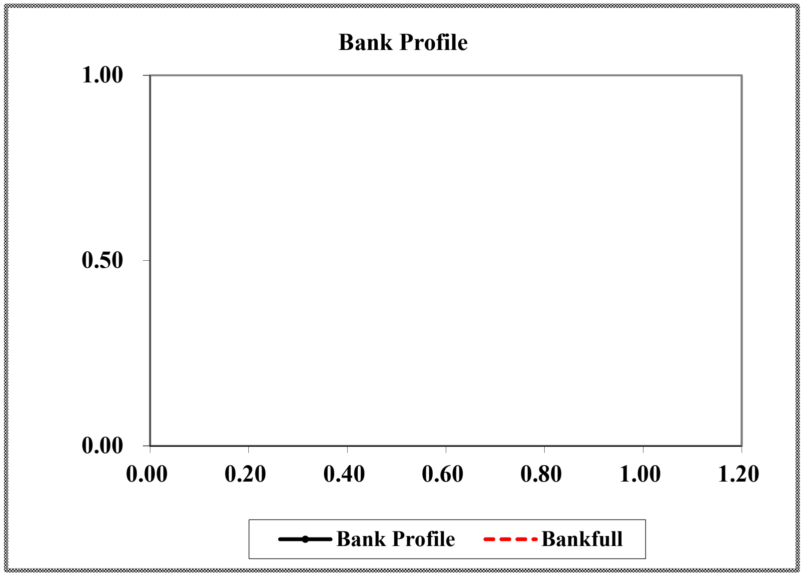
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 2**

Station: **136+68.35 to 137+75.04** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ……………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………...…… …………...NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… …………..NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	Ratio R_c / W_{bkf}	Near-Bank Stress (NBS)
0.42	6.88	0.0610465	Extreme

Method	2
Dominant Near-Bank Stress	
Extreme	

(3)

Pool Slope S_p	Average Slope S	Ratio S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	Ratio S_p / S_{rif}	Near-Bank Stress (NBS)

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	Ratio d_{nb} / d_{bkf}	Near-Bank Stress (NBS)

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Extreme**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:** 40.81
Reach:	135+84.96 to 136+80.59	**Comments:**						Very High
Location:	Left Bank 3	**Bank Length**	90					
Date:	5/4/2018							

Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.70	1.50	1.80	6.95	High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.17	2.70	0.06	8.86	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
30.00	0.06	1.89	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
40.00			5.11	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	40.81		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

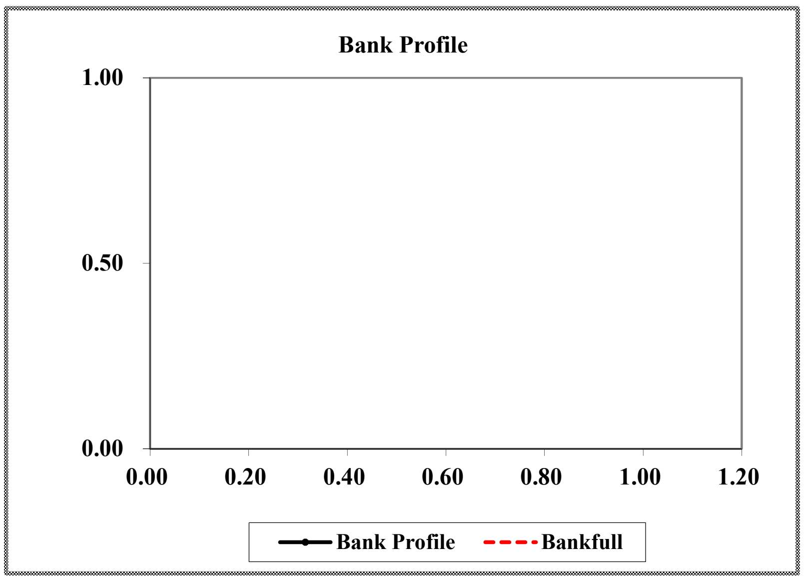
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 3**

Station: **135+84.96 to 136+80.59** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… …………………..….NBS = High / Very High

Extensive deposition (continuous, cross-channel)……………..…………….....……… …………....NBS = Extreme

Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
High	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**1.98**	**0.81**	**2.4444444**	**High**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **High**

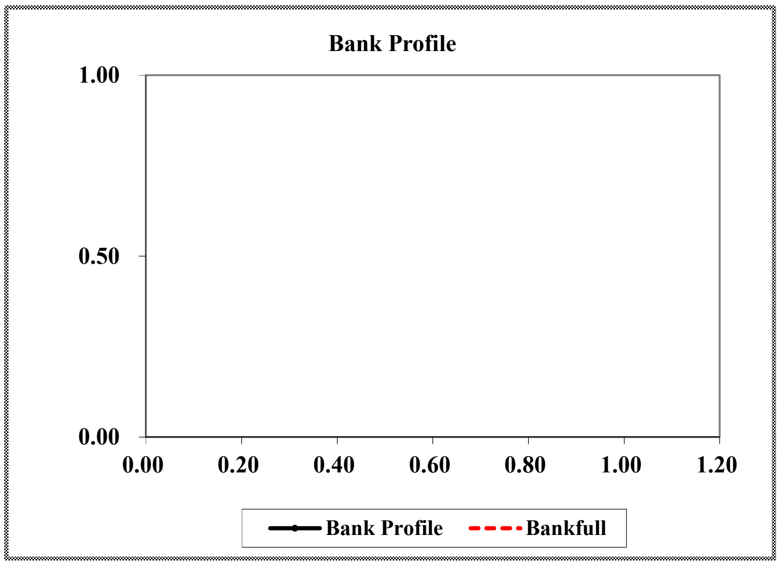
BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	37.87					
Reach:	135+92.67 to 136+68.35	**Comments:**							High					
Location:	Right Bank 3	**Bank Length**	87					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables					
Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
4.30	3.00	1.43	5.48	Moderate	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.50	4.30	0.12	8.26	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
50.00	0.12	5.81	8.91	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potential	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	37.87		

Bank Erosion Potential								
			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Adjustments							
Bank Material	**Bedrock**	Bedrock banks have a very low erosion potential.						
	Boulders	Boulder banks have a low erosion potential.						
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.						
	Clay/Silt Loam	Add 5 points.						
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.						
	Sand	Add 10 points.						
	Silt / Clay	No adjustment.						
	Stratification							
	Add 5-10 points depending on position of unstable layers in relation to bankfull stage.							

Bank Profile		
Horizontal Distance	**Vertical Height**	**Notes**
Bankfull		
Horizontal Distance	**Vertical Height**	**Notes**



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Right Bank 3**	
Station: **135+92.67 to 136+68.35**	Stream Type:	Valley Type:
Observers:		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… …………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………..……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… …………...NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	Ratio R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	Ratio S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	Ratio S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
Low	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	Ratio d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**2.44**	**2.21**	**1.1040724**	**Low**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating: Low

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	Observer(s):	PVC	Data:	SH	QA/QC:		Total Score:	51.00				
Reach:	135+2.07 to 135+84.96	Comments:							Extreme				
Location:	Left Bank 4	Bank Length	87					Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.20	1.00	3.20	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	3.20	0.13	8.10	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
5.00	0.13	0.66	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
90.00			7.90	High	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
5.00			10.00	Extreme	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	51.00		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Bank Material — Adjustments

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

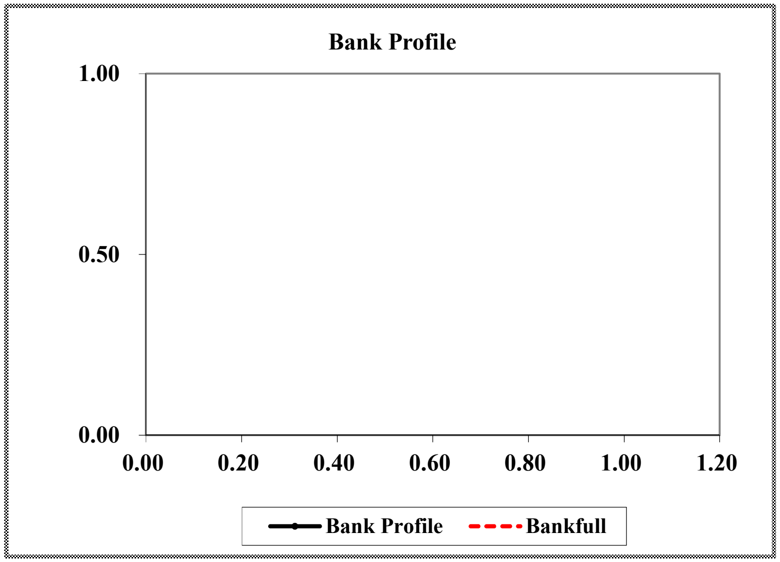
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 4**

Station: **135+2.07 to 135+84.96** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… …………………NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………………………… …………...NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………………….NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	Ratio R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	Ratio S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	Ratio S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
High	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	Ratio d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	1.98	0.81	2.4444444	High

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **High**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	35.95				
Reach:	135+7.97 to 135+92.67	**Comments:**							High				
Location:	Right Bank 4	**Bank Length**	83					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40	40-45

Total Score Values: Extreme 45-50

Erodibility Variables					
Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.20	1.00	2.20	8.14	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.17	2.20	0.08	8.70	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
70.00	0.08	5.41	8.95	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
30.00			2.44	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
70.00			2.71	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	35.95		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

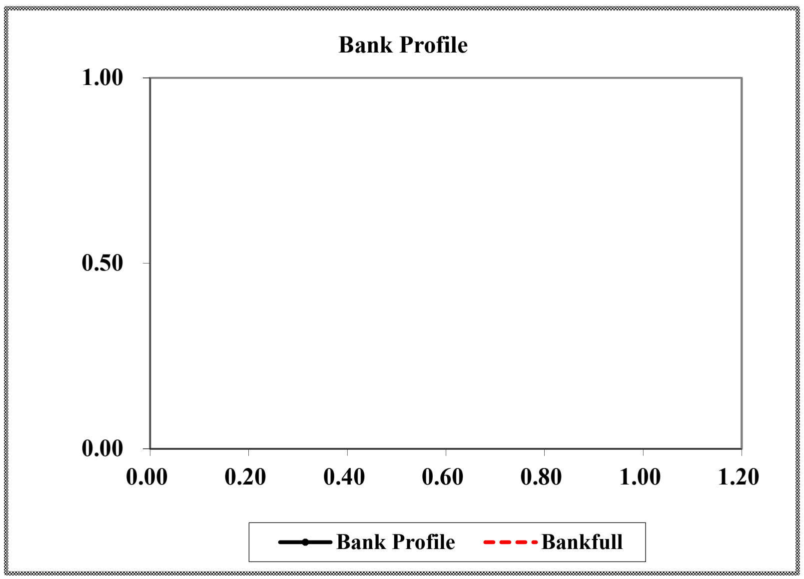
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 4**

Station: **135+7.97 to 135+92.67** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High

Extensive deposition (continuous, cross-channel)……………..……………..……. …………....NBS = Extreme

Chute cutoffs, down-valley meander migration, converging flow…………………… ……………NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	2.44	**2.21**	**1.1040724**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	41.13			
Reach:	133+88.95 to 135+2.07	**Comments:**							Very High			
Location:	Left Bank 5	**Bank Length**	133					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
4.00	1.40	2.86	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.17	4.00	0.04	10.00	Extreme	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
70.00	0.04	2.98	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potential	Notes
50.00			3.41	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
70.00			2.71	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**41.13**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

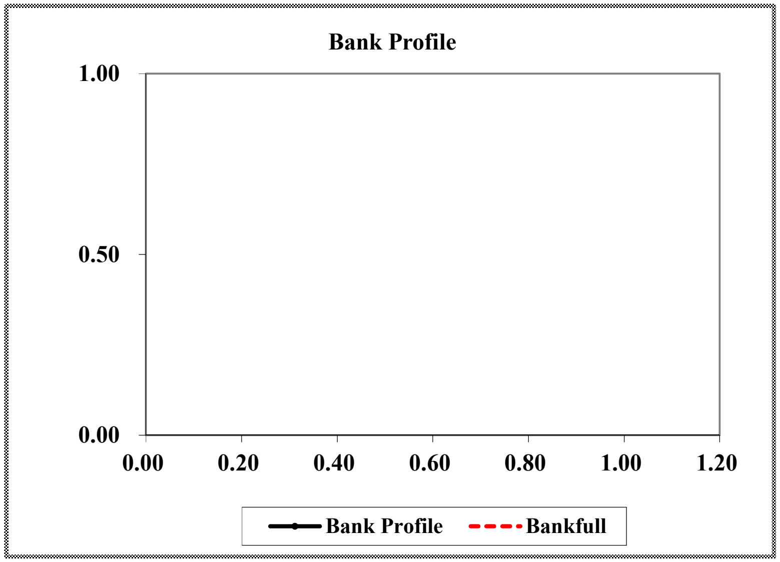
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Left Bank 5**	
Station: **133+88.95 to 135+2.07**	Stream Type:	Valley Type:
Observers:		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ……………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………..……… …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	1
Dominant Near-Bank Stress	
Very High	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Very High**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**37.00**				
Reach:	134+20.79 to 135+7.97	**Comments:**							**High**				
Location:	Right Bank 5	**Bank Length**	88					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45

Total Score Values: Extreme 45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
2.50	1.50	1.67	6.32	High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.42	2.50	0.17	7.66	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
40.00	0.17	6.72	8.81	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potential	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**37.00**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

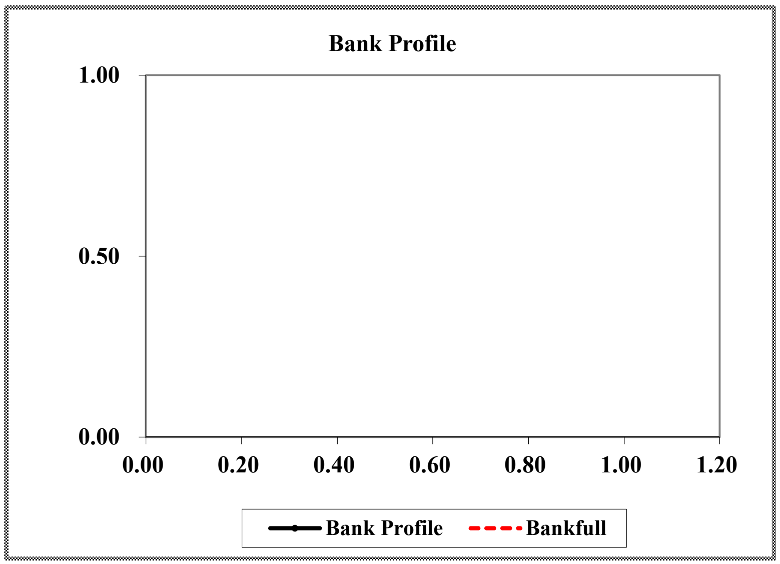
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Right Bank 5**	
Station: **134+20.79 to 135+7.97**	Stream Type:	Valley Type:
Observers:		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………..……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… …………...NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	2.44	**2.21**	**1.1040724**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating: Low

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	41.31			
Reach:	133+33.43 to 134+20.79	**Comments:**							Very High			
Location:	Right Bank 6	**Bank Length**	92					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40

Total Score Values	Very High	Extreme
	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
4.00	1.40	2.86	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.50	4.00	0.13	8.17	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
45.00	0.13	5.63	8.93	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**41.31**		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

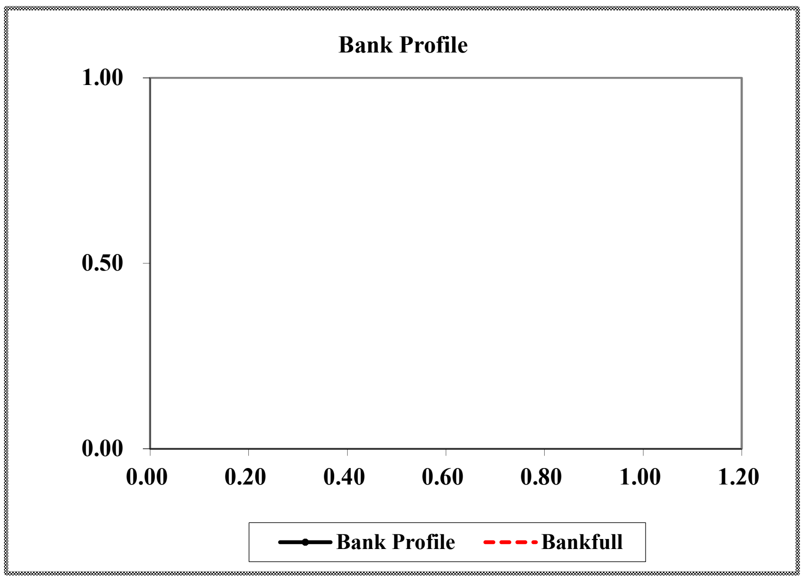
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 6**

Station: **133+33.43 to 134+20.79** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………….…….. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……………NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
High	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.77	**0.4**	**1.925**	**High**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **High**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**36.22**
Reach:	132+65.40 to 133+88.95	**Comments:**							**High**
Location:	Left Bank 6	**Bank Length**	124						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
4.00	2.00	2.00	7.90	High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.67	4.00	0.17	7.66	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
70.00	0.17	11.73	8.25	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
60.00			3.90	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
60.00			3.50	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**36.22**		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

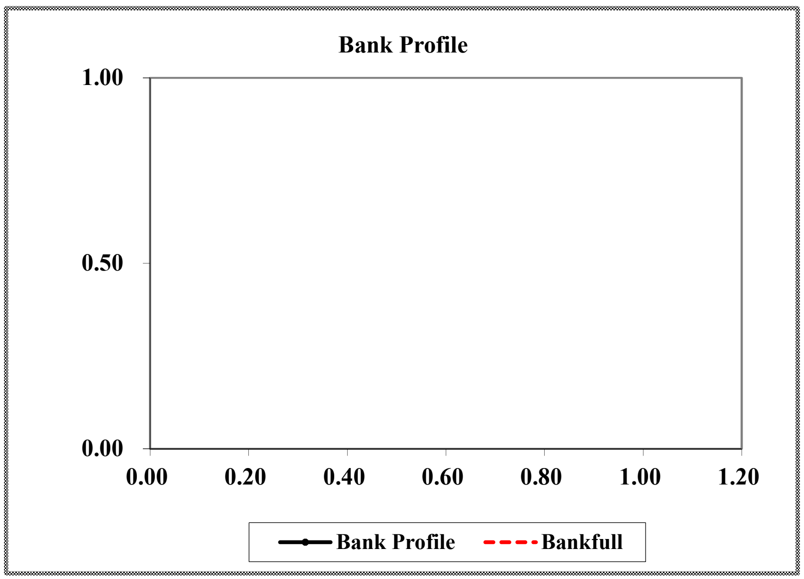
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 6**

Station: **133+88.95 to 135+2.07** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)
- Transverse and/or central bars-short and/or discontinuous……………………………..…NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………..……………...…… …………....NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
Low	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**1.15**	**0.91**	**1.2637363**	**Low**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**49.12**
Reach:	126+61.74 to 133+33.43	**Comments:**							**Extreme**
Location:	Right Bank 7	**Bank Length**	686						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables					
Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.50	1.00	3.50	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	3.50	0.12	8.22	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
10.00	0.12	1.20	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
5.00			10.00	Extreme	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			5.00		
		TOTAL SCORE	**49.12**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

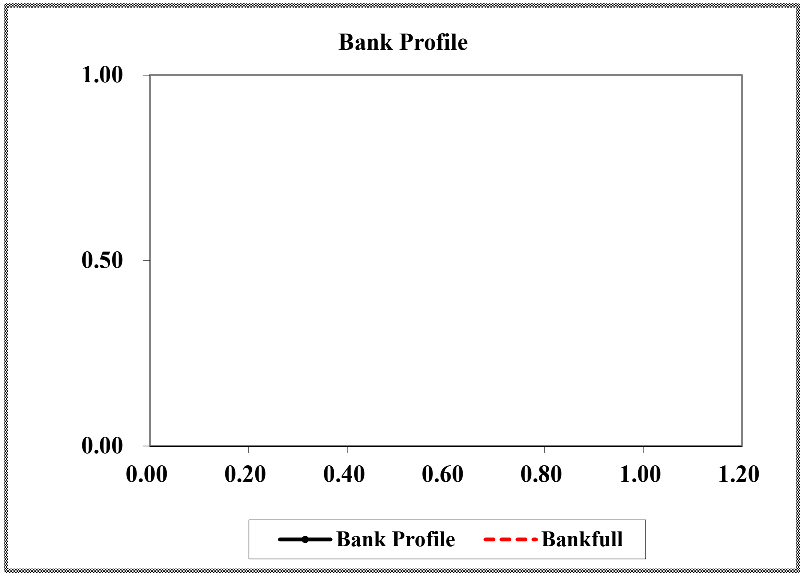
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile		
Horizontal Distance	**Vertical Height**	**Notes**

Bankfull		
Horizontal Distance	**Vertical Height**	**Notes**



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 7**

Station: **126+61.74 to 133+33.43** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
- Transverse and/or central bars-short and/or discontinuous………… ……………..….NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………..………….…..…. …………....NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
High	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
0.77	**0.4**	**1.925**	**High**

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **High**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	38.69
Reach:	126+57.48 to 132+65.40	**Comments:**							High
Location:	Left Bank 7	**Bank Length**	621						
Date:	5/4/2018								

Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio

Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
4.50	1.40	3.21	10.00	Extreme	

Root Depth / Bank Height Ratio

Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.50	4.50	0.11	8.32	Very High	

Weighted Root Density

Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
65.00	0.11	7.22	8.75	Very High	

Bank Angle

Bank Angle (°)		Index	Bank Erosion Potental	Notes
60.00		3.90	Low	

Surface Protection

Surface Protection (%)		Index	Bank Erosion Potental	Notes
70.00		2.71	Low	

	Adjustment		Notes
Bank Materials	5.00		

	Adjustment		Notes
Bank Stratification	0.00		

TOTAL SCORE	**38.69**	

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

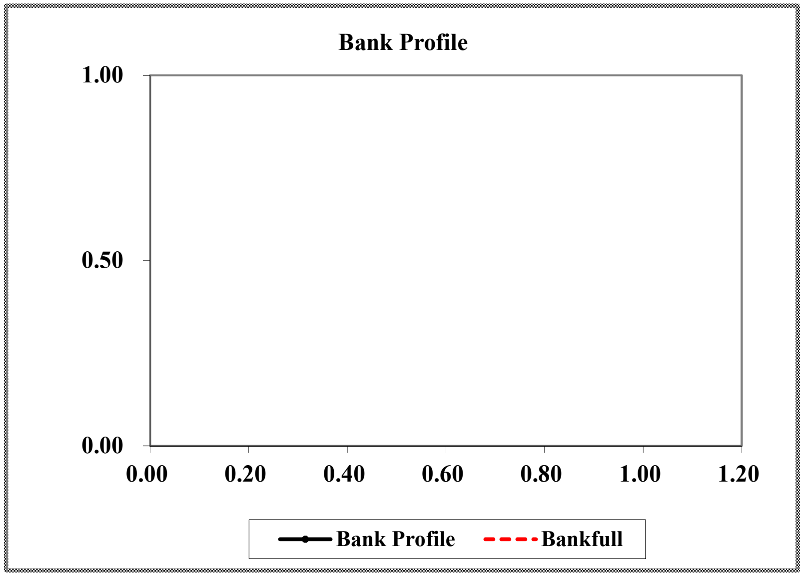
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 7**

Station: **126+57.48 to 132+65.40** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
- Transverse and/or central bars-short and/or discontinuous………… ……………..….NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………..…………..……. …………...NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
Low	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**1.15**	**0.91**	**1.2637363**	**Low**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	44.96				
Reach:	123+57.45 to 126+61.74	**Comments:**							Very High				
Location:	Right Bank 8	**Bank Length**	301					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45

Extreme
45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.50	1.50	2.33	8.33	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.33	3.50	0.09	8.51	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
15.00	0.09	1.41	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
20.00			7.22	High	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**44.96**		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

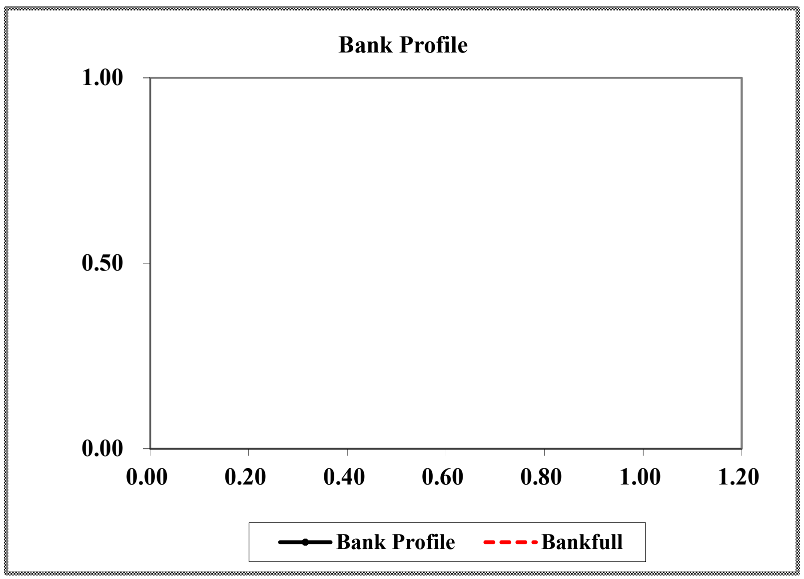
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Right Bank 8**	
Station: **123+57.45 to 126+61.74**	Stream Type:	Valley Type:
Observers:		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..………….....……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………….………..…NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	Ratio R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	Ratio S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	Ratio S_p / S_{rif}	Near-Bank Stress (NBS)

Method	**5**
Dominant Near-Bank Stress	
Low	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	Ratio d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
1.96	**1.76**	**1.1136364**	**Low**

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	Observer(s):	PVC	Data:	SH	QA/QC:		Total Score:	38.63				
Reach:	124+88.11 to 126+57.48	Comments:							High				
Location:	Left Bank 8	Bank Length	194					Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
3.00	1.00	3.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.42	3.00	0.14	8.00	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
60.00	0.14	8.40	8.62	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potential	Notes
60.00			3.90	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
65.00			3.11	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	38.63		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

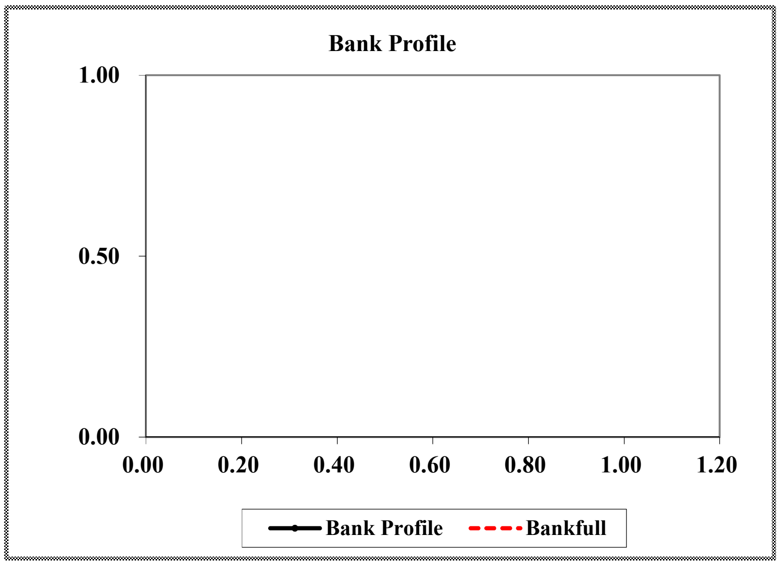
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 8**

Station: **124+88.11 to 126+57.48** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
- Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………..……………..……. …………....NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
1.69	1.31	1.2900763	Low

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**39.71**
Reach:	121+21.11 to 123+57.45	**Comments:**							**High**
Location:	Right Bank 9	**Bank Length**	239					**Total Score Values:**	
Date:	5/4/2018								

Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
5.00	2.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.33	5.00	0.07	8.82	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
50.00	0.07	3.30	10.00	Extreme	
Bank Angle					
Bank Angle (^{o})			Index	Bank Erosion Potental	Notes
50.00			3.41	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
55.00			3.90	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**39.71**		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Bank Material

Adjustments

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

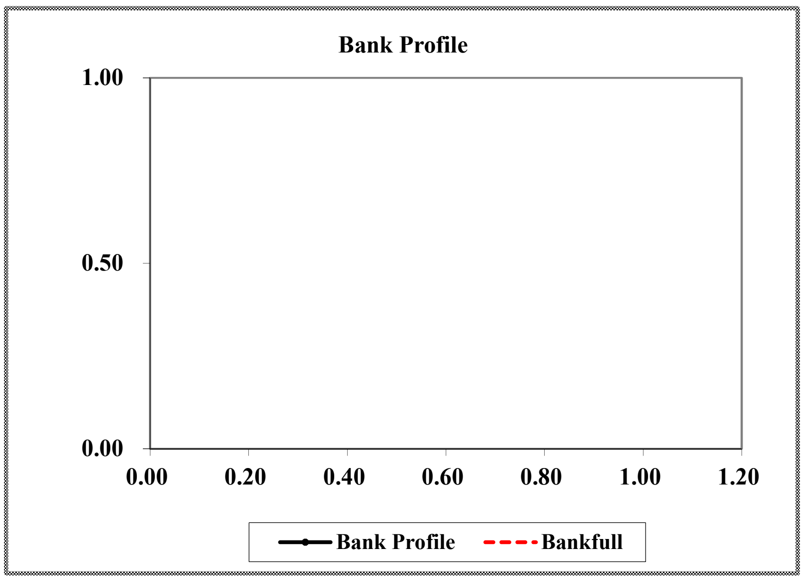
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Right Bank 9**	
Station: **121+21.11 to 123+57.45**	Stream Type:	Valley Type:
Observers:		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………..……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……………NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	**5**
Dominant Near-Bank Stress	
Moderate	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
0.57	**0.36**	**1.5833333**	**Moderate**

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating	**Moderate**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	40.66
Reach:	121+23.56 to 124+88.11	**Comments:**							Very High
Location:	Left Bank 9	**Bank Length**	409						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.50	1.20	2.92	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.50	3.50	0.14	8.00	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
50.00	0.14	7.14	8.76	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
75.00			5.40	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
60.00			3.50	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**40.66**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

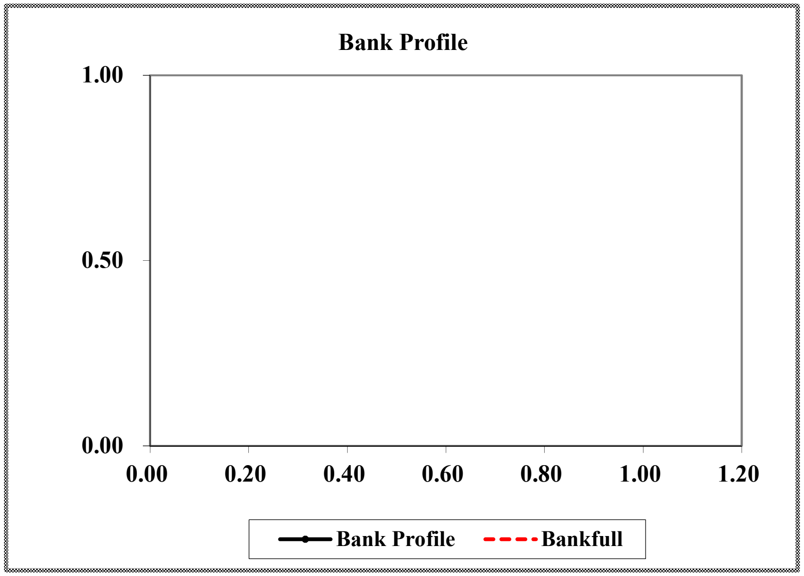
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 9**

Station: **121+23.56 to 124+88.11** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… …………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………..……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Moderate	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
0.67	**0.44**	**1.5227273**	**Moderate**

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Moderate**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	39.23				
Reach:	119+64.19 to 121+21.11	**Comments:**							High				
Location:	Right Bank 10	**Bank Length**	160					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.25	2.50	0.10	8.44	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
40.00	0.10	4.00	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
90.00			7.90	High	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**39.23**		

Bank Erosion Potential

Erodibility Variables			Very Low	Low	Moderate	High	Very High	Extreme
	Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material		
	Bedrock	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

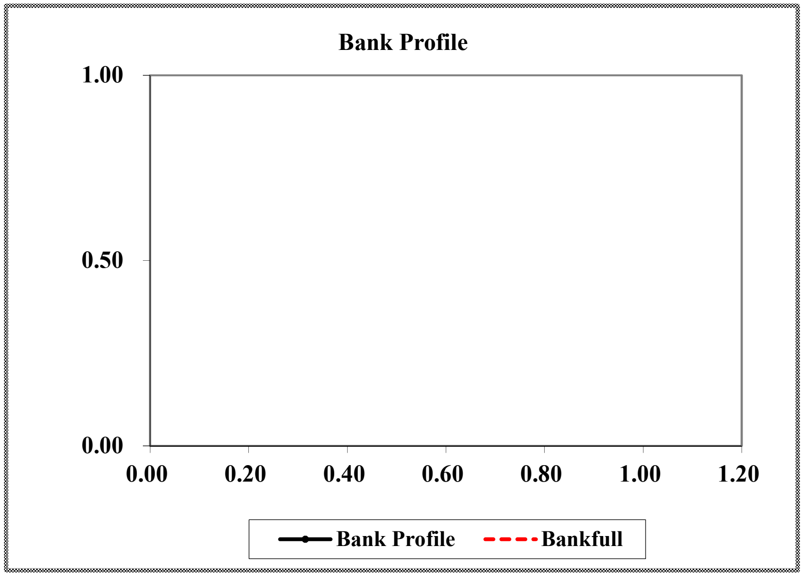
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 10**

Station: **119+64.19 to 121+21.11** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ……………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………...……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………….……..….NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	Ratio R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	Ratio S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	Ratio S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
Moderate	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	Ratio d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**0.57**	**0.36**	**1.5833333**	**Moderate**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Moderate**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:** 43.30
Reach:	120+25.66 to 121+23.56	**Comments:**						Very High
Location:	Left Bank 10	**Bank Length**	97					
Date:	5/4/2018							

Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.00	1.00	3.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	3.00	0.14	8.00	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
50.00	0.14	7.00	8.78	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
50.00			3.41	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
65.00			3.11	Low	
			Adjustment		Notes
Bank Materials			10.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**43.30**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

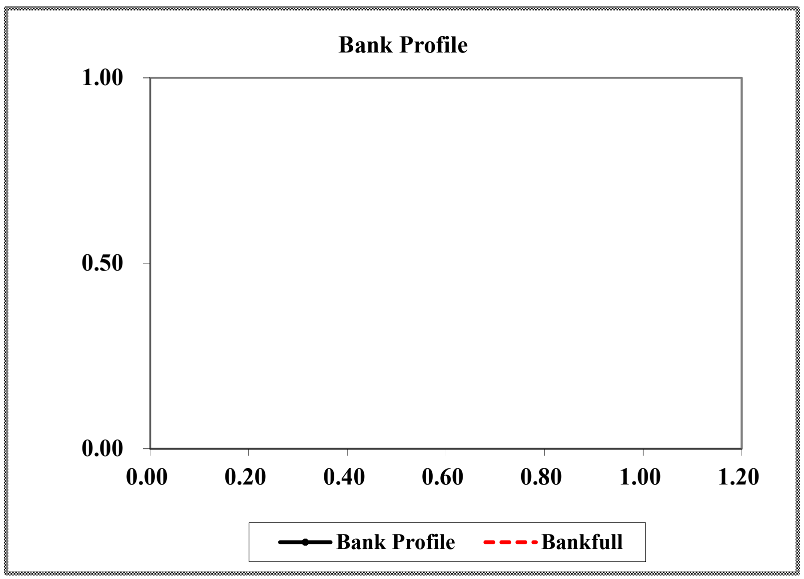
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 10**

Station: **120+25.66 to 121+23.56** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
- Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………..…………..…….. …………....NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Moderate	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.67	**0.44**	**1.5227273**	**Moderate**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Moderate**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**38.20**
Reach:	116+39.48 to 119+64.19	**Comments:**							**High**
Location:	Right Bank 11	**Bank Length**	325						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
4.50	1.50	3.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.67	4.50	0.15	7.92	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
65.00	0.15	9.68	8.48	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
80.00			1.90	Very Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	38.20		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

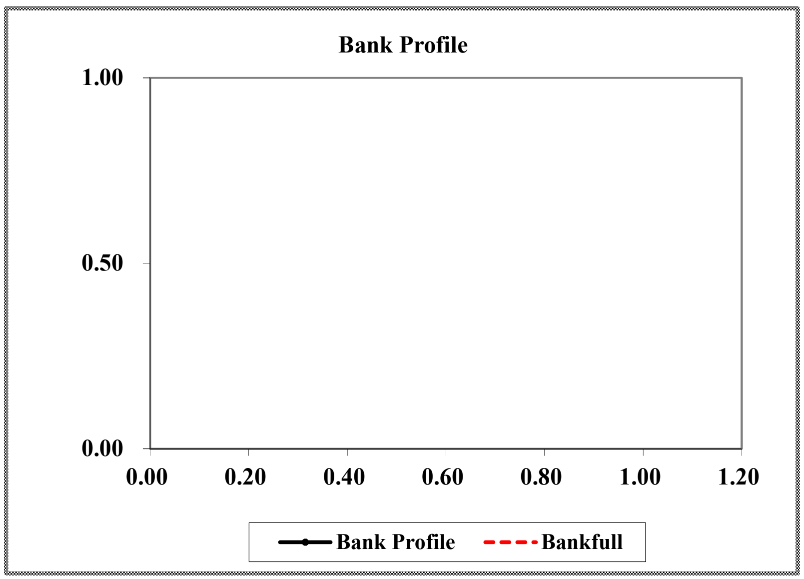
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 11**

Station: **116+39.48 to 119+64.19** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)…………….………….…….. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow………………….………..….NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
Low	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**0.56**	**0.39**	**1.4358974**	**Low**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**37.28**
Reach:	114+61.16 to 120+25.66	**Comments:**							**High**
Location:	Left Bank 11	**Bank Length**	595						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
4.50	1.50	3.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.67	4.50	0.15	7.92	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
60.00	0.15	8.93	8.56	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
60.00			3.90	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
80.00			1.90	Very Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**37.28**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

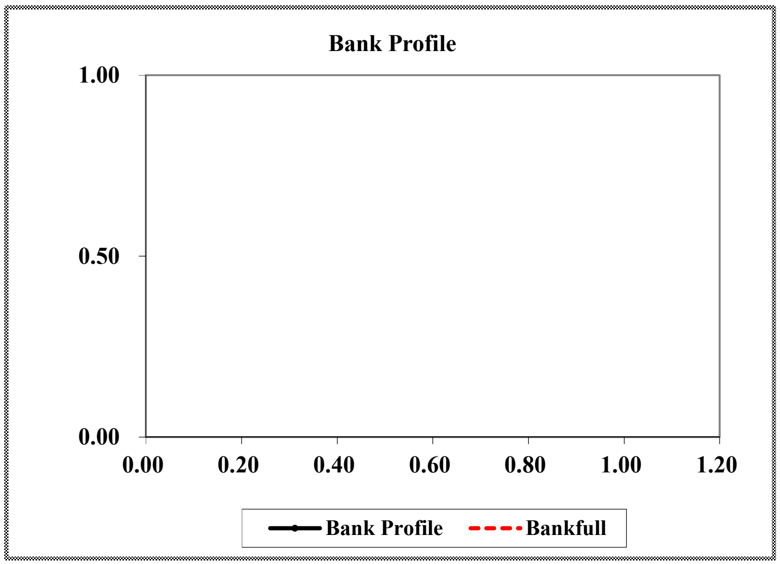
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 11**

Station: **114+61.16 to 120+25.66** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High

Extensive deposition (continuous, cross-channel)……………..…………..…… …………....NBS = Extreme

Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.57	**0.46**	**1.2391304**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	39.49				
Reach:	115+14.22 to 116+39.48	**Comments:**							High				
Location:	Right Bank 12	**Bank Length**	124					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40	40-45

Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio

Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
5.50	1.50	3.67	10.00	Extreme	

Root Depth / Bank Height Ratio

Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.67	5.50	0.12	8.20	Very High	

Weighted Root Density

Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
65.00	0.12	7.92	8.68	Very High	

Bank Angle

Bank Angle (°)		Index	Bank Erosion Potental	Notes
70.00		4.90	Moderate	

Surface Protection

Surface Protection (%)		Index	Bank Erosion Potental	Notes
70.00		2.71	Low	

	Adjustment		Notes
Bank Materials	5.00		
			Notes
Bank Stratification	0.00		
TOTAL SCORE	**39.49**		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

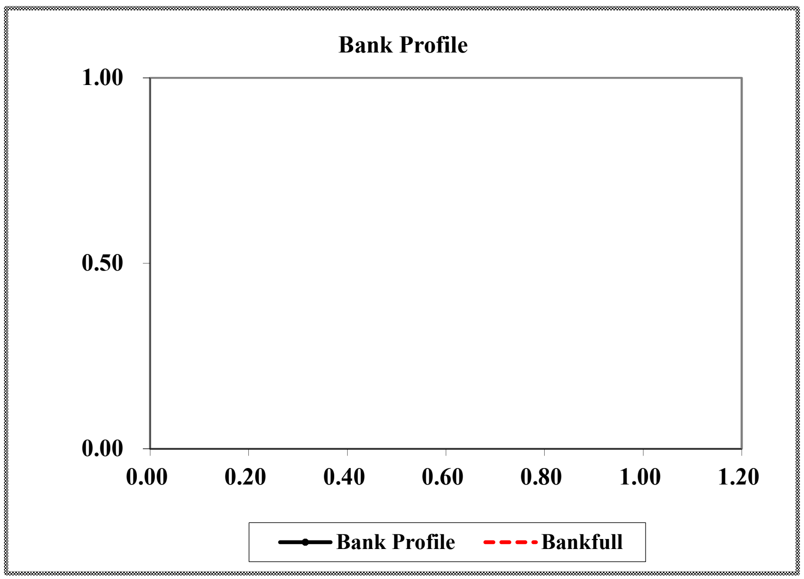
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Right Bank 12**	
Station: **115+14.22 to 116+39.48**	Stream Type:	Valley Type:
Observers:		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
- Transverse and/or central bars-short and/or discontinuous………… ……………….…NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………..…………..…… …………...NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.56	**0.39**	**1.4358974**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**32.76**
Reach:	111+99.76 to 114+61.16	**Comments:**							**High**
Location:	Left Bank 12	**Bank Length**	246						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables					
Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.00	1.00	3.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	3.00	0.14	8.00	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
65.00	0.14	9.10	8.54	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
60.00			3.90	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
75.00			2.32	Low	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**32.76**		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

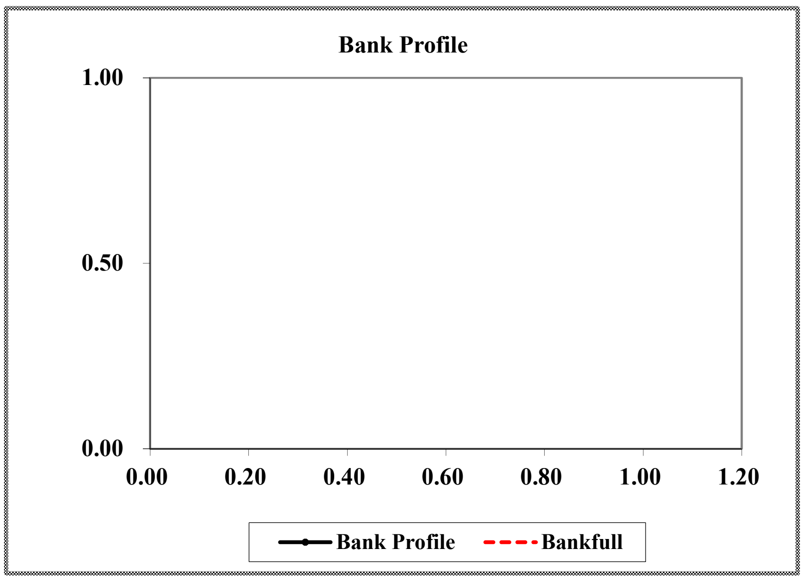
Bank Material	**Bedrock**	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile		
Horizontal Distance	**Vertical Height**	**Notes**

Bankfull		
Horizontal Distance	**Vertical Height**	**Notes**



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 12**

Station: **111+99.76 to 114+61.16** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

- Transverse and/or central bars-short and/or discontinuous………… ……………..….NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………..…………..…… …………...NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
0.41	3.97	0.1032746	Extreme

Method	2
Dominant Near-Bank Stress	
Extreme	

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating: Extreme

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	40.50
Reach:	113+44.63 to 115+14.22	**Comments:**							Very High
Location:	Right Bank 13	**Bank Length**	160						
Date:	5/4/2018								

Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.20	1.00	2.20	8.14	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.50	2.20	0.23	6.85	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
50.00	0.23	11.36	8.29	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
90.00			7.90	High	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**40.50**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

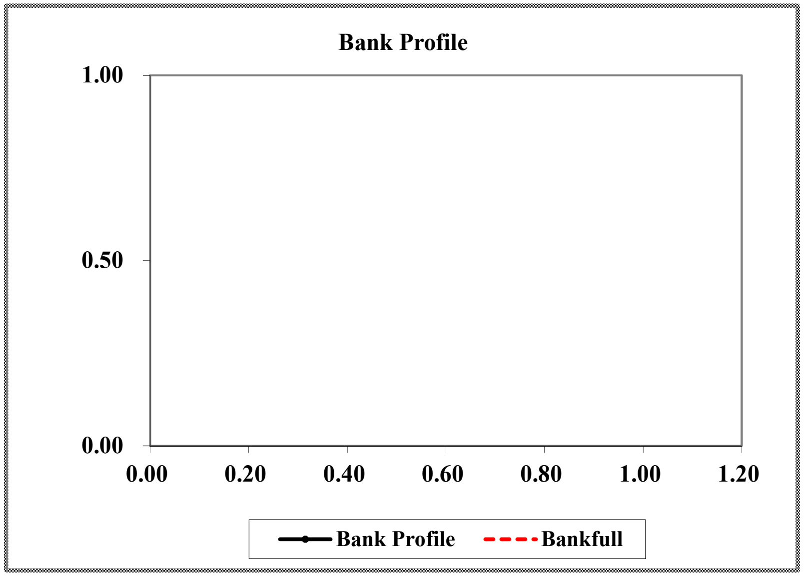
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 13**

Station: **113+44.63 to 115+14.22** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)
- Transverse and/or central bars-short and/or discontinuous……………………………...NBS = High / Very High
- Extensive deposition (continuous, cross-channel)…………………………………………...NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow……………………………...NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Moderate	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.45	**0.25**	**1.8**	**Moderate**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Moderate**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	Observer(s):	PVC	Data:	SH	QA/QC:		Total Score:	35.52				
Reach:	110+41.23 to 111+99.76	Comments:							High				
Location:	Left Bank 13	Bank Length	147					Total Score Values:	Very Low	Low	Moderate	High	Very High / Extreme
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45 / 45-50

Erodibility Variables					
Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.50	1.00	3.50	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	3.50	0.12	8.22	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
50.00	0.12	6.00	8.89	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
60.00			3.50	Low	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	35.52		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

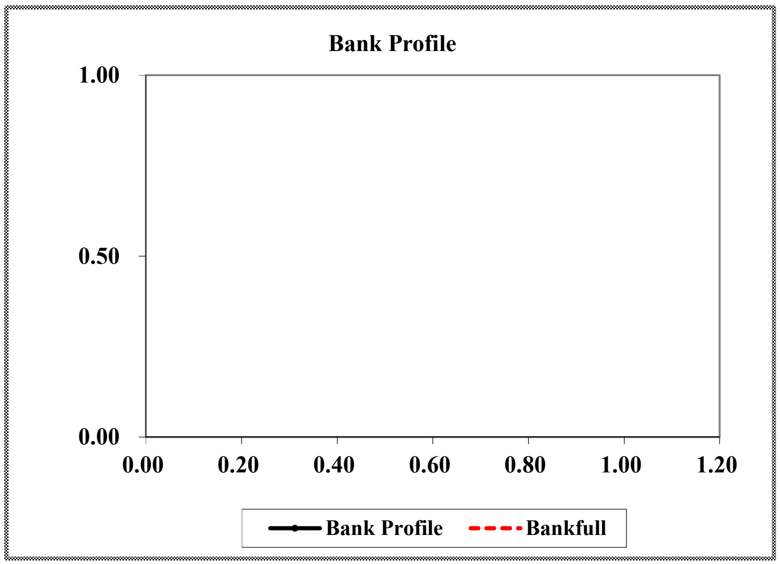
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 13**

Station: **110+41.23 to 111+99.76** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ……………..….NBS = High / Very High

Extensive deposition (continuous, cross-channel)……………..…………..……. …………...NBS = Extreme

Chute cutoffs, down-valley meander migration, converging flow…………………… ……………NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Moderate	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.73	**0.48**	**1.5208333**	**Moderate**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Moderate**

BANK EROSION HAZARD INDEX

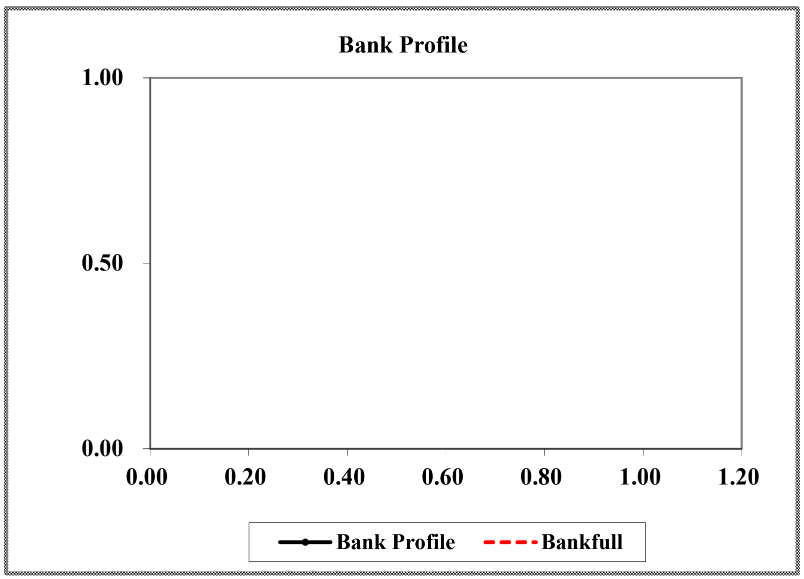
Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**49.56**
Reach:	112+84.76 to 113+44.63	**Comments:**							**Extreme**
Location:	Right Bank 14	**Bank Length**	76						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables					
Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.50	0.50	5.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	2.50	0.17	7.66	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
10.00	0.17	1.68	10.00	Extreme	
Bank Angle					
Bank Angle ($^{\circ}$)			Index	Bank Erosion Potental	Notes
90.00			7.90	High	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
10.00			9.00	Very High	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**49.56**		

Bank Erosion Potential								
			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Adjustments								
Bank Material	**Bedrock**	Bedrock banks have a very low erosion potential.						
	Boulders	Boulder banks have a low erosion potential.						
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.						
	Clay/Silt Loam	Add 5 points.						
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.						
	Sand	Add 10 points.						
	Silt / Clay	No adjustment.						
Stratification								
	Add 5-10 points depending on position of unstable layers in relation to bankfull stage.							

Bank Profile		
Horizontal Distance	**Vertical Height**	**Notes**
Bankfull		
Horizontal Distance	**Vertical Height**	**Notes**



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 14**

Station: **112+84.76 to 113+44.63** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous……….… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………...……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………….………..….NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
0.21	4.93	0.0425963	Extreme

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	2
Dominant Near-Bank Stress	
Extreme	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Extreme**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	Observer(s):	PVC	Data:	SH	QA/QC:		Total Score:	48.45
Reach:	108+67.52 to 110+41.23	Comments:							Extreme
Location:	Left Bank 14	Bank Length	188						
Date:	5/4/2018								

Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
3.00	1.00	3.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.33	3.00	0.11	8.33	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
10.00	0.11	1.10	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potential	Notes
90.00			7.90	High	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
20.00			7.22	High	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			5.00		
		TOTAL SCORE	48.45		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

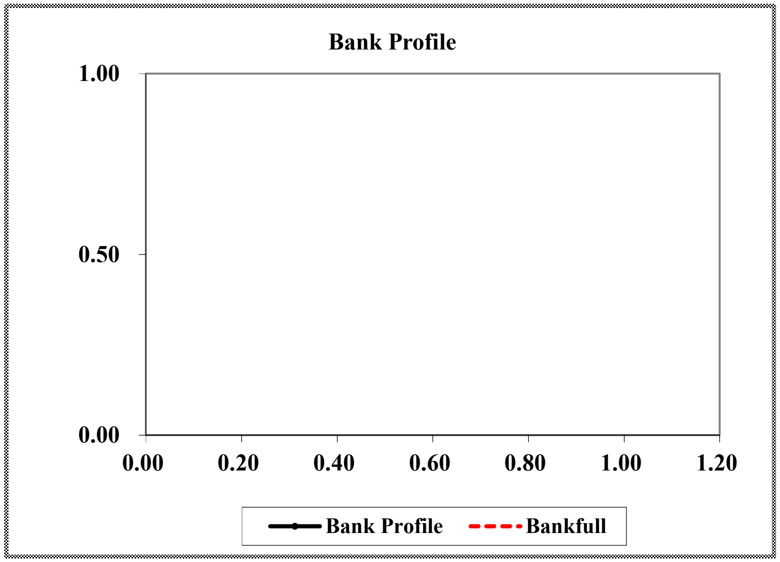
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 14**

Station: **108+67.52 to 110+41.23** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ………………...….NBS = High / Very High

Extensive deposition (continuous, cross-channel)……………..………………..……. …………....NBS = Extreme

Chute cutoffs, down-valley meander migration, converging flow…………………… …………….NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Moderate	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.73	**0.48**	**1.5208333**	**Moderate**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Moderate**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**43.20**
Reach:	112+3.47 to 112+84.76	**Comments:**							**Very High**
Location:	Right Bank 15	**Bank Length**	79						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables					
Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.00	1.50	2.00	7.90	High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.25	3.00	0.08	8.63	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
45.00	0.08	3.75	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
45.00			3.17	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
60.00			3.50	Low	
			Adjustment		Notes
Bank Materials			10.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**43.20**		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

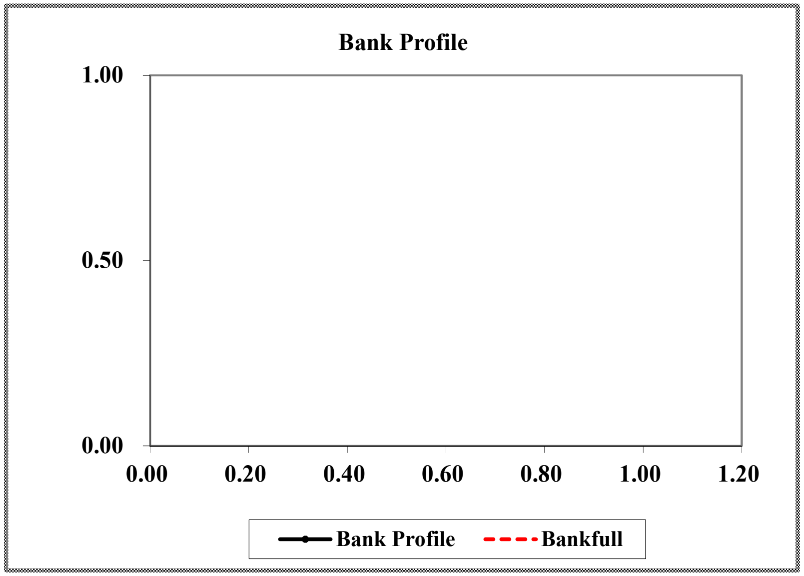
Adjustments

Bank Material	**Bedrock**	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile		
Horizontal Distance	**Vertical Height**	**Notes**
Bankfull		
Horizontal Distance	**Vertical Height**	**Notes**



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 15**

Station: **112+3.47 to 112+84.76** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous……………………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)………………..……………..………………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow……………………………….NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Moderate	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
0.45	**0.25**	**1.8**	**Moderate**

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Moderate**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	45.10					
Reach:	107+61.02 to 108+67.52	**Comments:**							Very High					
Location:	Left Bank 15	**Bank Length**	103					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.17	2.50	0.07	8.80	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
50.00	0.07	3.40	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potential	Notes
50.00			3.41	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			10.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**45.10**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

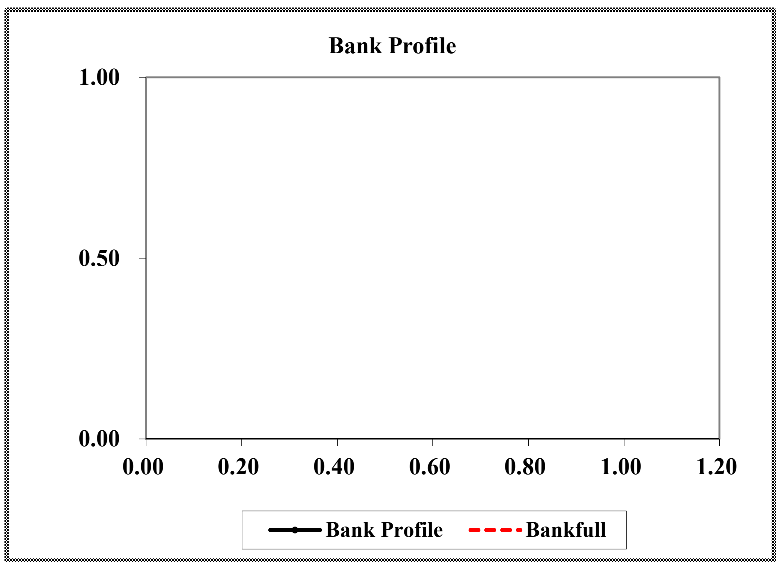
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 15**

Station: **107+61.02 to 108+67.52** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)
Transverse and/or central bars-short and/or discontinuous…………. ……………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………..…….. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.89	**0.65**	**1.3692308**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	34.67
Reach:	110+65.05 to 112+3.47	**Comments:**							High
Location:	Right Bank 16	**Bank Length**	140						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.50	1.00	3.50	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	3.50	0.12	8.22	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
50.00	0.12	6.00	8.89	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
55.00			3.66	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
55.00			3.90	Low	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**34.67**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

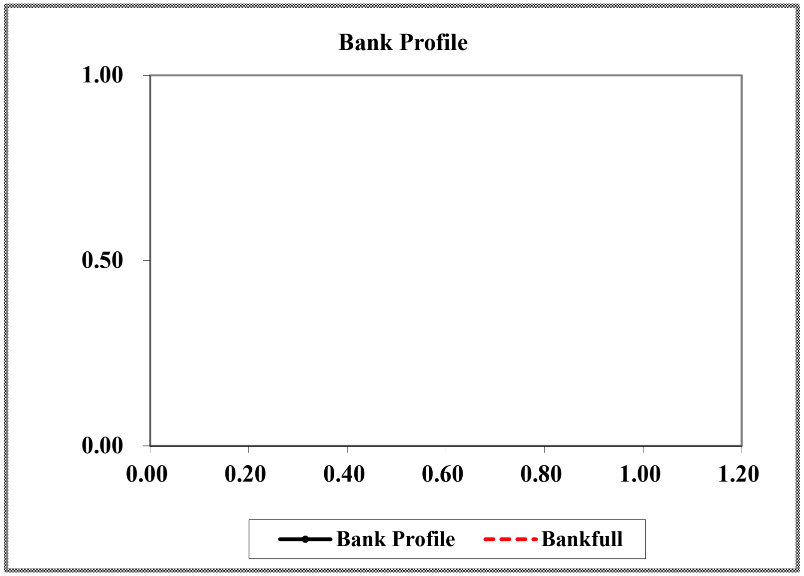
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 16**

Station: **110+65.05 to 112+3.47** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
- Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………..…………..……. …………....NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow…………………… …………...NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
Moderate	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**0.45**	**0.25**	**1.8**	**Moderate**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Moderate**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**	
Reach:	106+23.76 to 107+61.02	**Comments:**					
Location:	Left Bank 16	**Bank Length**	138				
Date:	5/4/2018						

Total Score:	43.56					
	Very High					
Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	2.50	0.17	7.66	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
55.00	0.17	9.24	8.53	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
55.00			3.90	Low	
			Adjustment		Notes
Bank Materials			10.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**43.56**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

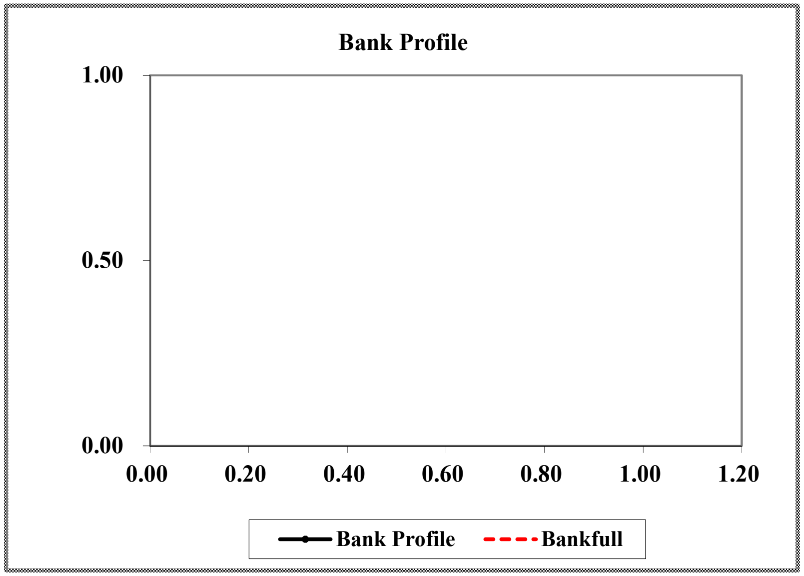
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Left Bank 16**	
Station: **106+23.76 to 107+61.02**	Stream Type:	Valley Type:
Observers:		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… …………………NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………………………… …………...NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow……………………………NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.89	**0.65**	**1.3692308**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**	
Reach:	107+61.59 to 110+65.05	**Comments:**					
Location:	Right Bank 17	**Bank Length**	298				
Date:	5/4/2018						

Total Score:	40.14					
	Very High					
Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
2.00	1.00	2.00	7.90	High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.25	2.00	0.13	8.17	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
50.00	0.13	6.25	8.86	Very High	
Bank Angle					
Bank Angle (^{o})			Index	Bank Erosion Potential	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**40.14**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

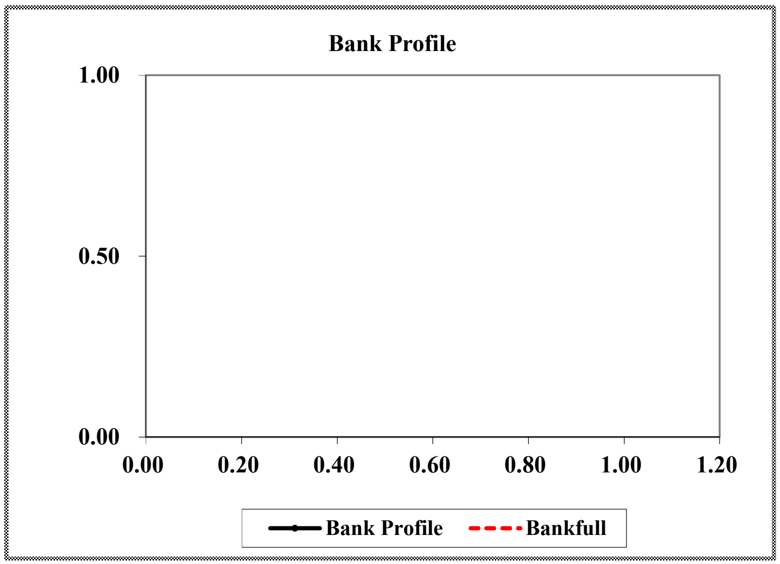
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 17**

Station: **107+61.59 to 110+65.05** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I — (1)

Transverse and/or central bars-short and/or discontinuous…………. ………………..….NBS = High / Very High

Extensive deposition (continuous, cross-channel)……………..…………..…….. …………....NBS = Extreme

Chute cutoffs, down-valley meander migration, converging flow……………………. …………..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	1
Dominant Near-Bank Stress	
Very High	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Very High**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	39.49			
Reach:	102+41.73 to 106+23.76	**Comments:**							High			
Location:	Left Bank 17	**Bank Length**	419					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.17	2.50	0.07	8.80	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
20.00	0.07	1.36	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
20.00			7.22	High	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	39.49		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	**Bedrock**	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

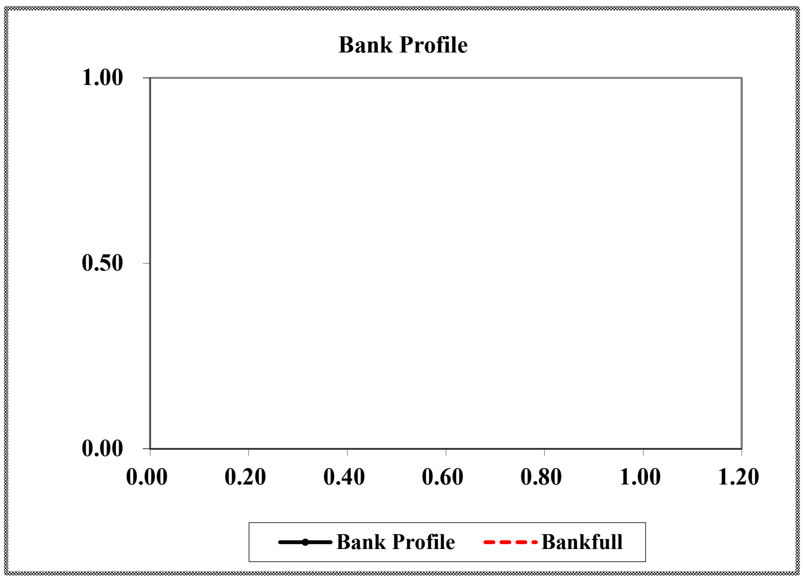
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 17**

Station: **102+41.73 to 106+23.76** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………..……… …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… …………….NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
High	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**2.08**	**1.11**	**1.8738739**	**High**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **High**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**		38.06			
Reach:	106+3.93 to 107+61.59	**Comments:**								High			
Location:	Right Bank 18	**Bank Length**	157					**Total Score**	Very Low	Low	Moderate	High	Very High	Extreme
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	2.50	0.17	7.66	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
55.00	0.17	9.24	8.53	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
65.00			4.40	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
55.00			3.90	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	38.06		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

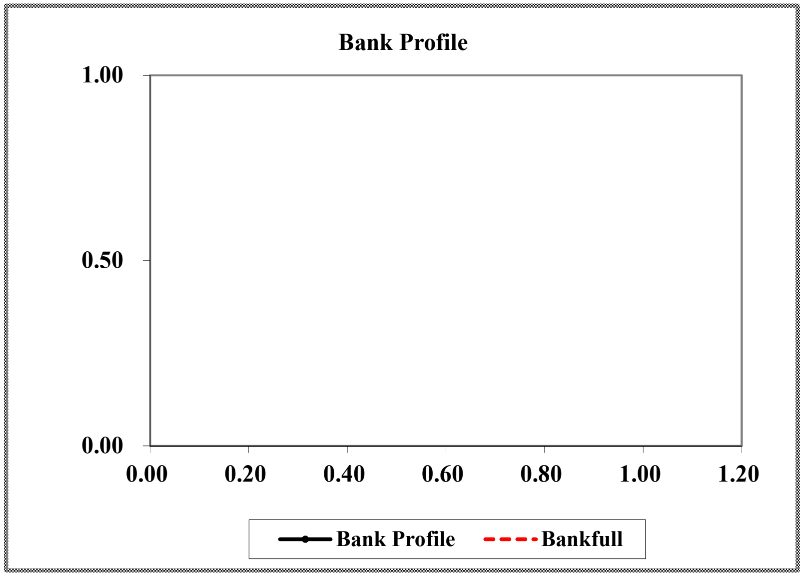
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 18**

Station: **106+3.93 to 107+61.59** Stream Type: Valley Type:

Observers: Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
- Transverse and/or central bars-short and/or discontinuous………… ……………...….NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………..……………..……. …………....NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow…………………… …………....NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
0.75	0.64	1.171875	Low

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating: Low

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**48.90**
Reach:	202+64.02 to 205+15.89	**Comments:**							**Extreme**
Location:	Left Bank 18	**Bank Length**	279						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.50	1.00	3.50	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.17	3.50	0.05	10.00	Extreme	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
10.00	0.05	0.49	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
60.00			3.90	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
5.00			10.00	Extreme	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**48.90**		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

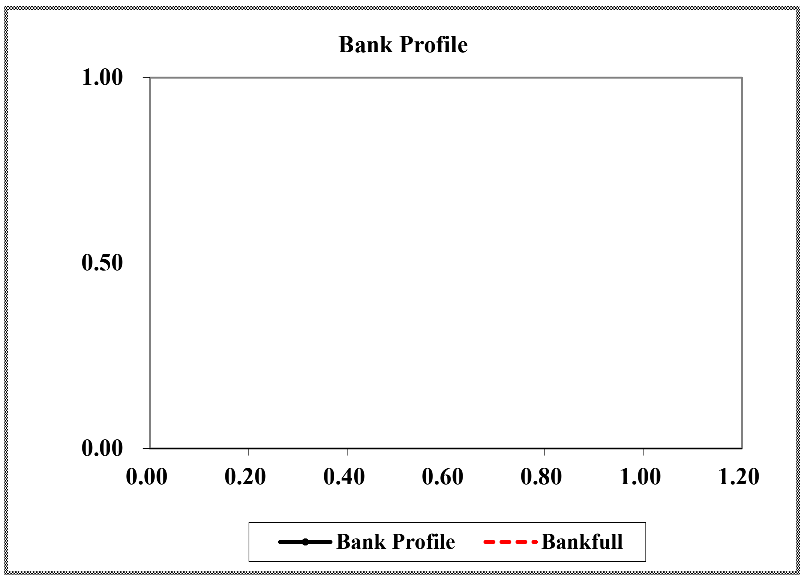
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	**Vertical Height**	**Notes**

Bankfull

Horizontal Distance	**Vertical Height**	**Notes**



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 18**

Station: **202+64.02 to 205+15.89** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ……………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………..……… …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……………NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.72	**0.55**	**1.3090909**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	42.67				
Reach:	102+40.18 to 106+3.93	**Comments:**							**Very High**				
Location:	Right Bank 19	**Bank Length**	362					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45

Extreme
45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.17	2.50	0.07	8.80	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
30.00	0.07	2.04	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potential	Notes
65.00			4.40	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
30.00			5.90	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**42.67**		

Bank Erosion Potential

Erodibility Variables			Very Low	Low	Moderate	High	Very High	Extreme
	Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material		
	Bedrock	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

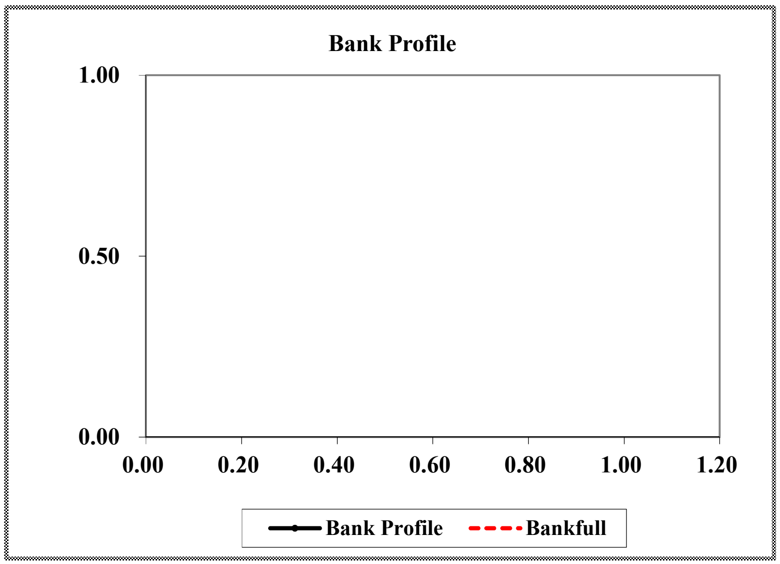
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 19**

Station: **102+40.18 to 106+3.93** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ……………….…NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………..…… …………...NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……………NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	Ratio R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	Ratio S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	Ratio S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	Ratio d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	2.37	**1.92**	**1.234375**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	40.03				
Reach:	205+15.89 to 205+62.34	**Comments:**							Very High				
Location:	Left Bank 19	**Bank Length**	43					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.00	1.00	2.00	7.90	High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.17	2.00	0.09	8.61	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
30.00	0.09	2.55	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
50.00			3.41	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
40.00			5.11	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**40.03**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

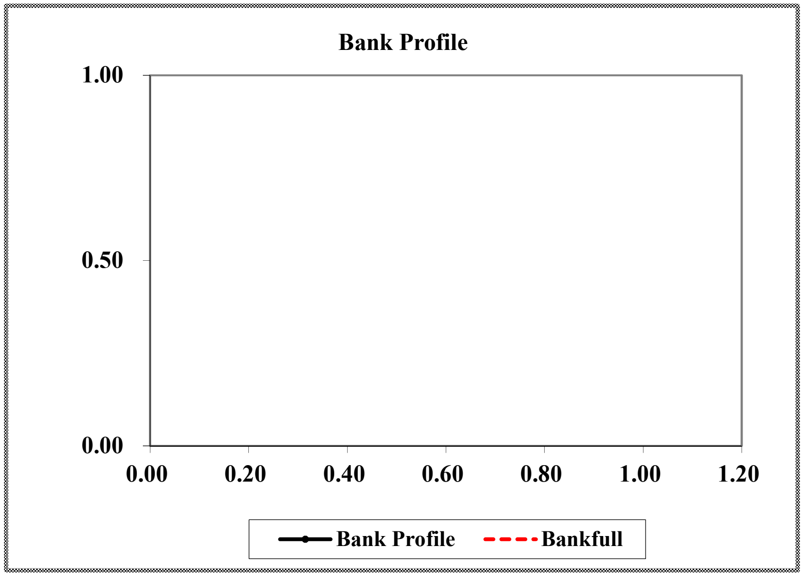
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 19**

Station: **205+15.89 to 205+62.34** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ……………...….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………..……… …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… …………...NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.72	**0.55**	**1.3090909**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	41.36
Reach:	202+64.58 to 205+11.94	**Comments:**							Very High
Location:	Right Bank 20	**Bank Length**	244						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
3.00	1.00	3.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.25	3.00	0.08	8.63	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
30.00	0.08	2.50	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
50.00			3.41	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	41.36		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

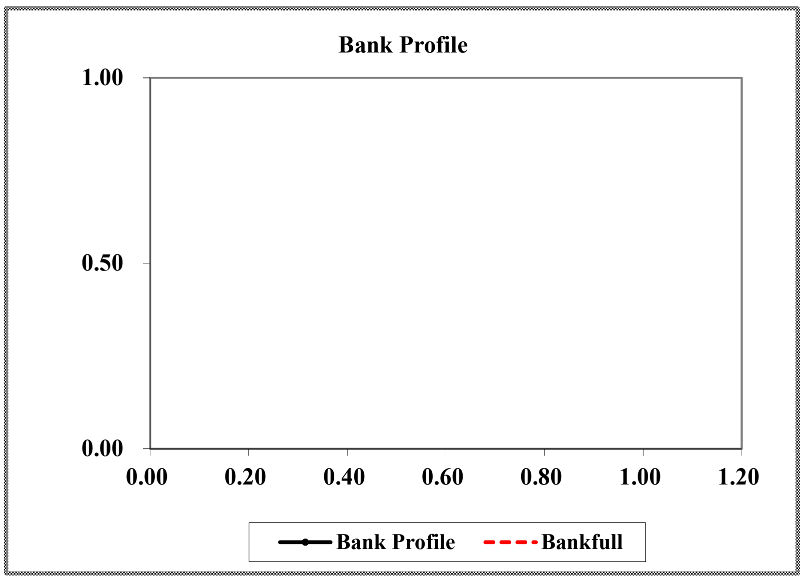
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Right Bank 20**	
Station: **202+64.58 to 205+11.94**	Stream Type:	Valley Type:
Observers: **PVC & SH**		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ……………….…NBS = High / Very High
Extensive deposition (continuous, cross-channel)…………….……………..……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	**5**
Dominant Near-Bank Stress	
Extreme	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.64	**0.2**	**3.2**	**Extreme**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Extreme**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	Observer(s):	PVC	Data:	SH	QA/QC:		Total Score:	37.77				
Reach:	404+4.57 to 405+60.53	Comments:							High				
Location:	Left Bank 20	Bank Length	155					Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables					
Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
0.50	0.50	1.00	1.00	Very Low	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.42	0.50	0.84	2.24	Low	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
10.00	0.84	8.40	8.62	Very High	
Bank Angle					
Bank Angle (º)			Index	Bank Erosion Potential	Notes
90.00			7.90	High	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
15.00			8.00	Very High	
			Adjustment		Notes
Bank Materials			10.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	37.77		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

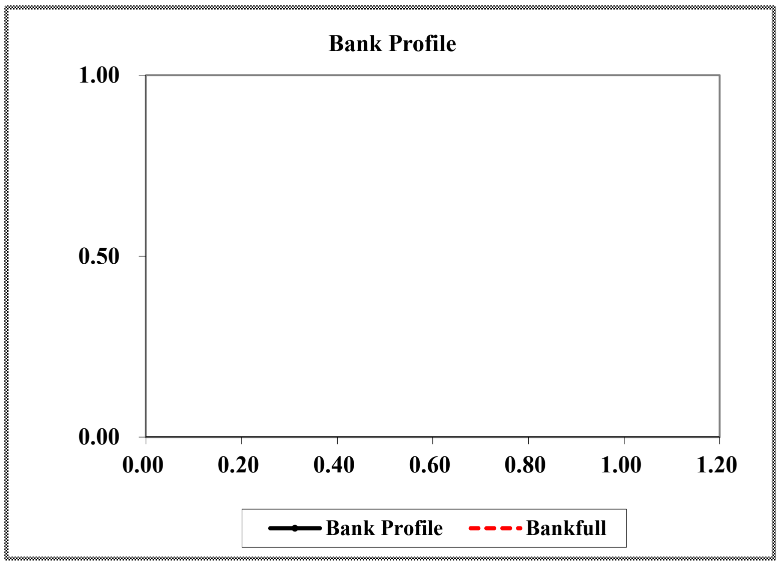
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 20**

Station: **404+4.57 to 405+60.53** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)
Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)…………….……………..……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow……………………..………..….NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.72	0.55	1.3090909	Low

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	41.23				
Reach:	205+11.94 to 205+58.48	**Comments:**							Very High				
Location:	Right Bank 21	**Bank Length**	47					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
2.00	1.00	2.00	7.90	High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.17	2.00	0.09	8.61	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
30.00	0.09	2.55	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potential	Notes
75.00			5.40	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**41.23**		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Bank Material

Adjustments	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

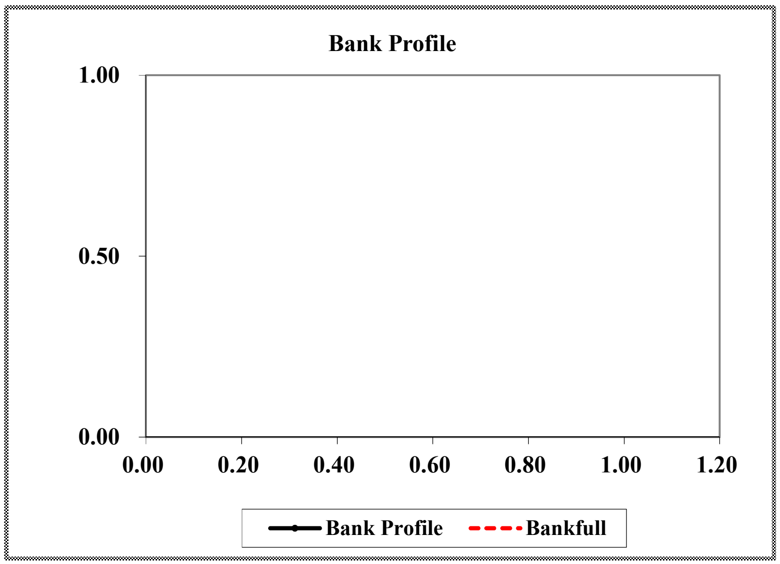
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 21**

Station: **205+11.94 to 205+58.48** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I — (1)

Transverse and/or central bars-short and/or discontinuous……….. …………..……NBS = High / Very High

Extensive deposition (continuous, cross-channel)…………….………….……. ………....NBS = Extreme

Chute cutoffs, down-valley meander migration, converging flow……………………….…….NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Extreme	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.64	**0.2**	**3.2**	**Extreme**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Extreme**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**36.05**				
Reach:	405+60.53 to 410+65.09	**Comments:**							**High**				
Location:	Left Bank 21	**Bank Length**	517					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.80	1.00	2.80	9.00	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.58	2.80	0.21	7.12	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
50.00	0.21	10.36	8.40	Very High	
Bank Angle					
Bank Angle (^{o})			Index	Bank Erosion Potental	Notes
50.00			3.41	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
65.00			3.11	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**36.05**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

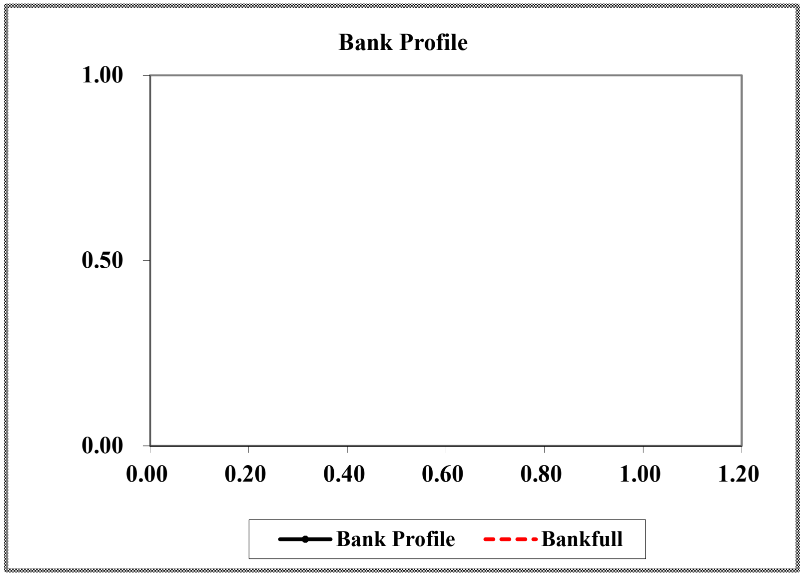
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 21**

Station: **405+60.53 to 410+65.09** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………….. ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………...……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………..…………..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.72	**0.55**	**1.3090909**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**		**37.77**			
Reach:	404+7.41 to 405+56.34	**Comments:**								**High**			
Location:	Right Bank 22	**Bank Length**	147					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
0.50	0.50	1.00	1.00	Very Low	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	0.50	0.84	2.24	Low	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
10.00	0.84	8.40	8.62	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
90.00			7.90	High	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
15.00			8.00	Very High	
			Adjustment		Notes
Bank Materials			10.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	37.77		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	**Bedrock**	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

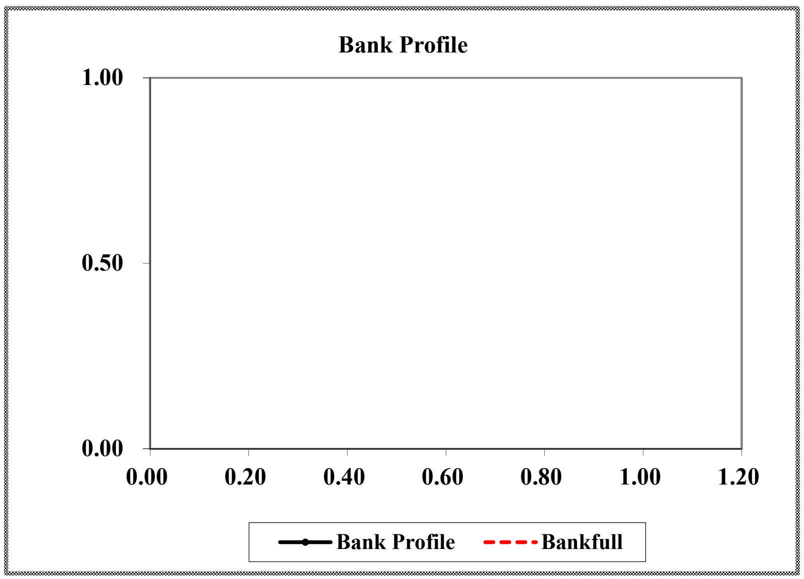
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 22**

Station: **404+7.41 to 405+56.34** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………..… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………….….…… …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow………………….……………..…NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	Ratio R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	Ratio S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	Ratio S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Extreme	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	Ratio d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
0.64	**0.2**	**3.2**	**Extreme**

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Extreme**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	Observer(s):	PVC	Data:	SH	QA/QC:		Total Score:	46.13			
Reach:	309+20.39 to 311+1.38	Comments:							Extreme			
Location:	Left Bank 22	Bank Length	178					Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.42	2.50	0.17	7.66	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
20.00	0.17	3.36	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
10.00			9.00	Very High	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			5.00		
		TOTAL SCORE	46.13		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

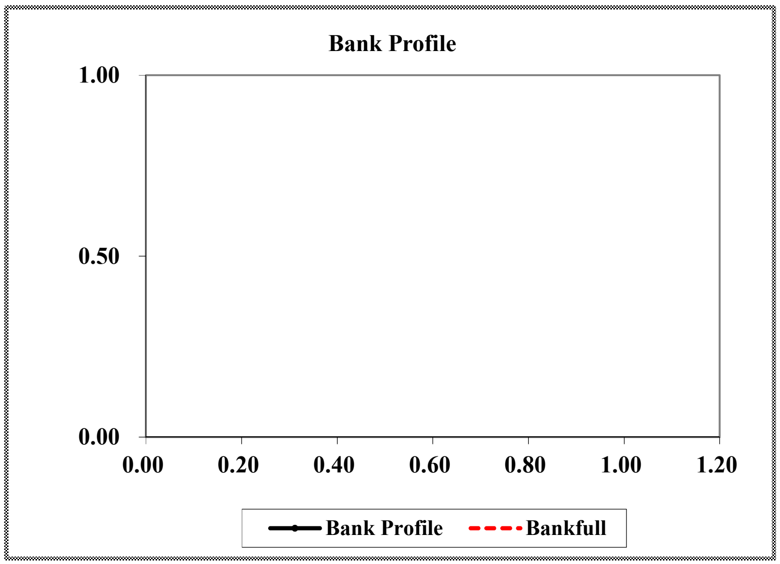
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 22**

Station: **309+20.39 to 311+1.38** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… …………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………….…….… …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
0.53	**0.38**	**1.3947368**	**Low**

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	33.39			
Reach:	405+56.34 to 410+65.81	**Comments:**							High			
Location:	Right Bank 23	**Bank Length**	516					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40

Very High	**Extreme**
40-45	45-50

Erodibility Variables					
Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.00	1.00	2.00	7.90	High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.58	2.00	0.29	6.00	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
50.00	0.29	14.50	7.97	High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
50.00			3.41	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
65.00			3.11	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**33.39**		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

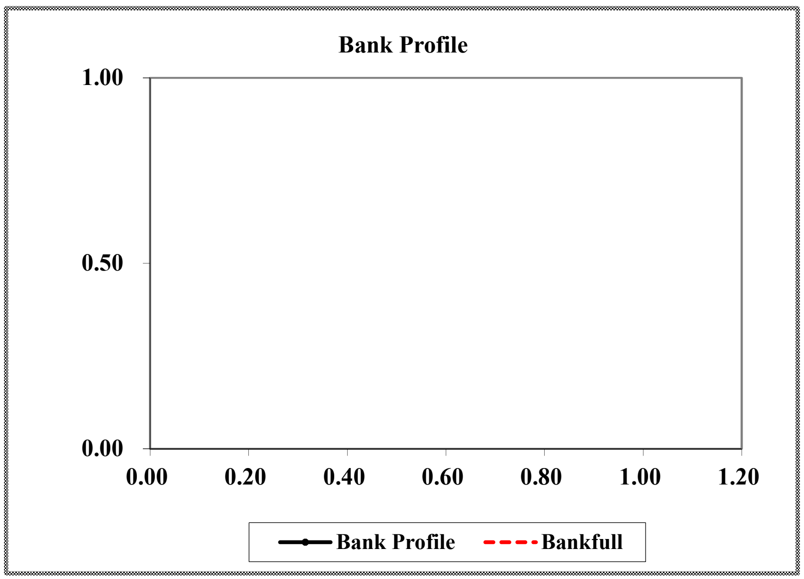
Adjustments

Bank Material		
	Bedrock	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile		
Horizontal Distance	**Vertical Height**	**Notes**
Bankfull		
Horizontal Distance	**Vertical Height**	**Notes**



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Right Bank 23**	
Station: **405+56.34 to 410+65.81**	Stream Type:	Valley Type:
Observers: **PVC & SH**		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………..……… …………...NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Extreme	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.64	**0.2**	**3.2**	**Extreme**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Extreme**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	**40.65**
Reach:	307+55.25 to 309+20.39	**Comments:**							**Very High**
Location:	Left Bank 23	**Bank Length**	163						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.17	2.50	0.07	8.80	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
40.00	0.07	2.72	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
45.00			3.17	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
40.00			5.11	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**40.65**		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	**Bedrock**	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

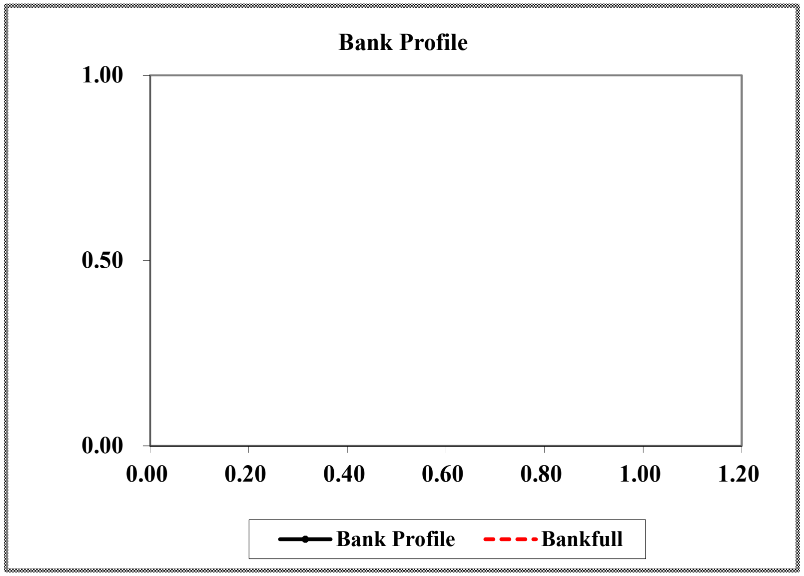
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 23**

Station: **307+55.25 to 309+20.39** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous……………………………..….NBS = High / Very High

Extensive deposition (continuous, cross-channel)………………..……………..……… ……………...NBS = Extreme

Chute cutoffs, down-valley meander migration, converging flow…………………… ……………NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	Ratio R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	Ratio S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	Ratio S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
Low	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	Ratio d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**0.53**	**0.38**	**1.3947368**	**Low**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	Observer(s):	PVC	Data:	SH	QA/QC:		Total Score:	36.77				
Reach:	306+16.05 to 310+97.33	Comments:							High				
Location:	Right Bank 24	Bank Length	486					Total Score	Very Low	Low	Moderate	High	Very High	Extreme
Date:	5/4/2018							Values:	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.58	2.50	0.23	6.79	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
60.00	0.23	13.92	8.01	Very High	
Bank Angle					
Bank Angle (^{o})			Index	Bank Erosion Potential	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
60.00			3.50	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	36.77		

Bank Erosion Potential

Erodibility Variables

		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Bank Material — Adjustments

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

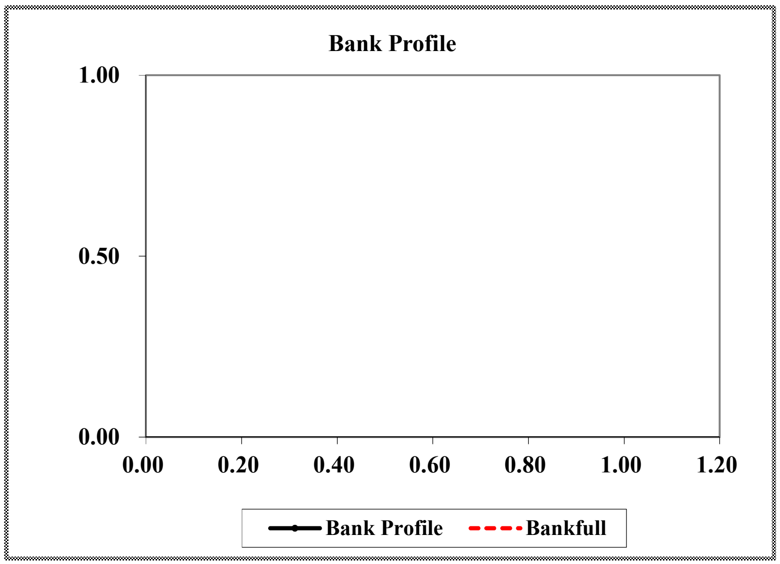
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 24**

Station: **306+16.05 to 310+97.33** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ……………..….NBS = High / Very High

Extensive deposition (continuous, cross-channel)……………..…………..……. …………...NBS = Extreme

Chute cutoffs, down-valley meander migration, converging flow…………………… …………..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	**5**
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.55	**0.43**	**1.2790698**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	36.77			
Reach:	306+18.16 to 307+55.25	**Comments:**							High			
Location:	Left Bank 24	**Bank Length**	137					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.58	2.50	0.23	6.79	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
60.00	0.23	13.92	8.01	Very High	
Bank Angle					
Bank Angle (^{o})			Index	Bank Erosion Potential	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
60.00			3.50	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**36.77**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

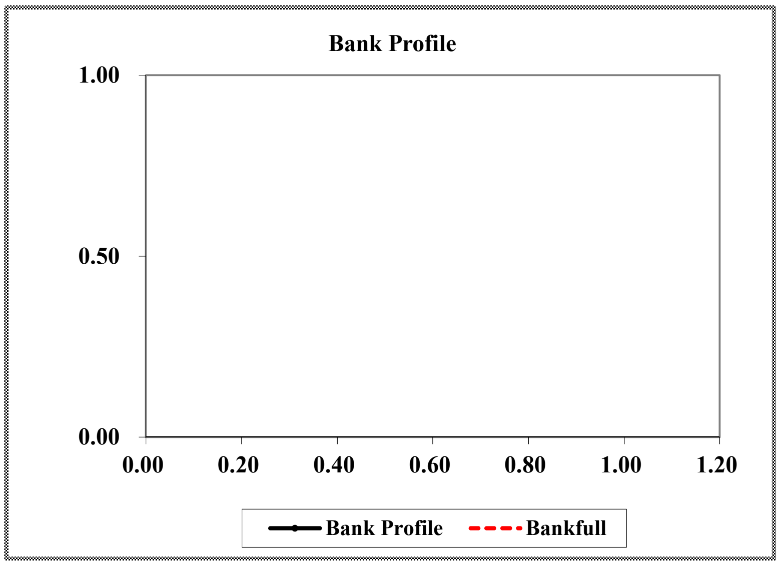
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 24**

Station: **306+18.16 to 307+55.25** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………….…….. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.53	**0.38**	**1.3947368**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	55.27
Reach:	305+52.82 to 306+16.05	**Comments:**							Extreme
Location:	Right Bank 25	**Bank Length**	62						
Date:	5/4/2018								

Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potential	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potential	Notes
0.17	2.50	0.07	8.80	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potential	Notes
5.00	0.07	0.34	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potential	Notes
90.00			7.90	High	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potential	Notes
5.00			10.00	Extreme	
			Adjustment		Notes
Bank Materials			10.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	55.27		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material		
	Bedrock	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

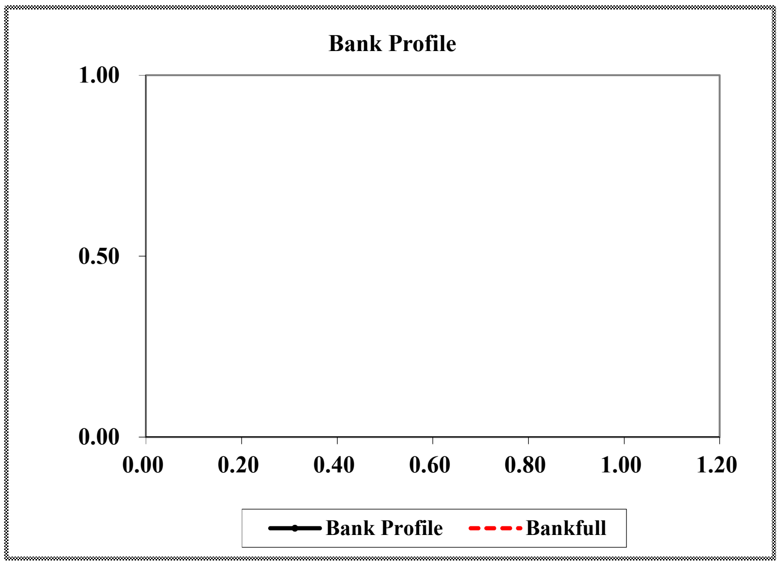
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 25**

Station: **305+52.82 to 306+16.05** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ……………...….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………..…… …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
Low	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**0.55**	**0.43**	**1.2790698**	**Low**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	Observer(s):	PVC	Data:	SH	QA/QC:		Total Score:	47.27
Reach:	305+51.43 to 306+18.16	Comments:							Extreme
Location:	Left Bank 25	Bank Length	65						
Date:	5/4/2018								

Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.17	2.50	0.07	8.80	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
10.00	0.07	0.68	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
20.00			1.90	Very Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
15.00			8.00	Very High	
			Adjustment		Notes
Bank Materials			10.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	47.27		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

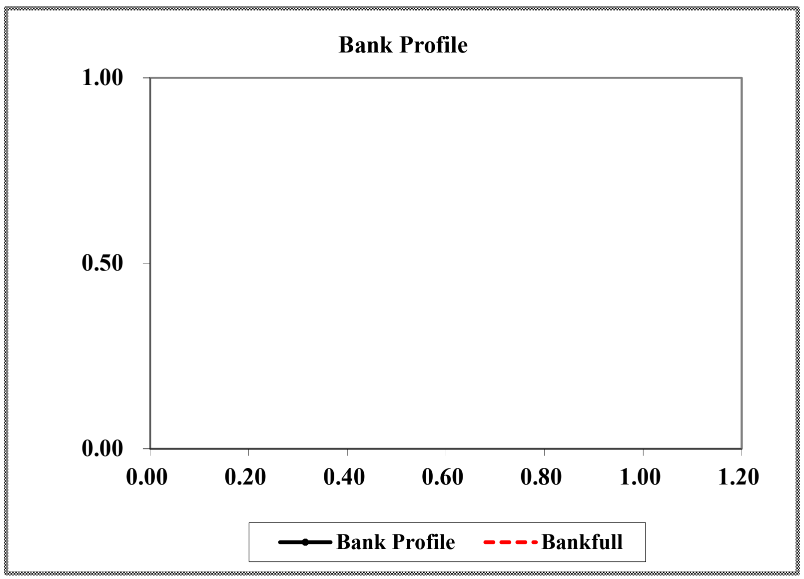
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Left Bank 25**	
Station: **305+51.43 to 306+18.16**	Stream Type:	Valley Type:
Observers: **PVC & SH**		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous……….… ………………..…NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………...……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow……………………..…………..…NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.53	**0.38**	**1.3947368**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating: Low

BANK EROSION HAZARD INDEX

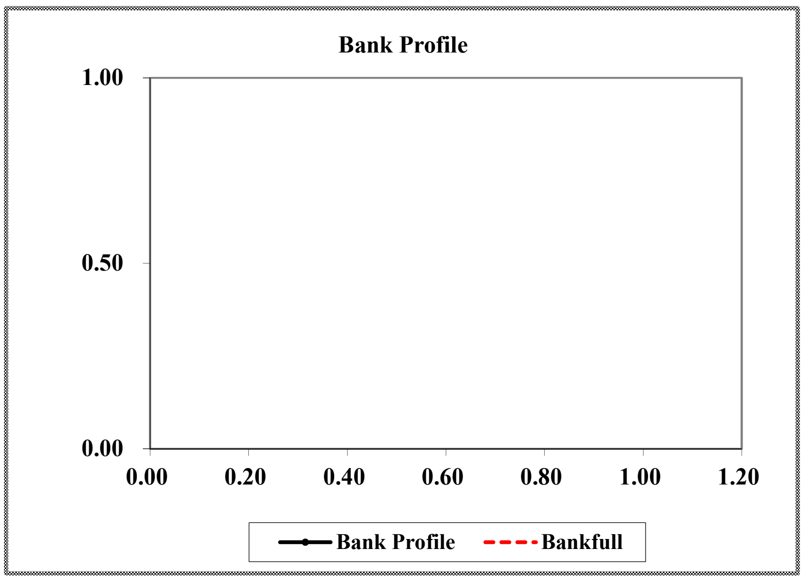
Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**		36.77				
Reach:	302+31.22 to 305+52.82	**Comments:**								High				
Location:	Right Bank 26	**Bank Length**	335					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables					
Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.58	2.50	0.23	6.79	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
60.00	0.23	13.92	8.01	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
60.00			3.50	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	36.77		

Bank Erosion Potential								
			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments		
Bank Material	**Bedrock**	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.
Stratification		
	Add 5-10 points depending on position of unstable layers in relation to bankfull stage.	

Bank Profile		
Horizontal Distance	**Vertical Height**	**Notes**
Bankfull		
Horizontal Distance	**Vertical Height**	**Notes**



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 26**

Station: **302+31.22 to 305+52.82** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
- Transverse and/or central bars-short and/or discontinuous…………. ……………..…..NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………..…………..……… …………....NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow…………………… …………....NBS = Extreme

Level II

(2)

Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)

Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)

Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)

Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
0.55	**0.43**	**1.2790698**	**Low**

(6)

Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)

Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	36.77				
Reach:	302+30.62 to 305+51.43	**Comments:**							High				
Location:	Left Bank 26	**Bank Length**	322					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.50	1.00	2.50	8.57	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.58	2.50	0.23	6.79	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
60.00	0.23	13.92	8.01	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
70.00			4.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
60.00			3.50	Low	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**36.77**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

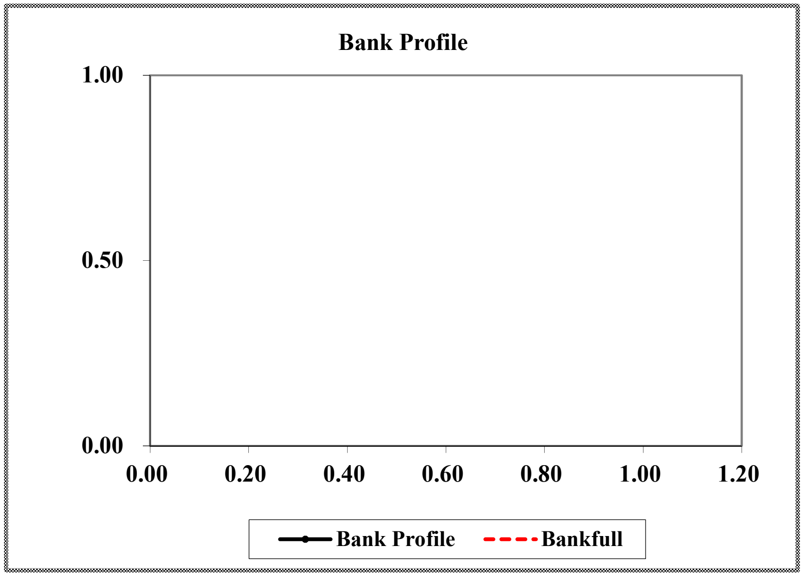
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston**	Location: **Left Bank 26**	
Station: **302+30.62 to 305+51.43**	Stream Type:	Valley Type:
Observers: **PVC & SH**		Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………... ……………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………...……. …………....NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow……………………..……..….NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	**5**
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.53	**0.38**	**1.3947368**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating | **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	30.90				
Reach:	301+33.97 to 302+31.22	**Comments:**							High				
Location:	Right Bank 27	**Bank Length**	111					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
4.00	1.00	4.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.17	4.00	0.04	10.00	Extreme	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
0.00	0.04				
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
0.00					
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	30.90		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

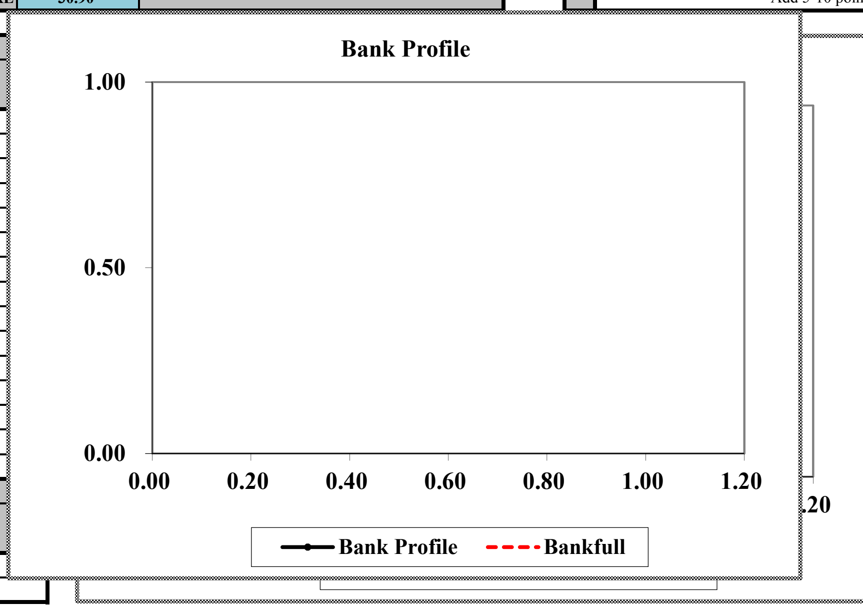
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 27**

Station: **301+33.97 to 302+31.22** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
Transverse and/or central bars-short and/or discontinuous………… ……………….….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………..……. …………...NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… …………..NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	5
Dominant Near-Bank Stress	
Low	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**0.55**	**0.43**	**1.2790698**	**Low**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	43.41				
Reach:	301+25.14 to 302+30.62	**Comments:**							Very High				
Location:	Left Bank 27	**Bank Length**	107					**Total Score**	**Very Low**	**Low**	**Moderate**	**High**	**Very High** / **Extreme**
Date:	5/4/2018							**Values:**	5-10	10-20	20-30	30-40	40-45 / 45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.00	1.00	2.00	7.90	High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.25	2.00	0.13	8.17	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
40.00	0.13	5.00	9.00	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
30.00			2.44	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
30.00			5.90	Moderate	
			Adjustment		Notes
Bank Materials			10.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**43.41**		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	**Bedrock**	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

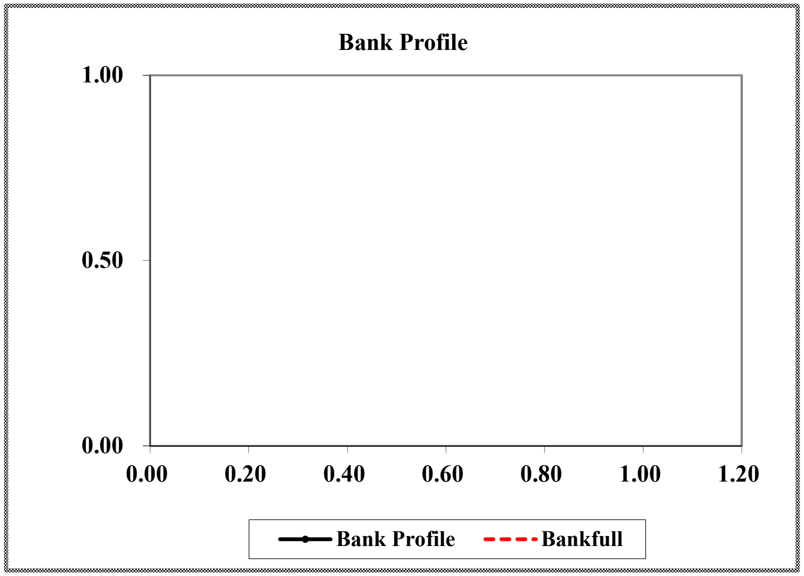
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 27**

Station: **301+25.14 to 302+30.62** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… …………………..….NBS = High / Very High

Extensive deposition (continuous, cross-channel)……………..…………..……… …………....NBS = Extreme

Chute cutoffs, down-valley meander migration, converging flow…………………… ……….…..NBS = Extreme

Level II

	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(2)				

	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(3)				

	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)
(4)				

Method	1
Dominant Near-Bank Stress	
Very High	

Level III

	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
(5)	**0.53**	**0.38**	**1.3947368**	**Low**

	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)
(6)								

Level IV

	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)
(7)		

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Very High**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**		45.43			
Reach:	500+3.19 to 503+63.08	**Comments:**								Very High			
Location:	Right Bank 28	**Bank Length**	345					**Total Score Values:**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
Date:	5/4/2018								5-10	10-20	20-30	30-40	40-45

Total Score Values:	Very Low	Low	Moderate	High	Very High	Extreme
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
6.00	1.50	4.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.50	6.00	0.08	8.63	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
20.00	0.08	1.67	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
30.00			5.90	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	45.43		

Bank Erosion Potential

Erodibility Variables			Very Low	Low	Moderate	High	Very High	Extreme
	Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material		
	Bedrock	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

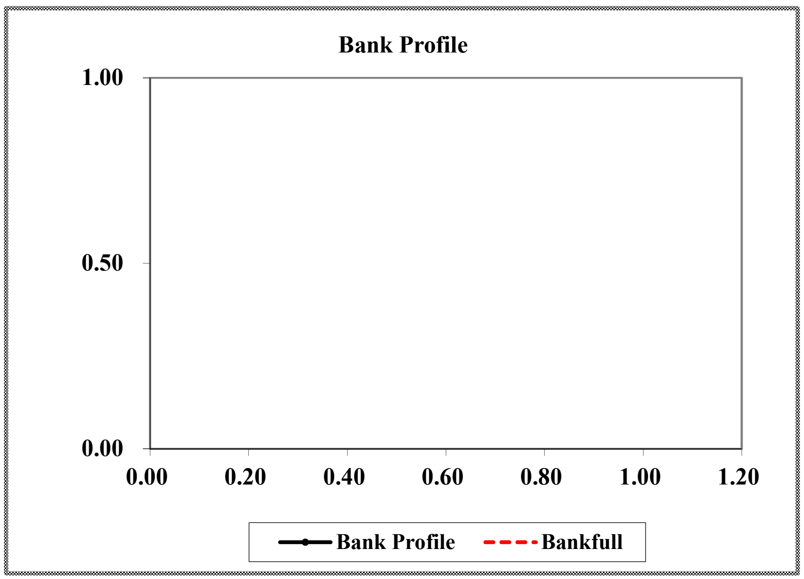
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 28**

Station: **500+3.19 to 503+63.08** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)
Transverse and/or central bars-short and/or discontinuous………… ………………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………..……. ……………...NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……………NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	1
Dominant Near-Bank Stress	
Very High	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.83	**0.62**	**1.3387097**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Very High**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	44.64
Reach:	500+2.38 to 503+65.54	**Comments:**							Very High
Location:	Left Bank 28	**Bank Length**	367						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
6.00	1.50	4.00	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.50	6.00	0.08	8.63	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
30.00	0.08	2.50	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
40.00			5.11	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**44.64**		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material		
	Bedrock	Bedrock banks have a very low erosion potential.
	Boulders	Boulder banks have a low erosion potential.
	Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
	Clay/Silt Loam	Add 5 points.
	Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
	Sand	Add 10 points.
	Silt / Clay	No adjustment.

Stratification

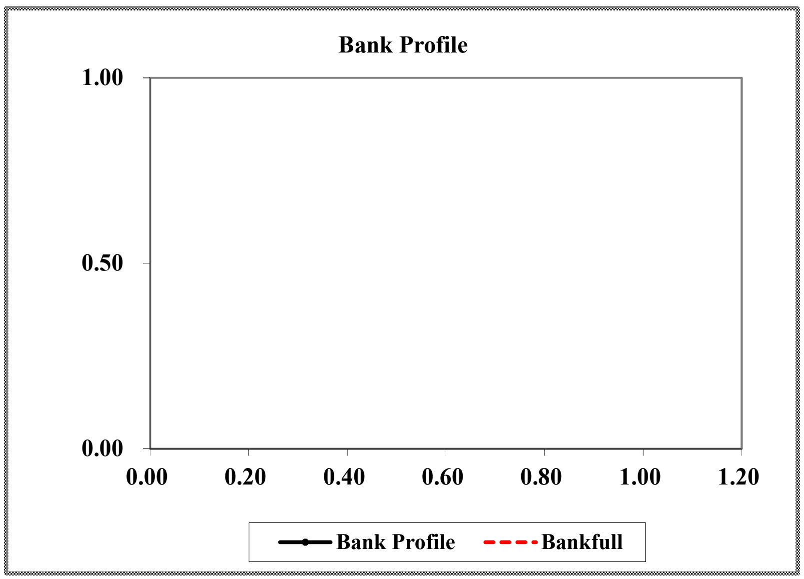
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 28**

Station: **500+2.38 to 503+65.54** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I

(1)
- Transverse and/or central bars-short and/or discontinuous……………NBS = High / Very High
- Extensive deposition (continuous, cross-channel)……………NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow……………NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)
(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)
(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Moderate	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.77	**0.49**	**1.5714286**	**Moderate**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Moderate**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	43.66			
Reach:	503+63.08 to 507+15.6	**Comments:**							Very High			
Location:	Right Bank 29	**Bank Length**	358					**Total Score Values:**	**Very Low** 5-10	**Low** 10-20	**Moderate** 20-30	**High** 30-40 / **Very High** 40-45 / **Extreme** 45-50
Date:	5/4/2018											

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
5.00	1.50	3.33	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.50	5.00	0.10	8.44	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
20.00	0.10	2.00	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	43.66		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

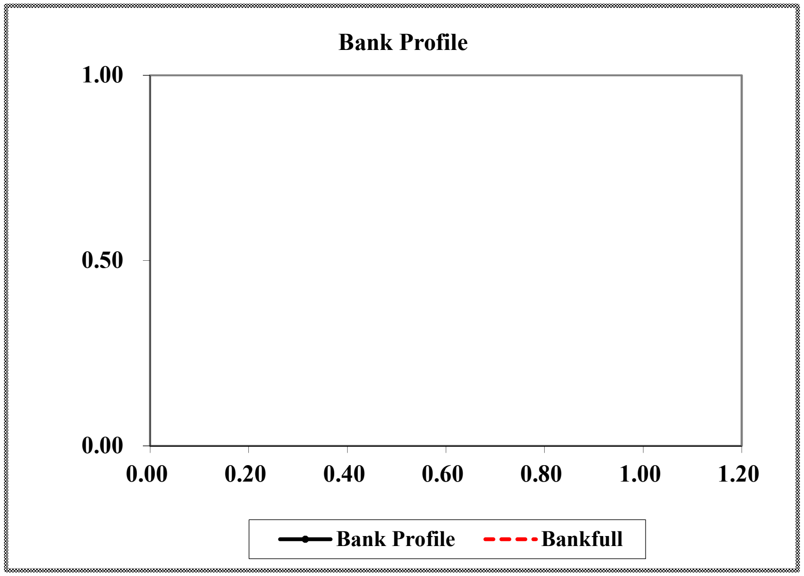
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Right Bank 29**

Station: **503+63.08 to 507+15.6** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1)	Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2)	Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3)	Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4)	Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5)	Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6)	Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7)	Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ……………….….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..……………..…… …………...NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……………NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Low	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.83	**0.62**	**1.3387097**	**Low**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Low**

BANK EROSION HAZARD INDEX

Stream:	Eccleston Mitigation Site	**Observer(s):**	PVC	**Data:**	SH	**QA/QC:**		**Total Score:**	44.45
Reach:	503+65.54 to 507+20.72	**Comments:**							Very High
Location:	Left Bank 29	**Bank Length**	352						
Date:	5/4/2018								

Total Score Values:	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
	5-10	10-20	20-30	30-40	40-45	45-50

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
5.00	1.50	3.33	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.50	5.00	0.10	8.44	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
30.00	0.10	3.00	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
80.00			5.90	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
40.00			5.11	Moderate	
			Adjustment		Notes
Bank Materials			5.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**44.45**		

Bank Erosion Potential

Erodibility Variables		Very Low	Low	Moderate	High	Very High	Extreme
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments (Bank Material)

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Clay/Silt Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

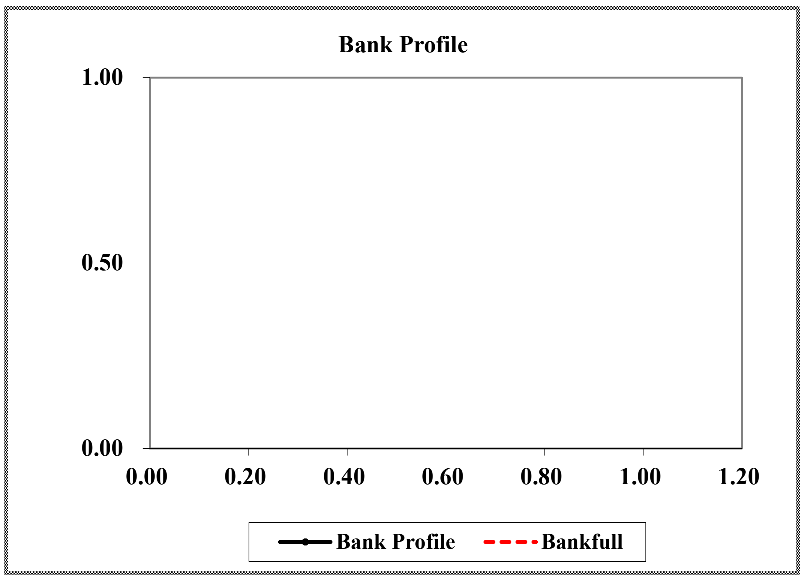
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes

Bankfull

Horizontal Distance	Vertical Height	Notes



Estimating Near-Bank Stress (NBS)

Stream: **Eccleston** Location: **Left Bank 29**

Station: **503+65.54 to 507+20.72** Stream Type: Valley Type:

Observers: **PVC & SH** Date: **5/4/2018**

Methods for Estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient	Level IV	Validation

Level I (1)

Transverse and/or central bars-short and/or discontinuous………… ……………..….NBS = High / Very High
Extensive deposition (continuous, cross-channel)……………..…………..……. …………...NBS = Extreme
Chute cutoffs, down-valley meander migration, converging flow…………………… ……….….NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Method	5
Dominant Near-Bank Stress	
Moderate	

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)
	0.77	**0.49**	**1.5714286**	**Moderate**

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting Values to a Near-Bank Stress (NBS) Rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating **Moderate**

Sediment and Nutrient Removal for TMDL Credit
Eccleston
Baltimore County, MD

By: PVC
Date: 12/20/2017

indicates results to be Reported to the State (per Section 7.1.3)

Protocol 1

Credit for Prevented Sediment during Storm Flow

Step 1: Estimate stream sediment erosion rate

Erosion Rate =	2024.8	tons/yr*	*-from Eccleston stream bank erosion rate (BEHI-NBS data)*
Study Length =	12754	LF	*-Combined right and left bank lengths*
Unit Erosion Rate =	0.158758	tons/ft/yr	** Unit Density of soil = 2286.74 lb/CY (per Bulk Density testing)*

Existing Stream length to be restored =	5564	LF	
x	0.158758	tons/ft/yr	
Total Erosion =	883.3	tons/yr	

Step 2: Convert stream bank erosion to nutrient loading

Nitrogen Concentration =	1.35	lbs/ton	*- from recommendations of the Expert Panel to Define Removal Rates for individual Stream*
Phosphorus Concentration =	0.445	lbs/ton	*Restoration Projects prepared by Tom Schueler and Bill Stack*

Step 3: Estimate stream restoration efficiency

Load Reductions (50% efficiency)		
Sediment (TSS) =	883,330	lbs/yr
Nitrogen (TN) =	596.2	lbs/yr
Phosphorus (TP) =	196.5	lbs/yr

Protocol 2

Credit for in-stream and riparian nutrient processing within the hyporheic zone during base

Step 1: Determine the total post construction stream length that has been reconnected using the bank height ratio of 1.0 or less

Restored (proposed) Stream Length =	6796	LF	*length of restored stream where BHR = 1.0 or less*

Step 2: Determine the dimensions of the hyporheic box

Channel Width =	9	ft	*where BHR = 1.0 or less*	*Channel Width = average of all stream reaches*
Left Floodplain Width =	5	ft	*(max. credit = 5 ft)*	
Right Floodplain Width =	5	ft	*(max. credit = 5 ft)*	
Width Hyporheic Box =	19	ft		

Depth Hyporheic Box =	5	ft	*from guidance*
x	6796	LF	
Total Vol. Hyporheic Zone =	645,620	ft^3	

Mass of hyporheic box =	31085.4	tons*	** Unit Density of soil = 2600 lb/CY*

Step 3: Multiply the hyporheic box mass by the unit denitrification rate

Unit Denitrification Rate =	1.06E-04	lbs/ton/day

Watershed Area at Downstream POI = 1,728 acres
Impervious Area = 22.7%

Load Reduction			
Nitrogen (TN) =	1202.7	lbs/yr*	**<40% of watershed annual N load (full credit is applicable)*

Protocol 3
Credit for Floodplain Reconnection Volume

**Not performed for this project*

APPENDIX F
Ecological Uplift

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION Intersection Trib
STATION # ________ RIVERMILE ________	STREAM CLASS
LAT ____________ LONG ____________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE 5/4/18 TIME ________ AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Intersection Trib

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ________

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION Below Cypress
STATION # ________ RIVERMILE ________	STREAM CLASS
LAT ____________ LONG ____________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE 5/4/18 TIME ________ AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Below Cypress

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ________

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION Downstream Forested Jones
STATION # ________ RIVERMILE ________	STREAM CLASS
LAT ____________ LONG ____________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE 5/4/18 TIME ________ AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Downstream Forested Jones

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ________

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION Walnut
STATION #________ RIVERMILE________	STREAM CLASS
LAT ________ LONG ________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE 5/4/18 TIME ______ AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Walnut

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ________

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION M.ddle Jones
STATION #________ RIVERMILE________	STREAM CLASS
LAT ________ LONG ________	RIVER BASIN
STOREET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE 5/4/18 TIME ________ AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Middle Jones

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ________

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION Braided Trib
STATION #________ RIVERMILE________	STREAM CLASS
LAT ____________ LONG ____________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE 5/4/18 TIME ________ AM PM REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Braided Trib

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line. Braided	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ________

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION Railroad Trib
STATION # ________ RIVERMILE ________	STREAM CLASS
LAT ____________ LONG ____________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE ________ TIME ________ AM PM
	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Railroad Trib

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ________

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION Cypress
STATION # ______ RIVERMILE ______	STREAM CLASS
LAT ______ LONG ______	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE 5/4/18 TIME ______ AM PM / REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Cypress

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ________

APPENDIX G
Design Computations

RIVERMORPH CROSS SECTION SUMMARY

River Name: Proposed Design
Reach Name: Main Stem
Cross Section Name: Typical Section - B stream
Survey Date: 09/27/2018

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2	
10	0	2	BKF
11.75	0	1.3	
16.25	0	1	
20.75	0	1.3	
22.5	0	2	
32	0	2	

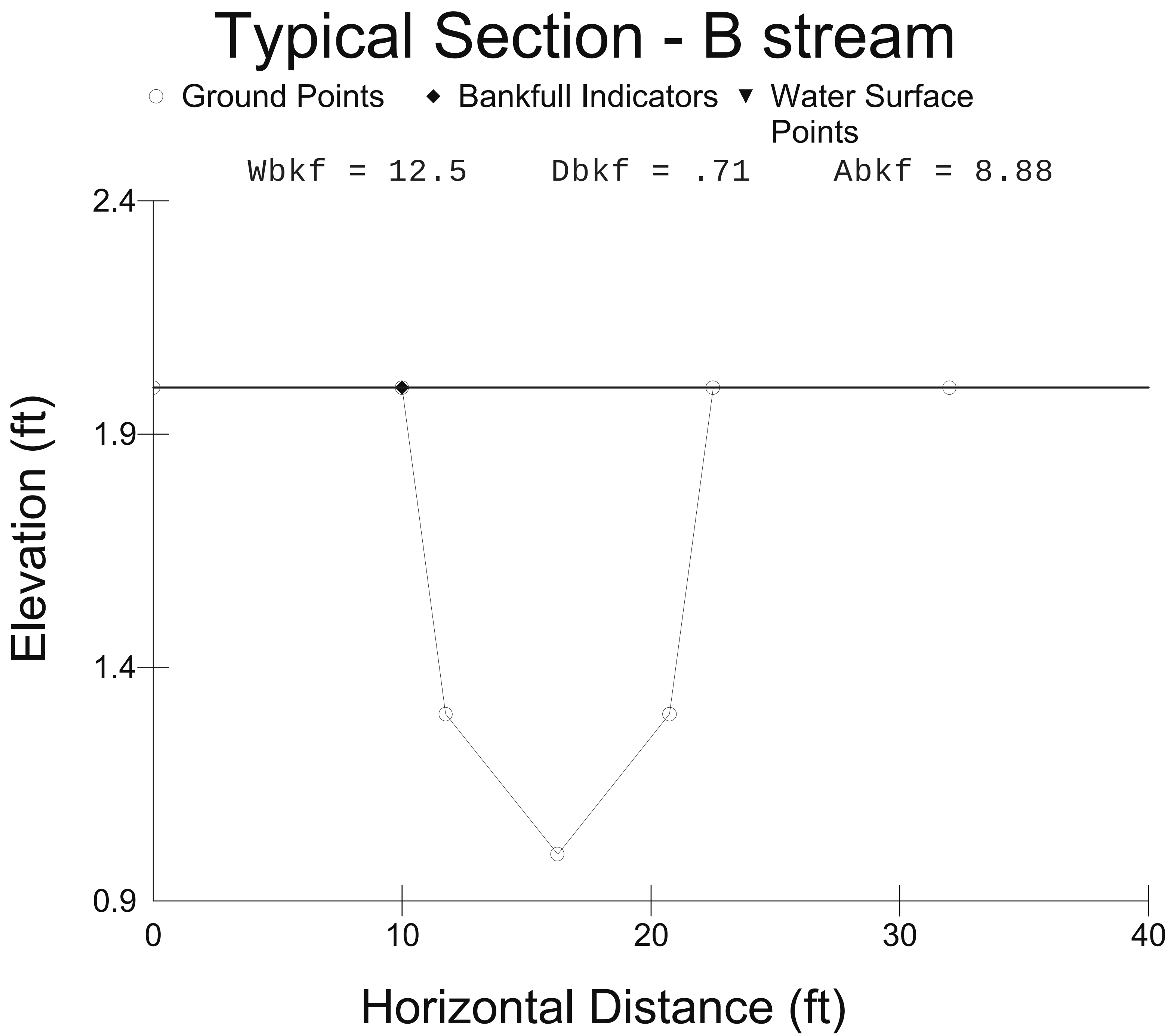
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	3	3	3
Bankfull Elevation (ft)	2	2	2
Floodprone Width (ft)	32	-----	-----
Bankfull Width (ft)	12.5	6.25	6.25
Entrenchment Ratio	2.56	-----	-----
Mean Depth (ft)	0.71	0.71	0.71
Maximum Depth (ft)	1	1	1
Width/Depth Ratio	17.61	8.8	8.8
Bankfull Area (sq ft)	8.88	4.44	4.44
Wetted Perimeter (ft)	12.79	7.39	7.39
Hydraulic Radius (ft)	0.69	0.6	0.6
Begin BKF Station	10	10	16.25
End BKF Station	22.5	16.25	22.5

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Typical Section - B stream
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 12.5
Dbkf = .71
Abkf = 8.88
2.4
1.9
1.4
0.9
Elevation (ft)
0
10
20
30
40
Horizontal Distance (ft)

RIVERMORPH CROSS SECTION SUMMARY

River Name: Proposed Design
Reach Name: Main Stem
Cross Section Name: Typical Section - C stream
Survey Date: 09/13/2018

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2	
10	0	2	BKF
11.5	0	1.4	
14.5	0	1.2	
17.5	0	1.4	
19	0	2	
29	0	2	

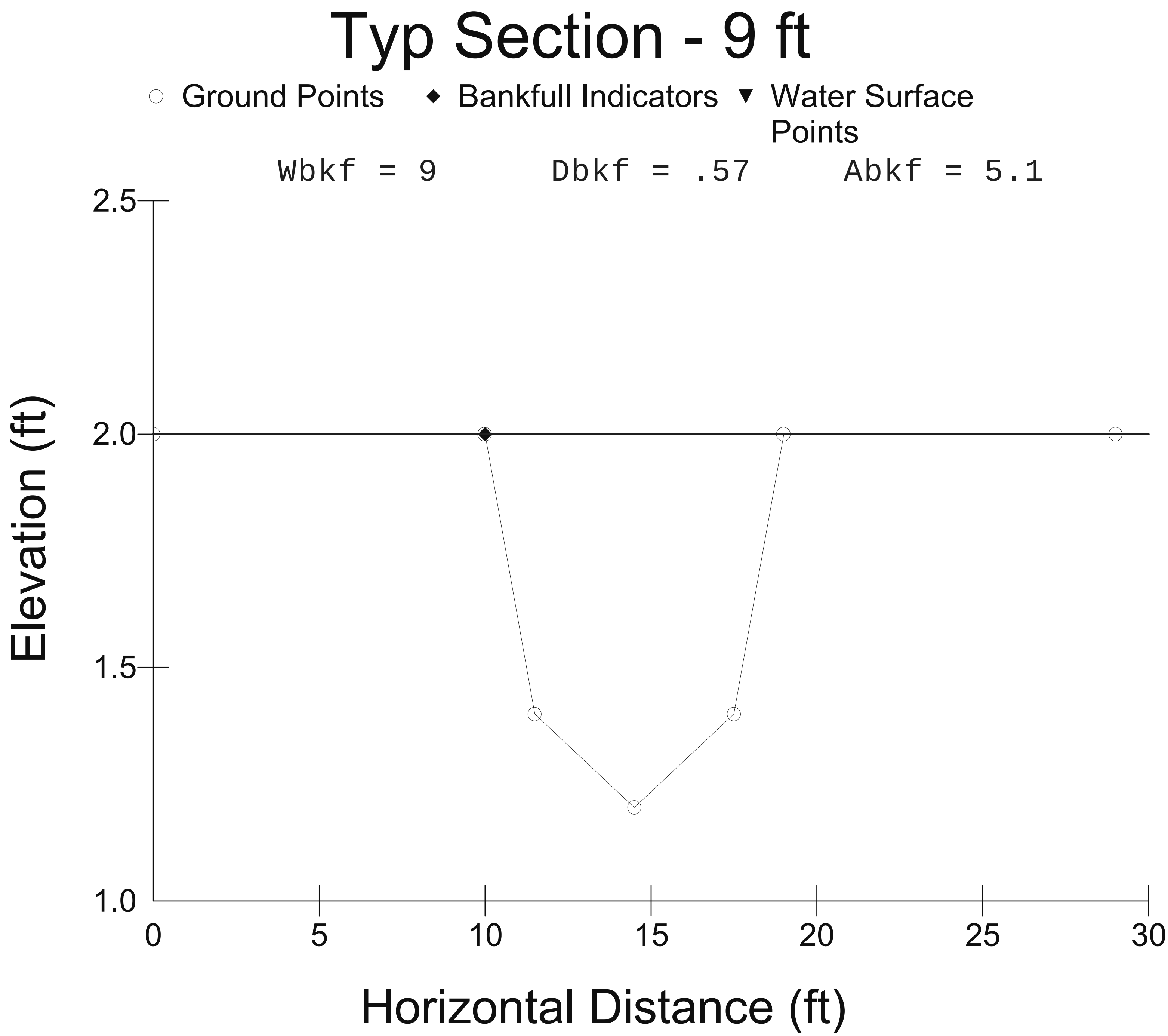
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2.8	2.8	2.8
Bankfull Elevation (ft)	2	2	2
Floodprone Width (ft)	29	-----	-----
Bankfull Width (ft)	9	4.5	4.5
Entrenchment Ratio	3.22	-----	-----
Mean Depth (ft)	0.57	0.57	0.57
Maximum Depth (ft)	0.8	0.8	0.8
Width/Depth Ratio	15.79	7.94	7.89
Bankfull Area (sq ft)	5.1	2.55	2.55
Wetted Perimeter (ft)	9.24	5.42	5.42
Hydraulic Radius (ft)	0.55	0.47	0.47
Begin BKF Station	10	10	14.5
End BKF Station	19	14.5	19

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


Typ Section - 9 ft
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 9
Dbkf = .57
Abkf = 5.1
Elevation (ft)
2.5
2.0
1.5
1.0
0
5
10
15
20
25
30
Horizontal Distance (ft)

RIVERMORPH CROSS SECTION SUMMARY

River Name: Proposed Design
Reach Name: South Tributary
Cross Section Name: Typical Section - B stream
Survey Date: 09/18/2018

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2	
10	0	2	BKF
10.75	0	1.7	
12	0	1.7	
13	0	1.3	
14	0	1.3	
15	0	1.7	
16.25	0	1.7	
17	0	2	
26	0	2	

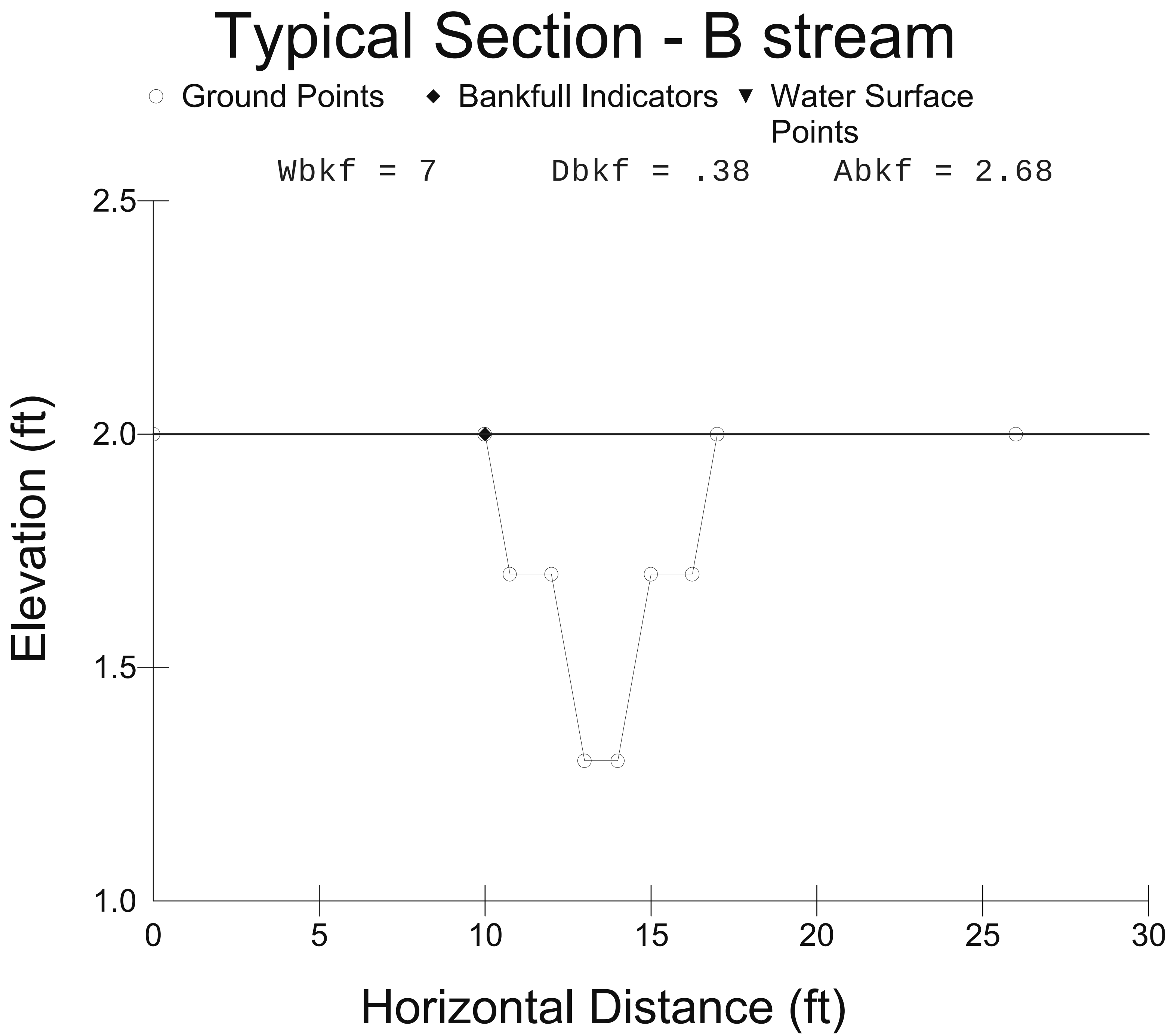
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2.7	2.7	2.7
Bankfull Elevation (ft)	2	2	2
Floodprone Width (ft)	26	-----	-----
Bankfull Width (ft)	7	3	4
Entrenchment Ratio	3.71	-----	-----
Mean Depth (ft)	0.38	0.33	0.42
Maximum Depth (ft)	0.7	0.7	0.7
Width/Depth Ratio	18.42	9.11	9.52
Bankfull Area (sq ft)	2.67	0.99	1.69
Wetted Perimeter (ft)	7.27	3.83	4.83
Hydraulic Radius (ft)	0.37	0.26	0.35
Begin BKF Station	10	10	13
End BKF Station	17	13	17

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Typical Section - B stream
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 7
Dbkf = .38
Abkf = 2.68
Elevation (ft)
2.5
2.0
1.5
1.0
0
5
10
15
20
25
30
Horizontal Distance (ft)

RIVERMORPH CROSS SECTION SUMMARY

River Name: Proposed Design
Reach Name: South Tributary
Cross Section Name: Typical Section - C Stream
Survey Date: 09/19/2018

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2	
10	0	2	BKF
11.05	0	1.58	
12.25	0	1.5	
13.45	0	1.58	
14.5	0	2	
24.5	0	2	

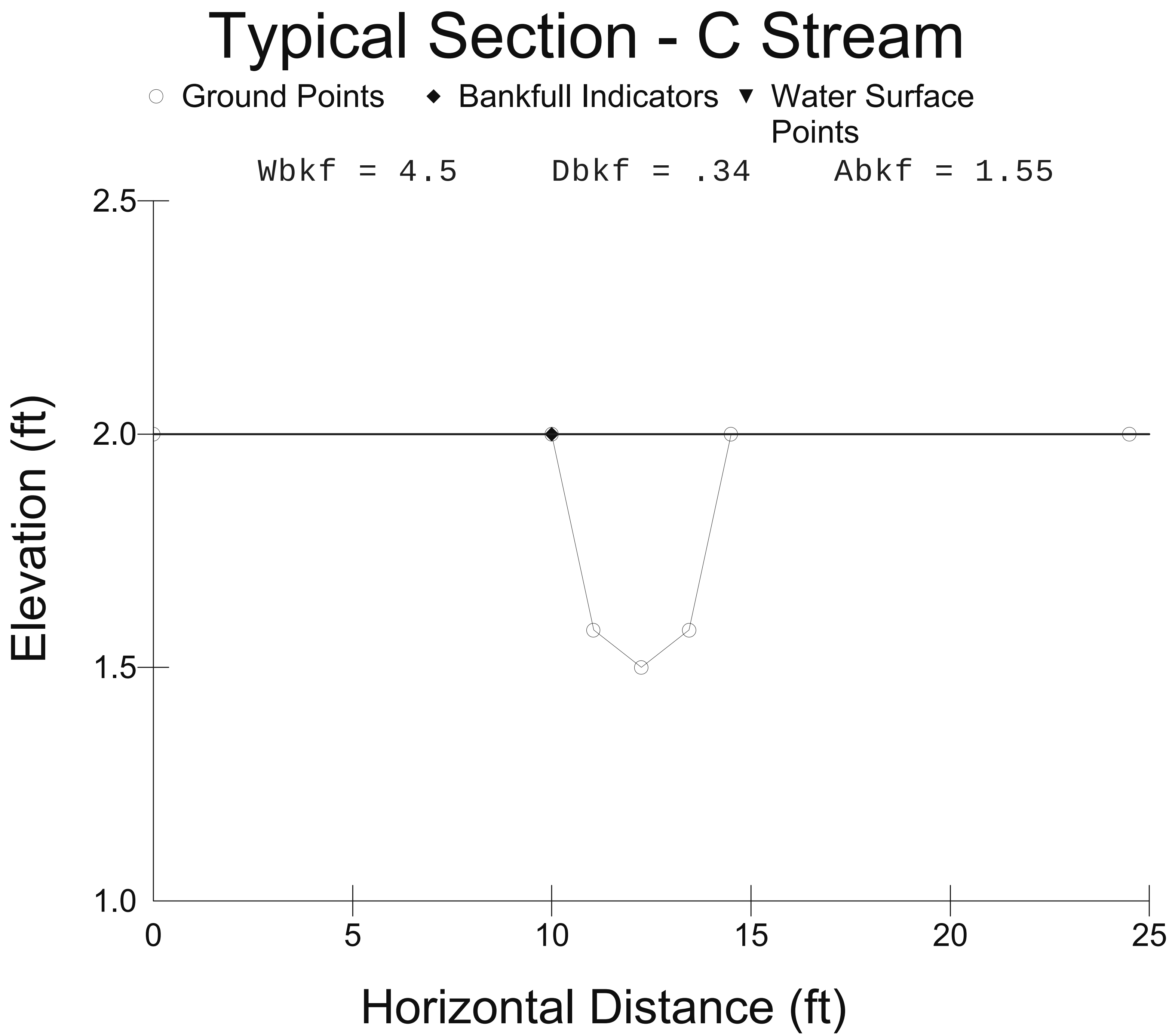
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2.5	2.5	2.5
Bankfull Elevation (ft)	2	2	2
Floodprone Width (ft)	24.5	-----	-----
Bankfull Width (ft)	4.5	2.25	2.25
Entrenchment Ratio	5.44	-----	-----
Mean Depth (ft)	0.34	0.34	0.34
Maximum Depth (ft)	0.5	0.5	0.5
Width/Depth Ratio	13.24	6.55	6.62
Bankfull Area (sq ft)	1.54	0.77	0.77
Wetted Perimeter (ft)	4.67	2.83	2.83
Hydraulic Radius (ft)	0.33	0.27	0.27
Begin BKF Station	10	10	12.25
End BKF Station	14.5	12.25	14.5

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Typical Section - C Stream
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 4.5
Dbkf = .34
Abkf = 1.55
2.5
2.0
1.5
1.0
Elevation (ft)
0
5
10
15
20
25
Horizontal Distance (ft)

RIVERMORPH CROSS SECTION SUMMARY

River Name: Proposed Design
Reach Name: North Tributary
Cross Section Name: Typical Section - B Stream 10ft
Survey Date: 09/18/2018

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2	
10	0	2	BKF
11.25	0	1.5	
12.75	0	1.5	
14	0	1.2	
16	0	1.2	
17.25	0	1.5	
18.75	0	1.5	
20	0	2	
30	0	2	

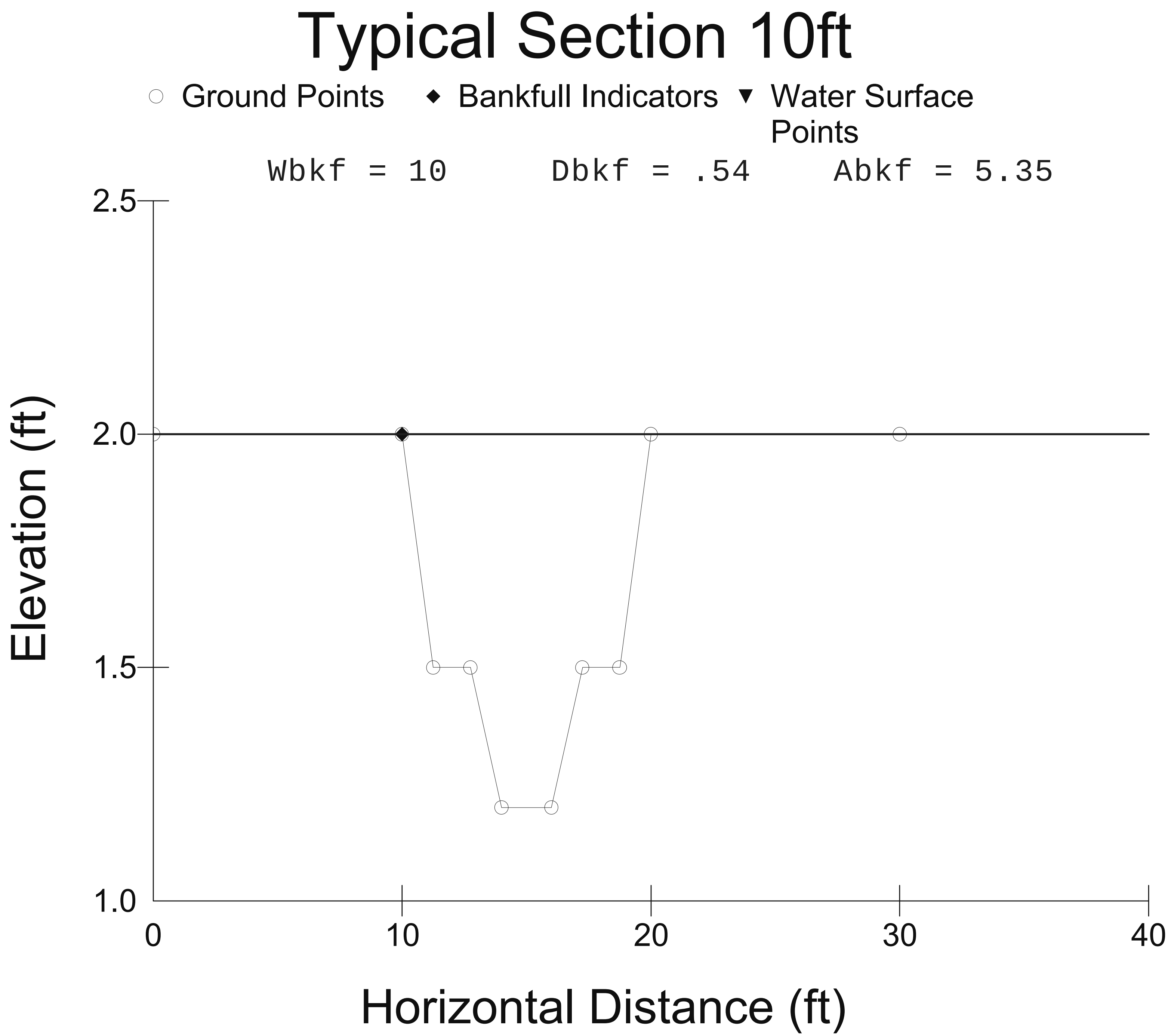
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2.8	2.8	2.8
Bankfull Elevation (ft)	2	2	2
Floodprone Width (ft)	30	-----	-----
Bankfull Width (ft)	10	5	5
Entrenchment Ratio	3	-----	-----
Mean Depth (ft)	0.53	0.53	0.54
Maximum Depth (ft)	0.8	0.8	0.8
Width/Depth Ratio	18.87	9.35	9.26
Bankfull Area (sq ft)	5.35	2.67	2.68
Wetted Perimeter (ft)	10.26	5.93	5.93
Hydraulic Radius (ft)	0.52	0.45	0.45
Begin BKF Station	10	10	15
End BKF Station	20	15	20

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


Typical Section 10ft
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 10
Dbkf = .54
Abkf = 5.35
2.5
2.0
1.5
1.0
Elevation (ft)
0
10
20
30
40
Horizontal Distance (ft)

RIVERMORPH CROSS SECTION SUMMARY

River Name: Proposed Design
Reach Name: North Tributary
Cross Section Name: Typical Section - C Stream
Survey Date: 09/18/2018

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2	
10	0	2	BKF
11.15	0	1.54	
13.25	0	1.4	
15.35	0	1.54	
16.5	0	2	
28	0	2	

Cross Sectional Geometry

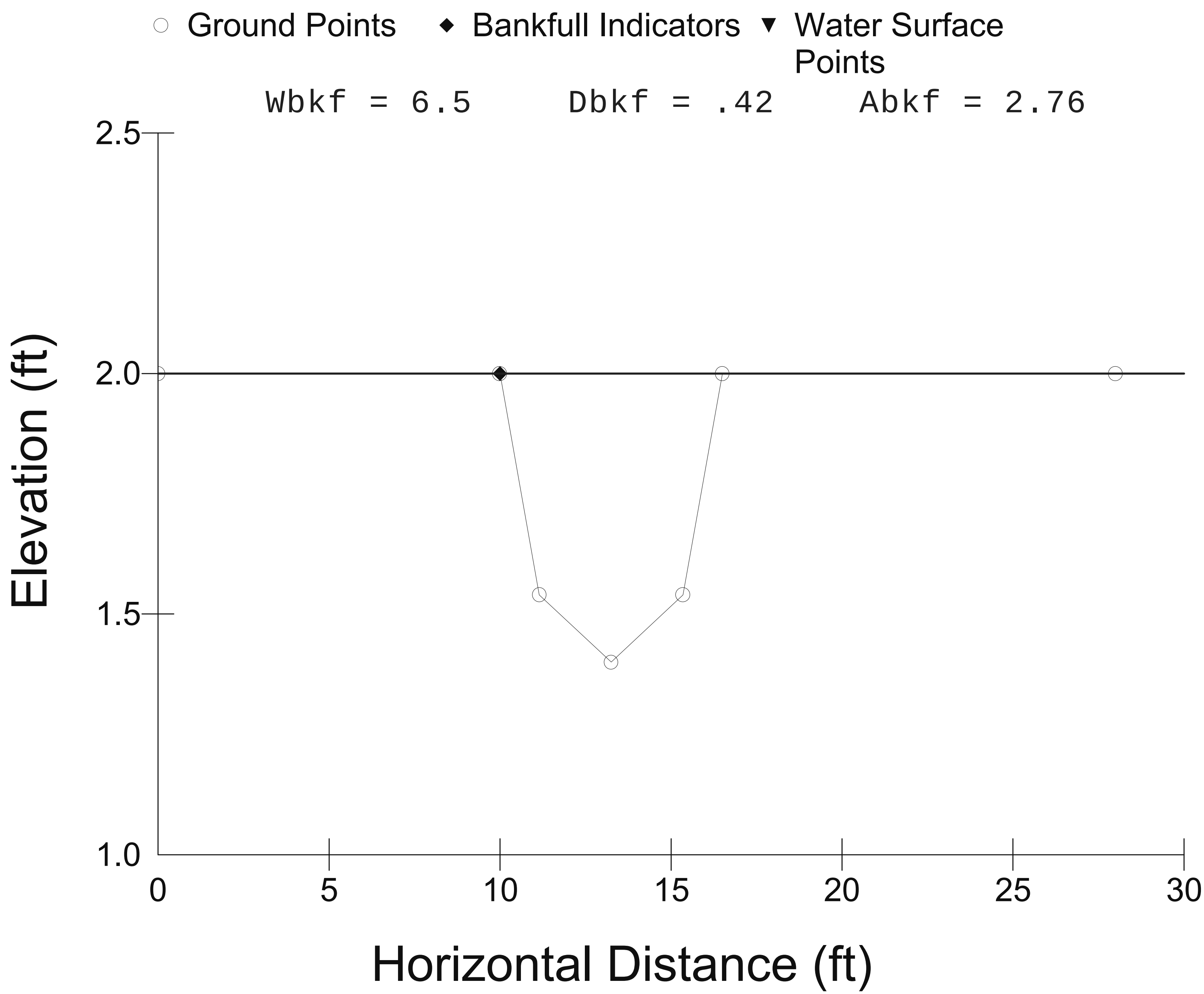
	Channel	Left	Right
Floodprone Elevation (ft)	2.6	2.6	2.6
Bankfull Elevation (ft)	2	2	2
Floodprone Width (ft)	28	-----	-----
Bankfull Width (ft)	6.5	4	2.5
Entrenchment Ratio	4.31	-----	-----
Mean Depth (ft)	0.42	0.45	0.38
Maximum Depth (ft)	0.6	0.6	0.55
Width/Depth Ratio	15.48	8.85	6.58
Bankfull Area (sq ft)	2.75	1.81	0.95
Wetted Perimeter (ft)	6.69	4.64	3.14
Hydraulic Radius (ft)	0.41	0.39	0.3
Begin BKF Station	10	10	14
End BKF Station	16.5	14	16.5

Entrainment Calculations

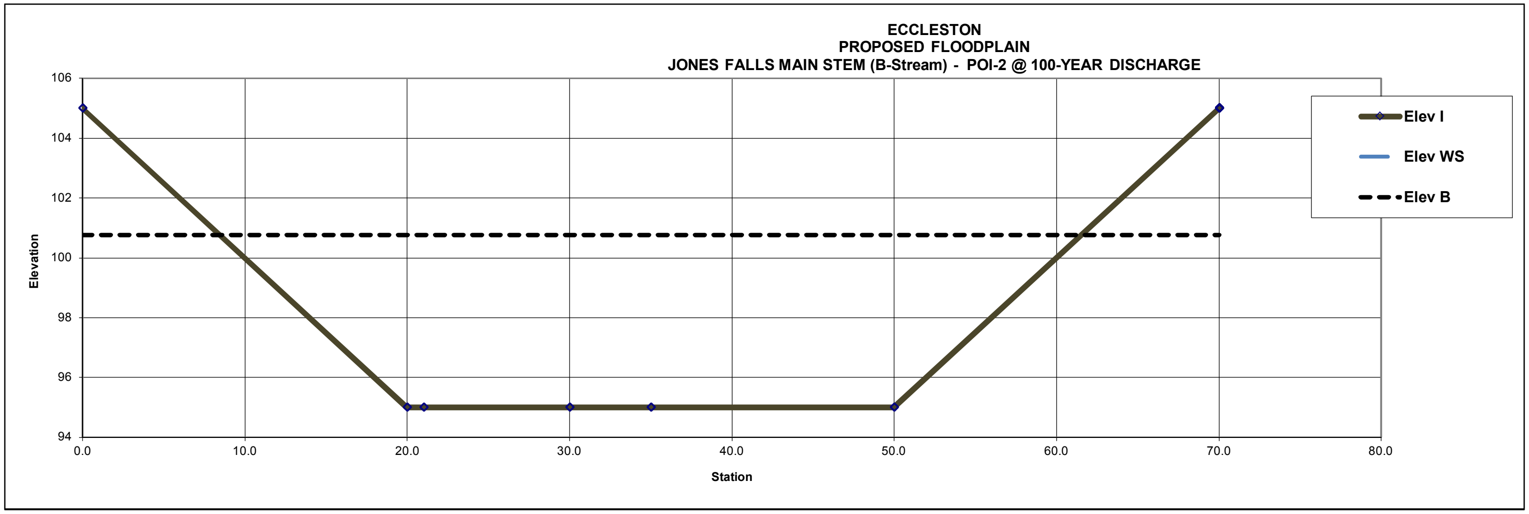
Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			

Typical C Stream Section



Proposed Floodplain - Jones Falls Sta. 100+00 to 101+43.02



Scale

0 0.5 1

INCHES

Note: Scale set for print and view magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

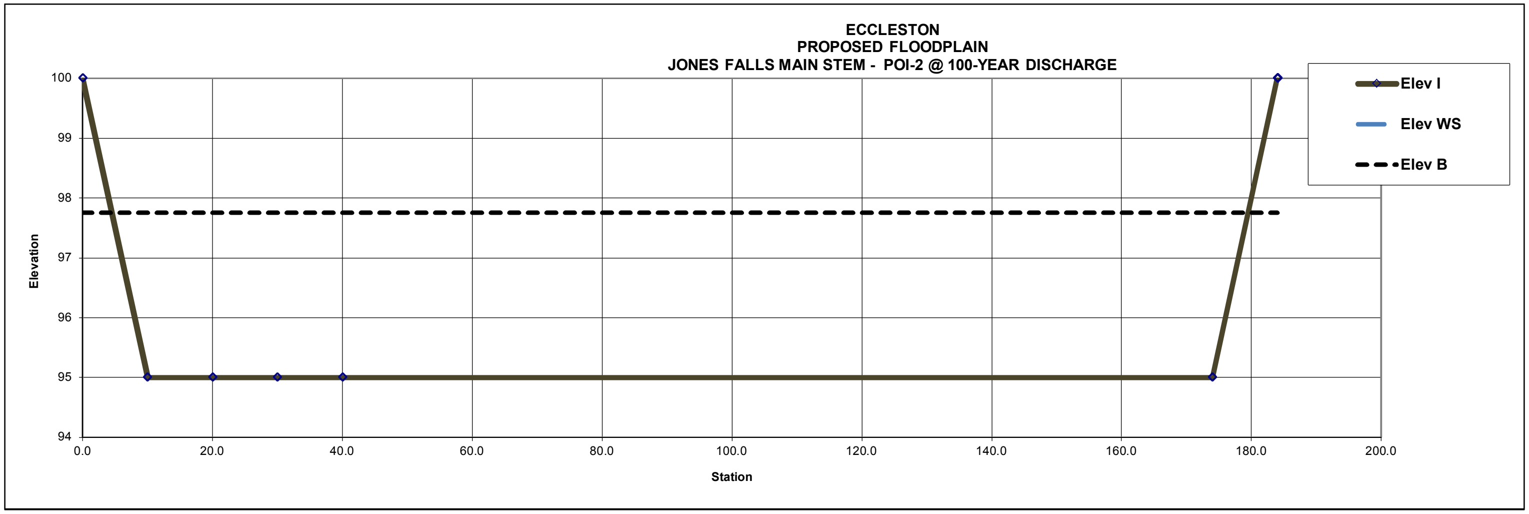
English Units

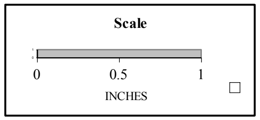
GEOMETRY	
Bank Full Elevation	100.77
Bank Full Width	53.06
Bank Full Depth	4.51
Maximum Depth	5.77
Bank Full Area	239.4
Hydraulic Radius	3.96
Wetted Perimeter	60.5
Width/Depth Ratio	11.8
Flood Prone Width	70.0
Entrenchment	
Stream Type	C4/E4
Rc	

English Units

HYDRAULICS	
Slope (ft/ft)	0.0205
Manning's n	0.08
Velocity (ft./s)	6.66
Froud #	0.59
Discharge (cu ft/s)	1593.4
Shear Stress (lb/sq ft)	5.06
CX Power (ft lb/s)	2038.2
Critical Size (mm)	497.1
Flow Type	Subcritical Flow
Rec. Interval	

Proposed Floodplain - Jones Falls Sta. 101+43.02 to 107+52.45





Note: Scale set for print and view magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

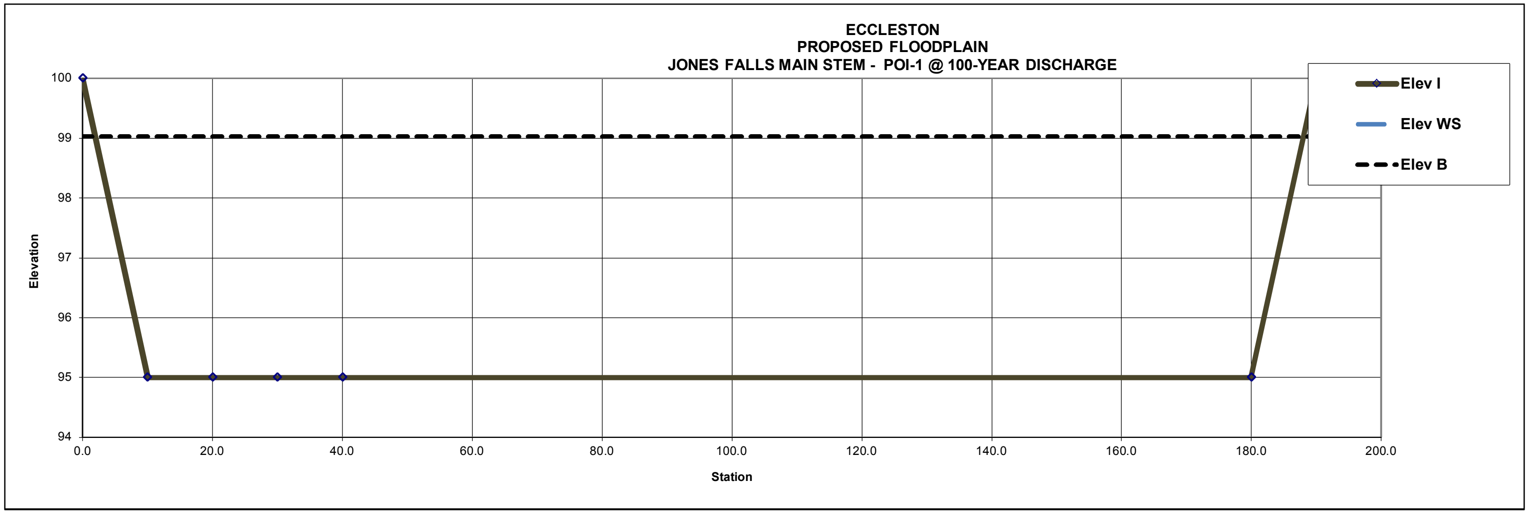
English Units

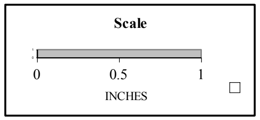
GEOMETRY	
Bank Full Elevation	97.75
Bank Full Width	175.01
Bank Full Depth	2.67
Maximum Depth	2.75
Bank Full Area	466.7
Hydraulic Radius	2.61
Wetted Perimeter	178.9
Width/Depth Ratio	65.6
Flood Prone Width	184.0
Entrenchment	
Stream Type	C4/E4
Rc	

English Units

HYDRAULICS	
Slope (ft/ft)	0.0094
Manning's n	0.08
Velocity (ft./s)	3.41
Froud #	0.37
Discharge (cu ft/s)	1593.1
Shear Stress (lb/sq ft)	1.53
CX Power (ft lb/s)	934.5
Critical Size (mm)	136.7
Flow Type	Subcritical Flow
Rec. Interval	

Proposed Floodplain - Jones Falls Sta. 107+52.45 to 126+76.91
*Minimum width of the proposed floodplain to calculate the maximum shear stress.





Note: Scale set for print and view magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

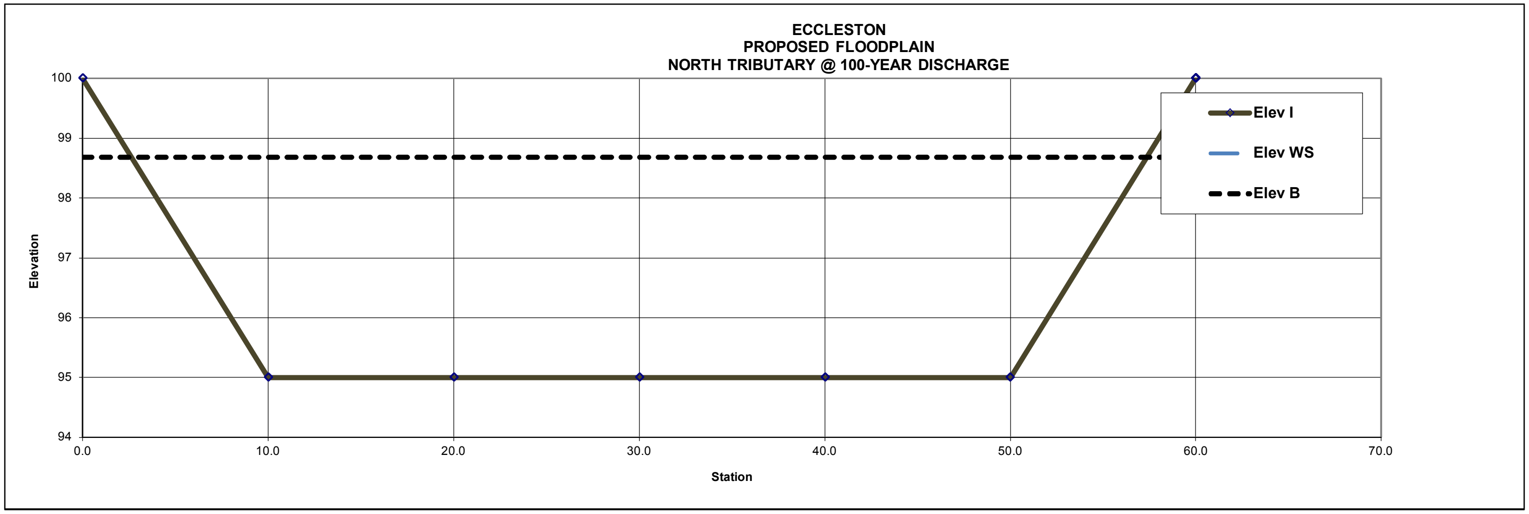
English Units

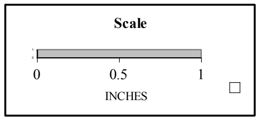
GEOMETRY	
Bank Full Elevation	99.03
Bank Full Width	186.11
Bank Full Depth	3.85
Maximum Depth	4.03
Bank Full Area	717.2
Hydraulic Radius	3.80
Wetted Perimeter	189.0
Width/Depth Ratio	48.3
Flood Prone Width	190.0
Entrenchment	
Stream Type	C4/E4
Rc	

English Units

HYDRAULICS	
Slope (ft/ft)	0.0094
Manning's n	0.08
Velocity (ft./s)	4.38
Froud #	0.40
Discharge (cu ft/s)	3144.2
Shear Stress (lb/sq ft)	2.23
CX Power (ft lb/s)	1844.3
Critical Size (mm)	204.9
Flow Type	Subcritical Flow
Rec. Interval	

Proposed Floodplain - North Tributary 600+00 to 601+35.58





Note: Scale set for print and view magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

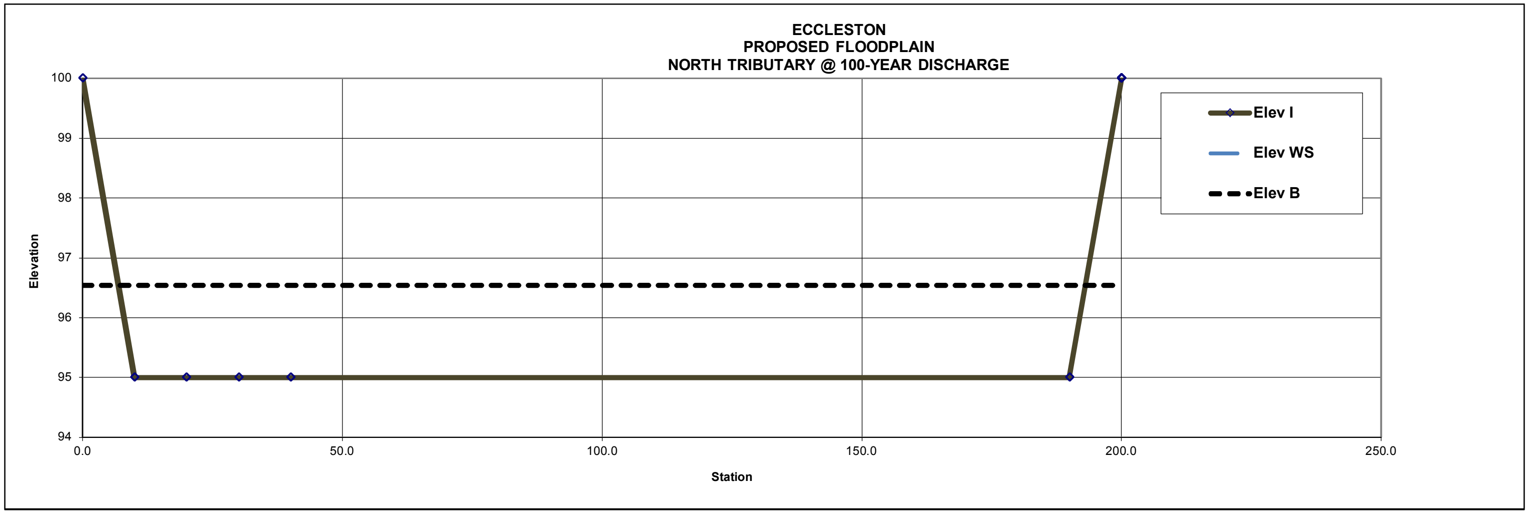
English Units

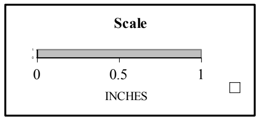
GEOMETRY	
Bank Full Elevation	98.68
Bank Full Width	54.72
Bank Full Depth	3.19
Maximum Depth	3.68
Bank Full Area	174.3
Hydraulic Radius	3.02
Wetted Perimeter	57.8
Width/Depth Ratio	17.2
Flood Prone Width	60.0
Entrenchment	
Stream Type	C4/E4
Rc	

English Units

HYDRAULICS	
Slope (ft/ft)	0.0230
Manning's n	0.08
Velocity (ft./s)	5.88
Froud #	0.60
Discharge (cu ft/s)	1025.7
Shear Stress (lb/sq ft)	4.33
CX Power (ft lb/s)	1472.0
Critical Size (mm)	420.0
Flow Type	Subcritical Flow
Rec. Interval	

Proposed Floodplain - North Tributary 601+35.58 to 607+66.51





Note: Scale set for print and view magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

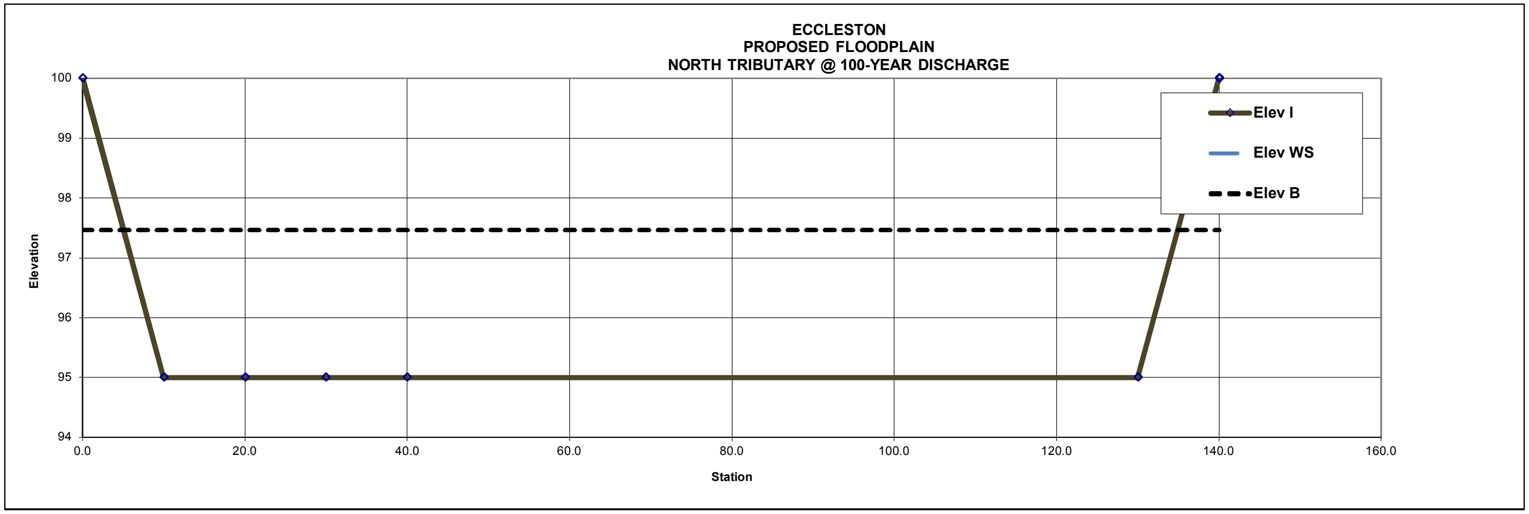
English Units

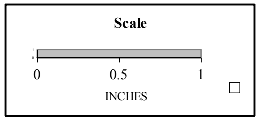
GEOMETRY	
Bank Full Elevation	96.54
Bank Full Width	186.16
Bank Full Depth	1.51
Maximum Depth	1.54
Bank Full Area	281.9
Hydraulic Radius	1.47
Wetted Perimeter	191.7
Width/Depth Ratio	122.9
Flood Prone Width	192.3
Entrenchment	1.03
Stream Type	C4/E4
Rc	

English Units

HYDRAULICS	
Slope (ft/ft)	0.0230
Manning's n	0.08
Velocity (ft./s)	3.64
Froud #	0.53
Discharge (cu ft/s)	1027.2
Shear Stress (lb/sq ft)	2.11
CX Power (ft lb/s)	1474.2
Critical Size (mm)	193.4
Flow Type	Subcritical Flow
Rec. Interval	

Proposed Floodplain - North Tributary 607+66.51 to 614+42.09





Note: Scale set for print and view magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

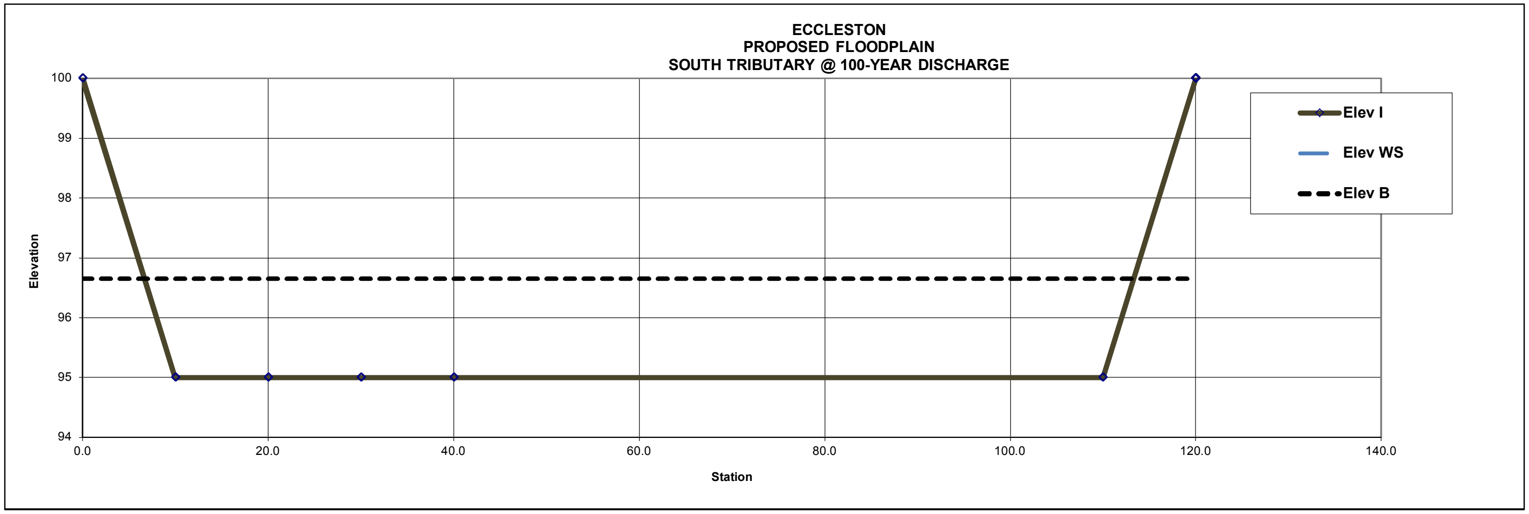
English Units

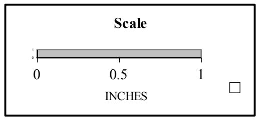
GEOMETRY	
Bank Full Elevation	97.47
Bank Full Width	129.86
Bank Full Depth	2.37
Maximum Depth	2.47
Bank Full Area	308.0
Hydraulic Radius	2.30
Wetted Perimeter	134.0
Width/Depth Ratio	54.8
Flood Prone Width	139.7
Entrenchment	1.08
Stream Type	C4/E4
Rc	

English Units

HYDRAULICS	
Slope (ft/ft)	0.0106
Manning's n	0.08
Velocity (ft./s)	3.33
Froud #	0.39
Discharge (cu ft/s)	1025.7
Shear Stress (lb/sq ft)	1.52
CX Power (ft lb/s)	678.4
Critical Size (mm)	135.7
Flow Type	Subcritical Flow
Rec. Interval	

Proposed Floodplain - South Tributary 200+00 to 207+62.80 and 300+00 to 304+16.88





Note: Scale set for print and view magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

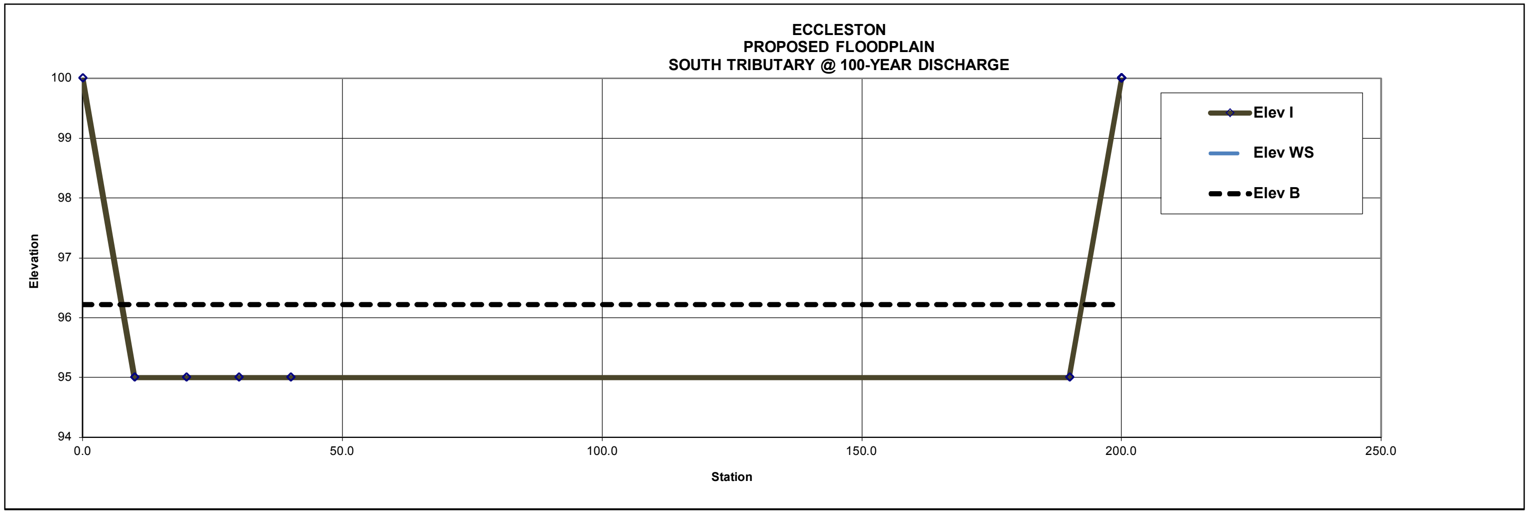
English Units

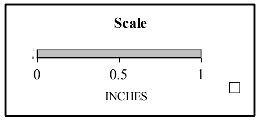
GEOMETRY	
Bank Full Elevation	96.65
Bank Full Width	106.60
Bank Full Depth	1.60
Maximum Depth	1.65
Bank Full Area	170.6
Hydraulic Radius	1.52
Wetted Perimeter	112.0
Width/Depth Ratio	66.6
Flood Prone Width	113.2
Entrenchment	1.06
Stream Type	C4/E4
Rc	

English Units

HYDRAULICS	
Slope (ft/ft)	0.0220
Manning's n	0.08
Velocity (ft./s)	3.65
Froud #	0.52
Discharge (cu ft/s)	622.1
Shear Stress (lb/sq ft)	2.09
CX Power (ft lb/s)	854.0
Critical Size (mm)	191.5
Flow Type	Subcritical Flow
Rec. Interval	

Proposed Floodplain - South Tributary 207+62.80 to 211+52.03 and 304+16.88 to 309+72.59





Note: Scale set for print and view magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

English Units

GEOMETRY	
Bank Full Elevation	96.22
Bank Full Width	184.88
Bank Full Depth	1.20
Maximum Depth	1.22
Bank Full Area	222.6
Hydraulic Radius	1.16
Wetted Perimeter	191.1
Width/Depth Ratio	153.6
Flood Prone Width	189.8
Entrenchment	1.03
Stream Type	C4/E4
Rc	

English Units

HYDRAULICS	
Slope (ft/ft)	0.0186
Manning's n	0.08
Velocity (ft./s)	2.80
Froud #	0.46
Discharge (cu ft/s)	624.2
Shear Stress (lb/sq ft)	1.35
CX Power (ft lb/s)	724.4
Critical Size (mm)	119.6
Flow Type	Subcritical Flow
Rec. Interval	

APPENDIX H
Hydraulics Analysis Data

Stream and Location: Eccleston

Reach: Intersection Tributary

Event for which n is assigned: Bankfull flow condition

1. Is roughness uniform throughout the reach being considered? Yes

If not, should n be assigned for the average condition of the reach? N/A

2. Is roughness uniformly distributed along the cross section? Yes

Is a division between channel and floodplain necessary? Yes

(Channel Roughness uses steps 3-13, Floodplain roughness uses steps 14-23.)

Is roughness uniformly distributed across the channel? Yes

If not, what basis should n for the individual segments be weighted? N/A

3. Describe the channel. Are present conditions representative of those during the flood?

A silt/sand bed stream with course gravel exhibiting a riffle / pool system.

If not, describe the probable conditions during the flood. Assume that channel conditions are representative of channel flowing full (to elevation of the floodplain/bankfull condition)

4. How will the roughness-producing effects of the following on the channel be accounted for?

Bank roughness:

Bedrock outcrops: No bedrock present.

Isolated boulders: No boulders present.

Vegetation: Mostly herbaceous near channel. Mix of woody and herbaceous vegetation in floodplain.

Obstructions: Woody debris jams.

Meander: Little to No sinuosity

5-10. Computation n for the channel

Segment Number and Material	Approximate Dimensions		Wetted perimeter	Area (sf)	Grain Size (mm)	Base n for segment	Adjustments	Adjusted n	Weight Factors	times weight factors
	width (ft)	depth (ft)								
1					10.75	0.029	None	N/A	N/A	0.029
								SUM		0.029
								Weighted n =		**0.029**

11-13. Computation n for the channel
Adjustment factors for the channel

Factor	Describe conditions briefly	Adjustment
Irregularity, n_1	Minor - Compares to carefully degraded channels in good condition but having slightly eroded or scoured side slopes.	0.005
Alignment, n_2	Alternating occasionally- Large and small cross sections alternate occasionally, or the main flow occasionally shifts from side to side owing to changes in cross-sectional shape.	0.003
Obstructions, n_3	Negligible- Few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, piers, or isolated boulders that occupy less than 5% of the cross-sectional area	0.004
Vegetation, n_4	Small- the average depth of flow is atleast two times the height of the vegetation	0.005
Meander, m	Minor- Ratio of the channel length to valley length is 1.0 to 1.2	1.00
	Weighted n plus n_x adjustments	0.046
	Computed n times m factor =	**0.046**

Stream and Location: Eccleston

Reach: South Tributary

Event for which n is assigned: Bankfull flow condition

1. Is roughness uniform throughout the reach being considered? Yes

If not, should n be assigned for the average condition of the reach? N/A

2. Is roughness uniformly distributed along the cross section? Yes

Is a division between channel and floodplain necessary? Yes

(Channel Roughness uses steps 3-13, Floodplain roughness uses steps 14-23.)

Is roughness uniformly distributed across the channel? Yes

If not, what basis should n for the individual segments be weighted? N/A

3. Describe the channel. Are present conditions representative of those during the flood?

A silt/sand bed stream with course gravel exhibiting a riffle / pool system.

If not, describe the probable conditions during the flood. Assume that channel conditions are representative of channel flowing full (to elevation of the floodplain/bankfull condition)

4. How will the roughness-producing effects of the following on the channel be accounted for?

Bank roughness:

Bedrock outcrops: No bedrock present.

Isolated boulders: No boulders present.

Vegetation: Mostly herbaceous near channel. Mix of woody and herbaceous vegetation in floodplain.

Obstructions: Woody debris jams.

Meander: Little to No sinuosity

5-10. Computation n for the channel

Segment Number and Material	Approximate Dimensions		Wetted perimeter	Area (sf)	Grain Size (mm)	Base n for segment	Adjustments	Adjusted n	Weight Factors	times weight factors
	width (ft)	depth (ft)								
1					37.42	0.032	None	N/A	N/A	0.032
								SUM		0.032
								Weighted n =		**0.032**

11-13. Computation n for the channel
Adjustment factors for the channel

Factor	Describe conditions briefly	Adjustment
Irregularity, n_1	Minor - Compares to carefully degraded channels in good condition but having slightly eroded or scoured side slopes.	0.005
Alignment, n_2	Alternating occasionally- Large and small cross sections alternate occasionally, or the main flow occasionally shifts from side to side owing to changes in cross-sectional shape.	0.003
Obstructions, n_3	Minor- Obstructions less than 15 percent of the cross-sectional area, and the spacing between obstructions is such that the sphere of influence around one obstruction does not extend to the sphere of influence around another obstruction.	0.007
Vegetation, n_4	Medium- Brushy, moderately dense vegetation, similar to 1-to-2-year-old willow trees in the dormant season, growing along the banks, and no significant vegetation is evident along the channel bottoms	0.010
Meander, m	Minor- Ratio of the channel length to valley length is 1.0 to 1.2	1.00
	Weighted n plus n_x adjustments	0.057
	Computed n times m factor =	**0.057**

Stream and Location: Eccleston

Reach: North Tributary

Event for which n is assigned: Bankfull flow condition

1. Is roughness uniform throughout the reach being considered? Yes

If not, should n be assigned for the average condition of the reach? N/A

2. Is roughness uniformly distributed along the cross section? Yes

Is a division between channel and floodplain necessary? Yes

(Channel Roughness uses steps 3-13, Floodplain roughness uses steps 14-23.)

Is roughness uniformly distributed across the channel? Yes

If not, what basis should n for the individual segments be weighted? N/A

3. Describe the channel. Are present conditions representative of those during the flood?

A silt/sand bed stream with course gravel exhibiting a riffle / pool system

If not, describe the probable conditions during the flood. Assume that channel conditions are representative of channel flowing full (to elevation of the floodplain/bankfull condition)

4. How will the roughness-producing effects of the following on the channel be accounted for?

Bank roughness:

Bedrock outcrops: No bedrock present.

Isolated boulders: No boulders present.

Vegetation: Mostly herbaceous near channel. Mix of woody and herbaceous vegetation in floodplain.

Obstructions: Woody debris jams.

Meander: Little to No sinuosity

5-10. Computation n for the channel

Segment Number and Material	Approximate Dimensions		Wetted perimeter	Area (sf)	Grain Size (mm)	Base n for segment	Adjustments	Adjusted n	Weight Factors	times weight factors
	width (ft)	depth (ft)								
1					26.67	0.031	None	N/A	N/A	0.031
								SUM		0.031
								Weighted n =		**0.031**

11-13. Computation n for the channel
Adjustment factors for the channel

Factor	Describe conditions briefly	Adjustment
Irregularity, n_1	Minor - Compares to carefully degraded channels in good condition but having slightly eroded or scoured side slopes.	0.005
Alignment, n_2	Alternating occasionally- Large and small cross sections alternate occasionally, or the main flow occasionally shifts from side to side owing to changes in cross-sectional shape.	0.003
Obstructions, n_3	Minor- Obstructions less than 15 percent of the cross-sectional area, and the spacing between obstructions is such that the sphere of influence around one obstruction does not extend to the sphere of influence around another obstruction.	0.007
Vegetation, n_4	Medium- Brushy, moderately dense vegetation, similar to 1-to-2-year-old willow trees in the dormant season, growing along the banks, and no significant vegetation is evident along the channel bottoms	0.015
Meander, m	Minor- Ratio of the channel length to valley length is 1.0 to 1.2	1.00
	Weighted n plus n_x adjustments	0.061
	Computed n times m factor =	**0.061**

Stream and Location: Eccleston

Reach: Main Stem

Event for which n is assigned: Bankfull flow condition

1. Is roughness uniform throughout the reach being considered? Yes

If not, should n be assigned for the average condition of the reach? N/A

2. Is roughness uniformly distributed along the cross section? Yes

Is a division between channel and floodplain necessary? Yes

(Channel Roughness uses steps 3-13, Floodplain roughness uses steps 14-23.)

Is roughness uniformly distributed across the channel? Yes

If not, what basis should n for the individual segments be weighted? N/A

3. Describe the channel. Are present conditions representative of those during the flood?

A silt/sand bed stream with course gravel exhibiting a riffle / pool system.

If not, describe the probable conditions during the flood. Assume that channel conditions are representative of channel flowing full (to elevation of the floodplain/bankfull condition)

4. How will the roughness-producing effects of the following on the channel be accounted for?

Bank roughness:

Bedrock outcrops: No bedrock present.

Isolated boulders: No boulders present.

Vegetation: Mostly herbaceous near channel. Mix of woody and herbaceous vegetation in floodplain.

Obstructions: Woody debris jams.

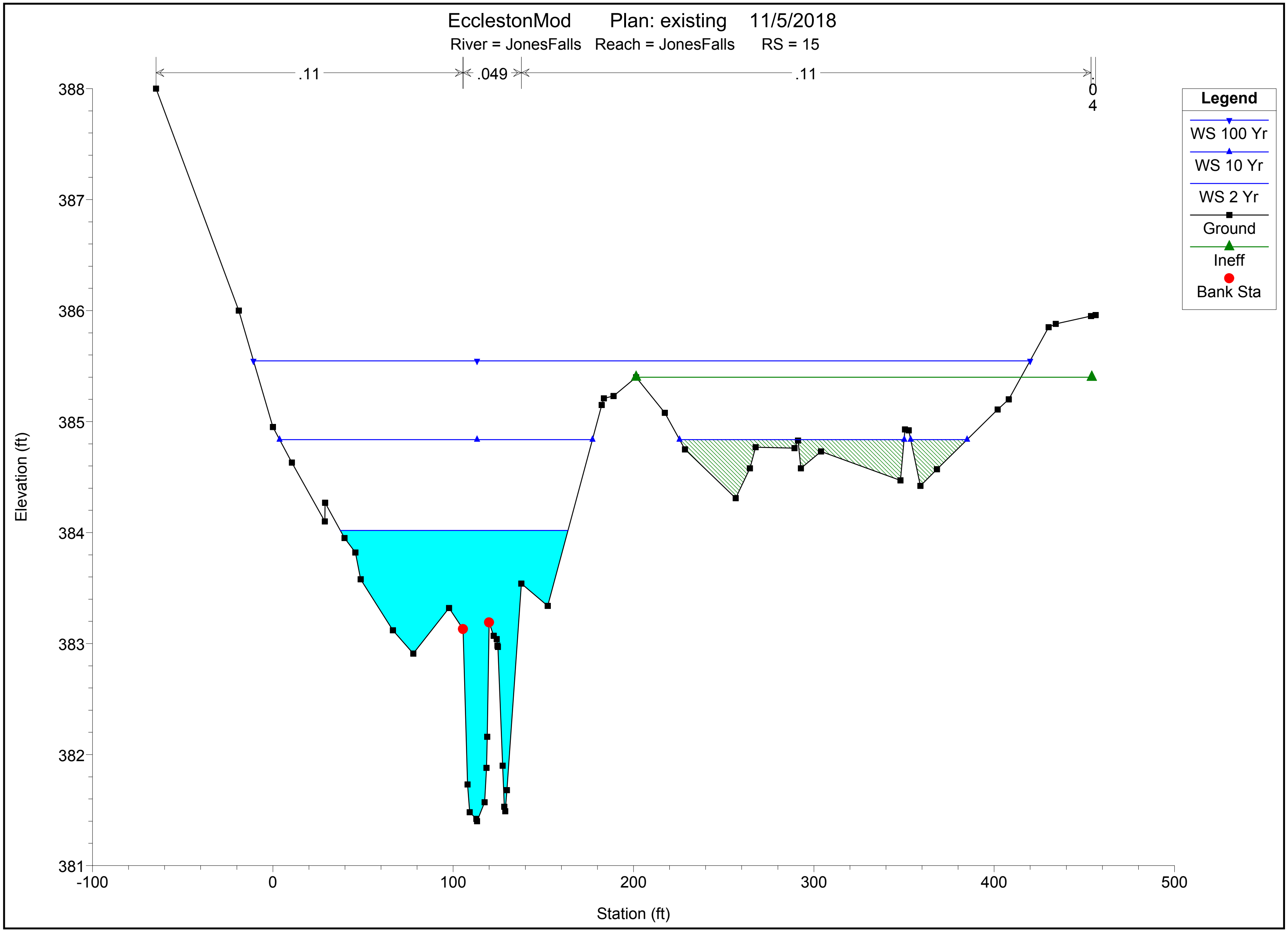
Meander: Little to No sinuosity

5-10. Computation n for the channel

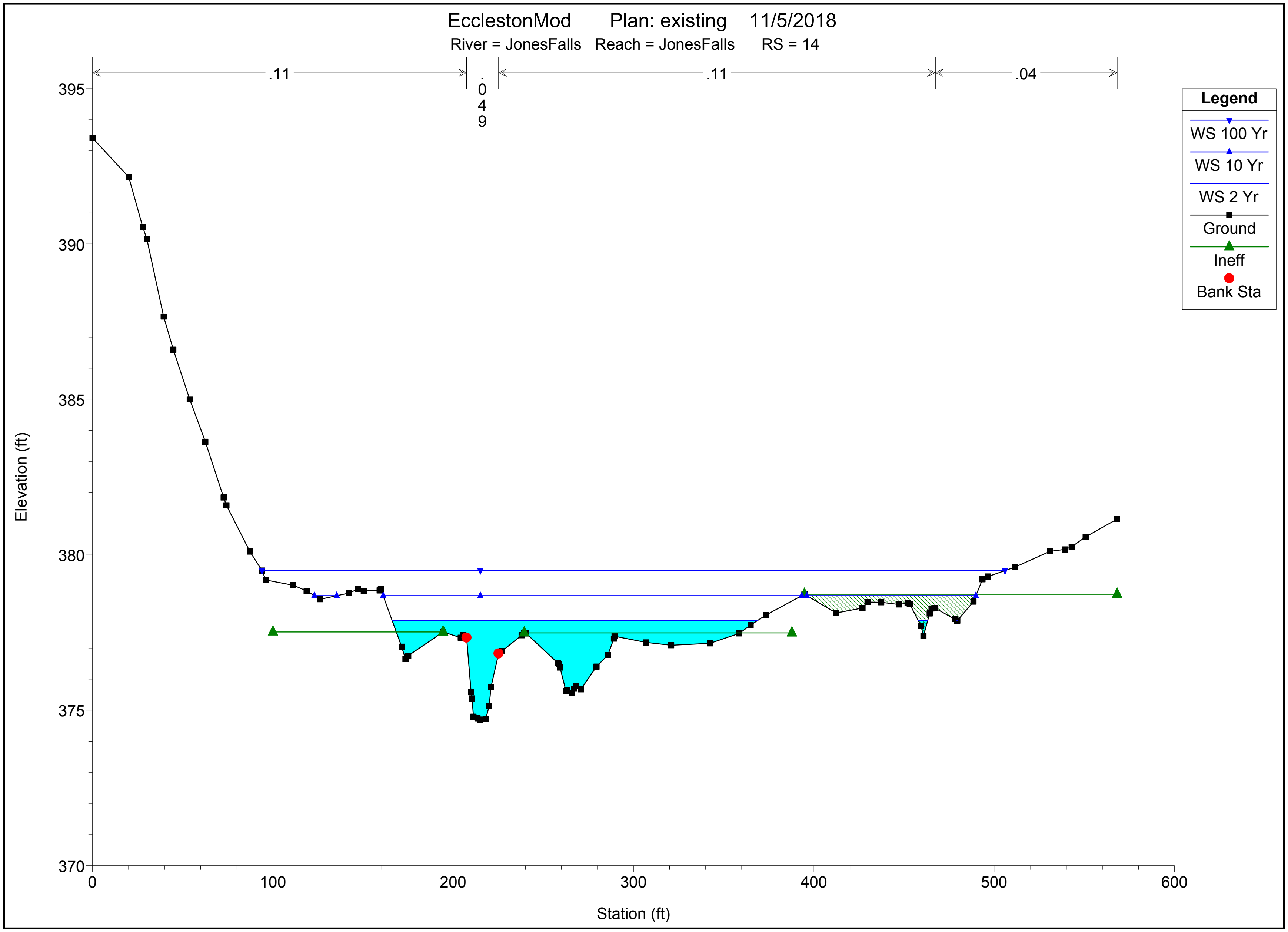
Segment Number and Material	Approximate Dimensions		Wetted perimeter	Area (sf)	Grain Size (mm)	Base n for segment	Adjustments	Adjusted n	Weight Factors	times weight factors
	width (ft)	depth (ft)								
1					36.892	0.032	None	N/A	N/A	0.032
								SUM		0.032
								Weighted n =		**0.032**

11-13. Computation n for the channel
Adjustment factors for the channel

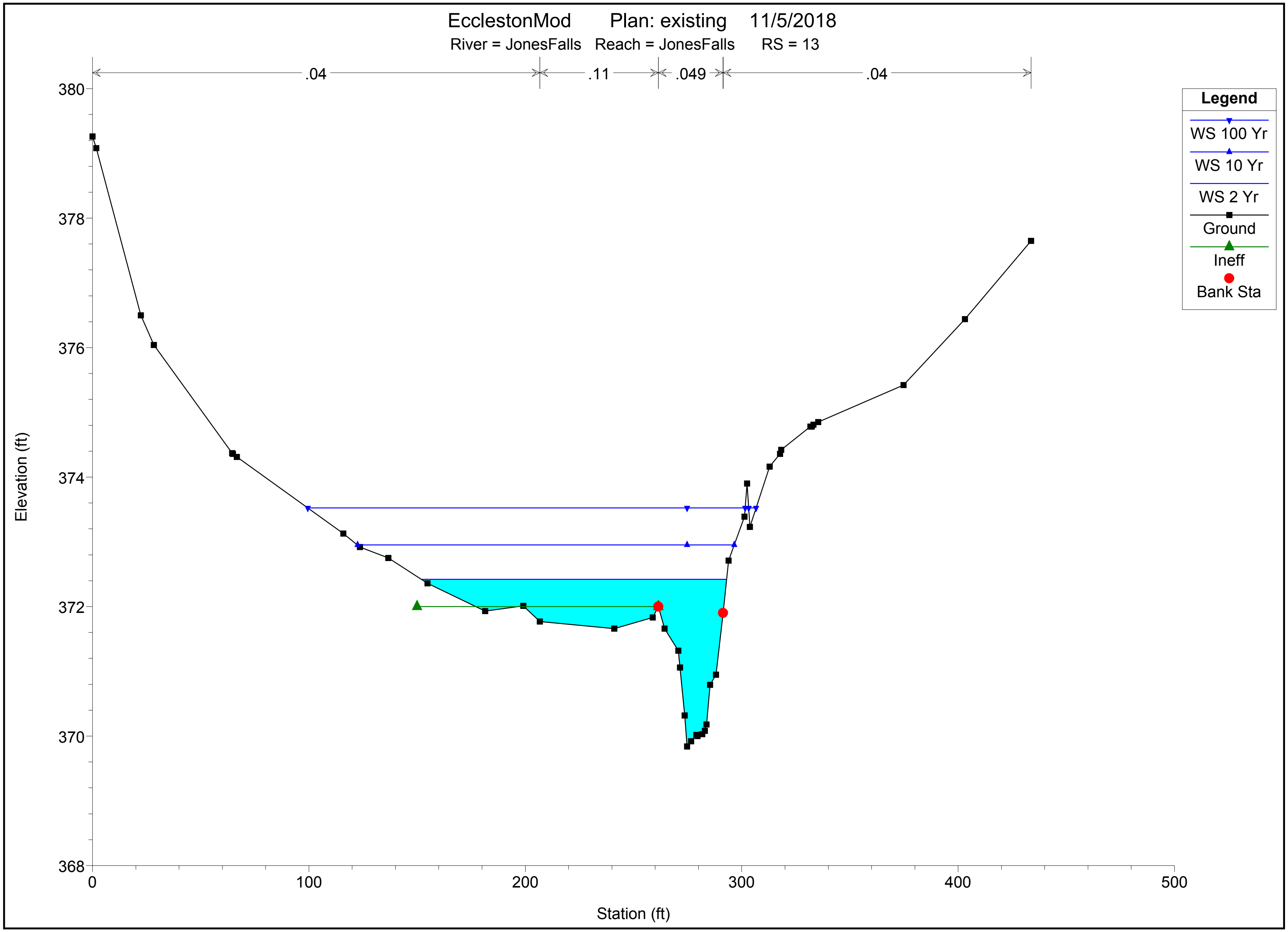
Factor	Describe conditions briefly	Adjustment
Irregularity, n_1	Minor - Compares to carefully degraded channels in good condition but having slightly eroded or scoured side slopes.	0.005
Alignment, n_2	Alternating occasionally- Large and small cross sections alternate occasionally, or the main flow occasionally shifts from side to side owing to changes in cross-sectional shape.	0.003
Obstructions, n_3	Minor- Obstructions less than 15 percent of the cross-sectional area, and the spacing between obstructions is such that the sphere of influence around one obstruction does not extend to the sphere of influence around another obstruction.	0.004
Vegetation, n_4	Small- the average depth of flow is atleast two times the height of the vegetation	0.005
Meander, m	Minor- Ratio of the channel length to valley length is 1.0 to 1.2	1.00
	Weighted n plus n_x adjustments	0.049
	Computed n times m factor =	**0.049**

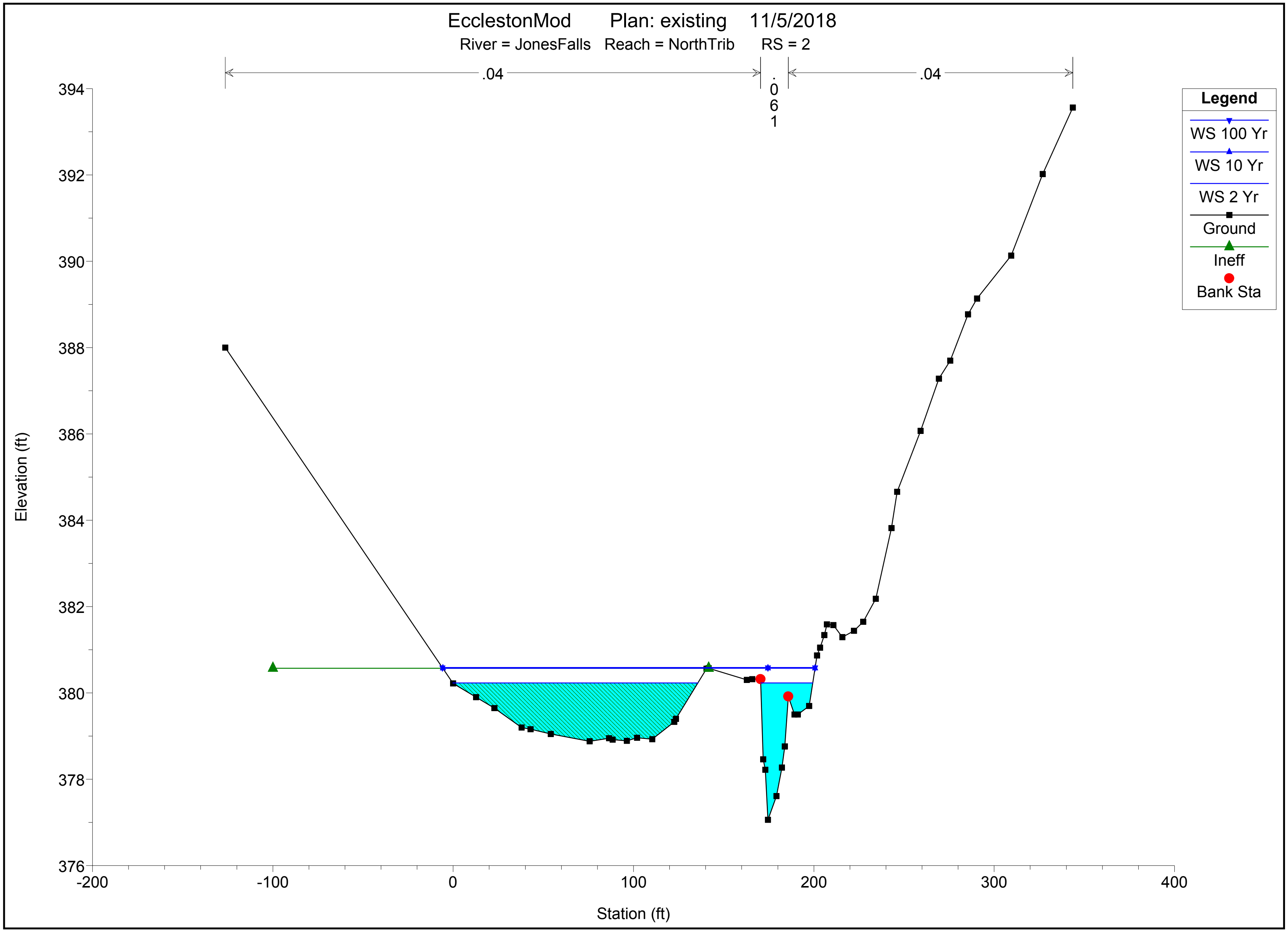


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls RS = 15
.11
.049
.11
0
4
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
388
387
386
385
384
383
382
381
-100
0
100
200
300
400
500
Station (ft)

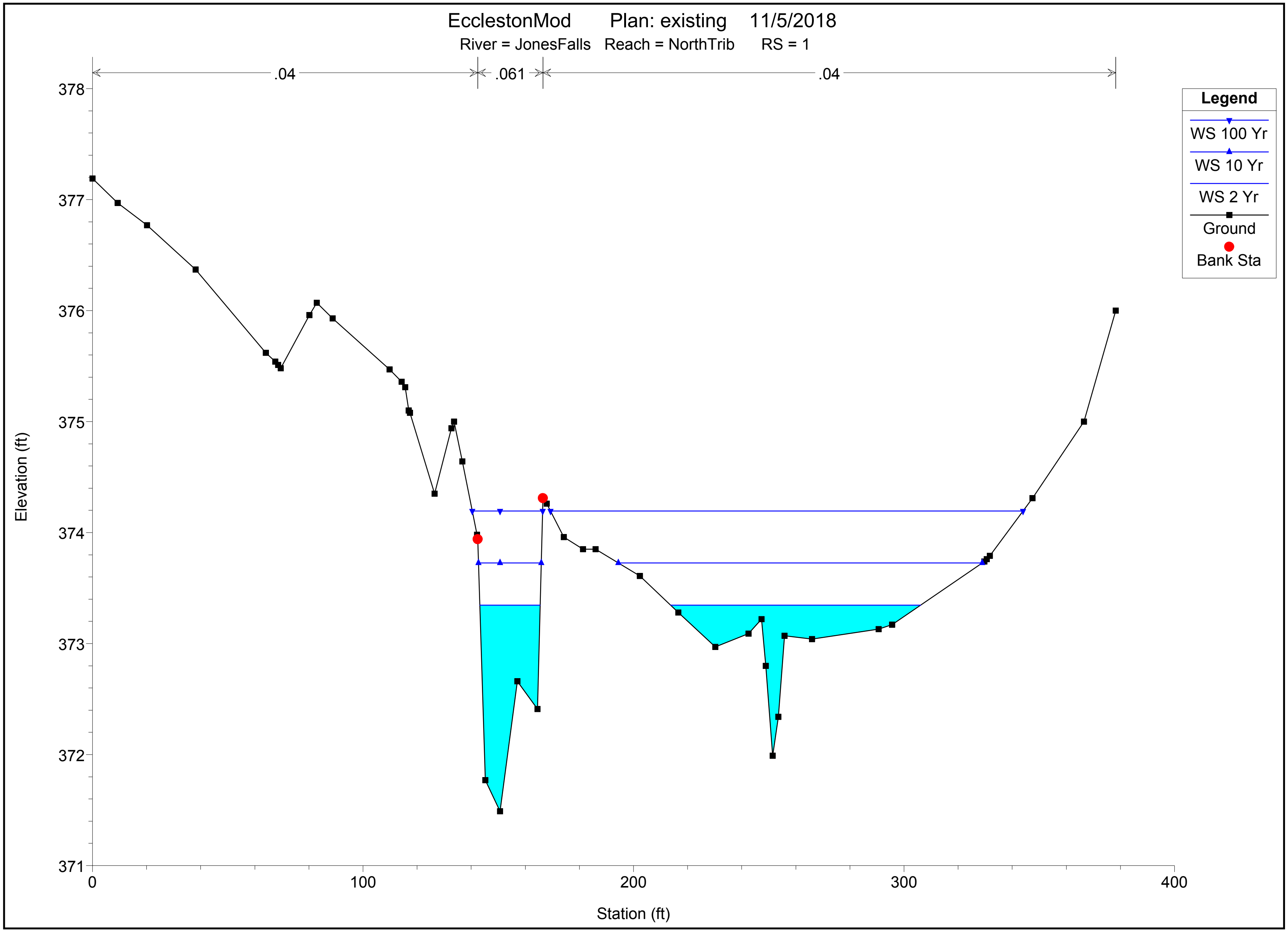


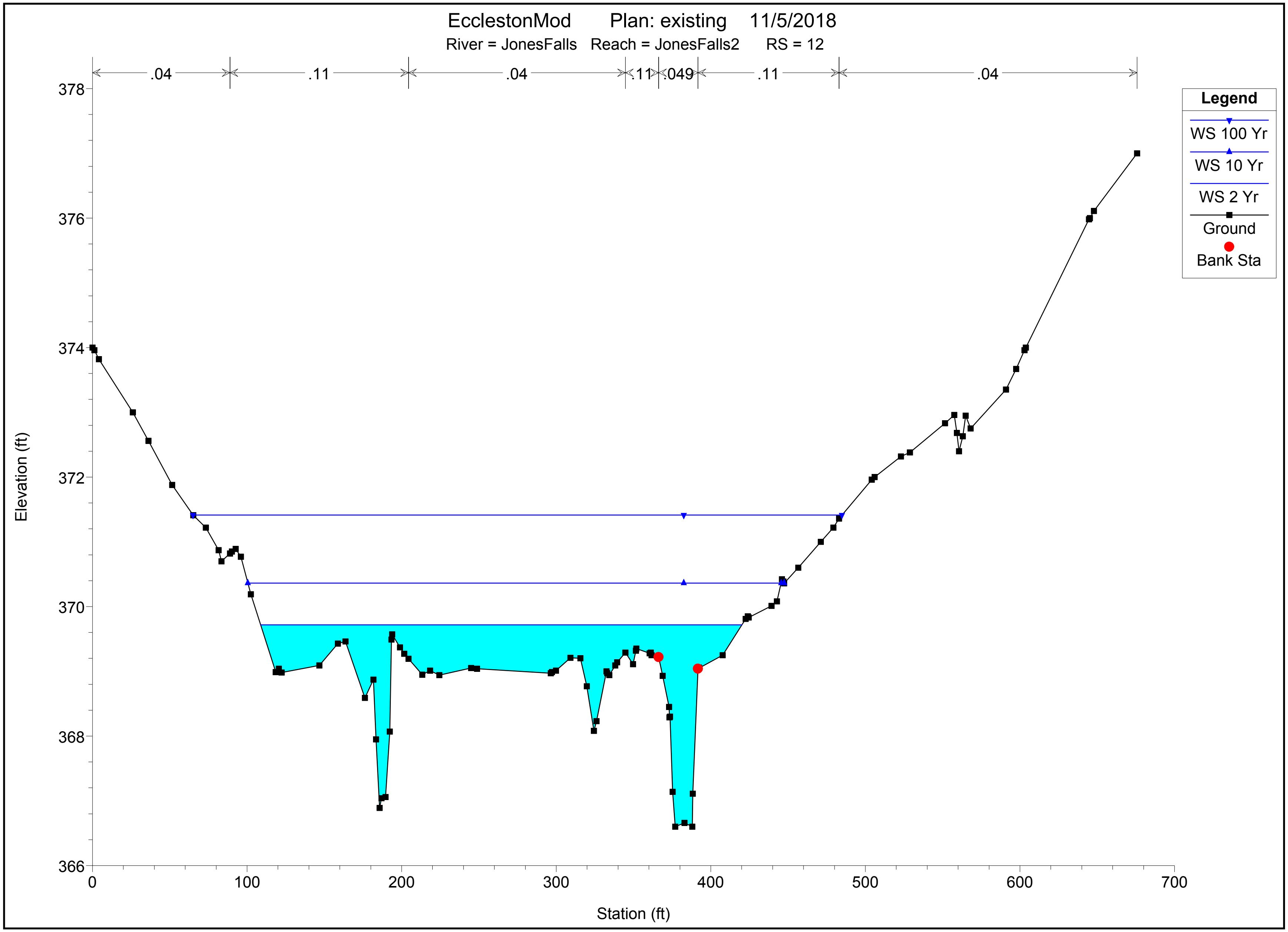
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls RS = 14
.11
.049
.11
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
395
390
385
380
375
370
0
100
200
300
400
500
600


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls RS = 13
.04
.11
.049
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
380
378
376
374
372
370
368
0
100
200
300
400
500
Station (ft)

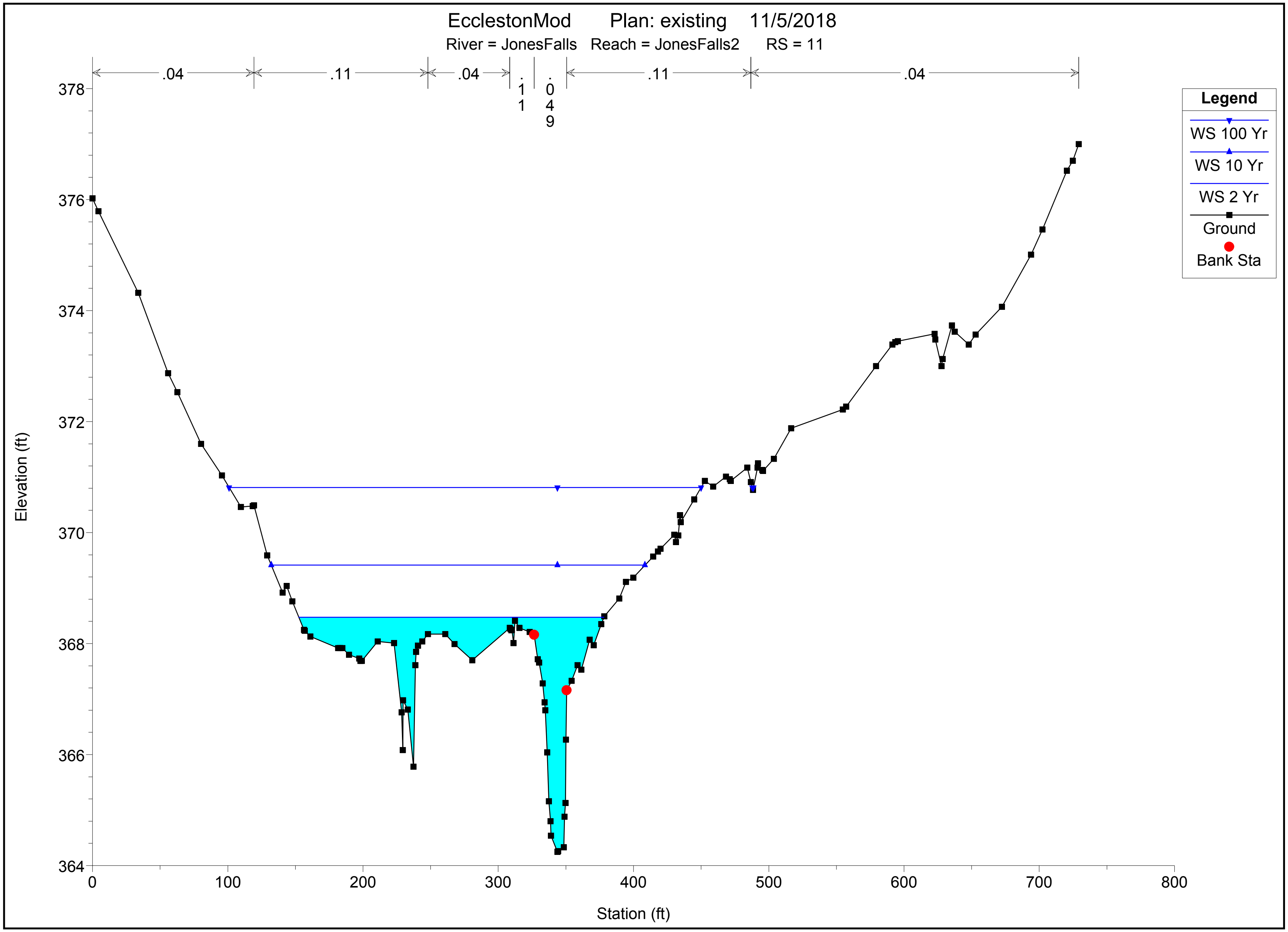


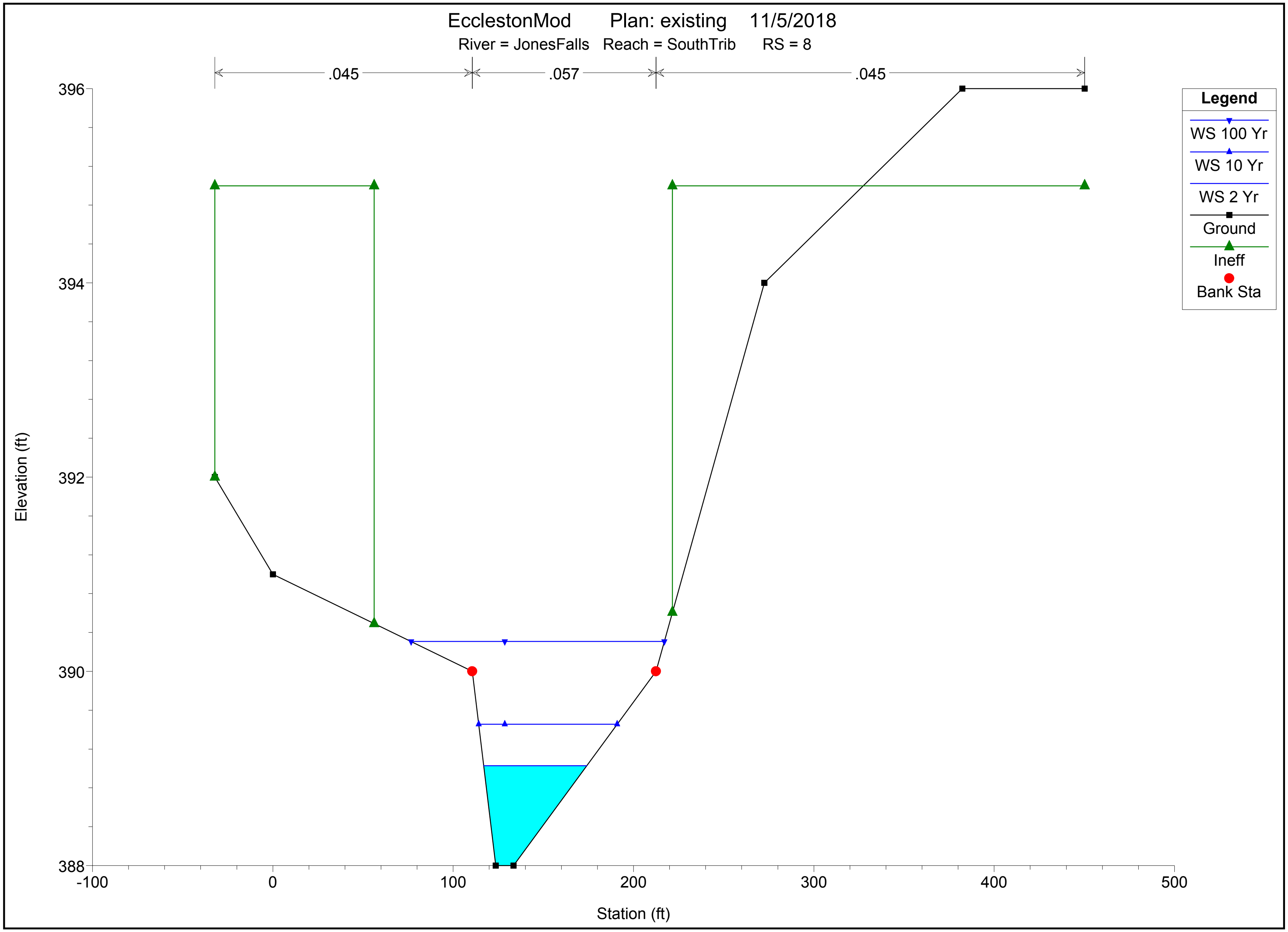
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = NorthTrib RS = 2
.04
.061
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
394
392
390
388
386
384
382
380
378
376
-200
-100
0
100
200
300
400

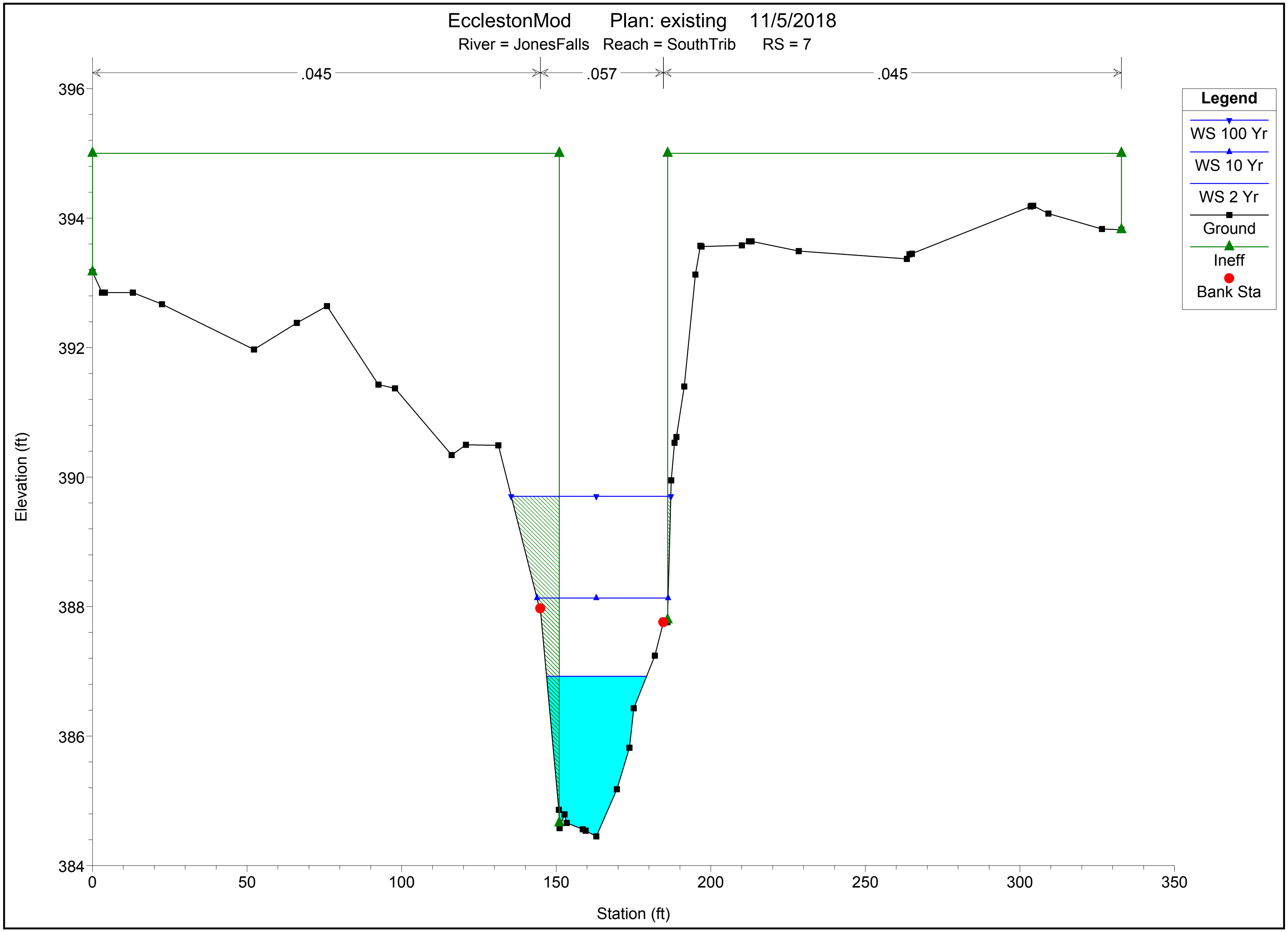

EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = NorthTrib RS = 1
.04
.061
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
378
377
376
375
374
373
372
371
Station (ft)
0
100
200
300
400



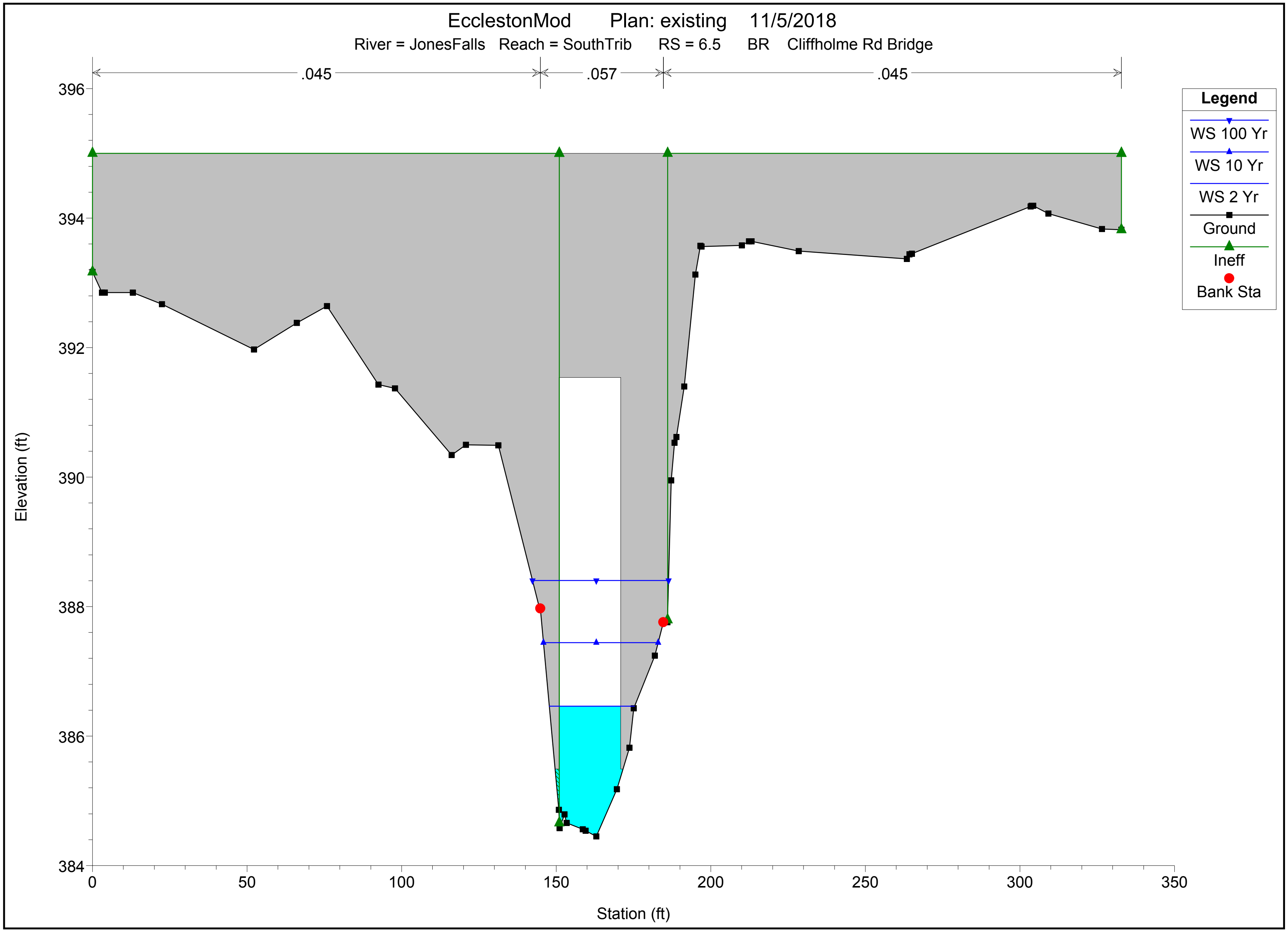
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls2 RS = 12
.04
.11
.04
.11
.049
.11
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
378
376
374
372
370
368
366
0
100
200
300
400
500
600
700

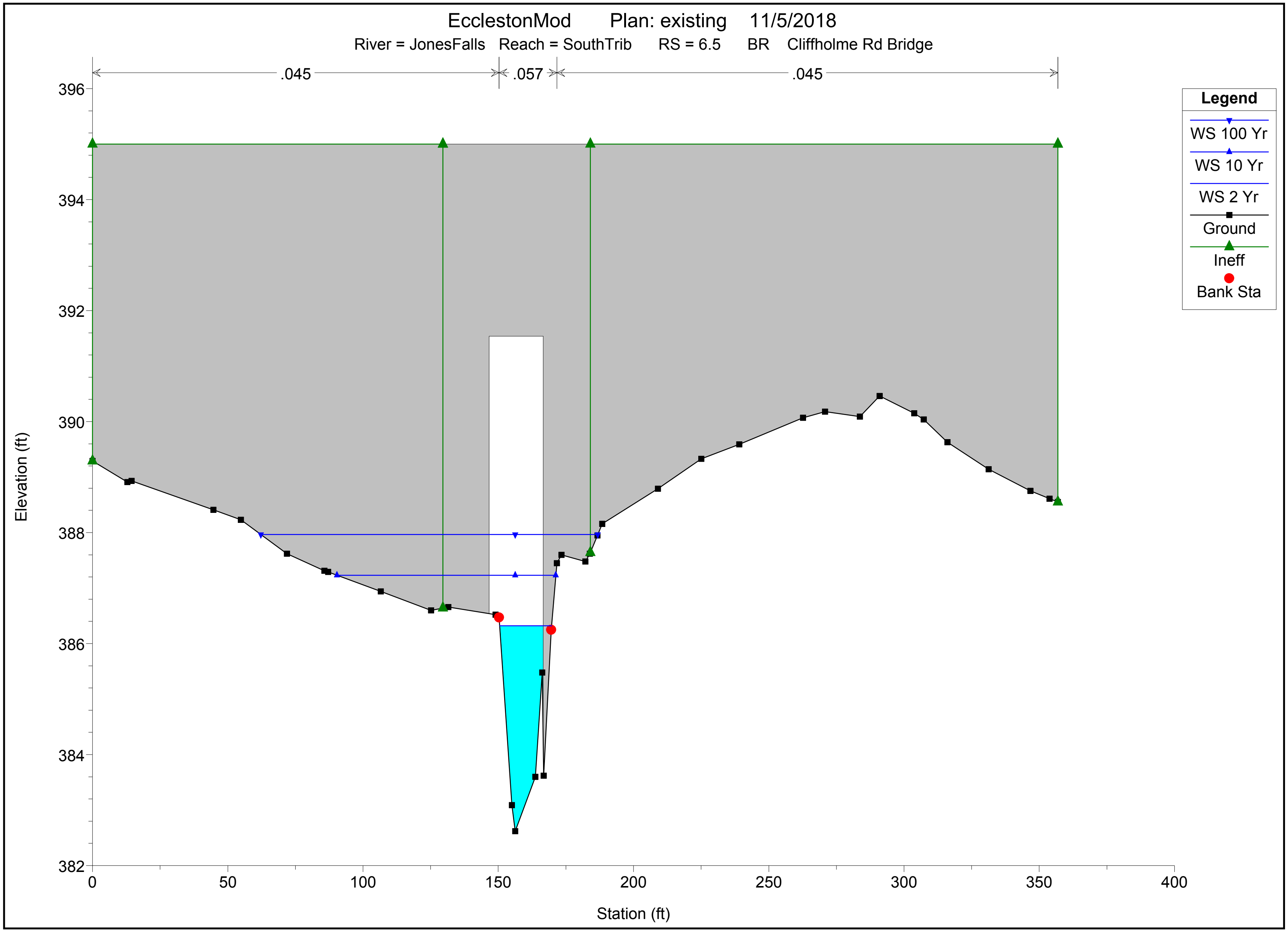

EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls2 RS = 11
.04
.11
.04
.11
.049
.11
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
378
376
374
372
370
368
366
364
0
100
200
300
400
500
600
700
800


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = SouthTrib RS = 8
.045
.057
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
396
394
392
390
388
-100
0
100
200
300
400
500

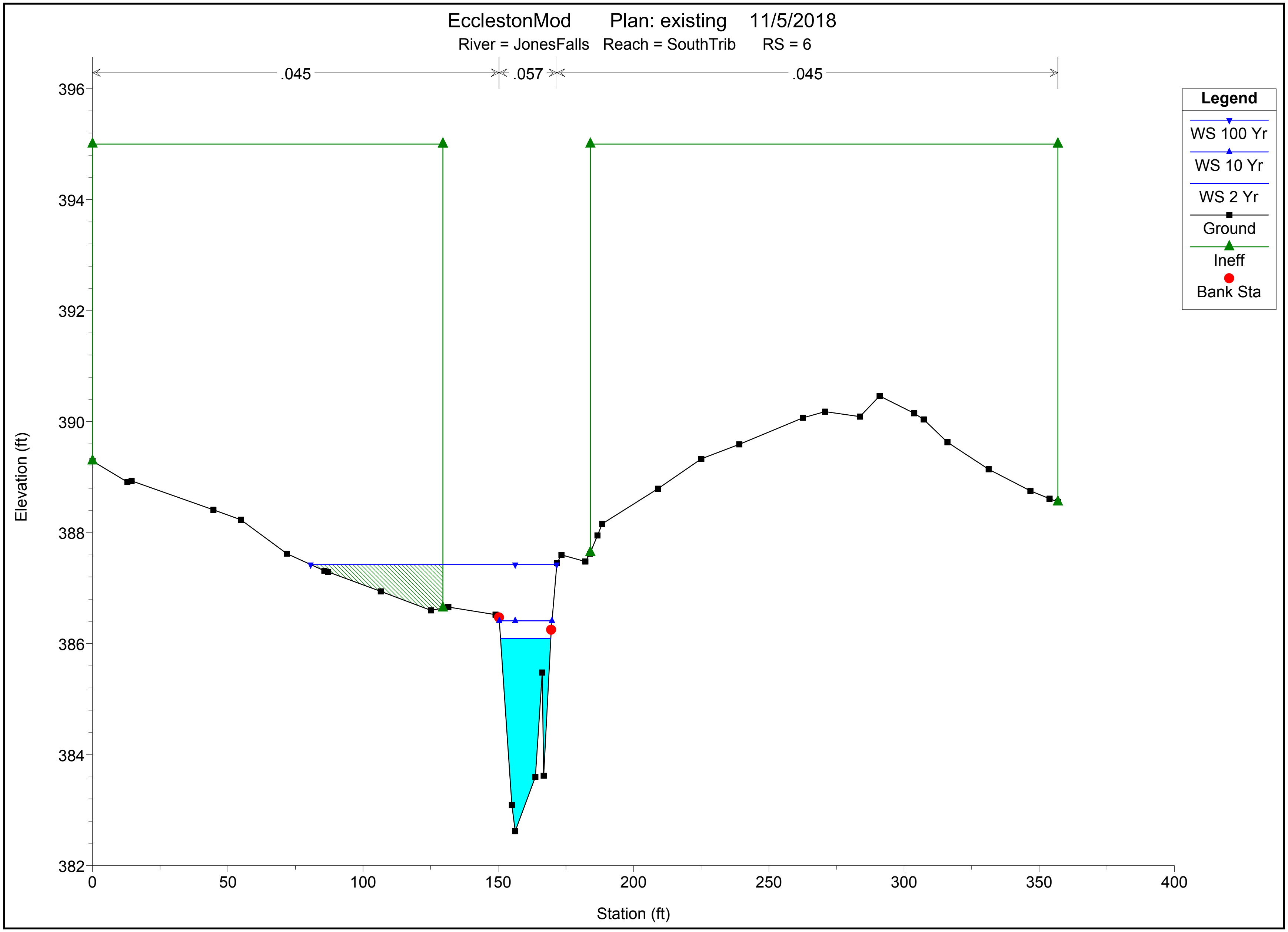


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = SouthTrib RS = 7
.045
.057
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
396
394
392
390
388
386
384
0
50
100
150
200
250
300
350
Station (ft)

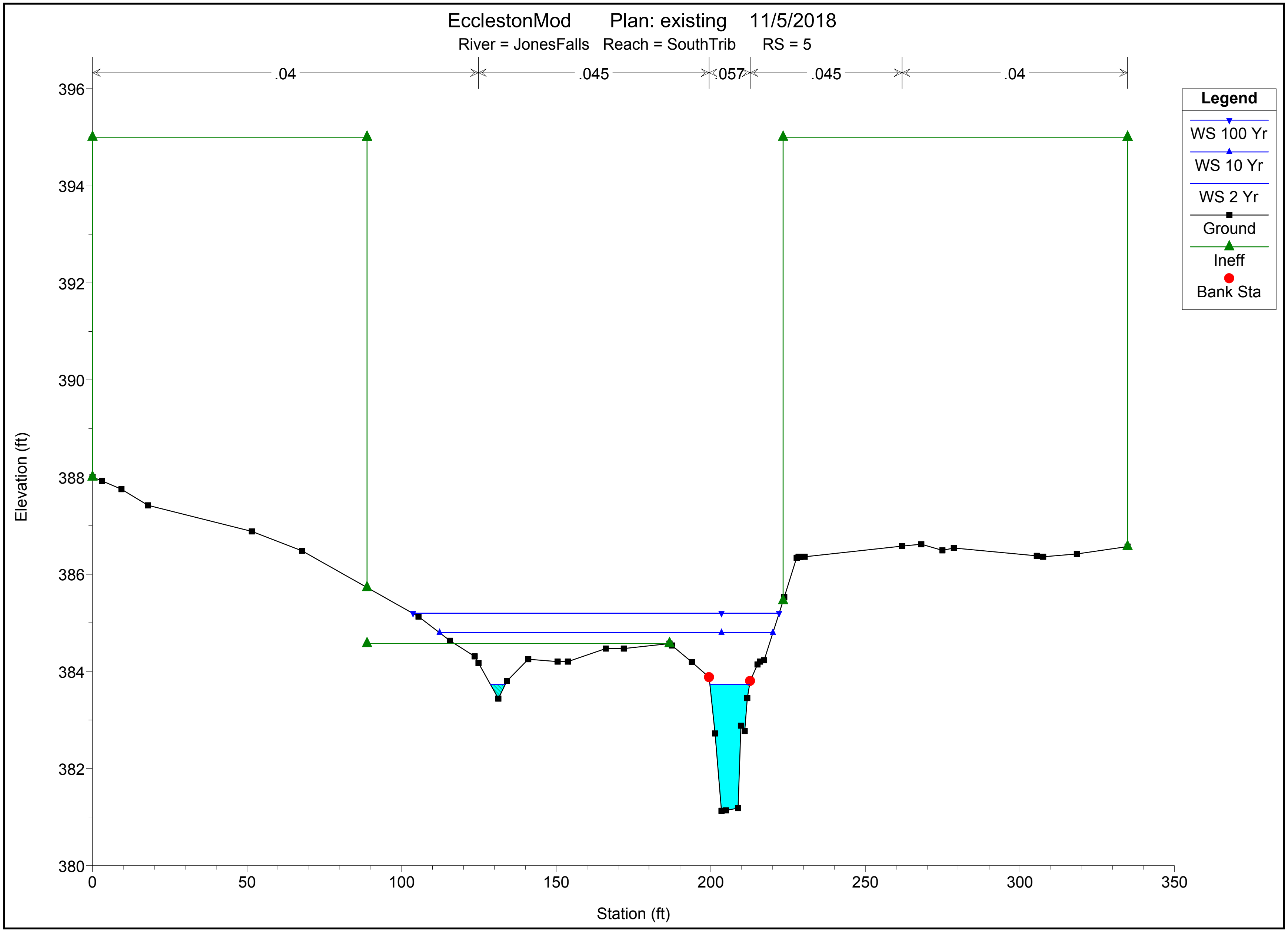

EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = SouthTrib RS = 6.5 BR Cliffholme Rd Bridge
.045
.057
.045
396
394
392
390
388
386
384
Elevation (ft)
0
50
100
150
200
250
300
350
Station (ft)
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta

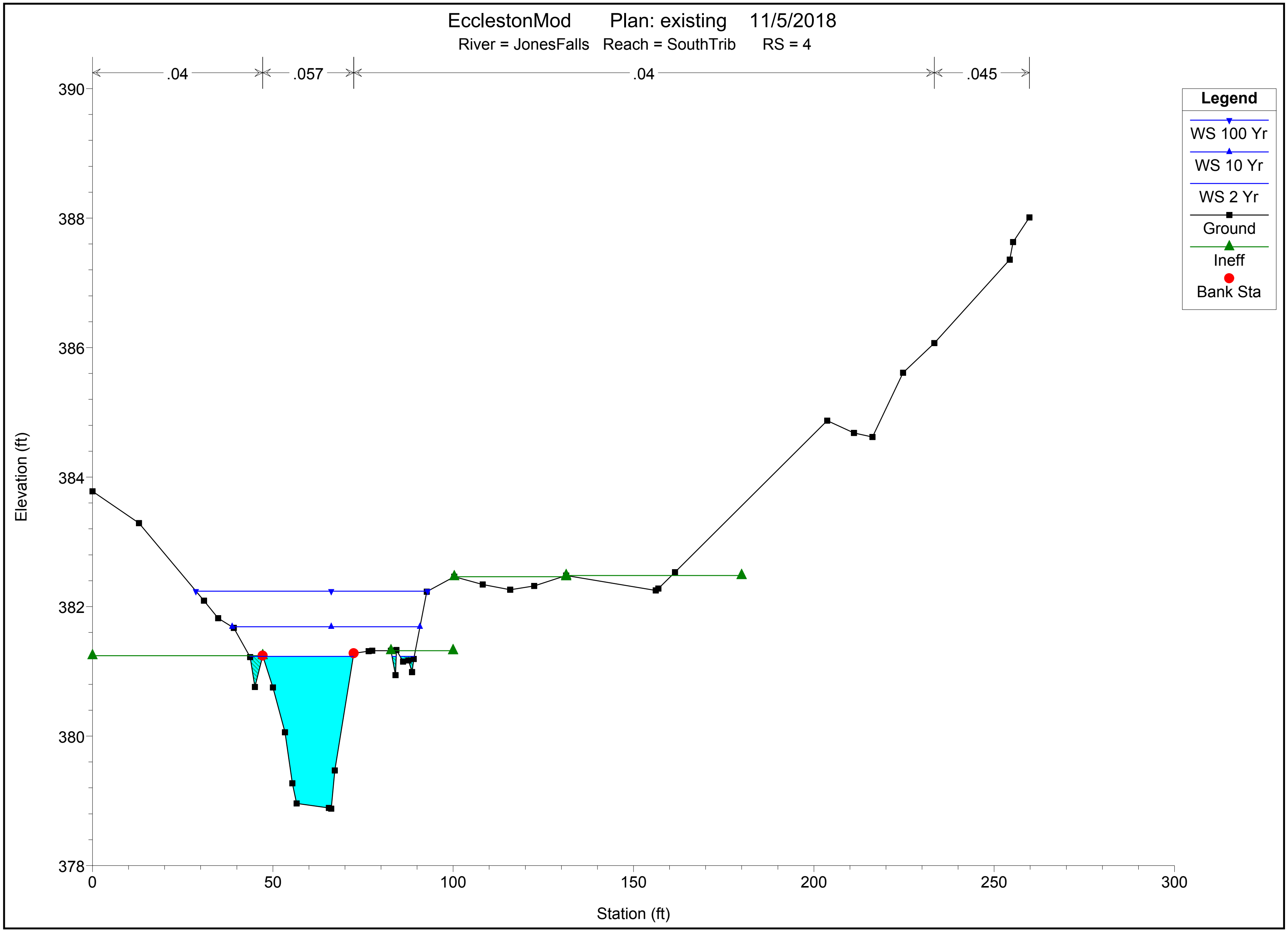


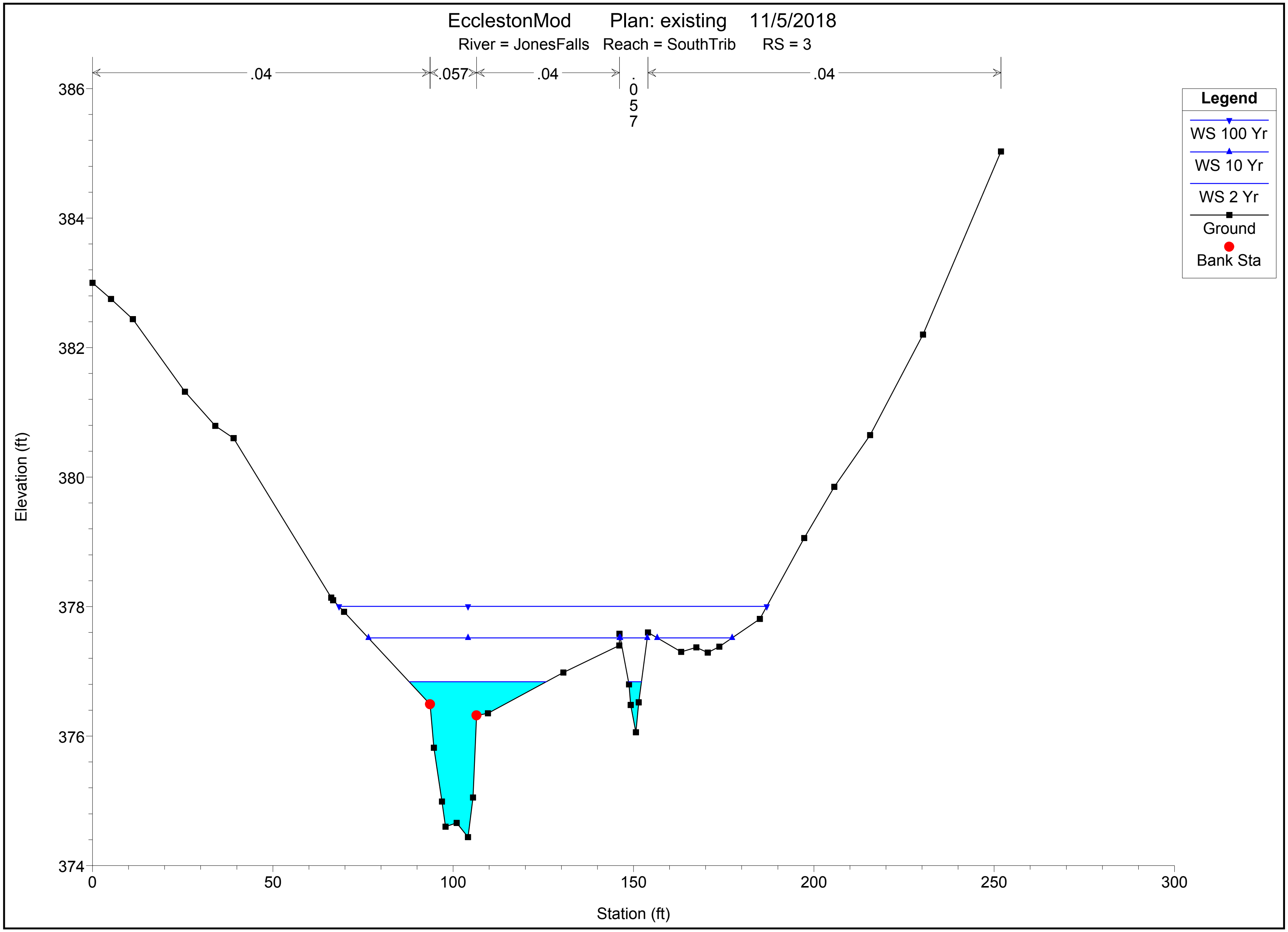
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = SouthTrib RS = 6.5 BR Cliffholme Rd Bridge
.045
.057
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
396
394
392
390
388
386
384
382
0
50
100
150
200
250
300
350
400

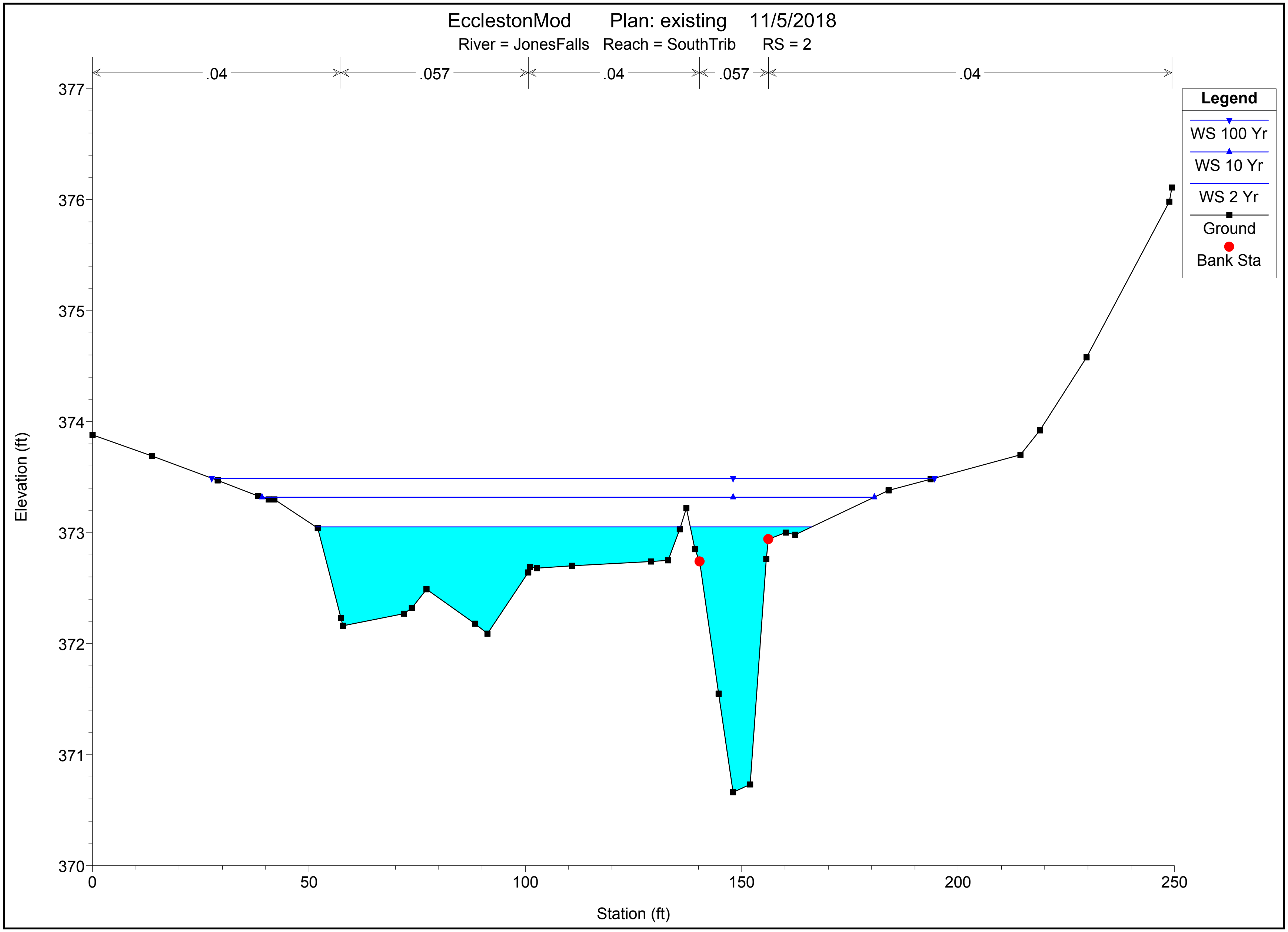


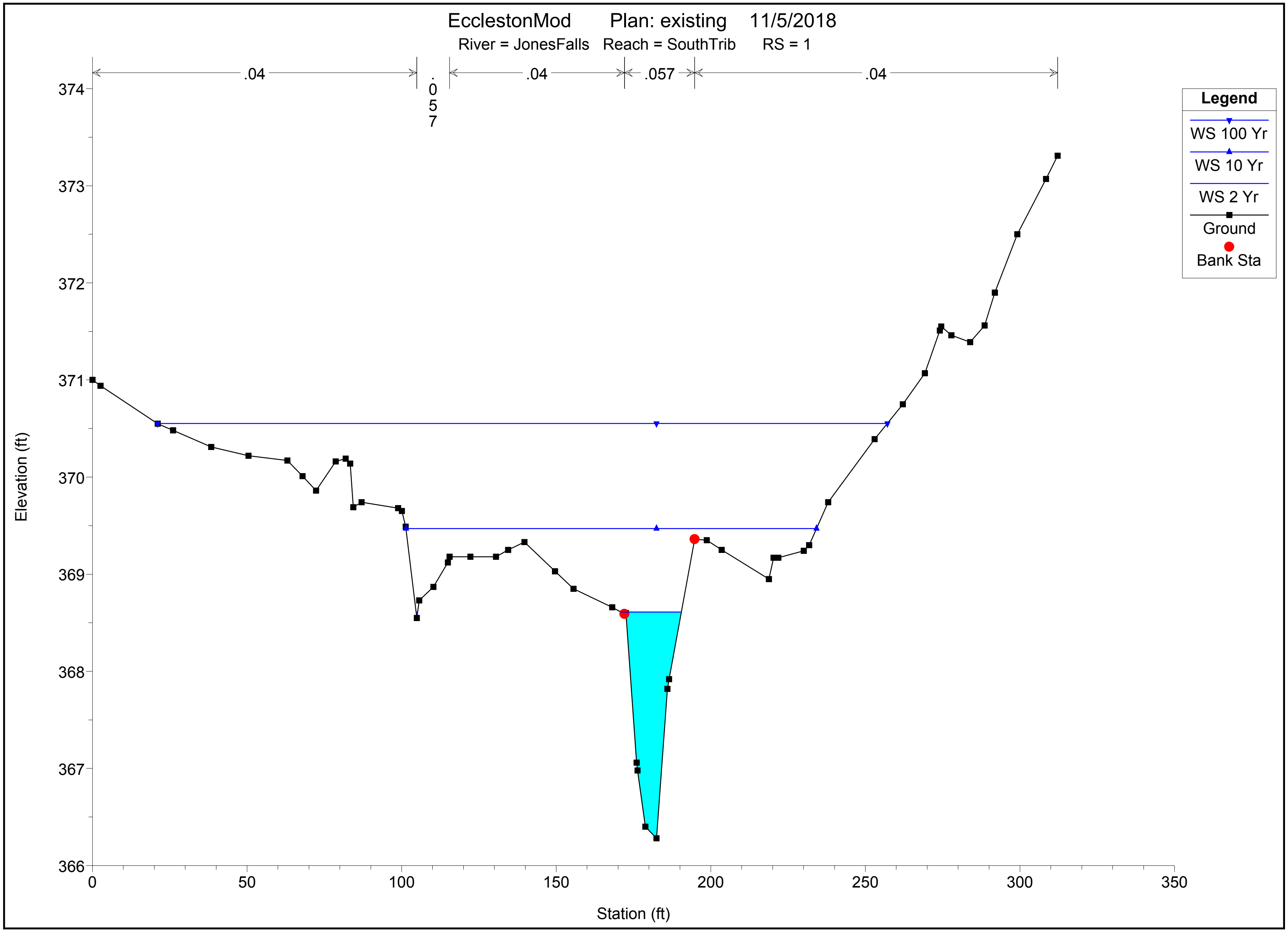
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = SouthTrib RS = 6
.045
.057
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
396
394
392
390
388
386
384
382
0
50
100
150
200
250
300
350
400
Station (ft)

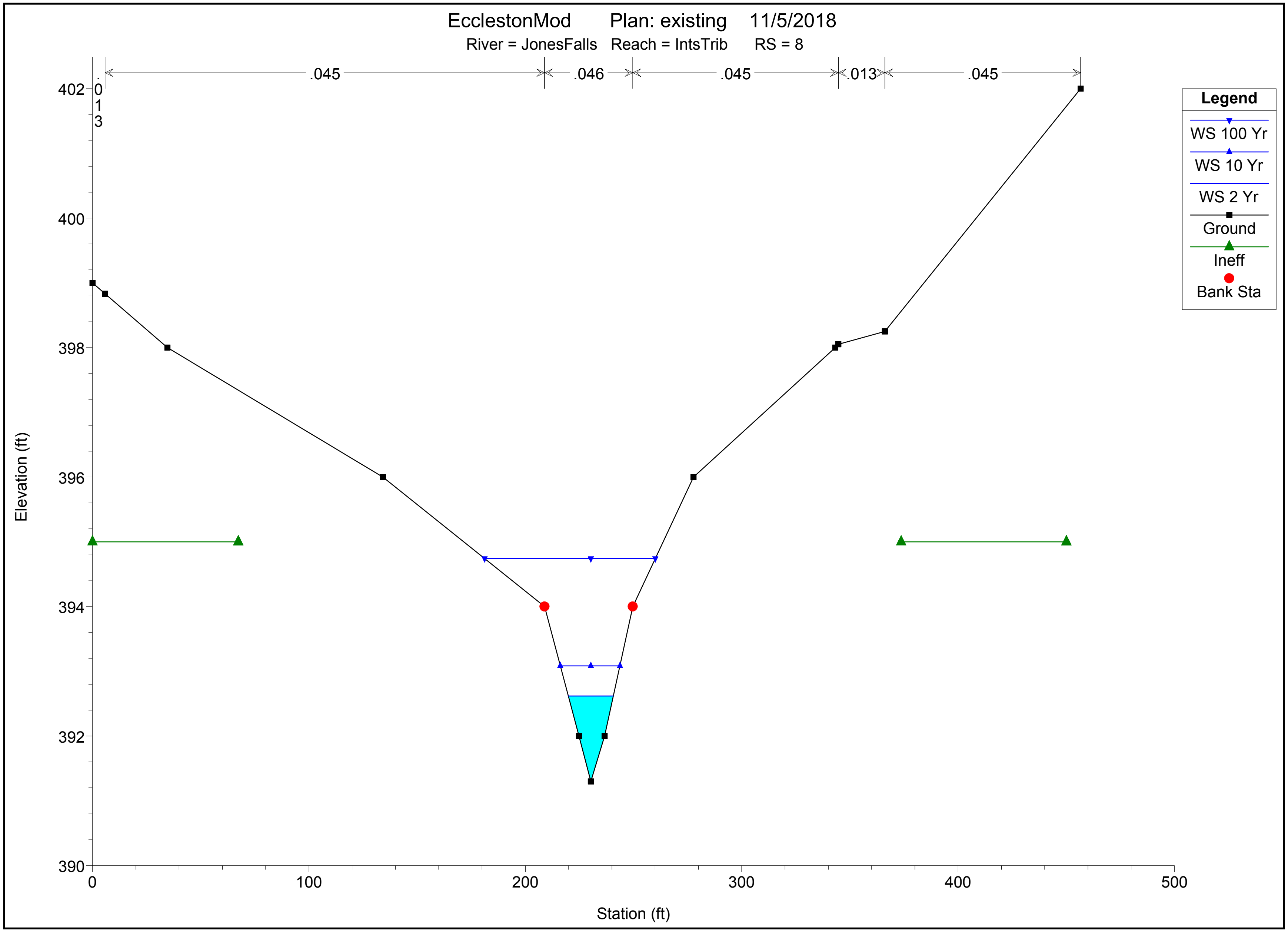

EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = SouthTrib RS = 5
.04
.045
.057
.045
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
396
394
392
390
388
386
384
382
380
0
50
100
150
200
250
300
350
Station (ft)


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = SouthTrib RS = 4
.04
.057
.04
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
390
388
386
384
382
380
378
0
50
100
150
200
250
300
Station (ft)

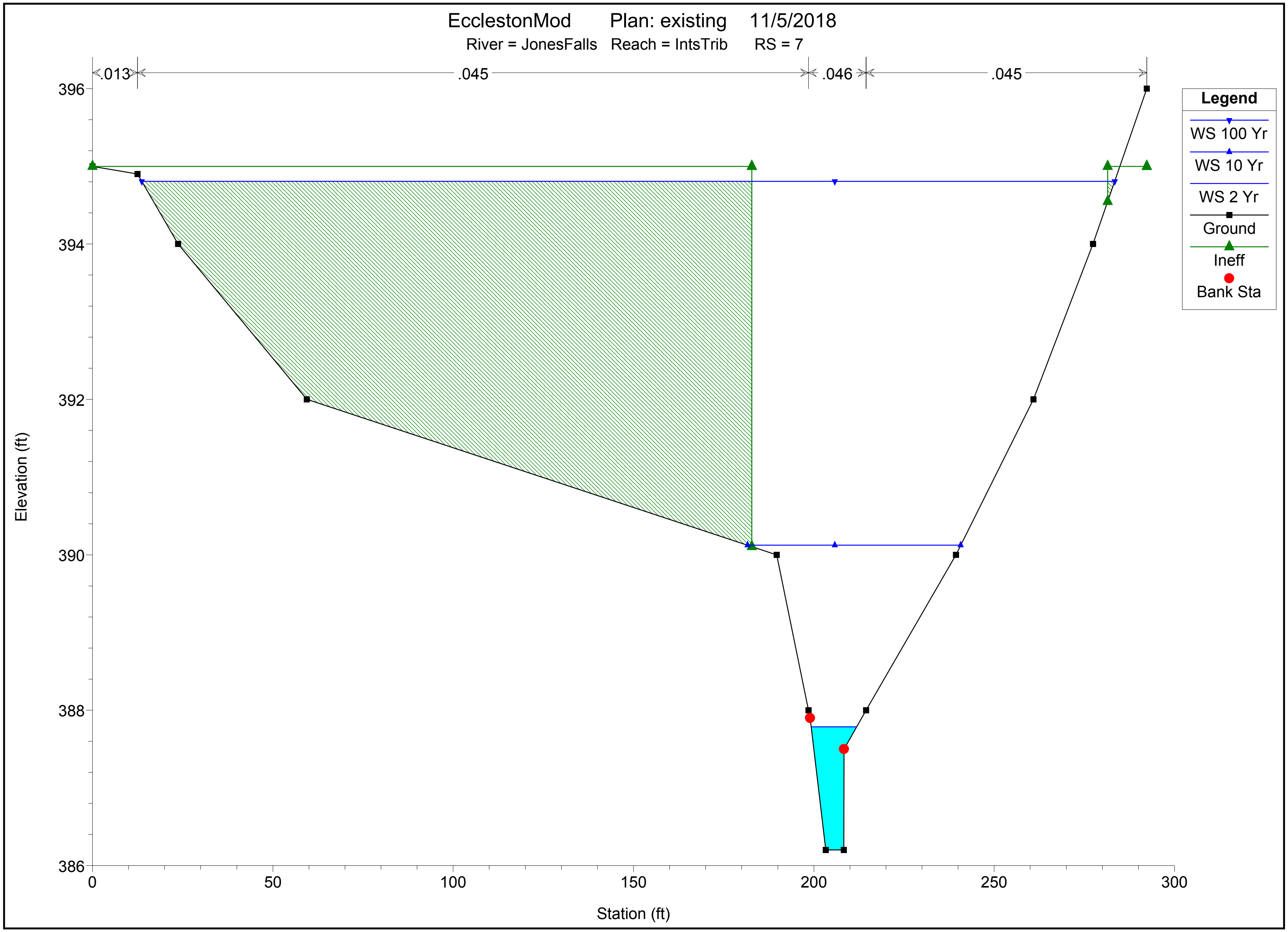

EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = SouthTrib RS = 3
.04
.057
.04
.057
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
386
384
382
380
378
376
374
0
50
100
150
200
250
300
Station (ft)


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = SouthTrib RS = 2
.04
.057
.04
.057
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
377
376
375
374
373
372
371
370
0
50
100
150
200
250
Station (ft)

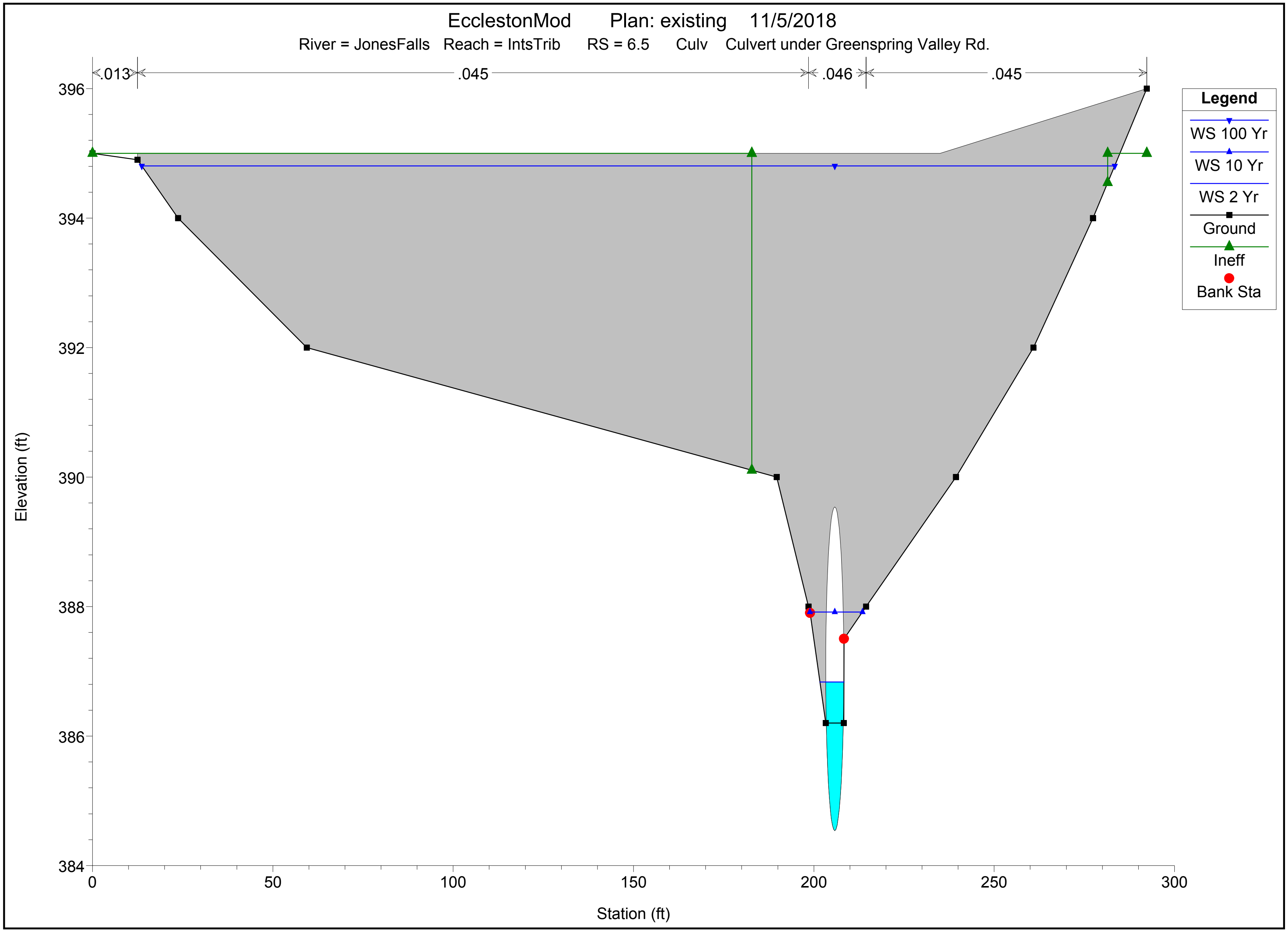

EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = SouthTrib RS = 1
.04
.057
.04
.057
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
374
373
372
371
370
369
368
367
366
0
50
100
150
200
250
300
350
Station (ft)



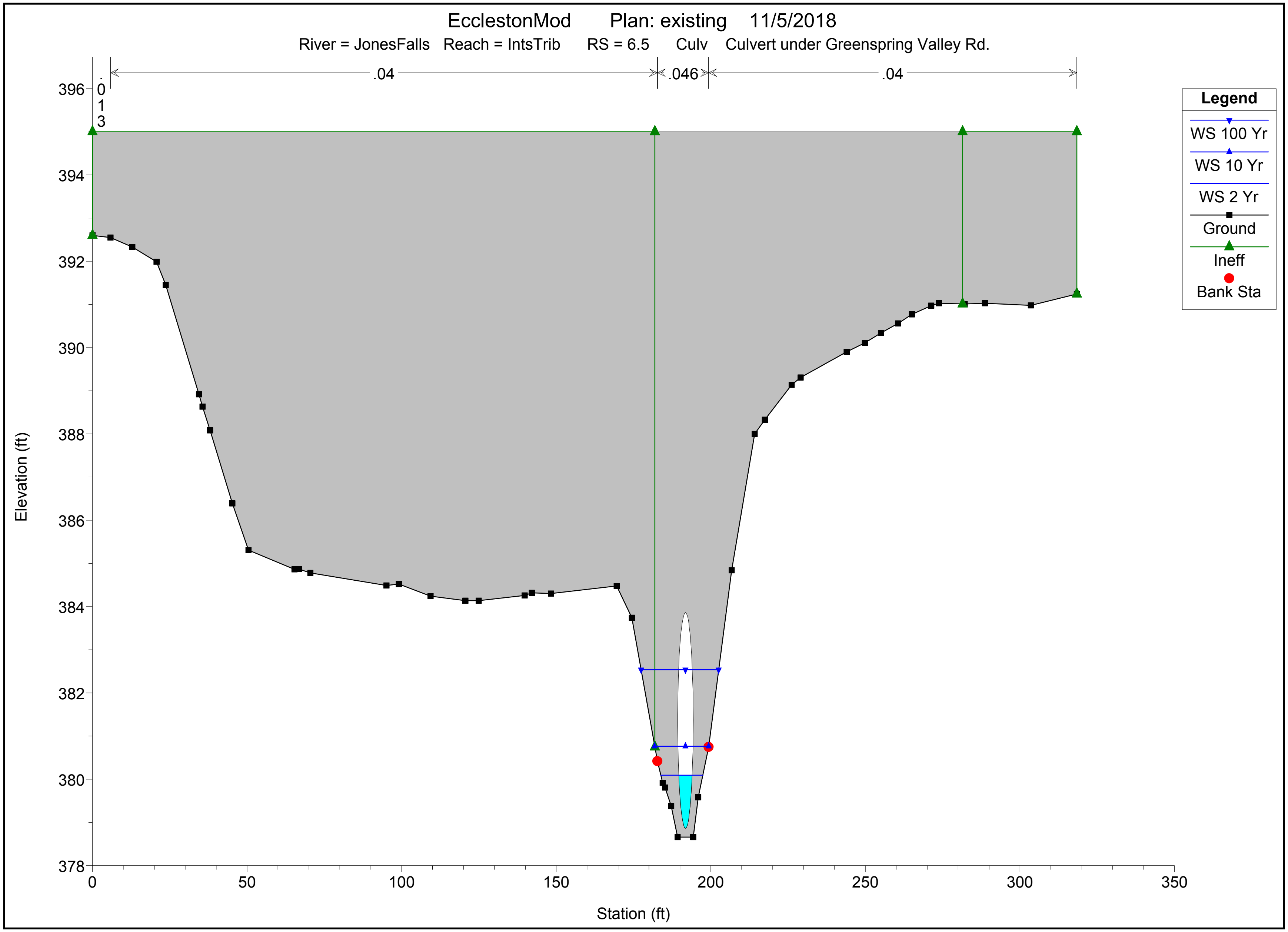
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 8
.045
.046
.045
.013
.045
.013
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
402
400
398
396
394
392
390
Station (ft)
0
100
200
300
400
500



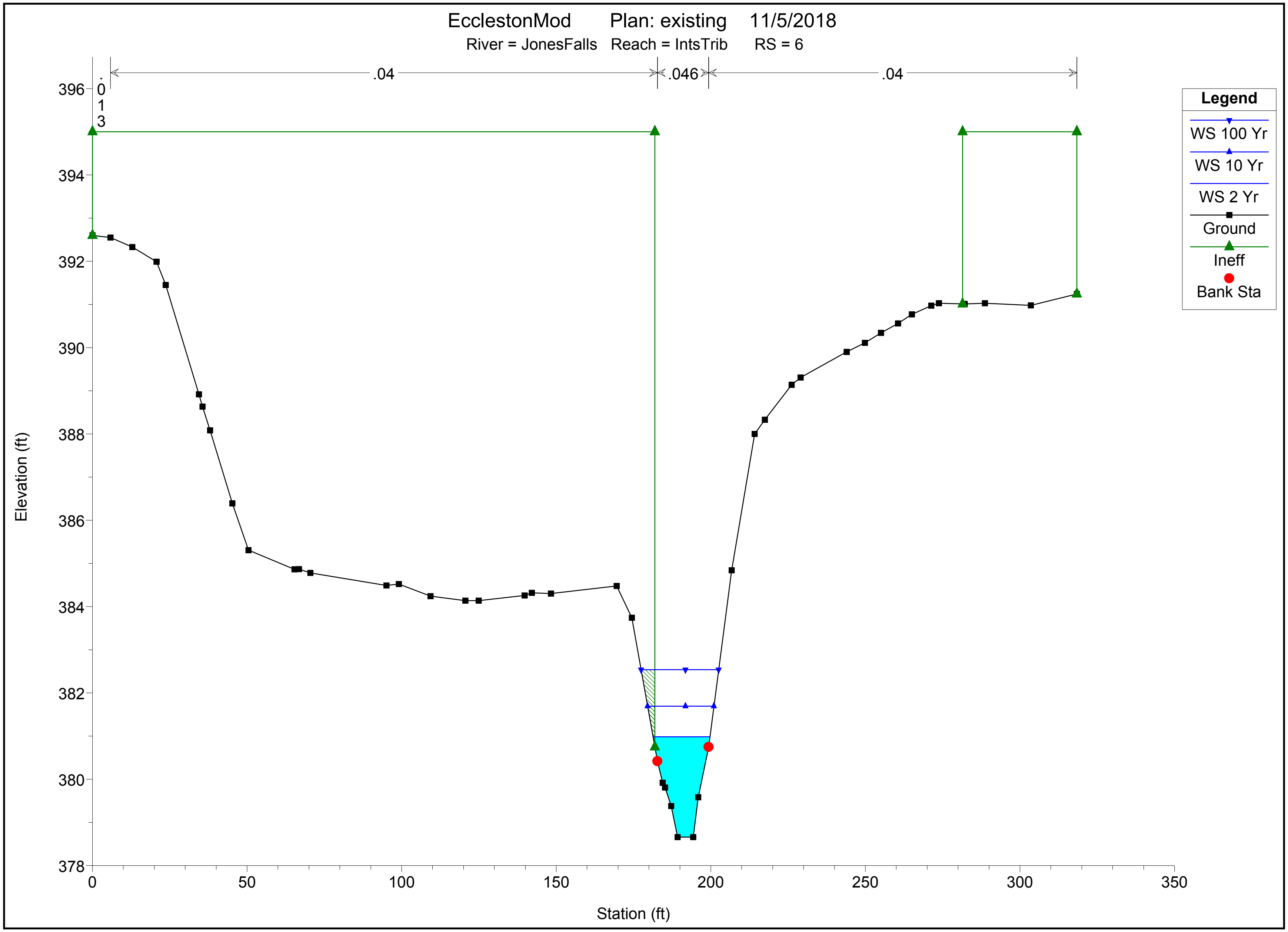
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 7
.013
.045
.046
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
396
394
392
390
388
386
0
50
100
150
200
250
300



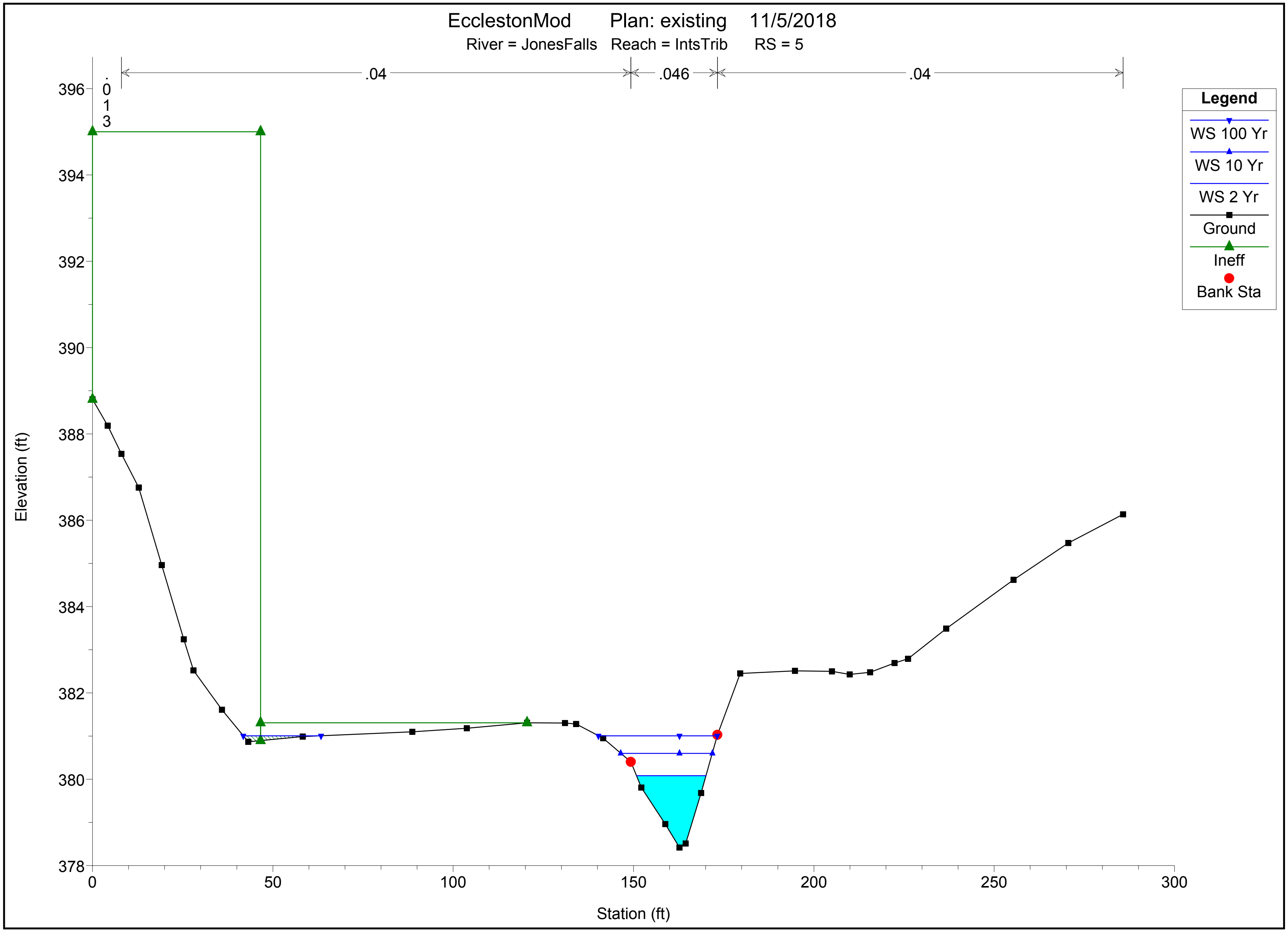
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 6.5 Culv Culvert under Greenspring Valley Rd.
.013
.045
.046
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
396
394
392
390
388
386
384
Station (ft)
0
50
100
150
200
250
300



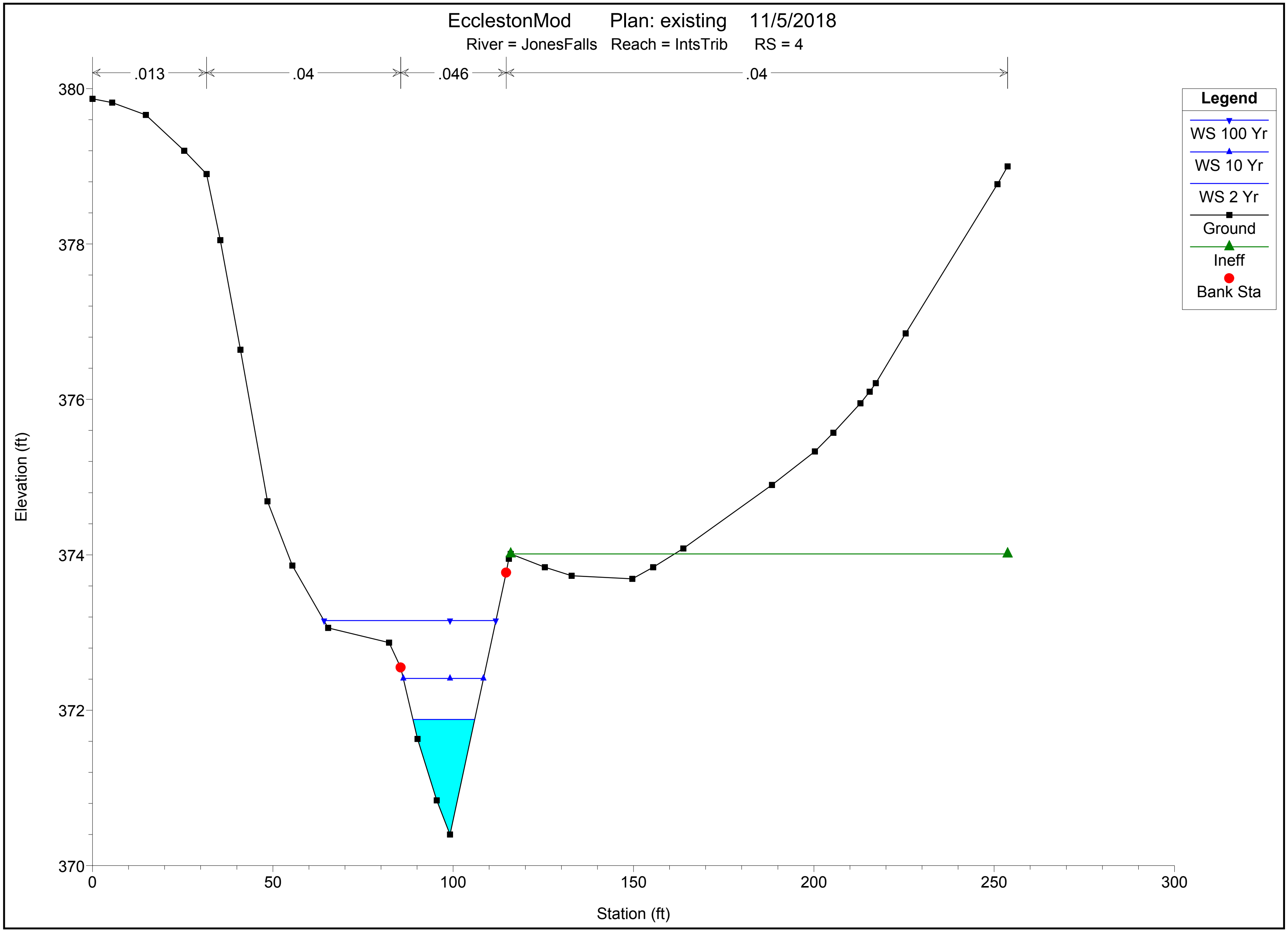
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 6.5 Culv Culvert under Greenspring Valley Rd.
.04
.046
.04
.013
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
396
394
392
390
388
386
384
382
380
378
0
50
100
150
200
250
300
350



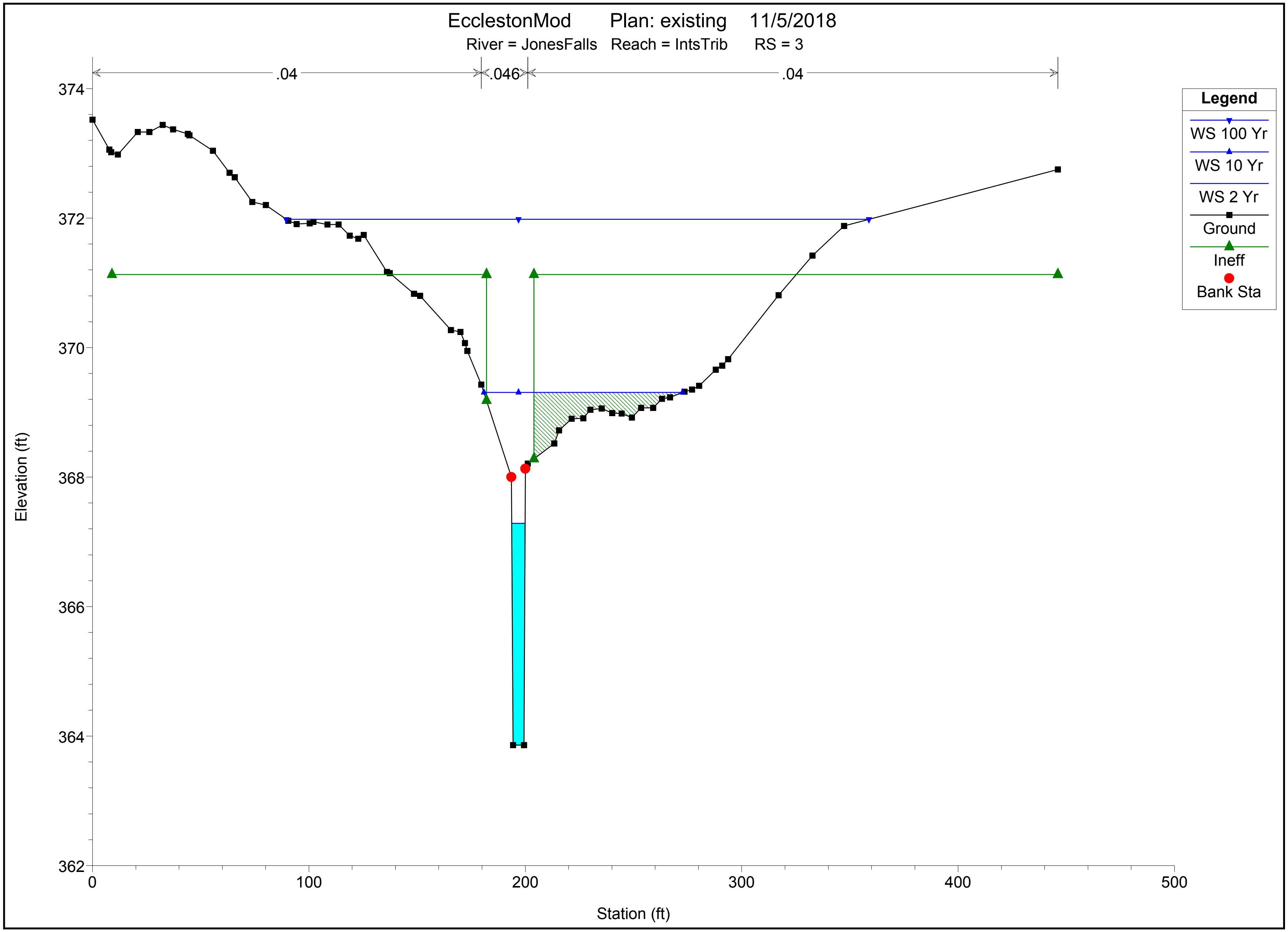
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 6
.04
.046
.04
.013
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
396
394
392
390
388
386
384
382
380
378
0
50
100
150
200
250
300
350



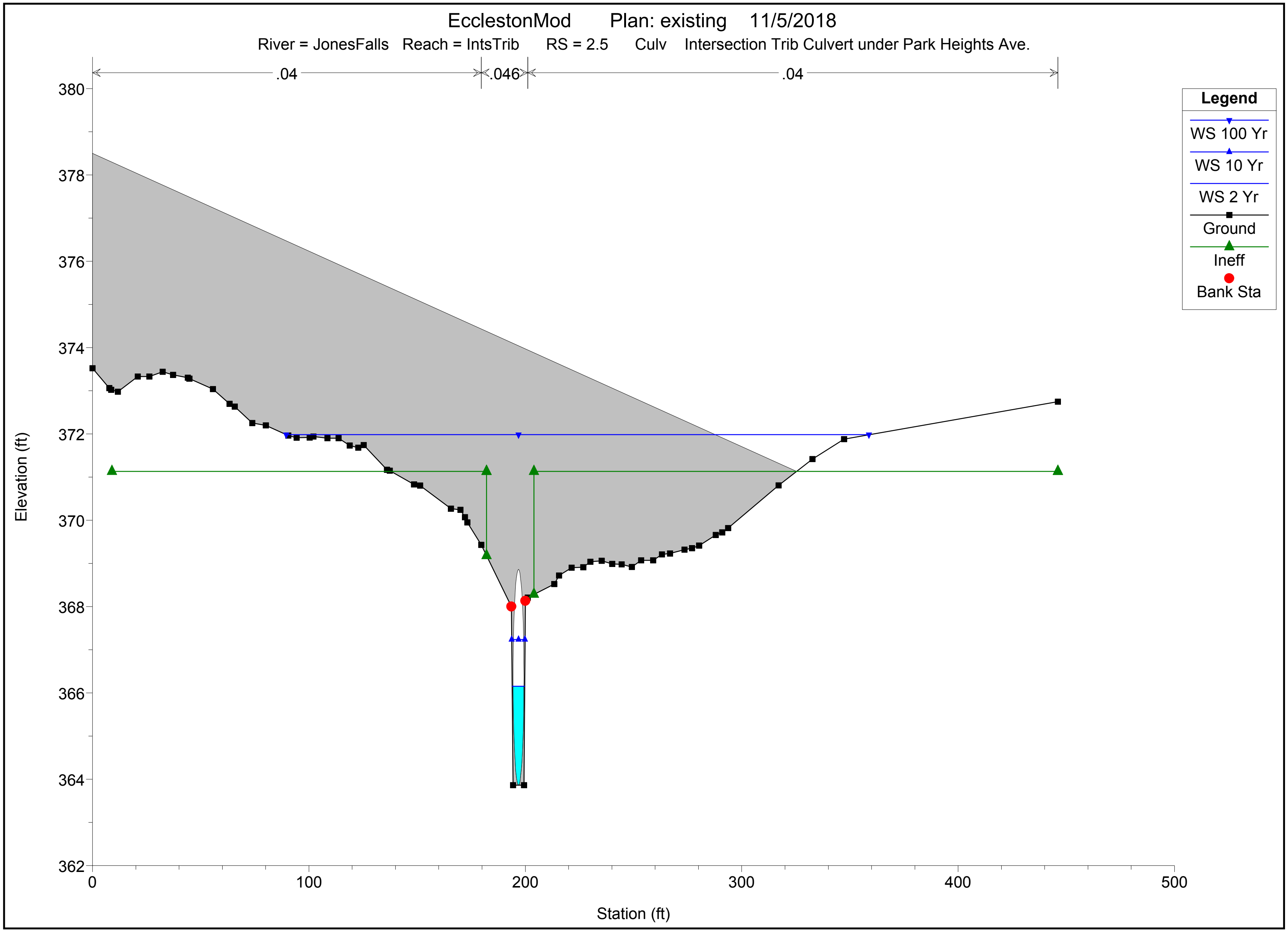
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 5
.04
.046
.04
.013
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
396
394
392
390
388
386
384
382
380
378
0
50
100
150
200
250
300
Station (ft)



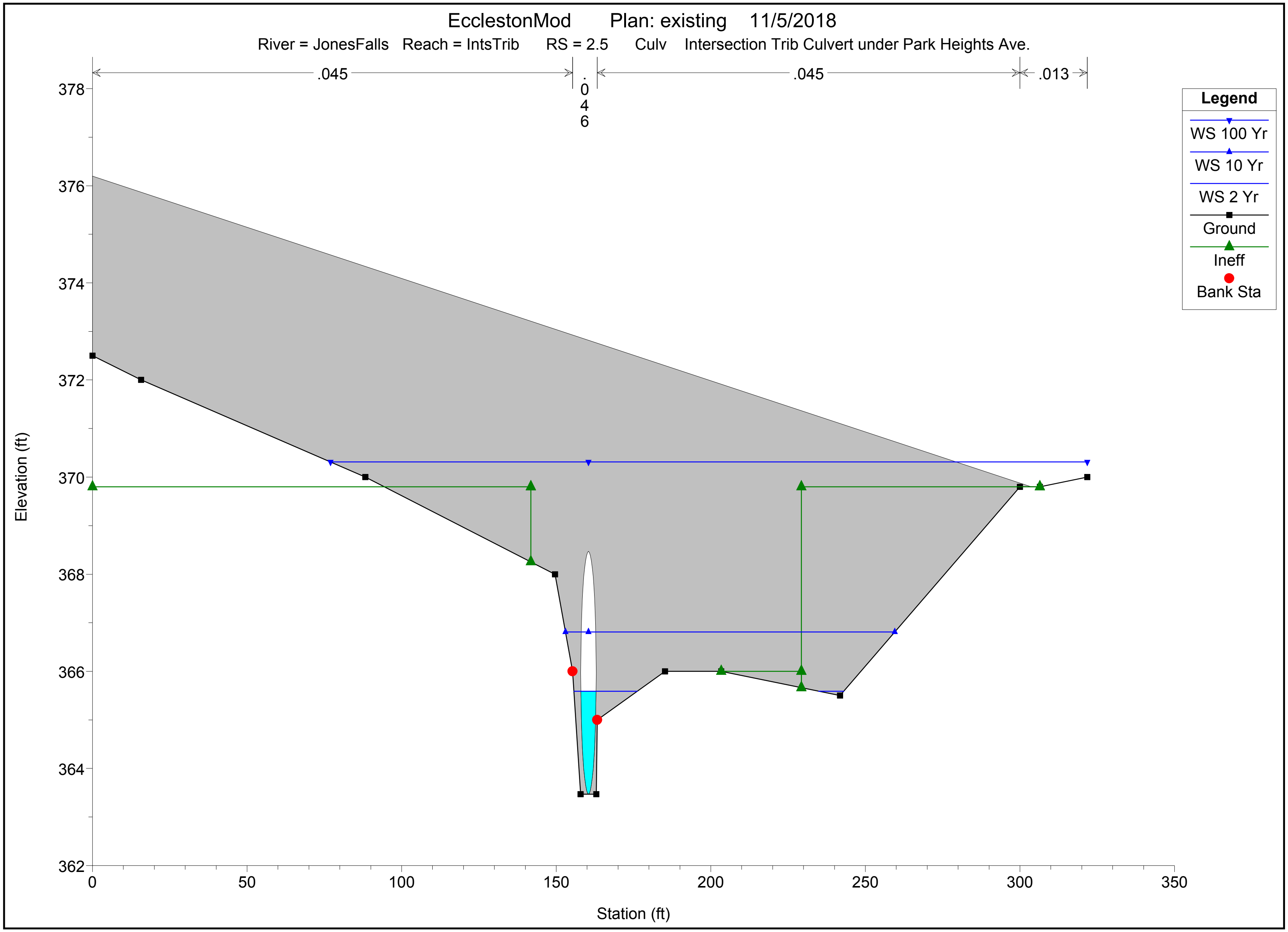
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 4
.013
.04
.046
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
380
378
376
374
372
370
0
50
100
150
200
250
300
Station (ft)



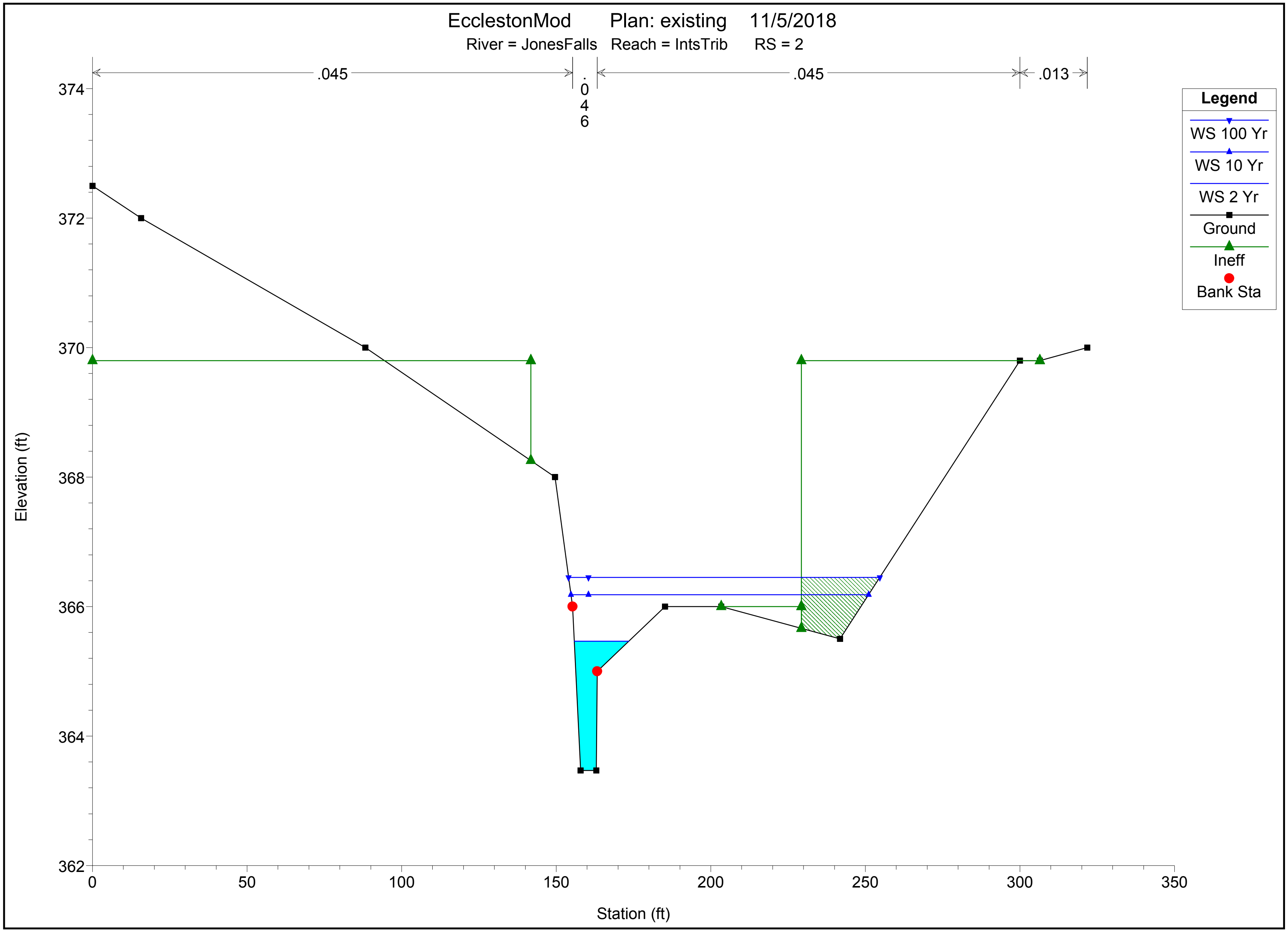
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 3
.04
.046
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
374
372
370
368
366
364
362
0
100
200
300
400
500



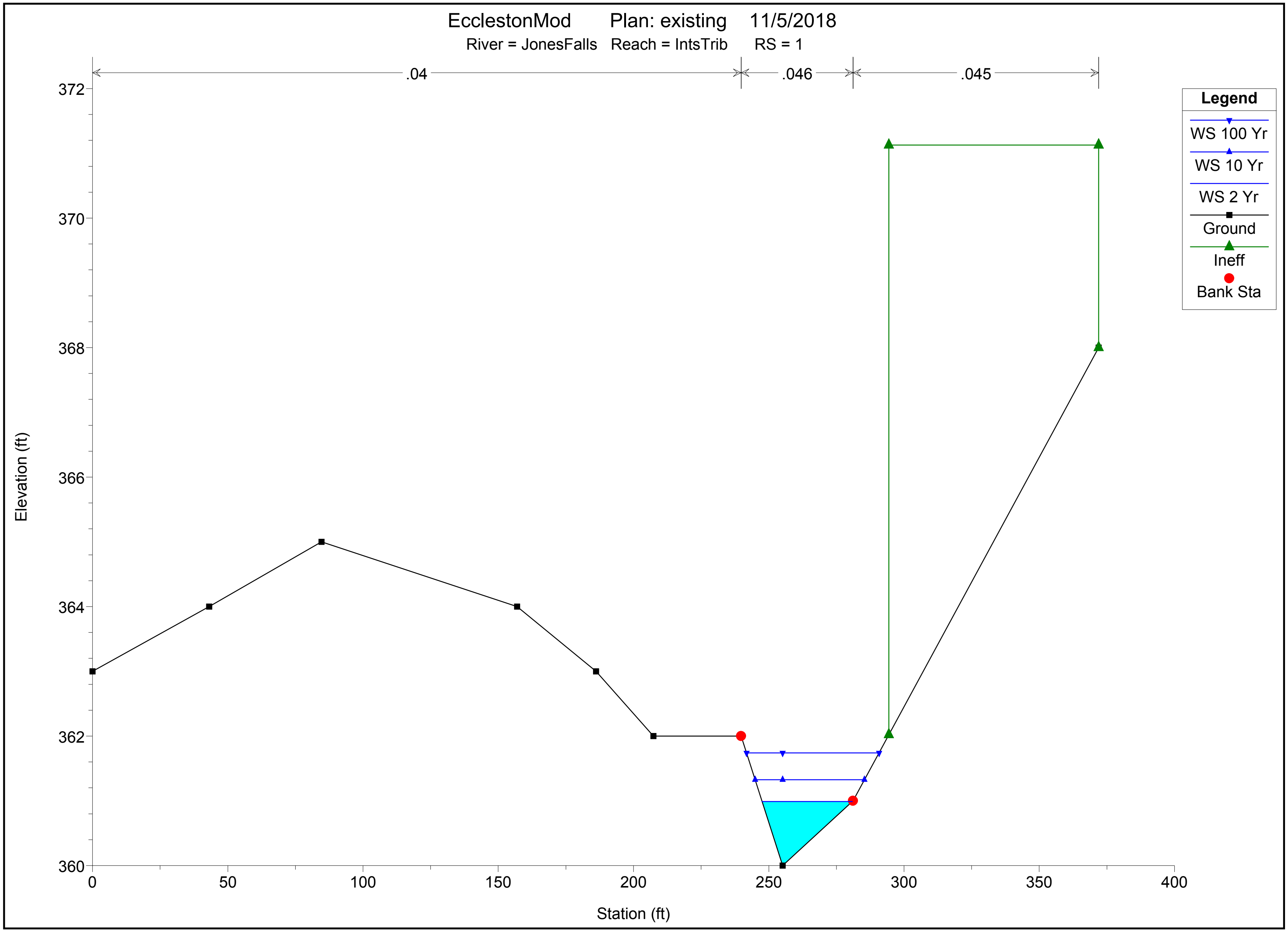
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 2.5 Culv Intersection Trib Culvert under Park Heights Ave.
.04
.046
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
380
378
376
374
372
370
368
366
364
362
0
100
200
300
400
500

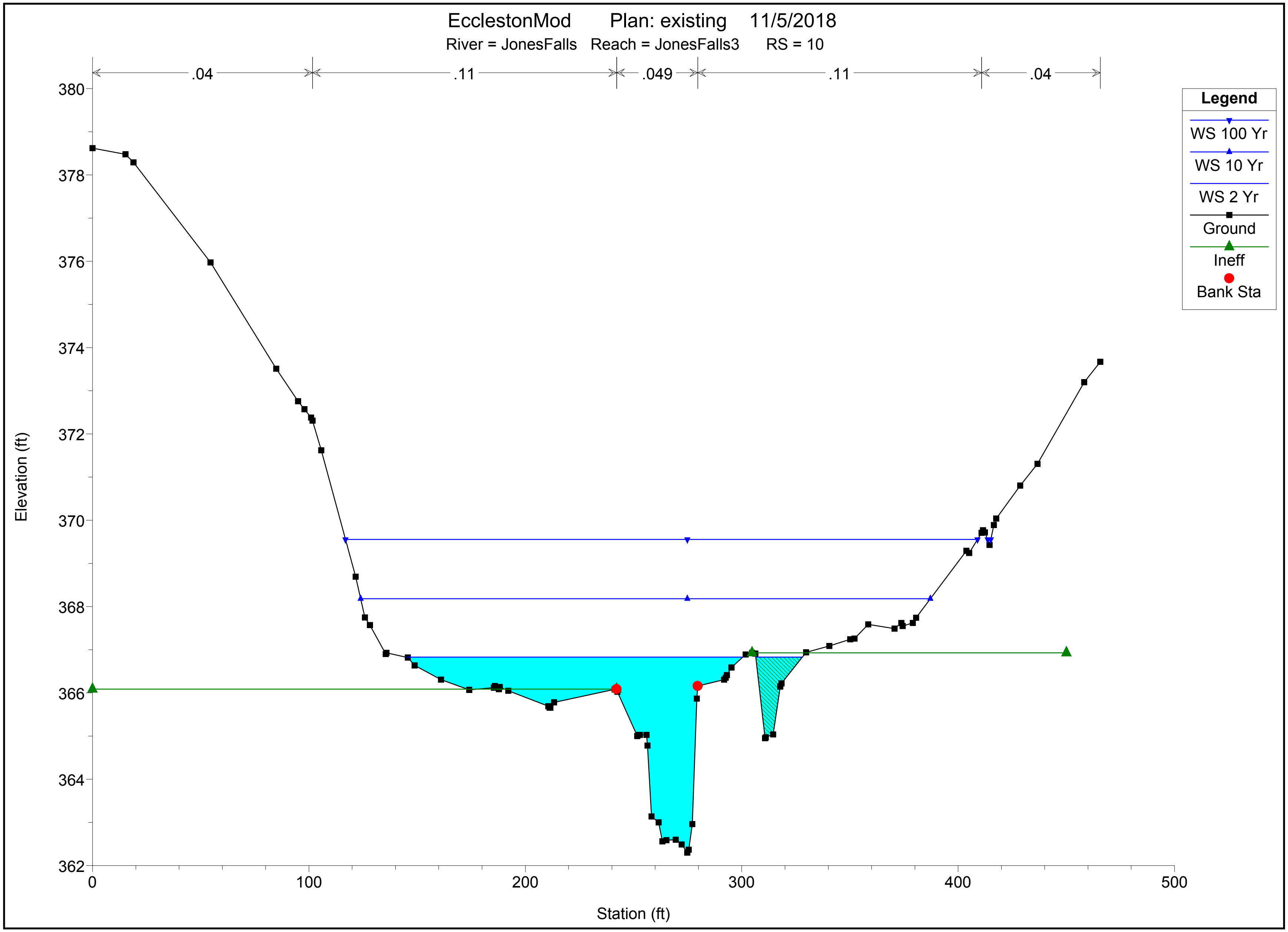


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 2.5 Culv Intersection Trib Culvert under Park Heights Ave.
.045
.046
.045
.013
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
378
376
374
372
370
368
366
364
362
0
50
100
150
200
250
300
350

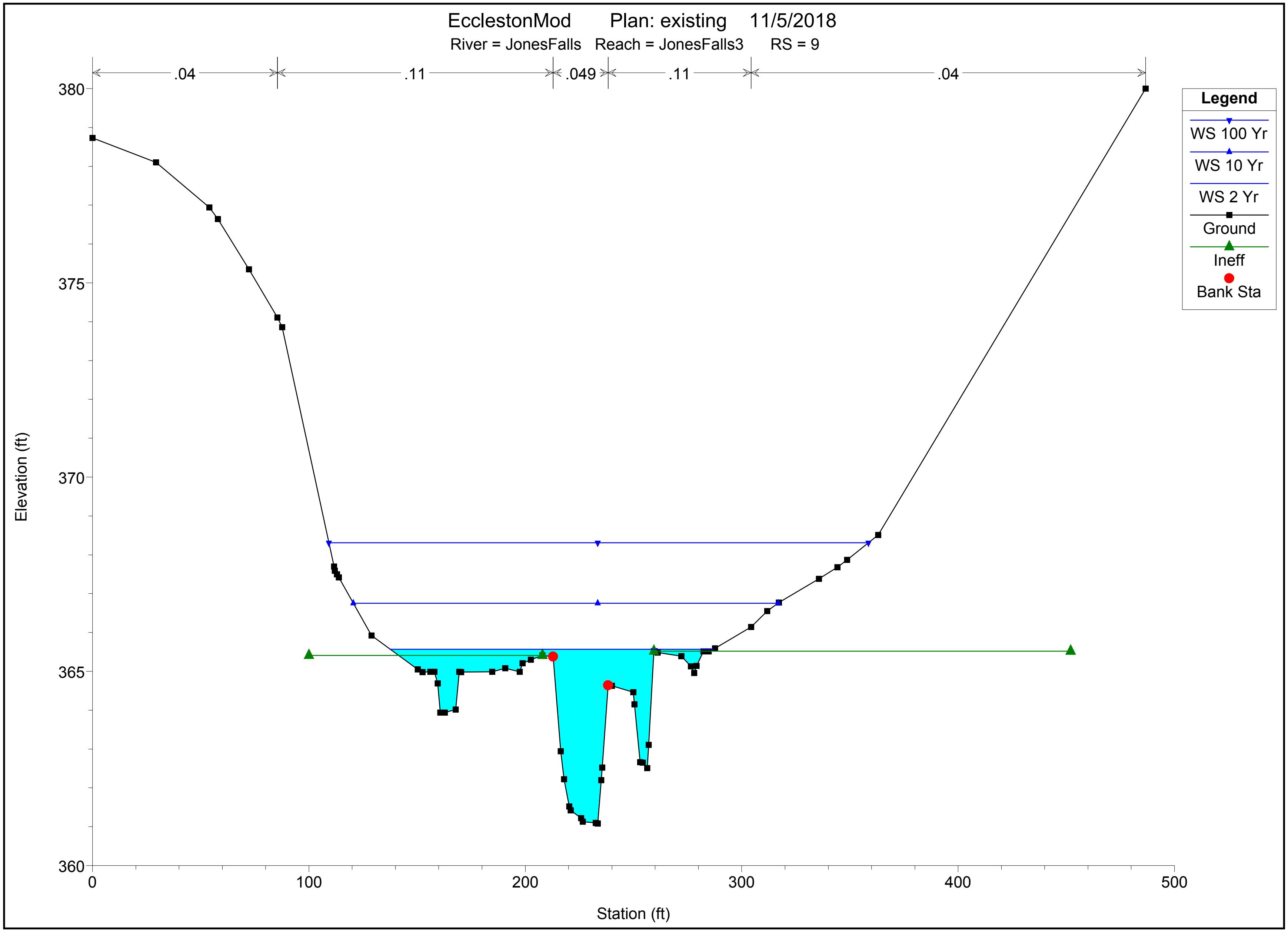


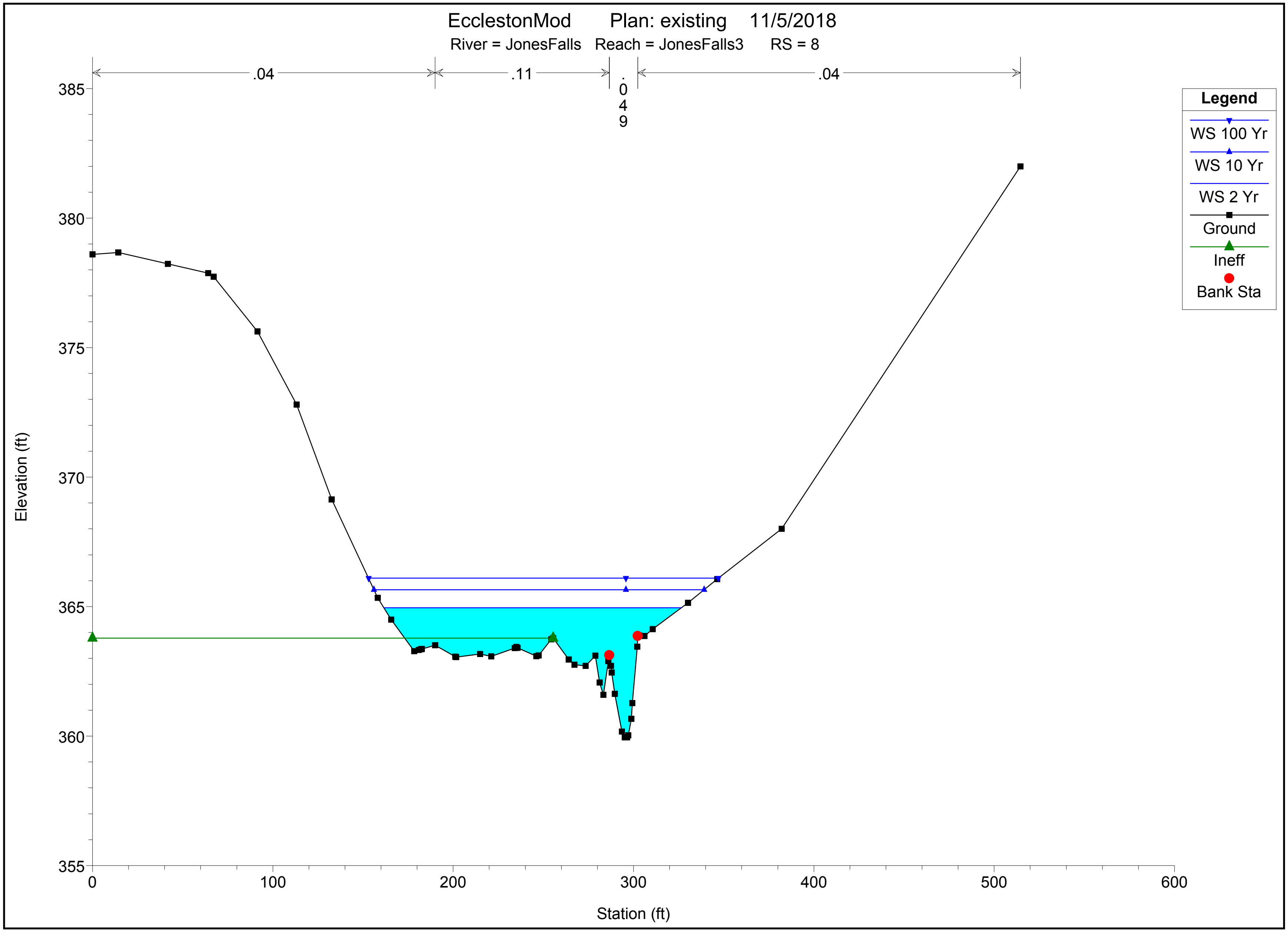
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 2
.045
.046
.045
.013
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
374
372
370
368
366
364
362
0
50
100
150
200
250
300
350


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = IntsTrib RS = 1
.04
.046
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
372
370
368
366
364
362
360
0
50
100
150
200
250
300
350
400
Station (ft)

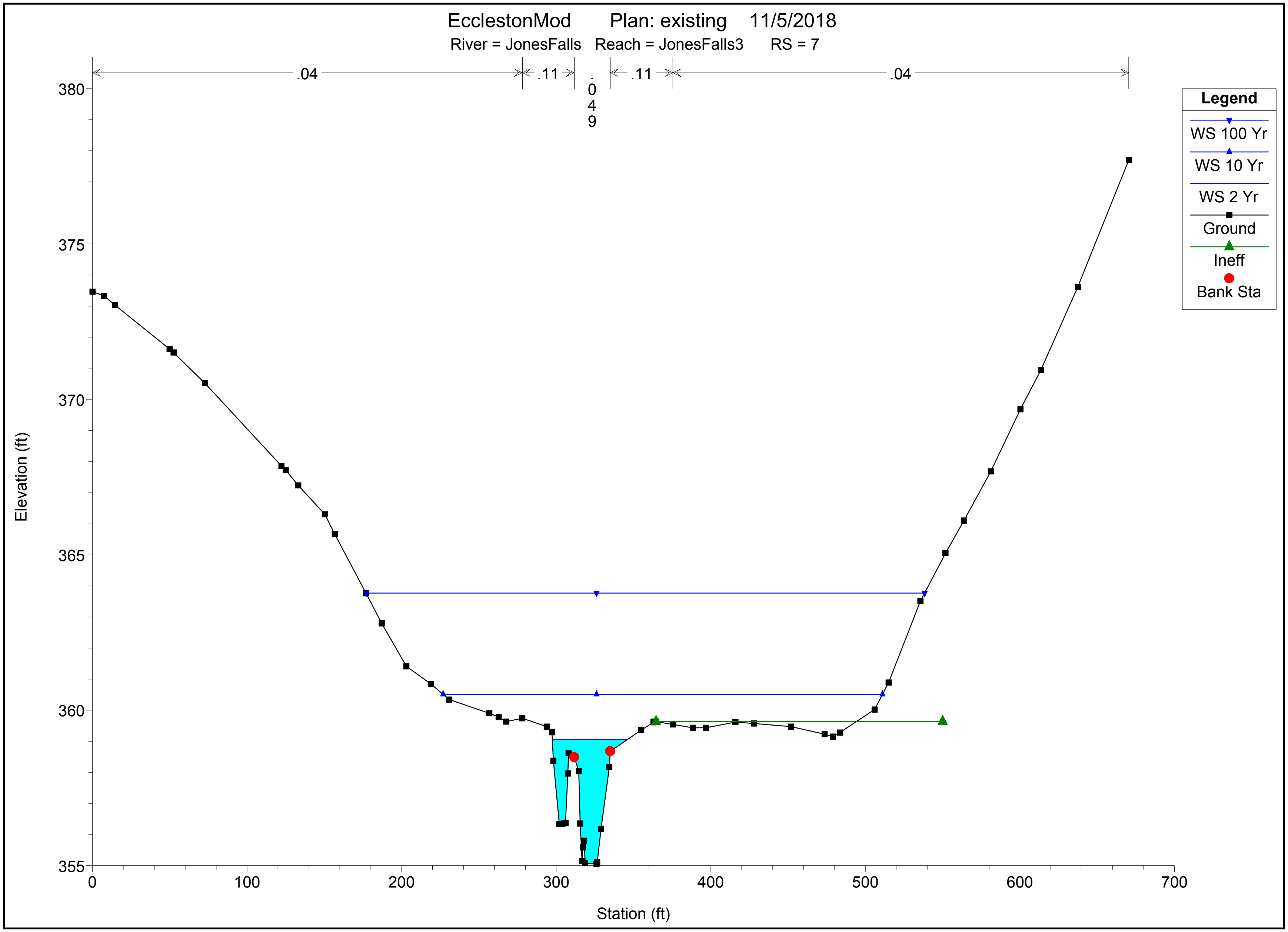


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 10
.04
.11
.049
.11
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
380
378
376
374
372
370
368
366
364
362
0
100
200
300
400
500

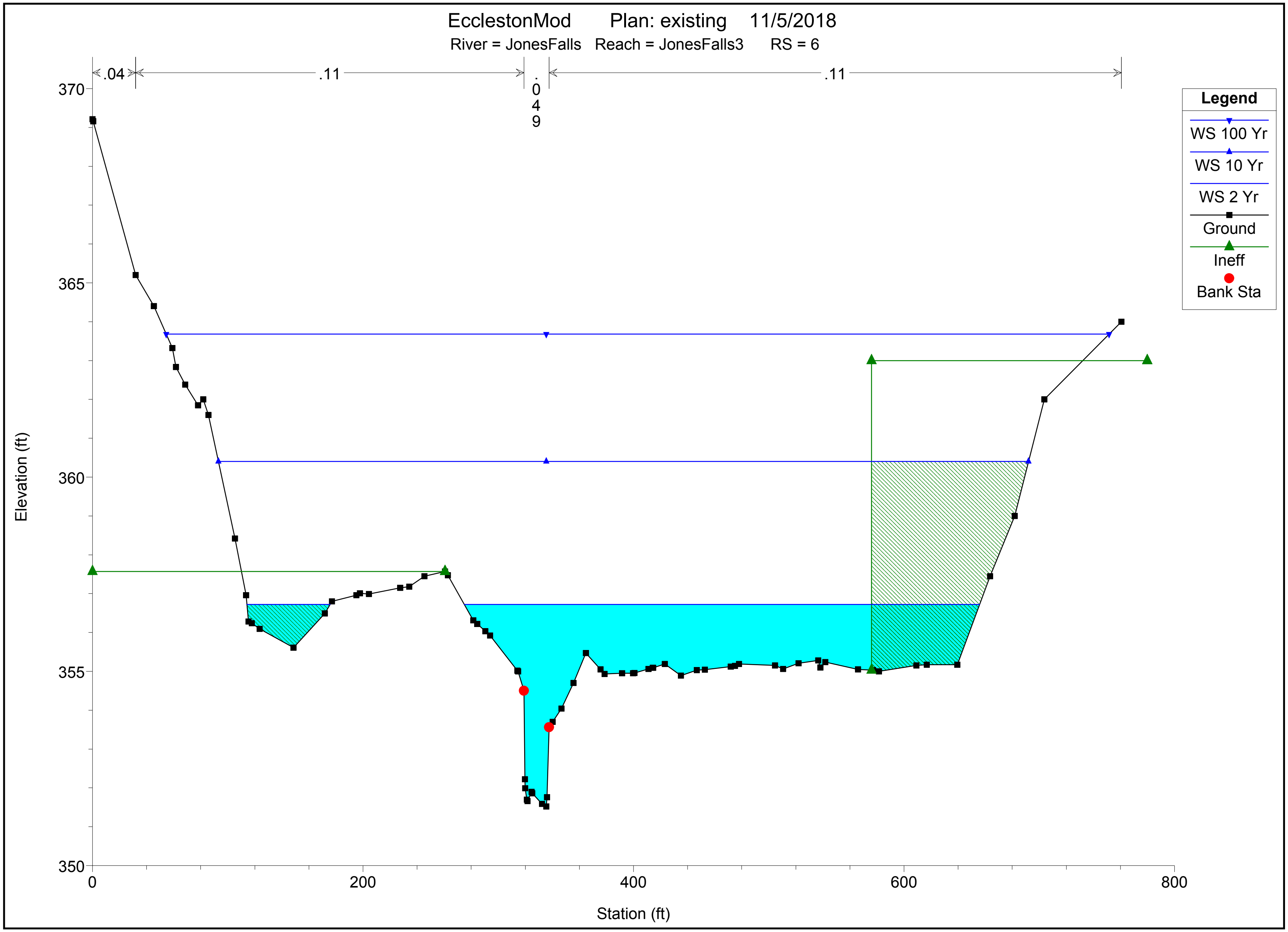

EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 9
.04
.11
.049
.11
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
380
375
370
365
360
0
100
200
300
400
500
Station (ft)



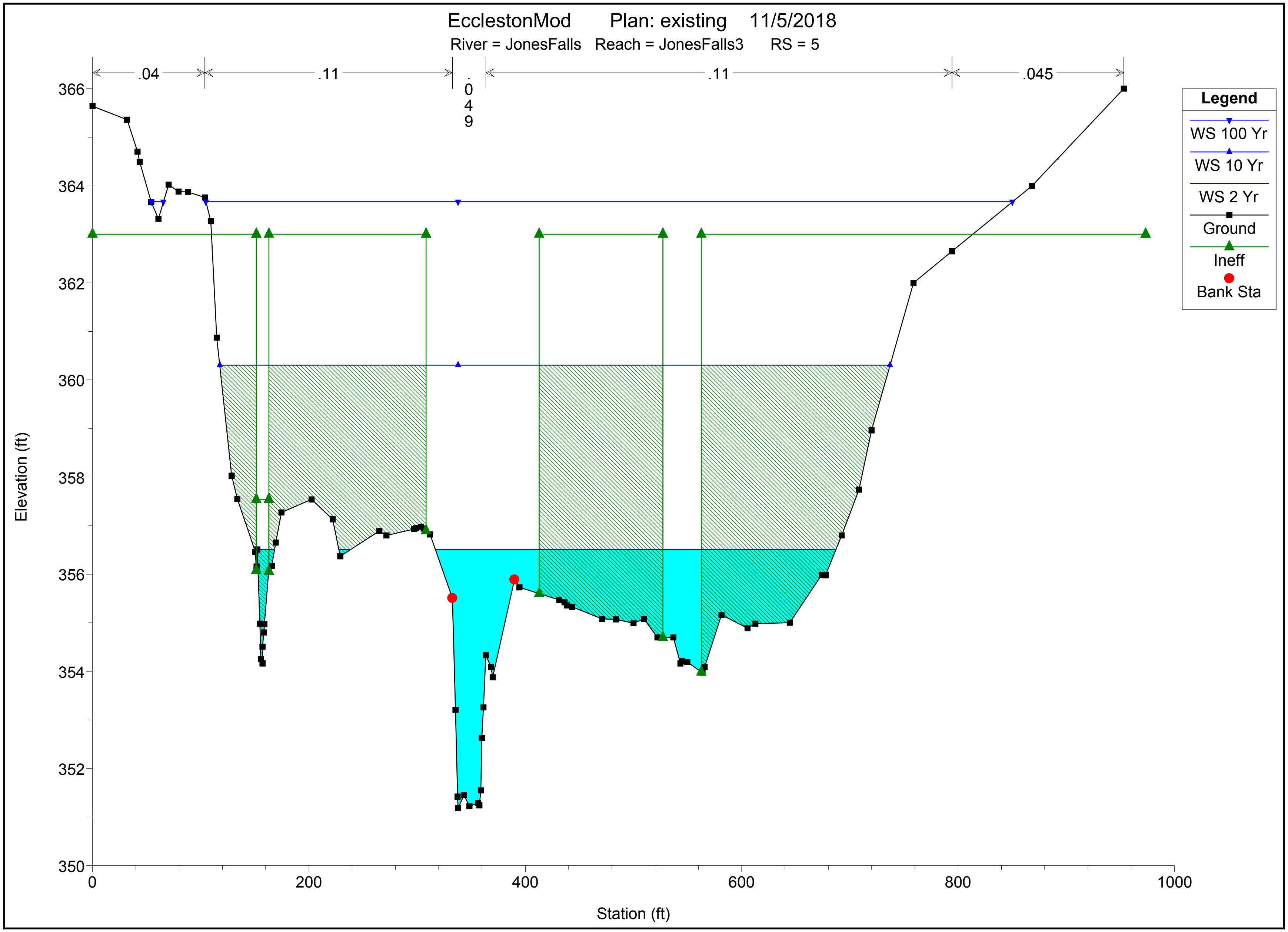
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 8
.04
.11
.049
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
385
380
375
370
365
360
355
0
100
200
300
400
500
600



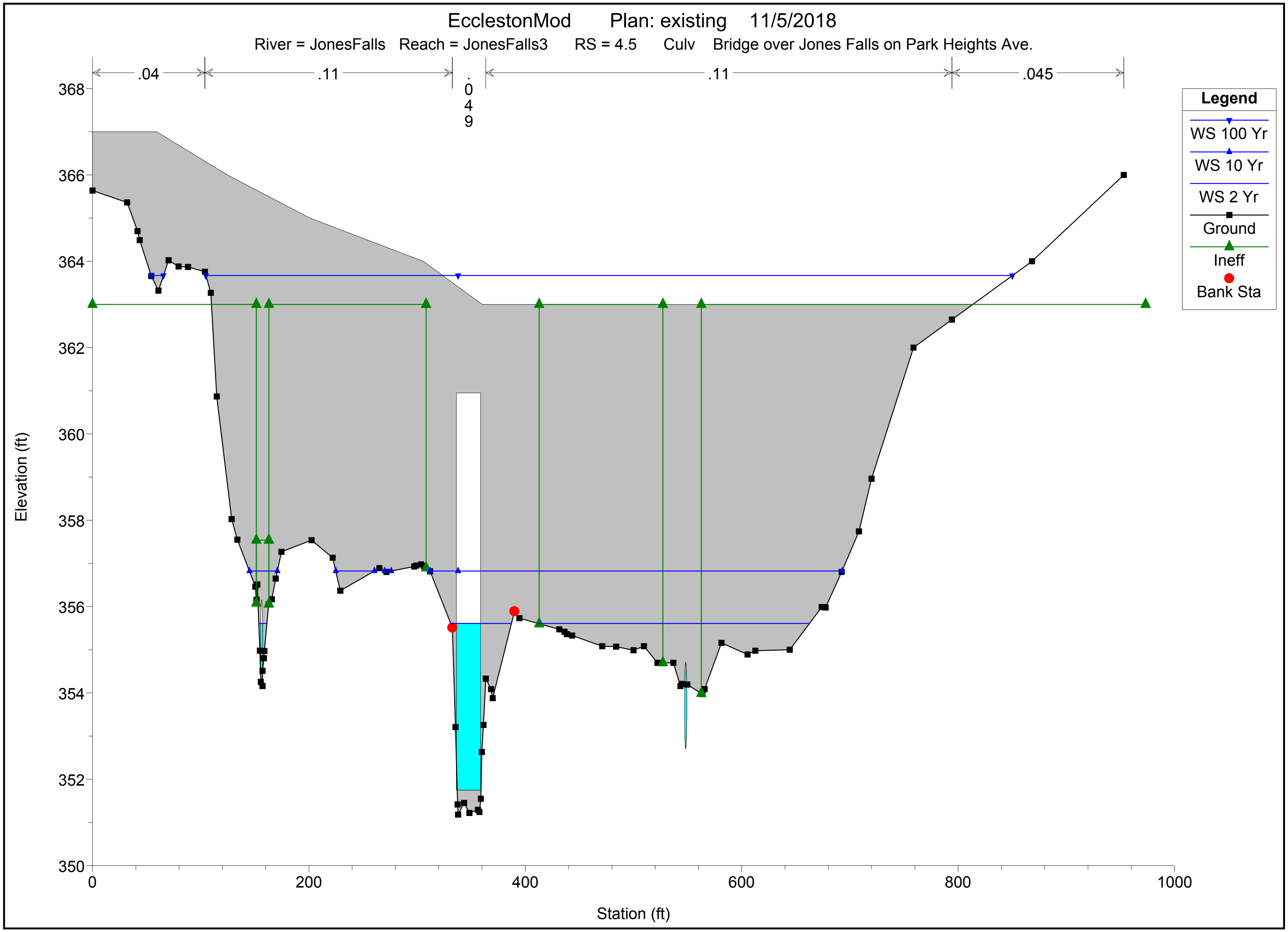
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 7
.04
.11
.049
.11
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
380
375
370
365
360
355
0
100
200
300
400
500
600
700



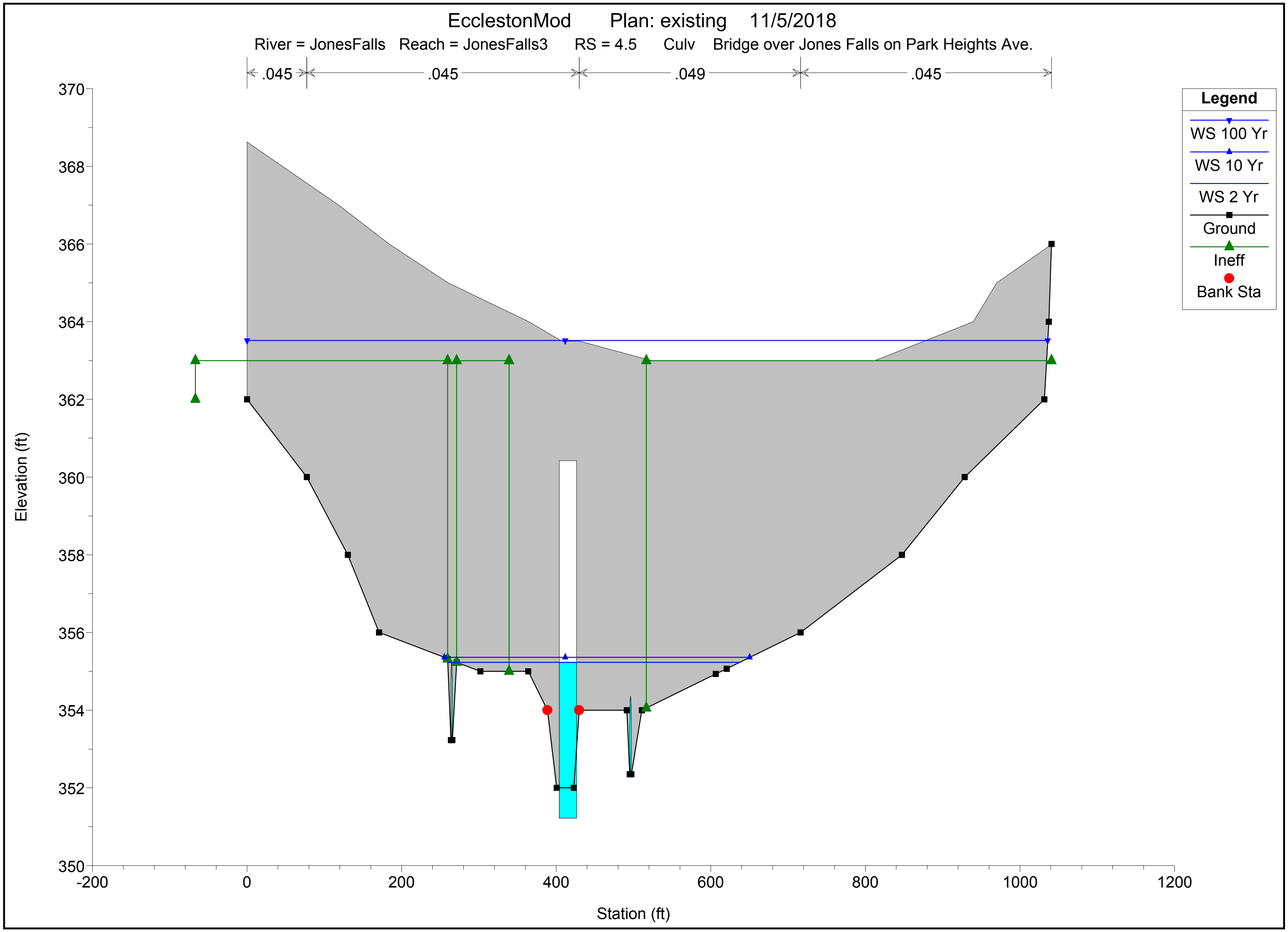
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 6
.04
.11
.049
.11
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
370
365
360
355
350
0
200
400
600
800

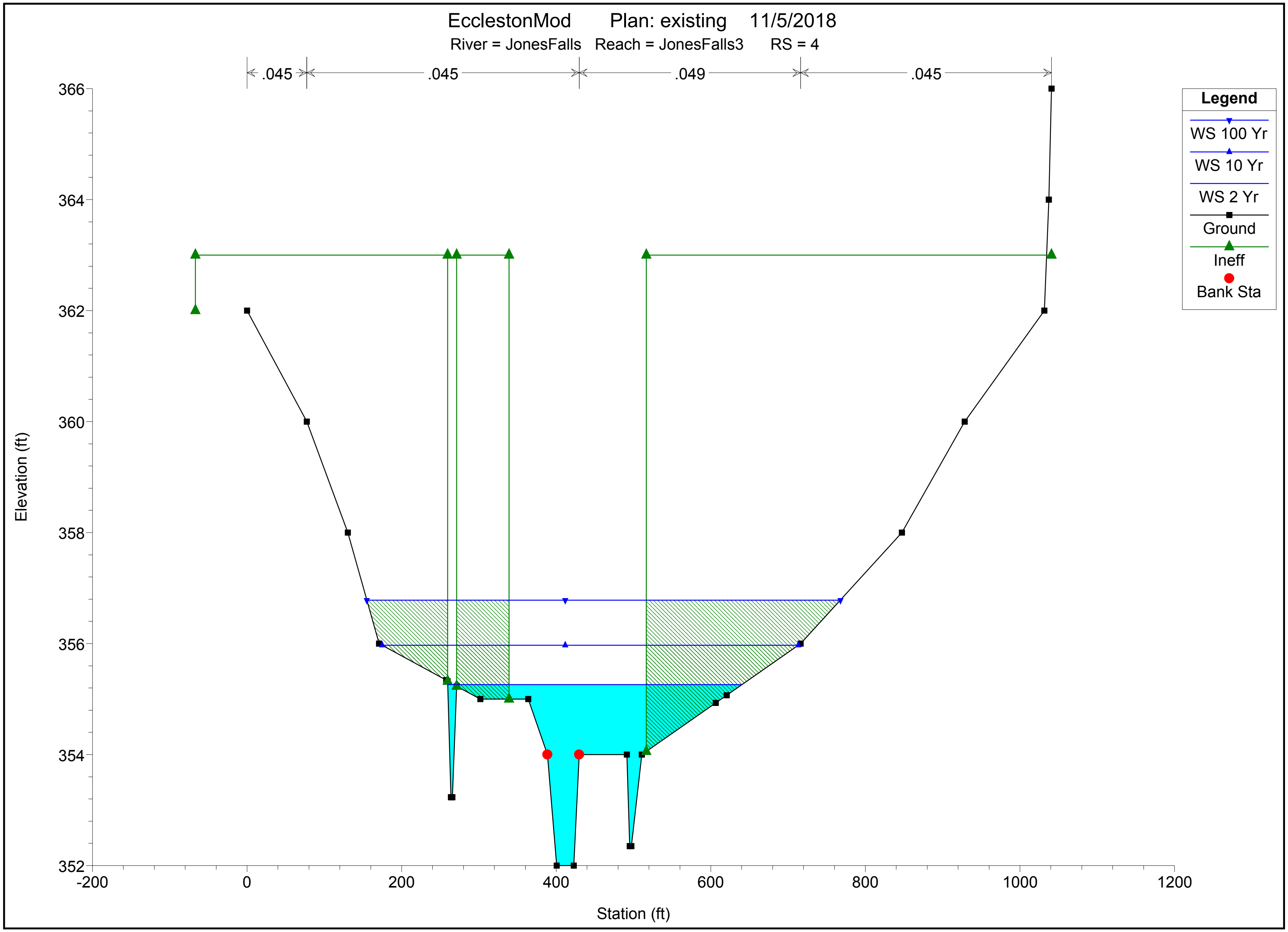


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 5
.04
.11
.049
.11
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
366
364
362
360
358
356
354
352
350
Station (ft)
0
200
400
600
800
1000

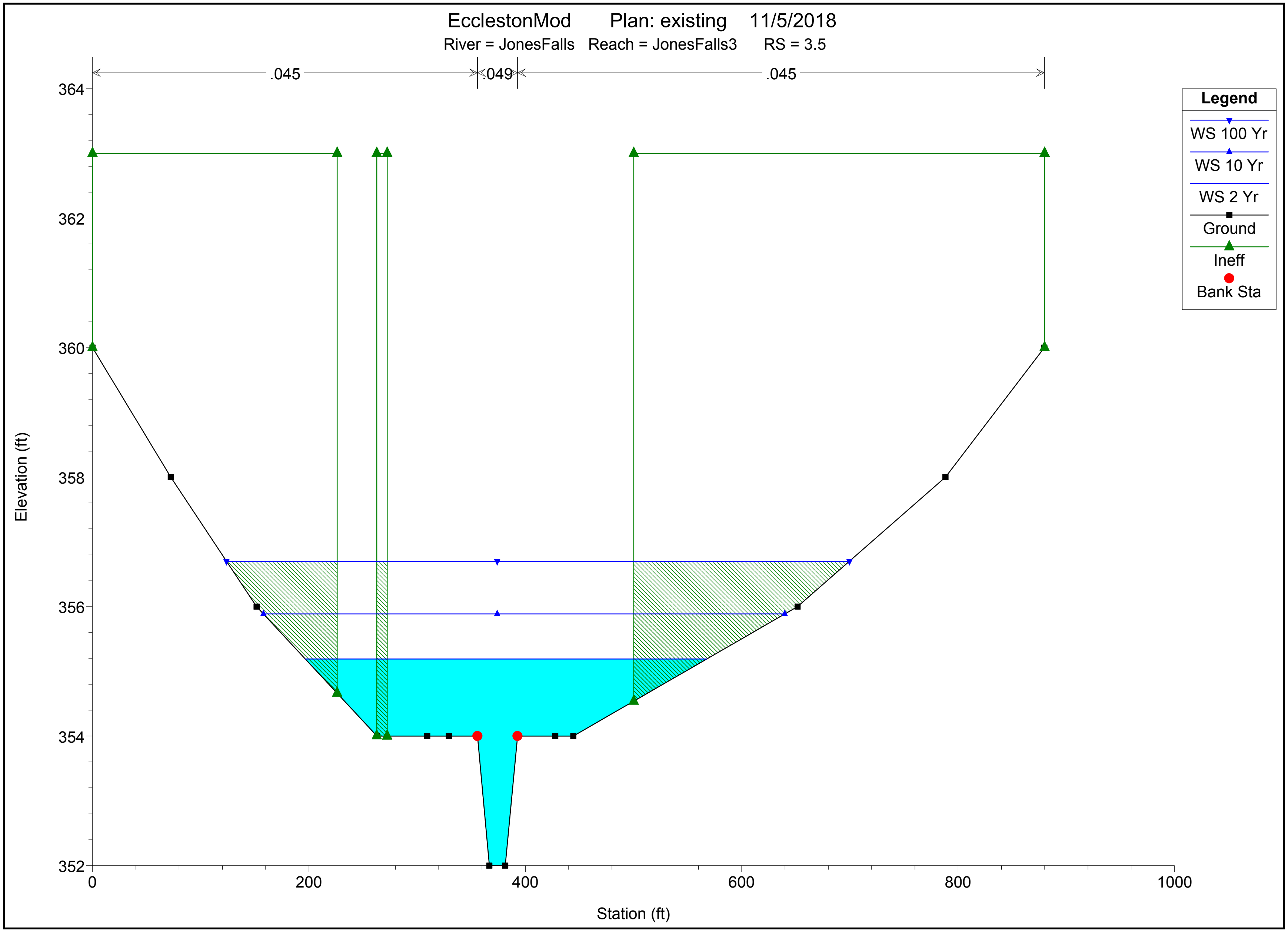


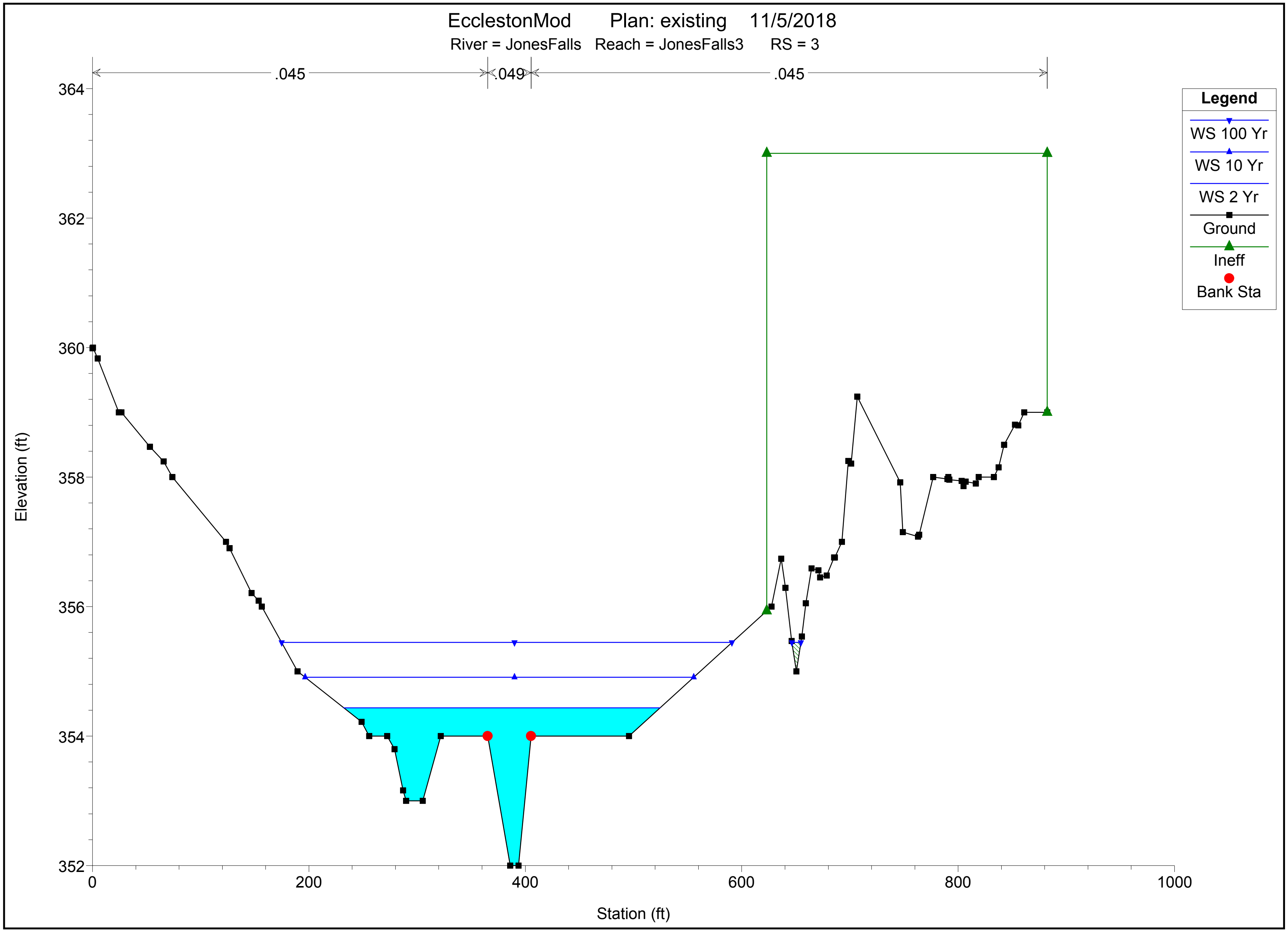
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 4.5 Culv Bridge over Jones Falls on Park Heights Ave.
.04
.11
.049
.11
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
368
366
364
362
360
358
356
354
352
350
0
200
400
600
800
1000


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 4.5 Culv Bridge over Jones Falls on Park Heights Ave.
.045
.045
.049
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
370
368
366
364
362
360
358
356
354
352
350
-200
0
200
400
600
800
1000
1200
Station (ft)

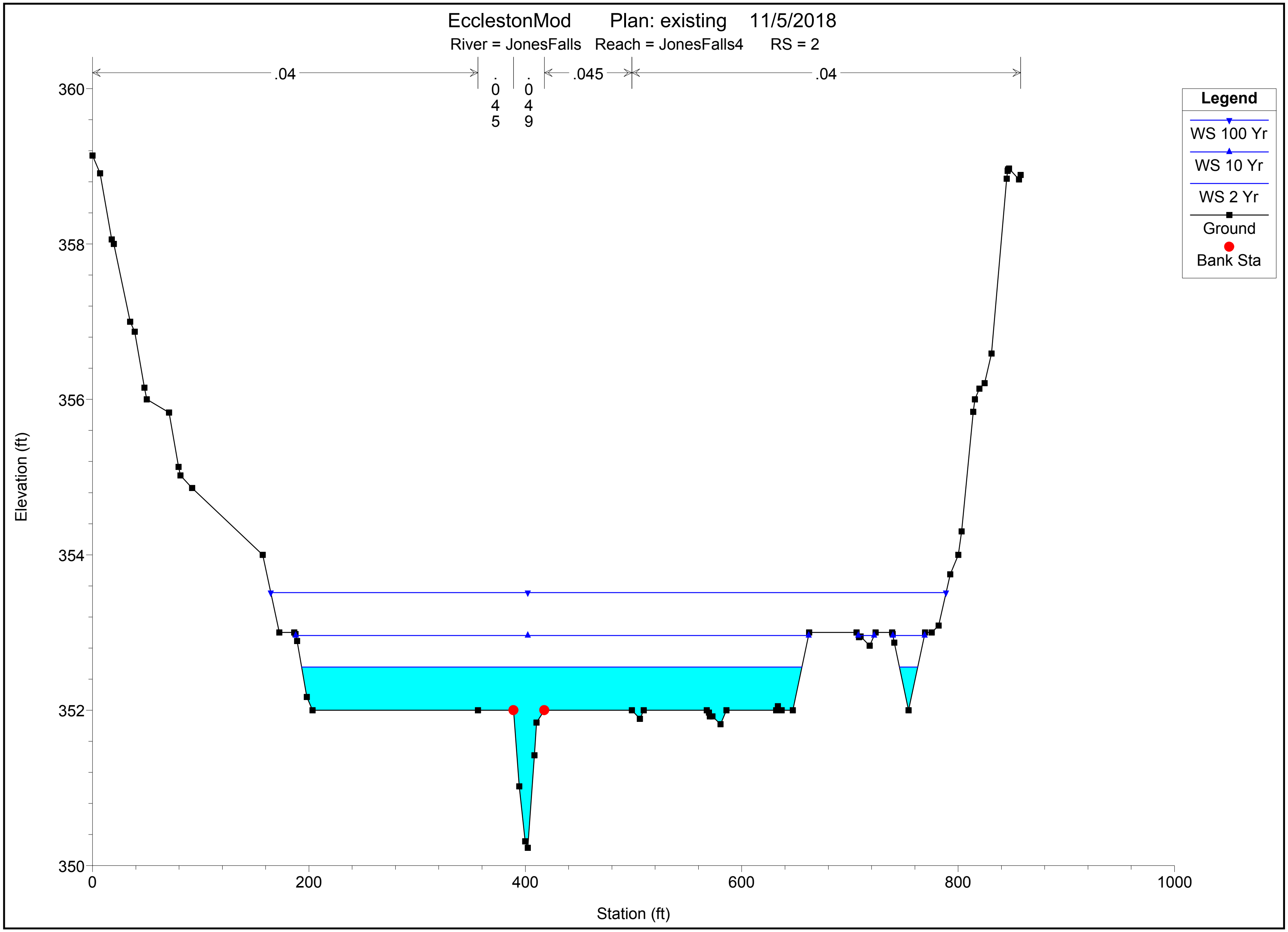


EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 4
.045
.045
.049
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
366
364
362
360
358
356
354
352
-200
0
200
400
600
800
1000
1200
Station (ft)

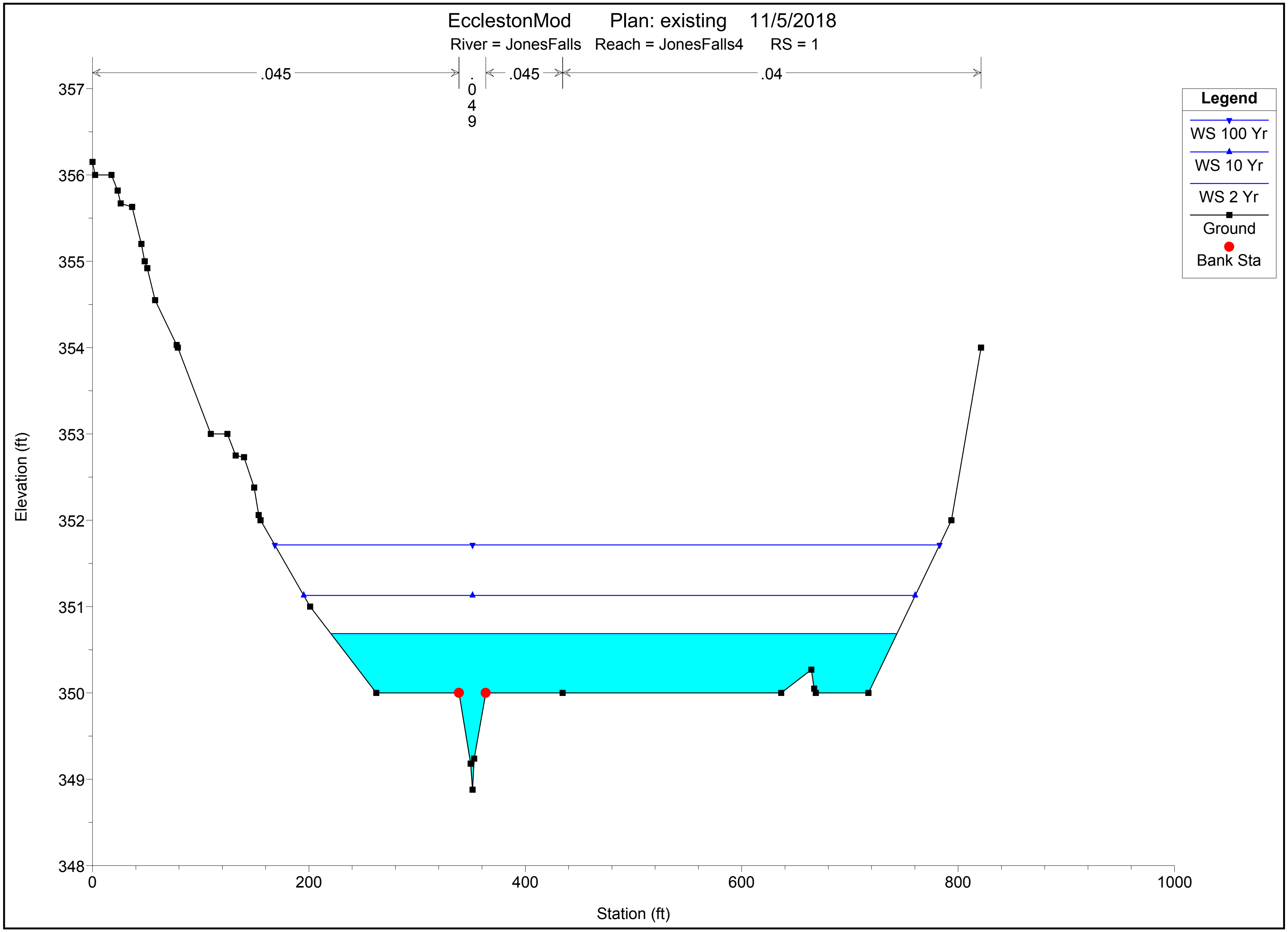

EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 3.5
.045
.049
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
364
362
360
358
356
354
352
0
200
400
600
800
1000
Station (ft)

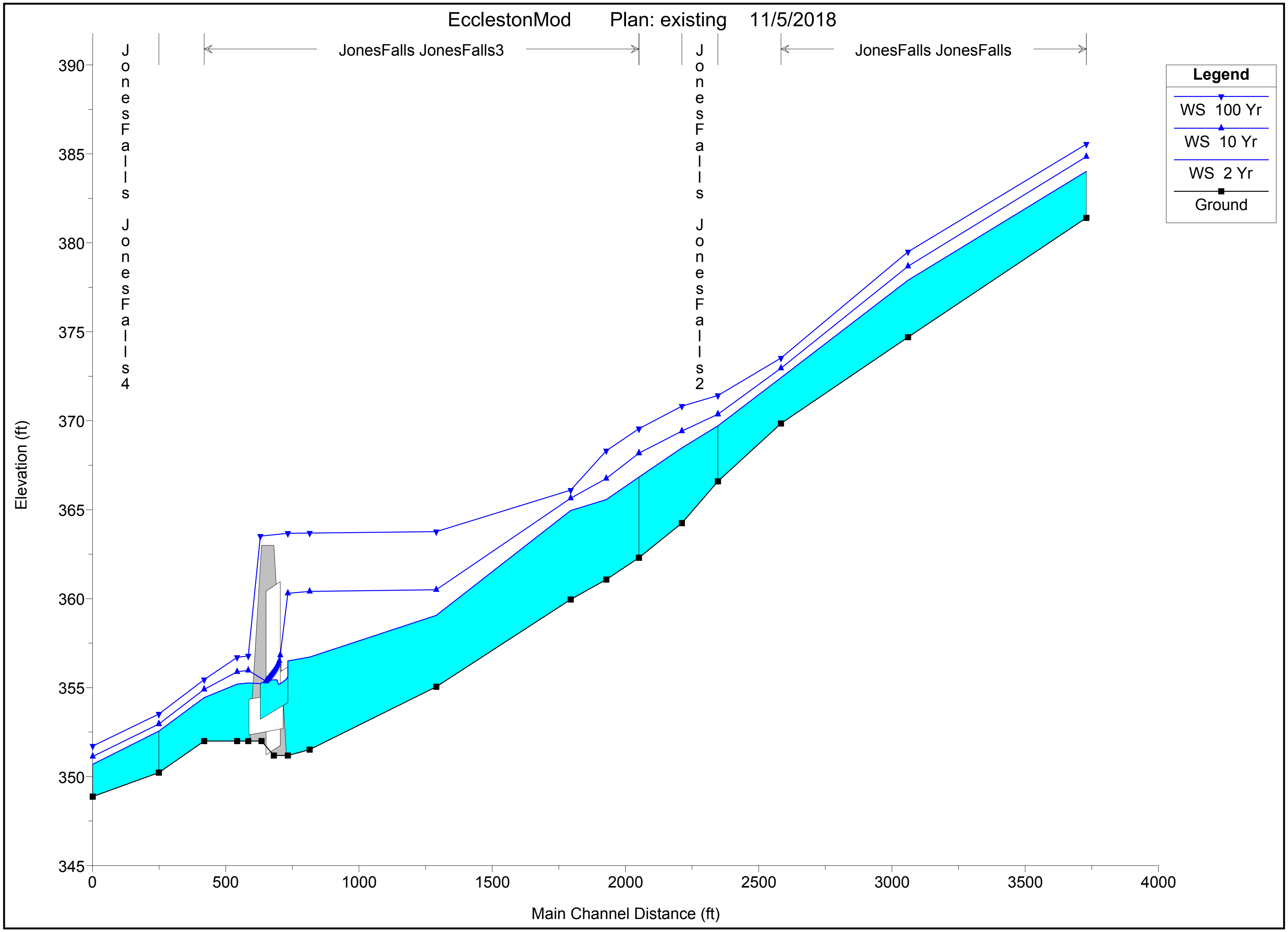


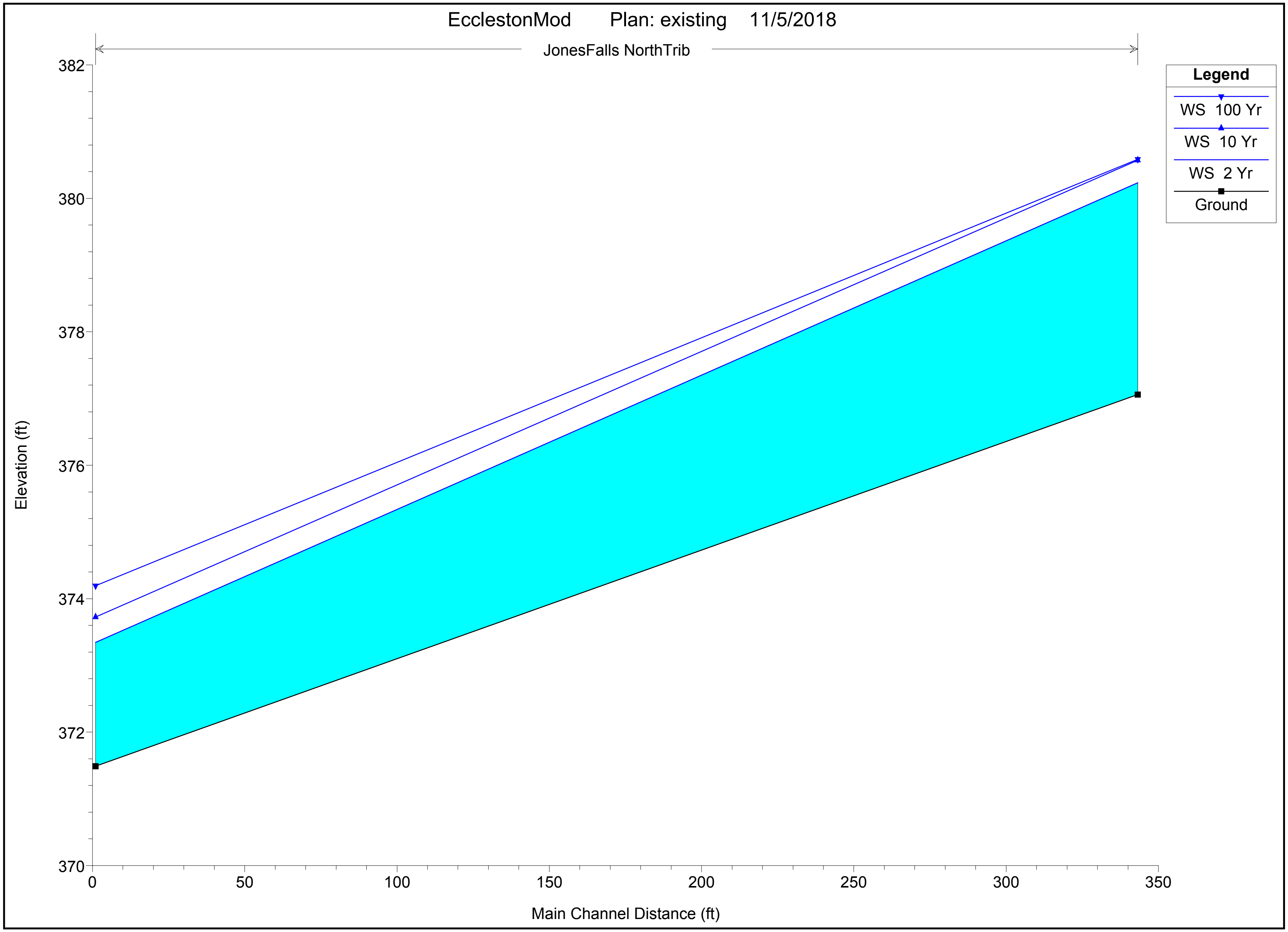
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls3 RS = 3
.045
.049
.045
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
364
362
360
358
356
354
352
0
200
400
600
800
1000



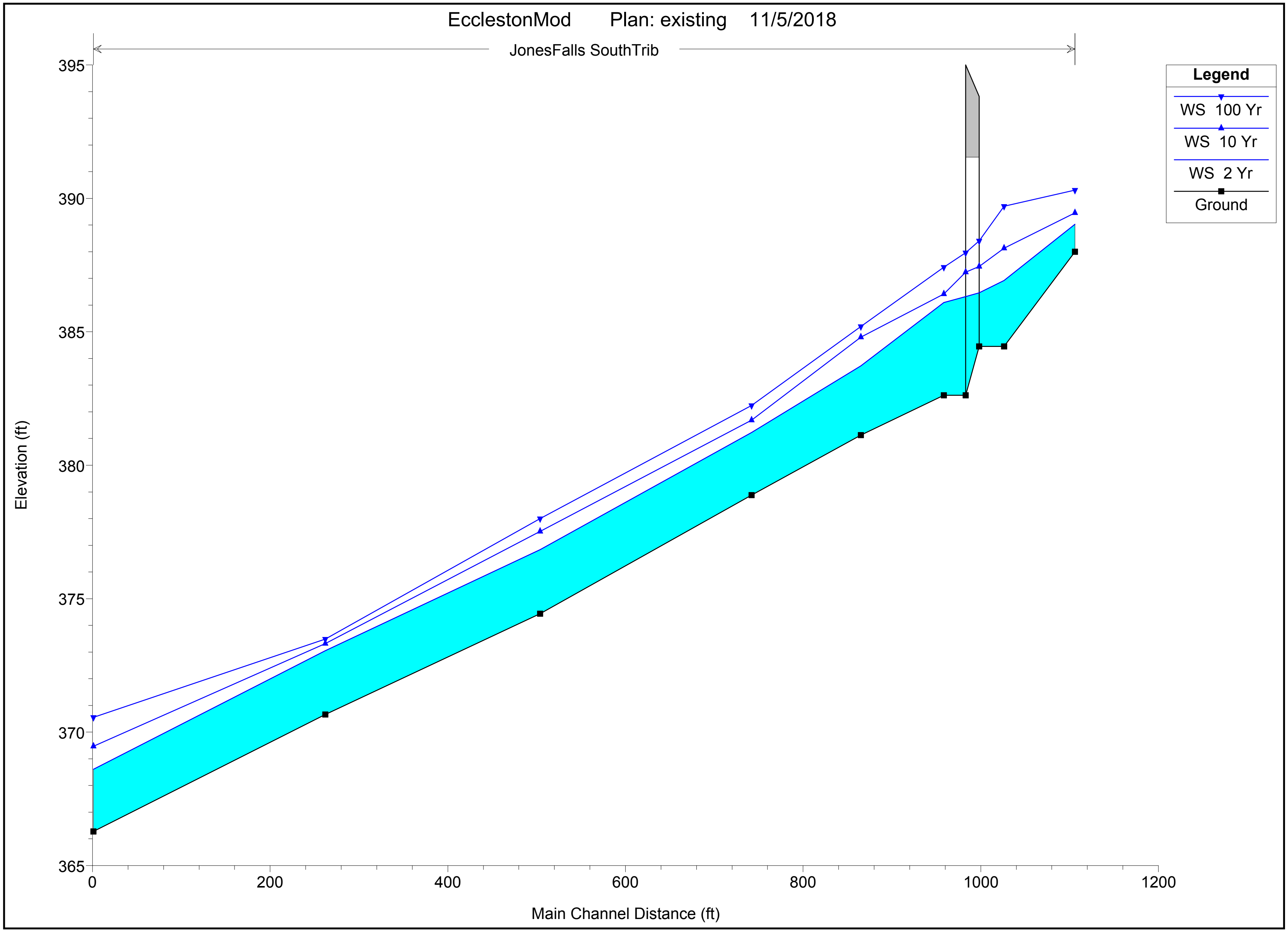
EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls4 RS = 2
.04
.045
.049
.045
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
360
358
356
354
352
350
0
200
400
600
800
1000

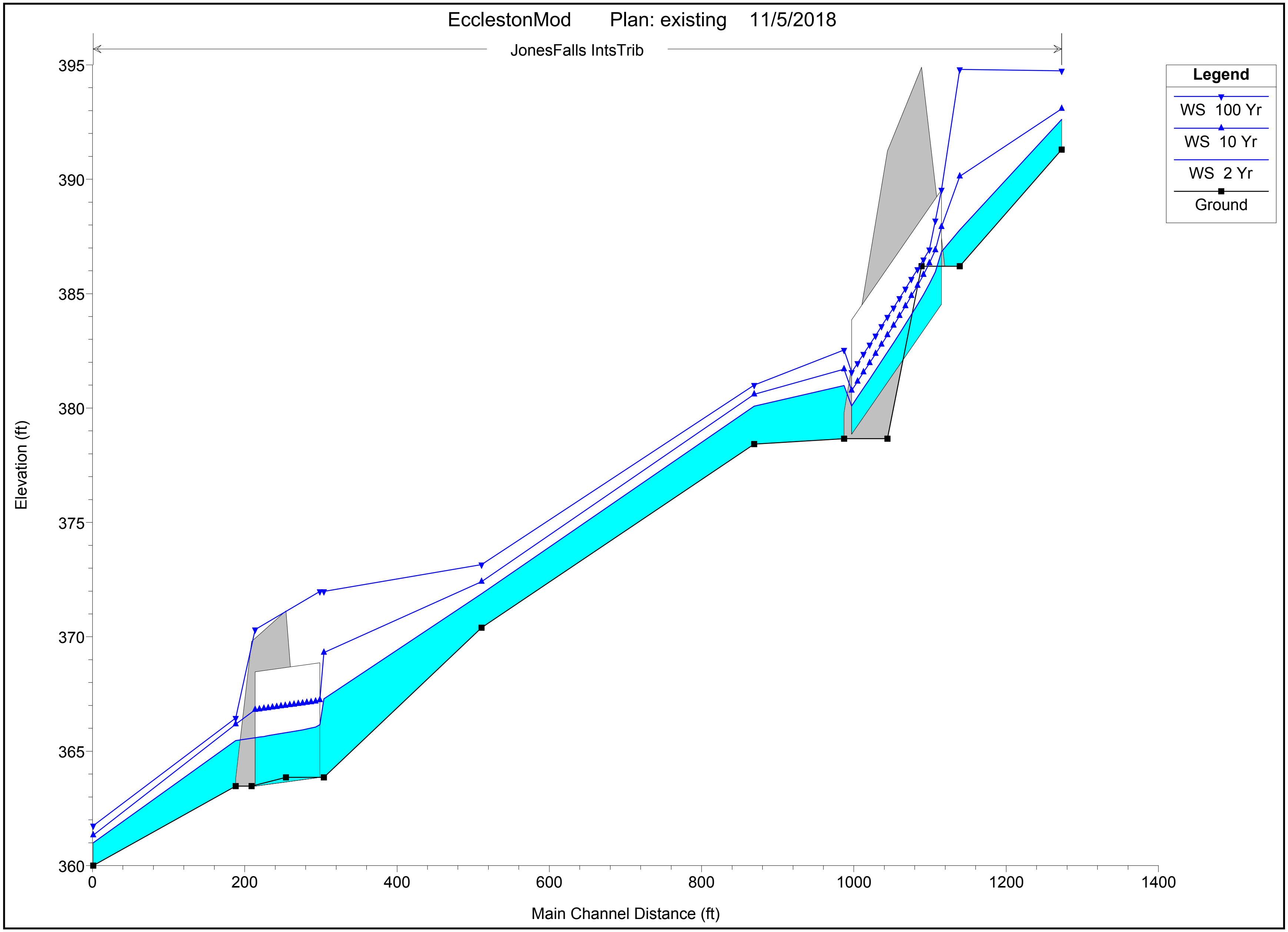

EcclestonMod Plan: existing 11/5/2018
River = JonesFalls Reach = JonesFalls4 RS = 1
.045
.049
.045
.04
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
357
356
355
354
353
352
351
350
349
348
0
200
400
600
800
1000
Station (ft)


EcclestonMod Plan: existing 11/5/2018
JonesFalls JonesFalls3
JonesFalls JonesFalls
JonesFalls JonesFalls4
JonesFalls JonesFalls2
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Elevation (ft)
390
385
380
375
370
365
360
355
350
345
0
500
1000
1500
2000
2500
3000
3500
4000
Main Channel Distance (ft)



EcclestonMod Plan: existing 11/5/2018
JonesFalls NorthTrib
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Elevation (ft)
382
380
378
376
374
372
370
0
50
100
150
200
250
300
350
Main Channel Distance (ft)


EcclestonMod Plan: existing 11/5/2018
JonesFalls SouthTrib
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Elevation (ft)
395
390
385
380
375
370
365
0
200
400
600
800
1000
1200
Main Channel Distance (ft)


EcclestonMod Plan: existing 11/5/2018
JonesFalls IntsTrib
Legend
WS 100 Yr
WS 10 Yr
WS 2 Yr
Ground
Elevation (ft)
Main Channel Distance (ft)
395
390
385
380
375
370
365
360
0
200
400
600
800
1000
1200
1400

HEC-RAS Plan: existing

Reach	River Sta	Profile	Q Total	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Flow Area	Top Width	Froude # Chl	Vel Total	Vel Chnl	Shear Total	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(sq ft)	(ft)		(ft/s)	(ft/s)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
JonesFalls	15	2 Yr	363.30	384.02	383.82	384.32	0.012619	119.71	126.26	0.66	3.03	5.62	0.74	1.67	0.57	0.67
JonesFalls	15	10 Yr	798.40	384.84	384.51	385.21	0.012592	243.79	329.25	0.69	3.27	6.89	1.09	2.27	0.93	1.08
JonesFalls	15	100 Yr	1593.40	385.55	385.28	385.89	0.013107	550.58	430.59	0.73	2.89	8.08	1.04	2.90	1.39	0.81
JonesFalls	14	2 Yr	363.30	377.89	377.63	378.08	0.007451	200.33	208.60	0.51	1.81	4.56	0.46	1.07	0.30	0.42
JonesFalls	14	10 Yr	798.40	378.68	378.14	378.90	0.007578	373.35	338.21	0.54	2.14	5.55	0.72	1.44	0.50	0.71
JonesFalls	14	100 Yr	1593.40	379.49	378.89	379.70	0.007232	722.67	411.93	0.55	2.20	6.29	0.79	1.72	0.56	0.82
JonesFalls	13	2 Yr	363.30	372.42	372.42	372.77	0.018113	105.01	141.06	0.77	3.46	5.48	0.84	1.76	0.59	0.28
JonesFalls	13	10 Yr	798.40	372.95	372.95	373.41	0.019186	187.68	174.09	0.83	4.25	6.84	1.29	2.49	1.05	0.44
JonesFalls	13	100 Yr	1593.40	373.52	373.52	374.15	0.021060	295.93	205.56	0.90	5.38	8.40	1.88	3.47	1.69	0.67
NorthTrib	2	2 Yr	175.50	380.23	379.88	380.55	0.015832	39.92	164.78	0.57	4.40	4.69	1.28	1.87		0.56
NorthTrib	2	10 Yr	459.70	380.57	380.57	380.63	0.002721	231.31	206.33	0.24	1.99	2.14	0.19	0.37	0.17	0.14
NorthTrib	2	100 Yr	1025.90	380.59	380.58	380.88	0.012940	234.70	206.66	0.53	4.37	4.68	0.91	1.77	0.84	0.68
NorthTrib	1	2 Yr	175.50	373.35	373.35	373.56	0.026426	51.70	114.70	0.69	3.39	4.21	0.73	1.81		0.46
NorthTrib	1	10 Yr	459.70	373.73	373.73	374.05	0.029422	103.17	157.67	0.76	4.46	5.22	1.19	2.57		0.94
NorthTrib	1	100 Yr	1025.90	374.19	374.19	374.66	0.026708	188.86	200.74	0.75	5.43	5.84	1.55	2.96	0.21	1.36
JonesFalls2	12	2 Yr	538.80	369.72	369.47	369.84	0.006215	253.00	311.32	0.46	2.13	3.89	0.31	0.81	0.28	0.16
JonesFalls2	12	10 Yr	1258.10	370.36		370.52	0.006097	466.75	345.10	0.48	2.70	4.58	0.51	1.02	0.50	0.29
JonesFalls2	12	100 Yr	2619.30	371.42		371.60	0.004519	869.13	419.90	0.44	3.01	4.87	0.58	1.04	0.61	0.36
JonesFalls2	11	2 Yr	538.80	368.48	368.48	368.85	0.011021	181.66	225.66	0.62	2.97	5.82	0.54	1.70	0.38	0.47
JonesFalls2	11	10 Yr	1258.10	369.41		369.72	0.008405	415.44	276.27	0.57	3.03	6.19	0.78	1.74	0.72	0.53
JonesFalls2	11	100 Yr	2619.30	370.81		371.06	0.005334	851.72	349.75	0.48	3.08	6.12	0.80	1.53	0.82	0.57
SouthTrib	8	2 Yr	151.70	389.03	389.03	389.33	0.056139	34.46	57.17	1.00	4.40	4.40	2.11	2.11		
SouthTrib	8	10 Yr	322.20	389.46	389.46	389.86	0.050145	63.03	76.80	0.99	5.11	5.11	2.57	2.57		
SouthTrib	8	100 Yr	622.10	390.30	389.94	390.59	0.017815	147.45	139.18	0.65	4.22	4.34	1.18	1.55	0.17	0.16
SouthTrib	7	2 Yr	151.70	386.87	385.94	387.02	0.006980	48.43	31.79	0.42	3.13	3.13	0.75	0.75		
SouthTrib	7	10 Yr	322.20	388.06	386.70	388.28	0.005926	86.65	42.03	0.41	3.72	3.73	0.91	0.94		0.11
SouthTrib	7	100 Yr	622.10	389.68	387.69	389.98	0.004211	143.36	51.53	0.38	4.34	4.36	1.06	1.09		0.50
SouthTrib	6.5		Bridge													
SouthTrib	6	2 Yr	151.70	385.93	384.86	386.15	0.008208	40.40	18.17	0.44	3.75	3.75	1.03	1.03		
SouthTrib	6	10 Yr	322.20	386.29	385.83	387.02	0.023740	47.15	19.08	0.76	6.83	6.83	3.28	3.29		
SouthTrib	6	100 Yr	622.10	387.35	387.35	388.31	0.021738	84.36	87.49	0.77	7.37	8.23	2.57	4.25	1.03	0.64
SouthTrib	5	2 Yr	151.70	383.73	383.66	384.49	0.044154	21.65	17.57	0.95	7.01	7.01	3.99	3.99		
SouthTrib	5	10 Yr	322.20	384.80	384.80	385.12	0.014240	84.71	107.82	0.58	3.80	5.45	0.68	2.06	0.46	0.48
SouthTrib	5	100 Yr	622.10	385.19	385.16	385.62	0.017061	129.68	118.42	0.66	4.80	6.54	1.14	2.83	0.90	0.83
SouthTrib	4	2 Yr	151.70	381.23	380.62	381.48	0.014222	37.81	33.61	0.58	4.01	4.01	1.30	1.30		
SouthTrib	4	10 Yr	322.20	381.69	381.61	382.18	0.021461	60.50	52.11	0.74	5.33	5.85	1.52	2.54	0.54	0.55
SouthTrib	4	100 Yr	622.10	382.24	382.23	383.00	0.025387	92.88	64.27	0.84	6.70	7.51	2.24	3.86	0.96	1.38
SouthTrib	3	2 Yr	151.70	376.84	376.84	377.27	0.022367	32.02	41.58	0.72	4.74	5.57	1.04	2.38	0.24	0.42
SouthTrib	3	10 Yr	322.20	377.52	377.52	377.87	0.015393	76.27	97.87	0.63	4.22	5.68	0.73	2.24	0.49	0.49
SouthTrib	3	100 Yr	622.10	378.00	377.92	378.41	0.014773	129.92	118.54	0.63	4.79	6.26	0.99	2.56	0.70	0.82

HEC-RAS Plan: existing (Continued)

Reach	River Sta	Profile	Q Total	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Flow Area	Top Width	Froude # Chl	Vel Total	Vel Chnl	Shear Total	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(sq ft)	(ft)		(ft/s)	(ft/s)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
SouthTrib	2	2 Yr	151.70	373.05		373.13	0.007095	72.19	112.33	0.40	2.10	2.85	0.28	0.66	0.24	0.03
SouthTrib	2	10 Yr	322.20	373.32		373.49	0.011655	106.10	141.52	0.53	3.04	4.06	0.54	1.26	0.52	0.16
SouthTrib	2	100 Yr	622.10	373.49	373.49	373.88	0.024403	132.22	167.00	0.78	4.70	6.24	1.20	2.89	1.22	0.41
SouthTrib	1	2 Yr	151.70	368.61	368.61	369.26	0.046497	23.56	20.08	1.00	6.44	6.45	3.27	3.56	0.05	
SouthTrib	1	10 Yr	322.20	369.47	369.47	369.77	0.017778	84.64	132.78	0.66	3.81	5.07	0.70	1.95	0.51	0.30
SouthTrib	1	100 Yr	622.10	370.55		370.64	0.002841	274.98	236.14	0.29	2.26	2.76	0.21	0.50	0.17	0.18
IntsTrib	8	2 Yr	66.30	392.61	392.61	392.96	0.035629	14.12	20.71	1.00	4.70	4.70	1.50	1.50		
IntsTrib	8	10 Yr	138.90	393.08	393.08	393.55	0.032574	25.30	27.44	1.01	5.49	5.49	1.86	1.86		
IntsTrib	8	100 Yr	261.20	394.74		394.86	0.002877	101.13	78.90	0.34	2.58	2.85	0.23	0.38	0.07	0.07
IntsTrib	7	2 Yr	66.30	387.79	387.79	388.31	0.030520	11.70	12.60	0.93	5.67	5.85	1.58	2.01		0.27
IntsTrib	7	10 Yr	138.90	390.12	388.53	390.17	0.001015	87.17	59.09	0.20	1.59	2.16	0.09	0.19	0.04	0.08
IntsTrib	7	100 Yr	261.20	394.81	389.18	394.81	0.000035	465.97	269.77	0.04	0.56	0.71	0.01	0.02	0.01	0.01
IntsTrib	6.5		Culvert													
IntsTrib	6	2 Yr	66.30	380.98	380.06	381.08	0.003314	26.97	18.43	0.35	2.46	2.48	0.30	0.32	0.08	0.02
IntsTrib	6	10 Yr	138.90	381.69	380.68	381.88	0.004116	40.14	21.50	0.41	3.46	3.53	0.51	0.57	0.26	0.11
IntsTrib	6	100 Yr	261.20	382.54	381.37	382.88	0.004894	56.99	25.14	0.47	4.58	4.74	0.80	0.93	0.55	0.24
IntsTrib	5	2 Yr	66.30	380.08	379.85	380.30	0.015759	17.59	19.28	0.70	3.77	3.77	0.88	0.88		
IntsTrib	5	10 Yr	138.90	380.60	380.36	380.96	0.016866	28.88	25.38	0.76	4.81	4.85	1.18	1.31	0.11	
IntsTrib	5	100 Yr	261.20	381.01	381.01	381.69	0.023771	40.67	54.47	0.94	6.42	6.69	1.80	2.31	0.43	
IntsTrib	4	2 Yr	66.30	371.88	371.88	372.27	0.034227	13.27	17.10	1.00	5.00	5.00	1.63	1.63		
IntsTrib	4	10 Yr	138.90	372.41	372.41	372.94	0.031022	23.67	22.23	1.00	5.87	5.87	2.03	2.03		
IntsTrib	4	100 Yr	261.20	373.15	373.15	373.70	0.019080	46.67	47.64	0.84	5.60	6.01	1.16	1.86	0.26	
IntsTrib	3	2 Yr	66.30	367.28	365.59	367.47	0.006169	19.11	6.16	0.35	3.47	3.47	0.62	0.62		
IntsTrib	3	10 Yr	138.90	369.31	366.65	369.49	0.003947	44.60	91.80	0.28	3.11	3.60	0.38	0.58	0.18	0.27
IntsTrib	3	100 Yr	261.20	371.98	368.80	371.99	0.000077	503.10	269.29	0.04	0.52	0.67	0.01	0.02	0.01	0.01
IntsTrib	2.5		Culvert													
IntsTrib	2	2 Yr	66.30	365.47	365.18	365.83	0.016488	14.88	17.64	0.68	4.46	5.00	0.78	1.36		0.24
IntsTrib	2	10 Yr	138.90	366.18	366.18	366.43	0.010415	45.61	96.30	0.57	3.05	4.82	0.39	1.15	0.06	0.27
IntsTrib	2	100 Yr	261.20	366.45	366.45	366.80	0.014253	65.61	100.67	0.67	3.98	6.08	0.75	1.76	0.19	0.61
IntsTrib	1	2 Yr	66.30	360.99	360.99	361.24	0.039364	16.55	33.41	1.00	4.01	4.01	1.21	1.21		
IntsTrib	1	10 Yr	138.90	361.33	361.33	361.69	0.031925	28.91	40.43	0.97	4.80	4.88	1.42	1.55		0.32
IntsTrib	1	100 Yr	261.20	361.74	361.74	362.23	0.027244	47.48	49.00	0.95	5.50	5.72	1.64	1.89		0.63
JonesFalls3	10	2 Yr	655.40	366.83	365.98	367.21	0.007744	191.94	176.92	0.54	3.41	5.24	0.59	1.33	0.36	0.21
JonesFalls3	10	10 Yr	1520.50	368.18	367.50	368.56	0.006274	523.99	263.19	0.52	2.90	6.07	0.77	1.57	0.74	0.50
JonesFalls3	10	100 Yr	3144.30	369.55	368.59	370.06	0.006843	904.91	293.43	0.57	3.47	7.63	1.30	2.27	1.33	0.98
JonesFalls3	9	2 Yr	655.40	365.57	364.46	366.14	0.009531	169.80	149.30	0.61	3.86	6.46	0.66	1.92	0.34	0.45
JonesFalls3	9	10 Yr	1520.50	366.76	366.61	367.53	0.011233	378.56	196.27	0.69	4.02	8.52	1.32	3.03	1.09	1.00
JonesFalls3	9	100 Yr	3144.30	368.31	367.88	369.06	0.009655	728.93	249.33	0.67	4.31	9.56	1.73	3.46	1.73	1.34

HEC-RAS Plan: existing (Continued)

Reach	River Sta	Profile	Q Total	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Flow Area	Top Width	Froude # Chl	Vel Total	Vel Chnl	Shear Total	Shear Chan	Shear LOB	Shear ROB
			(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(sq ft)	(ft)		(ft/s)	(ft/s)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
JonesFalls3	8	2 Yr	655.40	364.96	364.31	365.13	0.004963	284.78	165.06	0.43	2.30	4.74	0.53	1.03	0.52	0.19
JonesFalls3	8	10 Yr	1520.50	365.65	365.13	366.03	0.009597	406.13	183.18	0.62	3.74	7.39	1.31	2.35	1.37	0.59
JonesFalls3	8	100 Yr	3144.30	366.09	366.09	367.12	0.023572	489.32	193.98	0.98	6.43	12.34	3.66	6.35	3.92	1.79
JonesFalls3	7	2 Yr	655.40	359.06	359.06	360.22	0.026068	90.28	48.71	0.95	7.26	9.04	2.75	4.08	2.30	0.31
JonesFalls3	7	10 Yr	1520.50	360.51	360.51	361.01	0.010430	371.35	284.18	0.64	4.09	7.54	0.84	2.47	0.66	0.68
JonesFalls3	7	100 Yr	3144.30	363.77	361.16	363.85	0.000813	1440.05	361.39	0.20	2.18	3.07	0.20	0.34	0.17	0.20
JonesFalls3	6	2 Yr	655.40	356.72	355.74	356.81	0.001777	538.53	442.46	0.27	1.22	3.35	0.20	0.47	0.11	0.19
JonesFalls3	6	10 Yr	1520.50	360.40	356.50	360.42	0.000238	2276.50	598.93	0.11	0.67	1.79	0.07	0.11	0.05	0.08
JonesFalls3	6	100 Yr	3144.30	363.68	357.34	363.69	0.000150	4850.53	697.26	0.09	0.65	1.76	0.06	0.10	0.06	0.07
JonesFalls3	5	2 Yr	655.40	356.51	354.52	356.63	0.002172	292.83	399.72	0.29	2.24	3.00	0.30	0.43	0.07	0.22
JonesFalls3	5	10 Yr	1520.50	360.30	356.04	360.37	0.000743	881.31	619.46	0.16	1.73	2.48	0.26	0.31	0.19	0.25
JonesFalls3	5	100 Yr	3144.30	363.67	357.39	363.68	0.000123	5015.79	756.66	0.07	0.63	1.25	0.05	0.08	0.05	0.05
JonesFalls3	4.5		Culvert													
JonesFalls3	4	2 Yr	655.40	355.26	354.43	355.37	0.002391	281.42	380.61	0.34	2.33	3.19	0.22	0.41	0.09	0.22
JonesFalls3	4	10 Yr	1520.50	355.97	355.00	356.22	0.004092	415.44	538.37	0.46	3.66	4.84	0.56	0.89	0.34	0.55
JonesFalls3	4	100 Yr	3144.30	356.78	356.02	357.31	0.006518	569.52	612.62	0.60	5.52	7.02	1.21	1.74	0.87	1.21
JonesFalls3	3.5	2 Yr	655.40	355.19	354.61	355.26	0.002228	339.79	371.32	0.29	1.93	2.68	0.18	0.36	0.15	0.15
JonesFalls3	3.5	10 Yr	1520.50	355.89	355.06	356.03	0.003061	523.45	481.97	0.36	2.90	3.68	0.38	0.62	0.34	0.33
JonesFalls3	3.5	100 Yr	3144.30	356.70	355.65	356.99	0.004257	738.97	575.75	0.44	4.26	5.03	0.74	1.08	0.69	0.68
JonesFalls3	3	2 Yr	655.40	354.44	353.99	354.68	0.014080	194.01	292.32	0.68	3.38	4.95	0.58	1.42	0.55	0.34
JonesFalls3	3	10 Yr	1520.50	354.91	354.84	355.27	0.016323	348.16	359.27	0.77	4.37	6.32	0.99	2.13	0.93	0.74
JonesFalls3	3	100 Yr	3144.30	355.45	355.39	356.00	0.018691	556.75	424.49	0.85	5.65	7.88	1.56	3.05	1.54	1.25
JonesFalls4	2	2 Yr	721.70	352.56	352.42	352.67	0.009853	281.96	479.35	0.55	2.56	3.66	0.36	0.82	0.34	0.33
JonesFalls4	2	10 Yr	1659.40	352.96		353.15	0.009669	481.49	517.87	0.57	3.45	4.31	0.56	1.05	0.56	0.51
JonesFalls4	2	100 Yr	3405.50	353.51		353.79	0.009184	819.00	624.06	0.58	4.16	5.04	0.75	1.31	0.79	0.69
JonesFalls4	1	2 Yr	721.70	350.69	350.42	350.76	0.006131	342.99	523.08	0.43	2.10	2.61	0.25	0.44	0.22	0.25
JonesFalls4	1	10 Yr	1659.40	351.13	350.72	351.26	0.006135	583.50	565.06	0.45	2.84	3.24	0.40	0.61	0.33	0.40
JonesFalls4	1	100 Yr	3405.50	351.71	351.13	351.93	0.006131	929.09	614.41	0.48	3.67	3.99	0.58	0.83	0.49	0.60

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX   XXXX        XXXX       XX      XXXX
X     X  X       X    X       X   X     X  X    X
X     X  X       X            X   X    X    X   X
XXXXXXX  XXXX    X      XXX   XXXX     XXXXXX    XXXX
X     X  X       X            X  X     X    X        X
X     X  X       X    X       X   X    X    X        X
X     X  XXXXXX   XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: EcclestonMod
Project File : EcclestonMod.prj
Run Date and Time: 11/8/2018 1:15:52 PM

Project in English units

PLAN DATA

Plan Title: existing
Plan File : q:\2017\1710977_001_Eccleston_Mitigation\Working Data\Model\EcclestonMod.p01

Geometry Title: ExistGeoECC
Geometry File : q:\2017\1710977_001_Eccleston_Mitigation\Working Data\Model\EcclestonMod.g05

Flow Title   : EccNormalDepth_ULT
Flow File   : q:\2017\1710977_001_Eccleston_Mitigation\Working Data\Model\EcclestonMod.f01

Plan Summary Information:

Number of:	Cross Sections	= 34	Multiple Openings	=	0
	Culverts	= 3	Inline Structures	=	0
	Bridges	= 1	Lateral Structures	=	0

Computational Information
- Water surface calculation tolerance = 0.01
- Critical depth calculation tolerance = 0.01
- Maximum number of iterations = 20
- Maximum difference tolerance = 0.3
- Flow tolerance factor = 0.001

Computation Options
- Critical depth computed only where necessary
- Conveyance Calculation Method: At breaks in n values only
- Friction Slope Method: Average Conveyance
- Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: EccNormalDepth_ULT
Flow File : q:\2017\1710977_001_Eccleston_Mitigation\Working Data\Model\EcclestonMod.f01

Flow Data (cfs)

River	Reach	RS	2 Yr	10 Yr	100 Yr
JonesFalls	JonesFalls	15	363.3	798.4	1593.4
JonesFalls	NorthTrib	2	175.5	459.7	1025.9
JonesFalls	JonesFalls2	12	538.8	1258.1	2619.3
JonesFalls	SouthTrib	8	151.7	322.2	622.1
JonesFalls	IntsTrib	8	66.3	138.9	261.2
JonesFalls	JonesFalls3	10	655.4	1520.5	3144.3
JonesFalls	JonesFalls4	2	721.7	1659.4	3405.5

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
JonesFalls	JonesFalls4	2 Yr		Normal S = 0.00613
JonesFalls	JonesFalls4	10 Yr		Normal S = 0.00613
JonesFalls	JonesFalls4	100 Yr		Normal S = 0.00613

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls RS: 15

CROSS SECTION OUTPUT Profile #2 Yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	384.32				
Vel Head (ft)	0.30	Wt. n-Val.	0.110	0.049	0.055
W.S. Elev (ft)	384.02	Reach Len. (ft)	728.00	669.00	602.00
Crit W.S. (ft)	383.82	Flow Area (sq ft)	49.25	32.54	37.93
E.G. Slope (ft/ft)	0.012619	Area (sq ft)	49.25	32.54	

```
  37.93
  Q Total (cfs)              363.30    Flow (cfs)                 60.18      182.79
 120.33
  Top Width (ft)             126.26    Top Width (ft)             68.13       14.39
 43.73
  Vel Total (ft/s)             3.03    Avg. Vel. (ft/s)            1.22        5.62
   3.17
  Max Chl Dpth (ft)            2.62    Hydr. Depth (ft)            0.72        2.26
   0.87
  Conv. Total (cfs)          3234.1    Conv. (cfs)                535.7      1627.2
 1071.1
  Length Wtd. (ft)           651.71    Wetted Per. (ft)           68.16       15.36
 44.28
  Min Ch El (ft)             381.40    Shear (lb/sq ft)            0.57        1.67
   0.67
  Alpha                        2.11    Stream Power (lb/ft s)    456.22        0.00
   0.00
  Frctn Loss (ft)              6.21    Cum Volume (acre-ft)        1.76        1.36
   1.92
  C & E Loss (ft)              0.04    Cum SA (acres)              1.74        0.51
   2.17
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

```
  E.G. Elev (ft)             385.21    Element                  Left OB    Channel
Right OB
  Vel Head (ft)                0.37    Wt. n-Val.                 0.110       0.049
  0.061
  W.S. Elev (ft)             384.84    Reach Len. (ft)           728.00      669.00
 602.00
  Crit W.S. (ft)             384.51    Flow Area (sq ft)         120.25       44.30
  79.24
  E.G. Slope (ft/ft)       0.012592    Area (sq ft)              120.25       44.30
 112.84
  Q Total (cfs)              798.40    Flow (cfs)                203.44      305.47
 289.49
  Top Width (ft)             329.25    Top Width (ft)            101.82       14.39
 213.04
  Vel Total (ft/s)             3.27    Avg. Vel. (ft/s)            1.69        6.89
   3.65
  Max Chl Dpth (ft)            3.44    Hydr. Depth (ft)            1.18        3.08
   1.38
  Conv. Total (cfs)          7115.1    Conv. (cfs)               1813.0      2722.2
 2579.9
  Length Wtd. (ft)           651.23    Wetted Per. (ft)          101.98       15.36
 57.86
  Min Ch El (ft)             381.40    Shear (lb/sq ft)            0.93        2.27
   1.08
  Alpha                        2.22    Stream Power (lb/ft s)    456.22        0.00
   0.00
  Frctn Loss (ft)              6.26    Cum Volume (acre-ft)        3.84        1.81
   4.54
  C & E Loss (ft)              0.05    Cum SA (acres)              2.43        0.51
   4.75
```

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	385.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.34	Wt. n-Val.	0.110	0.049	0.078
W.S. Elev (ft)	385.55	Reach Len. (ft)	728.00	669.00	602.00
Crit W.S. (ft)	385.28	Flow Area (sq ft)	198.04	54.51	298.04
E.G. Slope (ft/ft)	0.013107	Area (sq ft)	198.04	54.51	298.04
Q Total (cfs)	1593.40	Flow (cfs)	436.48	440.22	716.70
Top Width (ft)	430.59	Top Width (ft)	116.23	14.39	299.98
Vel Total (ft/s)	2.89	Avg. Vel. (ft/s)	2.20	8.08	2.40
Max Chl Dpth (ft)	4.15	Hydr. Depth (ft)	1.70	3.79	0.99
Conv. Total (cfs)	13918.1	Conv. (cfs)	3812.6	3845.3	6260.2
Length Wtd. (ft)	645.39	Wetted Per. (ft)	116.40	15.36	300.68
Min Ch El (ft)	381.40	Shear (lb/sq ft)	1.39	2.90	0.81
Alpha	2.62	Stream Power (lb/ft s)	456.22	0.00	0.00
Frctn Loss (ft)	6.15	Cum Volume (acre-ft)	7.08	2.29	8.77
C & E Loss (ft)	0.04	Cum SA (acres)	3.43	0.51	5.63

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls RS: 14

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	378.08	Element	Left OB	Channel

Right OB
 Vel Head (ft)   0.18   Wt. n-Val.   0.110   0.049
 0.110
 W.S. Elev (ft)   377.89   Reach Len. (ft)   479.00   477.00
 479.00
 Crit W.S. (ft)   377.63   Flow Area (sq ft)   27.13   43.46
 129.74
 E.G. Slope (ft/ft)   0.007451   Area (sq ft)   27.13   43.46
 130.95
 Q Total (cfs)   363.30   Flow (cfs)   23.85   198.33
 141.12
 Top Width (ft)   208.60   Top Width (ft)   41.30   17.76
 149.54
 Vel Total (ft/s)   1.81   Avg. Vel. (ft/s)   0.88   4.56
 1.09
 Max Chl Dpth (ft)   3.19   Hydr. Depth (ft)   0.66   2.45
 0.90
 Conv. Total (cfs)   4208.7   Conv. (cfs)   276.3   2297.6
 1634.9
 Length Wtd. (ft)   477.74   Wetted Per. (ft)   41.43   18.88
 144.01
 Min Ch El (ft)   374.70   Shear (lb/sq ft)   0.30   1.07
 0.42
 Alpha   3.61   Stream Power (lb/ft s)   568.17   0.00
 0.00
 Frctn Loss (ft)   5.29   Cum Volume (acre-ft)   1.12   0.78
 0.76
 C & E Loss (ft)   0.02   Cum SA (acres)   0.83   0.26
 0.83

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

 E.G. Elev (ft)   378.90   Element   Left OB   Channel
Right OB
 Vel Head (ft)   0.21   Wt. n-Val.   0.110   0.049
 0.110
 W.S. Elev (ft)   378.68   Reach Len. (ft)   479.00   477.00
 479.00
 Crit W.S. (ft)   378.14   Flow Area (sq ft)   62.59   57.55
 253.21
 E.G. Slope (ft/ft)   0.007578   Area (sq ft)   62.59   57.55
 293.01
 Q Total (cfs)   798.40   Flow (cfs)   88.20   319.43
 390.77
 Top Width (ft)   338.21   Top Width (ft)   58.57   17.76
 261.89
 Vel Total (ft/s)   2.14   Avg. Vel. (ft/s)   1.41   5.55
 1.54
 Max Chl Dpth (ft)   3.98   Hydr. Depth (ft)   1.07   3.24
 1.51

```
  Conv. Total (cfs)          9171.8    Conv. (cfs)               1013.2     3669.5
 4489.1
  Length Wtd. (ft)           478.06    Wetted Per. (ft)           58.76      18.88
 168.42
  Min Ch El (ft)             374.70    Shear (lb/sq ft)            0.50       1.44
   0.71
  Alpha                        3.00    Stream Power (lb/ft s)    568.17       0.00
   0.00
  Frctn Loss (ft)              5.46    Cum Volume (acre-ft)        2.31       1.03
   1.74
  C & E Loss (ft)              0.02    Cum SA (acres)              1.09       0.26
   1.47
```

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
         need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 Yr

```
  E.G. Elev (ft)             379.70    Element                   Left OB    Channel
Right OB
  Vel Head (ft)                0.21    Wt. n-Val.                 0.110      0.049
  0.103
  W.S. Elev (ft)             379.49    Reach Len. (ft)           479.00     477.00
 479.00
  Crit W.S. (ft)             378.89    Flow Area (sq ft)         140.81      71.87
 509.99
  E.G. Slope (ft/ft)       0.007232    Area (sq ft)              140.81      71.87
 509.99
  Q Total (cfs)             1593.40    Flow (cfs)                186.60     451.94
 954.86
  Top Width (ft)             411.93    Top Width (ft)            113.40      17.76
 280.78
  Vel Total (ft/s)             2.20    Avg. Vel. (ft/s)            1.33       6.29
   1.87
  Max Chl Dpth (ft)            4.79    Hydr. Depth (ft)            1.24       4.05
   1.82
  Conv. Total (cfs)         18736.9    Conv. (cfs)               2194.3     5314.4
11228.2
  Length Wtd. (ft)           478.29    Wetted Per. (ft)          113.64      18.88
 281.31
  Min Ch El (ft)             374.70    Shear (lb/sq ft)            0.56       1.72
   0.82
  Alpha                        2.78    Stream Power (lb/ft s)    568.17       0.00
   0.00
  Frctn Loss (ft)              5.50    Cum Volume (acre-ft)        4.25       1.32
   3.19
  C & E Loss (ft)              0.04    Cum SA (acres)              1.51       0.26
   1.62
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls RS: 13

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	372.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.35	Wt. n-Val.	0.076	0.049	0.040
W.S. Elev (ft)	372.42	Reach Len. (ft)	236.77	236.77	236.77
Crit W.S. (ft)	372.42	Flow Area (sq ft)	57.07	47.53	0.41
E.G. Slope (ft/ft)	0.018113	Area (sq ft)	57.07	47.53	0.41
Q Total (cfs)	363.30	Flow (cfs)	102.13	260.36	0.81
Top Width (ft)	141.06	Top Width (ft)	109.47	30.01	1.58
Vel Total (ft/s)	3.46	Avg. Vel. (ft/s)	1.79	5.48	1.97
Max Chl Dpth (ft)	2.58	Hydr. Depth (ft)	0.52	1.58	0.26
Conv. Total (cfs)	2699.4	Conv. (cfs)	758.8	1934.5	6.0
Length Wtd. (ft)	236.77	Wetted Per. (ft)	109.48	30.56	1.67
Min Ch El (ft)	369.84	Shear (lb/sq ft)	0.59	1.76	0.28
Alpha	1.87	Stream Power (lb/ft s)	433.72	0.00	0.00
Frctn Loss (ft)	2.12	Cum Volume (acre-ft)	0.66	0.28	0.03
C & E Loss (ft)	0.07	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	373.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.068	0.049	0.040
W.S. Elev (ft)	372.95	Reach Len. (ft)	236.77	236.77	236.77
Crit W.S. (ft)	372.95	Flow Area (sq ft)	122.32	63.46	1.91
E.G. Slope (ft/ft)	0.019186	Area (sq ft)	122.32	63.46	1.91
Q Total (cfs)	798.40	Flow (cfs)	359.58	433.79	5.03
Top Width (ft)	174.09	Top Width (ft)	139.00	30.01	5.08
Vel Total (ft/s)	4.25	Avg. Vel. (ft/s)	2.94	6.84	2.63
Max Chl Dpth (ft)	3.11	Hydr. Depth (ft)	0.88	2.11	0.38
Conv. Total (cfs)	5764.0	Conv. (cfs)	2596.0	3131.7	36.3
Length Wtd. (ft)	236.77	Wetted Per. (ft)	139.02	30.56	5.22
Min Ch El (ft)	369.84	Shear (lb/sq ft)	1.05	2.49	0.44
Alpha	1.62	Stream Power (lb/ft s)	433.72	0.00	0.00
Frctn Loss (ft)	2.09	Cum Volume (acre-ft)	1.29	0.37	0.12
C & E Loss (ft)	0.09	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	374.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.63	Wt. n-Val.	0.062	0.049	0.040
W.S. Elev (ft)	373.52	Reach Len. (ft)	236.77	236.77	236.77
Crit W.S. (ft)	373.52	Flow Area (sq ft)	208.27	80.64	7.02
E.G. Slope (ft/ft)	0.021060	Area (sq ft)	208.27	80.64	7.02
Q Total (cfs)	1593.40	Flow (cfs)	889.28	677.53	26.59
Top Width (ft)	205.56	Top Width (ft)	161.96	30.01	13.59
Vel Total (ft/s)	5.38	Avg. Vel. (ft/s)	4.27	8.40	

```
   3.79
  Max Chl Dpth (ft)             3.68    Hydr. Depth (ft)          1.29       2.69
   0.52
  Conv. Total (cfs)          10979.8    Conv. (cfs)             6127.8     4668.7
  183.2
  Length Wtd. (ft)            236.77    Wetted Per. (ft)        161.99      30.56
  13.87
  Min Ch El (ft)              369.84    Shear (lb/sq ft)          1.69       3.47
   0.67
  Alpha                         1.39    Stream Power (lb/ft s)  433.72       0.00
   0.00
  Frctn Loss (ft)               1.68    Cum Volume (acre-ft)      2.33       0.49
   0.34
  C & E Loss (ft)               0.13    Cum SA (acres)
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: JonesFalls
REACH: NorthTrib   RS: 2

CROSS SECTION OUTPUT Profile #2 Yr

```
  E.G. Elev (ft)              380.55    Element                 Left OB    Channel
Right OB
  Vel Head (ft)                 0.32    Wt. n-Val.                          0.061
  0.040
  W.S. Elev (ft)              380.23    Reach Len. (ft)         337.47     342.24
 354.84
  Crit W.S. (ft)              379.88    Flow Area (sq ft)                   32.25
   7.67
  E.G. Slope (ft/ft)        0.015832    Area (sq ft)            129.10      32.25
   7.67
  Q Total (cfs)               175.50    Flow (cfs)                         151.07
  24.43
  Top Width (ft)              164.78    Top Width (ft)          135.97      15.26
  13.54
  Vel Total (ft/s)              4.40    Avg. Vel. (ft/s)                     4.69
   3.18
  Max Chl Dpth (ft)             3.17    Hydr. Depth (ft)                     2.11
   0.57
  Conv. Total (cfs)           1394.8    Conv. (cfs)                        1200.6
  194.1
  Length Wtd. (ft)            345.55    Wetted Per. (ft)                    17.06
  13.64
```

```
  Min Ch El (ft)            377.06    Shear (lb/sq ft)                        1.87
   0.56
  Alpha                       1.05    Stream Power (lb/ft s)    343.62        0.00
   0.00
  Frctn Loss (ft)             6.95    Cum Volume (acre-ft)        1.01        0.45
   0.24
  C & E Loss (ft)             0.03    Cum SA (acres)              0.53        0.15
   0.43
```

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
         need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

```
  E.G. Elev (ft)            380.63    Element                   Left OB    Channel
Right OB
  Vel Head (ft)               0.06    Wt. n-Val.                 0.040      0.061
   0.040
  W.S. Elev (ft)            380.57    Reach Len. (ft)           337.47     342.24
 354.84
  Crit W.S. (ft)            380.57    Flow Area (sq ft)         181.46      37.41
  12.44
  E.G. Slope (ft/ft)      0.002721    Area (sq ft)              181.46      37.41
  12.44
  Q Total (cfs)             459.70    Flow (cfs)                358.48      79.87
  21.35
  Top Width (ft)            206.33    Top Width (ft)            176.21      15.33
  14.79
  Vel Total (ft/s)            1.99    Avg. Vel. (ft/s)            1.98       2.14
   1.72
  Max Chl Dpth (ft)           3.51    Hydr. Depth (ft)            1.03       2.44
   0.84
  Conv. Total (cfs)         8812.6    Conv. (cfs)               6872.2     1531.2
  409.2
  Length Wtd. (ft)          344.52    Wetted Per. (ft)          176.29      17.17
  14.94
  Min Ch El (ft)            377.06    Shear (lb/sq ft)            0.17       0.37
   0.14
  Alpha                       1.01    Stream Power (lb/ft s)    343.62       0.00
   0.00
  Frctn Loss (ft)             2.20    Cum Volume (acre-ft)        1.67       0.57
   0.63
  C & E Loss (ft)             0.03    Cum SA (acres)              0.68       0.15
   0.61
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
         need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	380.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.30	Wt. n-Val.	0.040	0.061	0.040
W.S. Elev (ft)	380.59	Reach Len. (ft)	337.47	342.24	354.84
Crit W.S. (ft)	380.58	Flow Area (sq ft)	184.36	37.66	12.69
E.G. Slope (ft/ft)	0.012940	Area (sq ft)	184.36	37.66	12.69
Q Total (cfs)	1025.90	Flow (cfs)	801.82	176.13	47.94
Top Width (ft)	206.66	Top Width (ft)	176.48	15.33	14.86
Vel Total (ft/s)	4.37	Avg. Vel. (ft/s)	4.35	4.68	3.78
Max Chl Dpth (ft)	3.53	Hydr. Depth (ft)	1.04	2.46	0.85
Conv. Total (cfs)	9018.7	Conv. (cfs)	7048.8	1548.4	421.5
Length Wtd. (ft)	345.34	Wetted Per. (ft)	176.55	17.17	15.00
Min Ch El (ft)	377.06	Shear (lb/sq ft)	0.84	1.77	0.68
Alpha	1.01	Stream Power (lb/ft s)	343.62	0.00	0.00
Frctn Loss (ft)	6.21	Cum Volume (acre-ft)	2.50	0.72	1.36
C & E Loss (ft)	0.02	Cum SA (acres)	0.69	0.15	0.77

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: JonesFalls
REACH: NorthTrib RS: 1

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	373.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.		0.061	0.040

```
  W.S. Elev (ft)            373.35    Reach Len. (ft)           238.81     238.81
 238.81
  Crit W.S. (ft)            373.35    Flow Area (sq ft)                     25.59
  26.11
  E.G. Slope (ft/ft)      0.026426    Area (sq ft)                          25.59
  26.11
  Q Total (cfs)             175.50    Flow (cfs)                           107.79
  67.71
  Top Width (ft)            114.70    Top Width (ft)                        22.30
  92.40
  Vel Total (ft/s)            3.39    Avg. Vel. (ft/s)                       4.21
   2.59
  Max Chl Dpth (ft)           1.86    Hydr. Depth (ft)                       1.15
   0.28
  Conv. Total (cfs)         1079.6    Conv. (cfs)                           663.1
  416.5
  Length Wtd. (ft)          238.81    Wetted Per. (ft)                      23.33
  92.74
  Min Ch El (ft)            371.49    Shear (lb/sq ft)                       1.81
   0.46
  Alpha                       1.17    Stream Power (lb/ft s)    378.27       0.00
   0.00
  Frctn Loss (ft)             1.95    Cum Volume (acre-ft)        0.51       0.22
   0.10
  C & E Loss (ft)             0.03    Cum SA (acres)
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
         for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
         water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
         defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Yr

```
  E.G. Elev (ft)            374.05    Element                   Left OB    Channel
Right OB
  Vel Head (ft)               0.32    Wt. n-Val.                            0.061
  0.040
  W.S. Elev (ft)            373.73    Reach Len. (ft)           238.81     238.81
 238.81
  Crit W.S. (ft)            373.73    Flow Area (sq ft)                     34.25
  68.92
  E.G. Slope (ft/ft)      0.029422    Area (sq ft)                          34.25
  68.92
  Q Total (cfs)             459.70    Flow (cfs)                           178.93
 280.77
  Top Width (ft)            157.67    Top Width (ft)                        23.19
 134.48
  Vel Total (ft/s)            4.46    Avg. Vel. (ft/s)                       5.22
   4.07
  Max Chl Dpth (ft)           2.24    Hydr. Depth (ft)                       1.48
   0.51
```

Conv. Total (cfs)	2680.0	Conv. (cfs)		1043.1	1636.9
Length Wtd. (ft)	238.81	Wetted Per. (ft)		24.50	134.82
Min Ch El (ft)	371.49	Shear (lb/sq ft)		2.57	0.94
Alpha	1.05	Stream Power (lb/ft s)	378.27	0.00	0.00
Frctn Loss (ft)	2.00	Cum Volume (acre-ft)	0.97	0.29	0.30
C & E Loss (ft)	0.05	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	374.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.040	0.061	0.040
W.S. Elev (ft)	374.19	Reach Len. (ft)	238.81	238.81	238.81
Crit W.S. (ft)	374.19	Flow Area (sq ft)	0.26	45.32	143.27
E.G. Slope (ft/ft)	0.026708	Area (sq ft)	0.26	45.32	143.27
Q Total (cfs)	1025.90	Flow (cfs)	0.39	264.51	761.00
Top Width (ft)	200.74	Top Width (ft)	2.05	23.97	174.72
Vel Total (ft/s)	5.43	Avg. Vel. (ft/s)	1.52	5.84	5.31
Max Chl Dpth (ft)	2.70	Hydr. Depth (ft)	0.13	1.89	0.82
Conv. Total (cfs)	6277.5	Conv. (cfs)	2.4	1618.5	4656.6
Length Wtd. (ft)	238.81	Wetted Per. (ft)	2.07	25.54	175.08
Min Ch El (ft)	371.49	Shear (lb/sq ft)	0.21	2.96	1.36
Alpha	1.01	Stream Power (lb/ft s)	378.27	0.00	0.00
Frctn Loss (ft)	1.55	Cum Volume (acre-ft)	1.78	0.39	0.72
C & E Loss (ft)	0.08	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls2 RS: 12

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	369.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.055	0.049	0.110
W.S. Elev (ft)	369.72	Reach Len. (ft)	95.54	134.75	134.02
Crit W.S. (ft)	369.47	Flow Area (sq ft)	185.42	55.57	12.01
E.G. Slope (ft/ft)	0.006215	Area (sq ft)	185.42	55.57	12.01
Q Total (cfs)	538.80	Flow (cfs)	315.31	216.27	7.22
Top Width (ft)	311.32	Top Width (ft)	257.55	25.44	28.32
Vel Total (ft/s)	2.13	Avg. Vel. (ft/s)	1.70	3.89	0.60
Max Chl Dpth (ft)	3.12	Hydr. Depth (ft)	0.72	2.18	0.42
Conv. Total (cfs)	6834.4	Conv. (cfs)	3999.5	2743.3	91.6
Length Wtd. (ft)	118.18	Wetted Per. (ft)	259.18	26.75	28.33
Min Ch El (ft)	366.60	Shear (lb/sq ft)	0.28	0.81	0.16
Alpha	1.71	Stream Power (lb/ft s)	675.78	0.00	0.00
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	0.63	0.51	0.13
C & E Loss (ft)	0.03	Cum SA (acres)	0.47	0.08	0.09

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	370.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.	0.056	0.049	

```
  0.110
  W.S. Elev (ft)          370.36    Reach Len. (ft)           95.54     134.75
 134.02
  Crit W.S. (ft)                    Flow Area (sq ft)        354.00      71.95
  40.80
  E.G. Slope (ft/ft)    0.006097    Area (sq ft)             354.00      71.95
  40.80
  Q Total (cfs)          1258.10    Flow (cfs)               892.83     329.47
  35.80
  Top Width (ft)          345.10    Top Width (ft)           265.81      25.44
  53.85
  Vel Total (ft/s)          2.70    Avg. Vel. (ft/s)           2.52       4.58
   0.88
  Max Chl Dpth (ft)         3.76    Hydr. Depth (ft)           1.33       2.83
   0.76
  Conv. Total (cfs)      16112.1    Conv. (cfs)             11434.2     4219.4
  458.5
  Length Wtd. (ft)        110.77    Wetted Per. (ft)         267.46      26.75
  53.88
  Min Ch El (ft)          366.60    Shear (lb/sq ft)           0.50       1.02
   0.29
  Alpha                     1.38    Stream Power (lb/ft s)   675.78       0.00
   0.00
  Frctn Loss (ft)           0.79    Cum Volume (acre-ft)       1.60       0.71
   0.52
  C & E Loss (ft)           0.01    Cum SA (acres)             0.50       0.08
   0.17


Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT  Profile #100 Yr


  E.G. Elev (ft)          371.60    Element                 Left OB    Channel
Right OB
  Vel Head (ft)             0.18    Wt. n-Val.                0.056      0.049
  0.110
  W.S. Elev (ft)          371.42    Reach Len. (ft)           95.54     134.75
 134.02
  Crit W.S. (ft)                    Flow Area (sq ft)        650.49      98.74
 119.89
  E.G. Slope (ft/ft)    0.004519    Area (sq ft)             650.49      98.74
 119.89
  Q Total (cfs)          2619.30    Flow (cfs)              2008.01     480.73
 130.57
  Top Width (ft)          419.90    Top Width (ft)           301.36      25.44
  93.10
  Vel Total (ft/s)          3.01    Avg. Vel. (ft/s)           3.09       4.87
   1.09
  Max Chl Dpth (ft)         4.82    Hydr. Depth (ft)           2.16       3.88
   1.29
  Conv. Total (cfs)      38964.4    Conv. (cfs)             29870.9     7151.2
 1942.3
  Length Wtd. (ft)        107.45    Wetted Per. (ft)         303.05      26.75
  93.15
  Min Ch El (ft)          366.60    Shear (lb/sq ft)           0.61       1.04
   0.36
  Alpha                     1.29    Stream Power (lb/ft s)   675.78       0.00
   0.00
  Frctn Loss (ft)           0.53    Cum Volume (acre-ft)       3.08       0.96
   1.32
```

C & E Loss (ft)	0.01	Cum SA (acres)	0.58	0.08	0.30

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls2 RS: 11

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	368.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.	0.076	0.049	0.110
W.S. Elev (ft)	368.48	Reach Len. (ft)	161.20	161.20	161.20
Crit W.S. (ft)	368.48	Flow Area (sq ft)	97.64	65.08	18.95
E.G. Slope (ft/ft)	0.011021	Area (sq ft)	97.64	65.08	18.95
Q Total (cfs)	538.80	Flow (cfs)	139.46	378.47	20.87
Top Width (ft)	225.66	Top Width (ft)	174.03	24.00	27.63
Vel Total (ft/s)	2.97	Avg. Vel. (ft/s)	1.43	5.82	1.10
Max Chl Dpth (ft)	4.23	Hydr. Depth (ft)	0.56	2.71	0.69
Conv. Total (cfs)	5132.3	Conv. (cfs)	1328.4	3605.1	198.8
Length Wtd. (ft)	161.20	Wetted Per. (ft)	176.37	26.36	27.69
Min Ch El (ft)	364.25	Shear (lb/sq ft)	0.38	1.70	0.47
Alpha	2.77	Stream Power (lb/ft s)	729.24	0.00	0.00
Frctn Loss (ft)	1.45	Cum Volume (acre-ft)	0.31	0.32	0.09
C & E Loss (ft)	0.00	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	369.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.30	Wt. n-Val.	0.071	0.049	0.110
W.S. Elev (ft)	369.41	Reach Len. (ft)	161.20	161.20	161.20
Crit W.S. (ft)		Flow Area (sq ft)	269.79	87.54	58.11
E.G. Slope (ft/ft)	0.008405	Area (sq ft)	269.79	87.54	58.11
Q Total (cfs)	1258.10	Flow (cfs)	644.22	541.83	72.05
Top Width (ft)	276.27	Top Width (ft)	194.35	24.00	57.93
Vel Total (ft/s)	3.03	Avg. Vel. (ft/s)	2.39	6.19	1.24
Max Chl Dpth (ft)	5.16	Hydr. Depth (ft)	1.39	3.65	1.00
Conv. Total (cfs)	13722.5	Conv. (cfs)	7026.7	5909.9	785.9
Length Wtd. (ft)	161.20	Wetted Per. (ft)	196.72	26.36	58.00
Min Ch El (ft)	364.25	Shear (lb/sq ft)	0.72	1.74	0.53
Alpha	2.13	Stream Power (lb/ft s)	729.24	0.00	0.00
Frctn Loss (ft)	1.15	Cum Volume (acre-ft)	0.91	0.46	0.36
C & E Loss (ft)	0.01	Cum SA (acres)			

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	371.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.	0.070	0.049	0.110
W.S. Elev (ft)	370.81	Reach Len. (ft)	161.20	161.20	161.20
Crit W.S. (ft)		Flow Area (sq ft)	558.38	121.15	172.19
E.G. Slope (ft/ft)	0.005334	Area (sq ft)	558.38	121.15	172.19
Q Total (cfs)	2619.30	Flow (cfs)	1632.72	741.88	244.70
Top Width (ft)	349.75	Top Width (ft)	225.52	24.00	100.23
Vel Total (ft/s)	3.08	Avg. Vel. (ft/s)	2.92	6.12	1.42
Max Chl Dpth (ft)	6.56	Hydr. Depth (ft)	2.48	5.05	1.72
Conv. Total (cfs)	35862.9	Conv. (cfs)	22354.9	10157.6	3350.4
Length Wtd. (ft)	161.20	Wetted Per. (ft)	227.95	26.36	100.41
Min Ch El (ft)	364.25	Shear (lb/sq ft)	0.82	1.53	

```
  0.57
 Alpha                       1.71    Stream Power (lb/ft s)    729.24       0.00
  0.00
 Frctn Loss (ft)             0.98    Cum Volume (acre-ft)        1.76       0.62
  0.87
 C & E Loss (ft)             0.03    Cum SA (acres)
```

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION

RIVER: JonesFalls
REACH: SouthTrib   RS: 8

CROSS SECTION OUTPUT Profile #2 Yr

```
 E.G. Elev (ft)            389.33    Element                   Left OB    Channel
Right OB
 Vel Head (ft)               0.30    Wt. n-Val.                            0.057
 W.S. Elev (ft)            389.03    Reach Len. (ft)            75.00      80.00
 75.00
 Crit W.S. (ft)            389.03    Flow Area (sq ft)                     34.46
 E.G. Slope (ft/ft)      0.056139    Area (sq ft)                          34.46
 Q Total (cfs)             151.70    Flow (cfs)                           151.70
 Top Width (ft)             57.17    Top Width (ft)                        57.17
 Vel Total (ft/s)            4.40    Avg. Vel. (ft/s)                       4.40
 Max Chl Dpth (ft)           1.03    Hydr. Depth (ft)                       0.60
 Conv. Total (cfs)          640.3    Conv. (cfs)                           640.3
 Length Wtd. (ft)           80.00    Wetted Per. (ft)                      57.26
 Min Ch El (ft)            388.00    Shear (lb/sq ft)                       2.11
 Alpha                       1.00    Stream Power (lb/ft s)    450.20       0.00
  0.00
 Frctn Loss (ft)             1.22    Cum Volume (acre-ft)        0.36       0.89
  0.07
 C & E Loss (ft)             0.04    Cum SA (acres)              0.57       0.49
  0.20
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	389.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.41	Wt. n-Val.		0.057	
W.S. Elev (ft)	389.46	Reach Len. (ft)	75.00	80.00	75.00
Crit W.S. (ft)	389.46	Flow Area (sq ft)		63.03	
E.G. Slope (ft/ft)	0.050145	Area (sq ft)		63.03	
Q Total (cfs)	322.20	Flow (cfs)		322.20	
Top Width (ft)	76.80	Top Width (ft)		76.80	
Vel Total (ft/s)	5.11	Avg. Vel. (ft/s)		5.11	
Max Chl Dpth (ft)	1.46	Hydr. Depth (ft)		0.82	
Conv. Total (cfs)	1438.8	Conv. (cfs)		1438.8	
Length Wtd. (ft)	80.00	Wetted Per. (ft)		76.93	
Min Ch El (ft)	388.00	Shear (lb/sq ft)		2.57	
Alpha	1.00	Stream Power (lb/ft s)	450.20	0.00	0.00
Frctn Loss (ft)	1.05	Cum Volume (acre-ft)	0.97	1.27	0.45
C & E Loss (ft)	0.06	Cum SA (acres)	1.17	0.53	0.72

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth

with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	390.59	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.045	0.057	0.045
W.S. Elev (ft)	390.30	Reach Len. (ft)	75.00	80.00	75.00
Crit W.S. (ft)	389.94	Flow Area (sq ft)	4.88	141.91	0.66
E.G. Slope (ft/ft)	0.017815	Area (sq ft)	4.88	141.91	0.66
Q Total (cfs)	622.10	Flow (cfs)	6.04	615.24	0.82
Top Width (ft)	139.18	Top Width (ft)	32.87	101.85	4.46
Vel Total (ft/s)	4.22	Avg. Vel. (ft/s)	1.24	4.34	1.23
Max Chl Dpth (ft)	2.30	Hydr. Depth (ft)	0.15	1.39	0.15
Conv. Total (cfs)	4660.9	Conv. (cfs)	45.2	4609.5	6.1
Length Wtd. (ft)	79.94	Wetted Per. (ft)	32.87	102.03	4.47
Min Ch El (ft)	388.00	Shear (lb/sq ft)	0.17	1.55	0.16
Alpha	1.05	Stream Power (lb/ft s)	450.20	0.00	0.00
Frctn Loss (ft)	0.61	Cum Volume (acre-ft)	1.97	1.75	1.13
C & E Loss (ft)	0.00	Cum SA (acres)	1.72	0.55	0.95

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: JonesFalls
REACH: SouthTrib RS: 7

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	387.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.057	
W.S. Elev (ft)	386.87	Reach Len. (ft)	28.00	28.00	28.00
Crit W.S. (ft)	385.94	Flow Area (sq ft)		48.43	
E.G. Slope (ft/ft)	0.006980	Area (sq ft)		52.67	

```
  Q Total (cfs)             151.70    Flow (cfs)                           151.70
  Top Width (ft)             31.79    Top Width (ft)                        31.79
  Vel Total (ft/s)            3.13    Avg. Vel. (ft/s)                       3.13
  Max Chl Dpth (ft)           2.42    Hydr. Depth (ft)                       1.74
  Conv. Total (cfs)         1815.8    Conv. (cfs)                          1815.8
  Length Wtd. (ft)           28.00    Wetted Per. (ft)                      28.09
  Min Ch El (ft)            384.45    Shear (lb/sq ft)                       0.75
  Alpha                       1.00    Stream Power (lb/ft s)    332.83       0.00
   0.00
  Frctn Loss (ft)             0.33    Cum Volume (acre-ft)        0.36       0.81
   0.07
  C & E Loss (ft)             0.07    Cum SA (acres)              0.57       0.41
   0.20
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10 Yr

```
  E.G. Elev (ft)            388.28    Element                    Left OB    Channel
Right OB
  Vel Head (ft)               0.22    Wt. n-Val.                              0.057
  0.045
  W.S. Elev (ft)            388.06    Reach Len. (ft)             28.00      28.00
  28.00
  Crit W.S. (ft)            386.70    Flow Area (sq ft)                      86.23
   0.41
  E.G. Slope (ft/ft)      0.005926    Area (sq ft)                0.05       96.60
   0.43
  Q Total (cfs)             322.20    Flow (cfs)                            321.73
   0.47
  Top Width (ft)             42.03    Top Width (ft)              0.76       39.75
   1.52
  Vel Total (ft/s)            3.72    Avg. Vel. (ft/s)                        3.73
   1.13
  Max Chl Dpth (ft)           3.61    Hydr. Depth (ft)                        2.56
   0.30
  Conv. Total (cfs)         4185.5    Conv. (cfs)                           4179.4
    6.1
  Length Wtd. (ft)           28.00    Wetted Per. (ft)                       34.02
   1.39
  Min Ch El (ft)            384.45    Shear (lb/sq ft)                        0.94
   0.11
  Alpha                       1.01    Stream Power (lb/ft s)    332.83       0.00
   0.00
  Frctn Loss (ft)             0.29    Cum Volume (acre-ft)        0.97       1.13
   0.45
  C & E Loss (ft)             0.13    Cum SA (acres)              1.17       0.42
   0.71
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	389.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.		0.057	0.045
W.S. Elev (ft)	389.68	Reach Len. (ft)	28.00	28.00	28.00
Crit W.S. (ft)	387.69	Flow Area (sq ft)		140.73	2.63
E.G. Slope (ft/ft)	0.004211	Area (sq ft)	8.23	160.99	3.64
Q Total (cfs)	622.10	Flow (cfs)		613.46	8.64
Top Width (ft)	51.53	Top Width (ft)	9.34	39.75	2.44
Vel Total (ft/s)	4.34	Avg. Vel. (ft/s)		4.36	3.28
Max Chl Dpth (ft)	5.23	Hydr. Depth (ft)		4.18	1.92
Conv. Total (cfs)	9587.1	Conv. (cfs)		9454.0	133.1
Length Wtd. (ft)	28.00	Wetted Per. (ft)		34.02	1.39
Min Ch El (ft)	384.45	Shear (lb/sq ft)		1.09	0.50
Alpha	1.00	Stream Power (lb/ft s)	332.83	0.00	0.00
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	1.96	1.47	1.12
C & E Loss (ft)	0.29	Cum SA (acres)	1.68	0.42	0.95

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: JonesFalls
REACH: SouthTrib RS: 6

CROSS SECTION OUTPUT Profile #2 Yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	386.15				
Vel Head (ft)	0.22	Wt. n-Val.		0.057	
W.S. Elev (ft)	385.93	Reach Len. (ft)	96.56	93.29	86.62
Crit W.S. (ft)	384.86	Flow Area (sq ft)		40.40	
E.G. Slope (ft/ft)	0.008208	Area (sq ft)		40.40	
Q Total (cfs)	151.70	Flow (cfs)		151.70	
Top Width (ft)	18.17	Top Width (ft)		18.17	
Vel Total (ft/s)	3.75	Avg. Vel. (ft/s)		3.75	
Max Chl Dpth (ft)	3.31	Hydr. Depth (ft)		2.22	
Conv. Total (cfs)	1674.5	Conv. (cfs)		1674.5	
Length Wtd. (ft)	93.29	Wetted Per. (ft)		20.15	
Min Ch El (ft)	382.62	Shear (lb/sq ft)		1.03	
Alpha	1.00	Stream Power (lb/ft s)	356.91	0.00	0.00
Frctn Loss (ft)	1.50	Cum Volume (acre-ft)	0.36	0.74	0.07
C & E Loss (ft)	0.16	Cum SA (acres)	0.57	0.37	0.20

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10 Yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	387.02				
Vel Head (ft)	0.73	Wt. n-Val.		0.057	0.000
W.S. Elev (ft)	386.29	Reach Len. (ft)	96.56	93.29	86.62
Crit W.S. (ft)	385.83	Flow Area (sq ft)		47.14	0.00
E.G. Slope (ft/ft)	0.023740	Area (sq ft)		47.14	0.00
Q Total (cfs)	322.20	Flow (cfs)		322.20	0.00
Top Width (ft)	19.08	Top Width (ft)		19.01	0.07
Vel Total (ft/s)	6.83	Avg. Vel. (ft/s)		6.83	0.27

```
  Max Chl Dpth (ft)            3.67    Hydr. Depth (ft)                     2.48
   0.02
  Conv. Total (cfs)          2091.2    Conv. (cfs)                        2091.2
    0.0
  Length Wtd. (ft)            93.77    Wetted Per. (ft)                    21.24
   0.08
  Min Ch El (ft)             382.62    Shear (lb/sq ft)                     3.29

  Alpha                        1.00    Stream Power (lb/ft s)   356.91      0.00
   0.00
  Frctn Loss (ft)              1.70    Cum Volume (acre-ft)       0.97      1.03
   0.45
  C & E Loss (ft)              0.20    Cum SA (acres)             1.16      0.39
   0.71


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate the
         need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT  Profile #100 Yr


  E.G. Elev (ft)             388.31    Element                   Left OB   Channel
Right OB
  Vel Head (ft)                0.97    Wt. n-Val.                 0.045     0.057
  0.057
  W.S. Elev (ft)             387.35    Reach Len. (ft)            96.56     93.29
  86.62
  Crit W.S. (ft)             387.35    Flow Area (sq ft)          15.82     67.51
   1.03
  E.G. Slope (ft/ft)       0.021738    Area (sq ft)               34.41     67.51
   1.03
  Q Total (cfs)              622.10    Flow (cfs)                 64.06    555.63
   2.41
  Top Width (ft)              87.49    Top Width (ft)             66.35     19.26
   1.88
  Vel Total (ft/s)             7.37    Avg. Vel. (ft/s)            4.05      8.23
   2.34
  Max Chl Dpth (ft)            4.73    Hydr. Depth (ft)            0.76      3.51
   0.55
  Conv. Total (cfs)          4219.4    Conv. (cfs)                434.5    3768.5
   16.3
  Length Wtd. (ft)            94.16    Wetted Per. (ft)           20.84     21.55
   2.18
  Min Ch El (ft)             382.62    Shear (lb/sq ft)            1.03      4.25
   0.64
  Alpha                        1.14    Stream Power (lb/ft s)   356.91      0.00
   0.00
  Frctn Loss (ft)              1.81    Cum Volume (acre-ft)       1.94      1.33
   1.12
  C & E Loss (ft)              0.27    Cum SA (acres)             1.66      0.39
   0.95


Warning: The energy equation could not be balanced within the specified number of
iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
```

indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: JonesFalls
REACH: SouthTrib   RS: 5

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	384.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.76	Wt. n-Val.		0.057	
W.S. Elev (ft)	383.73	Reach Len. (ft)	136.21	123.08	111.20
Crit W.S. (ft)	383.66	Flow Area (sq ft)		21.65	
E.G. Slope (ft/ft)	0.044154	Area (sq ft)	0.67	21.65	
Q Total (cfs)	151.70	Flow (cfs)		151.70	
Top Width (ft)	17.57	Top Width (ft)	4.71	12.86	
Vel Total (ft/s)	7.01	Avg. Vel. (ft/s)		7.01	
Max Chl Dpth (ft)	2.60	Hydr. Depth (ft)		1.68	
Conv. Total (cfs)	721.9	Conv. (cfs)		721.9	
Length Wtd. (ft)	123.08	Wetted Per. (ft)		14.97	
Min Ch El (ft)	381.13	Shear (lb/sq ft)		3.99	
Alpha	1.00	Stream Power (lb/ft s)	334.83	0.00	0.00
Frctn Loss (ft)	2.85	Cum Volume (acre-ft)	0.36	0.68	0.07
C & E Loss (ft)	0.15	Cum SA (acres)	0.56	0.34	0.20

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	385.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.32	Wt. n-Val.	0.045	0.057	0.045
W.S. Elev (ft)	384.80	Reach Len. (ft)	136.21	123.08	111.20
Crit W.S. (ft)	384.80	Flow Area (sq ft)	44.80	35.86	4.05
E.G. Slope (ft/ft)	0.014240	Area (sq ft)	44.80	35.86	4.05
Q Total (cfs)	322.20	Flow (cfs)	116.18	195.38	10.64
Top Width (ft)	107.82	Top Width (ft)	87.16	13.31	7.35
Vel Total (ft/s)	3.80	Avg. Vel. (ft/s)	2.59	5.45	2.63
Max Chl Dpth (ft)	3.67	Hydr. Depth (ft)	0.51	2.69	0.55
Conv. Total (cfs)	2700.1	Conv. (cfs)	973.6	1637.3	89.2
Length Wtd. (ft)	125.04	Wetted Per. (ft)	87.28	15.47	7.43
Min Ch El (ft)	381.13	Shear (lb/sq ft)	0.46	2.06	0.48
Alpha	1.43	Stream Power (lb/ft s)	334.83	0.00	0.00
Frctn Loss (ft)	2.16	Cum Volume (acre-ft)	0.92	0.94	0.44
C & E Loss (ft)	0.02	Cum SA (acres)	1.07	0.35	0.71

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	385.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.43	Wt. n-Val.	0.045	0.057	0.045
W.S. Elev (ft)	385.19	Reach Len. (ft)	136.21	123.08	111.20

```
  Crit W.S. (ft)            385.16    Flow Area (sq ft)           81.15       41.16
   7.37
  E.G. Slope (ft/ft)      0.017061    Area (sq ft)                81.15       41.16
   7.37
  Q Total (cfs)             622.10    Flow (cfs)                 326.08      269.10
  26.92
  Top Width (ft)            118.42    Top Width (ft)              95.77       13.31
   9.34
  Vel Total (ft/s)            4.80    Avg. Vel. (ft/s)             4.02        6.54
   3.65
  Max Chl Dpth (ft)           4.06    Hydr. Depth (ft)             0.85        3.09
   0.79
  Conv. Total (cfs)         4762.7    Conv. (cfs)                2496.4      2060.2
  206.1
  Length Wtd. (ft)          125.83    Wetted Per. (ft)            95.90       15.47
   9.46
  Min Ch El (ft)            381.13    Shear (lb/sq ft)             0.90        2.83
   0.83
  Alpha                       1.20    Stream Power (lb/ft s)     334.83        0.00
   0.00
  Frctn Loss (ft)             2.59    Cum Volume (acre-ft)         1.81        1.21
   1.11
  C & E Loss (ft)             0.03    Cum SA (acres)               1.48        0.35
   0.93
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: JonesFalls
REACH: SouthTrib   RS: 4

CROSS SECTION OUTPUT Profile #2 Yr

```
  E.G. Elev (ft)            381.48    Element                    Left OB     Channel
Right OB
  Vel Head (ft)               0.25    Wt. n-Val.                              0.057

  W.S. Elev (ft)            381.23    Reach Len. (ft)            261.13      237.95
 226.16
  Crit W.S. (ft)            380.62    Flow Area (sq ft)                       37.81

  E.G. Slope (ft/ft)      0.014222    Area (sq ft)                 0.81       37.81
   0.52
  Q Total (cfs)             151.70    Flow (cfs)                             151.70

  Top Width (ft)             33.61    Top Width (ft)               3.52       25.03
   5.06
  Vel Total (ft/s)            4.01    Avg. Vel. (ft/s)                         4.01

  Max Chl Dpth (ft)           2.35    Hydr. Depth (ft)                         1.51

  Conv. Total (cfs)         1272.1    Conv. (cfs)                            1272.1
```

```
  Length Wtd. (ft)          237.45    Wetted Per. (ft)                       25.78

  Min Ch El (ft)            378.88    Shear (lb/sq ft)                        1.30

  Alpha                       1.00    Stream Power (lb/ft s)    259.77        0.00
   0.00
  Frctn Loss (ft)             4.18    Cum Volume (acre-ft)        0.36        0.59
   0.07
  C & E Loss (ft)             0.02    Cum SA (acres)              0.55        0.29
   0.19


Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate the
         need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #10 Yr


  E.G. Elev (ft)            382.18    Element                   Left OB    Channel
Right OB
  Vel Head (ft)               0.49    Wt. n-Val.                 0.040      0.057
   0.040
  W.S. Elev (ft)            381.69    Reach Len. (ft)           261.13     237.95
  226.16
  Crit W.S. (ft)            381.61    Flow Area (sq ft)           3.50      49.34
   7.66
  E.G. Slope (ft/ft)      0.021461    Area (sq ft)                3.50      49.34
   7.66
  Q Total (cfs)             322.20    Flow (cfs)                 10.42     288.83
  22.94
  Top Width (ft)             52.11    Top Width (ft)              8.52      25.23
  18.36
  Vel Total (ft/s)            5.33    Avg. Vel. (ft/s)            2.97       5.85
   3.00
  Max Chl Dpth (ft)           2.81    Hydr. Depth (ft)            0.41       1.96
   0.42
  Conv. Total (cfs)         2199.4    Conv. (cfs)                 71.1     1971.6
  156.6
  Length Wtd. (ft)          236.82    Wetted Per. (ft)            8.68      26.00
  18.74
  Min Ch El (ft)            378.88    Shear (lb/sq ft)            0.54       2.54
   0.55
  Alpha                       1.12    Stream Power (lb/ft s)    259.77       0.00
   0.00
  Frctn Loss (ft)             4.27    Cum Volume (acre-ft)        0.85       0.82
   0.43
  C & E Loss (ft)             0.04    Cum SA (acres)              0.92       0.30
   0.67


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate the
         need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #100 Yr
```

E.G. Elev (ft)	383.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.76	Wt. n-Val.	0.040	0.057	0.040
W.S. Elev (ft)	382.24	Reach Len. (ft)	261.13	237.95	226.16
Crit W.S. (ft)	382.23	Flow Area (sq ft)	11.34	63.24	18.30
E.G. Slope (ft/ft)	0.025387	Area (sq ft)	11.34	63.24	18.30
Q Total (cfs)	622.10	Flow (cfs)	48.10	475.09	98.91
Top Width (ft)	64.27	Top Width (ft)	18.54	25.23	20.50
Vel Total (ft/s)	6.70	Avg. Vel. (ft/s)	4.24	7.51	5.41
Max Chl Dpth (ft)	3.36	Hydr. Depth (ft)	0.61	2.51	0.89
Conv. Total (cfs)	3904.4	Conv. (cfs)	301.9	2981.8	620.8
Length Wtd. (ft)	236.33	Wetted Per. (ft)	18.71	26.00	20.96
Min Ch El (ft)	378.88	Shear (lb/sq ft)	0.96	3.86	1.38
Alpha	1.10	Stream Power (lb/ft s)	259.77	0.00	0.00
Frctn Loss (ft)	4.49	Cum Volume (acre-ft)	1.67	1.07	1.08
C & E Loss (ft)	0.11	Cum SA (acres)	1.30	0.30	0.90

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: JonesFalls
REACH: SouthTrib   RS: 3

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	377.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.43	Wt. n-Val.	0.040	0.057	0.043
W.S. Elev (ft)	376.84	Reach Len. (ft)	243.00	242.00	242.00
Crit W.S. (ft)	376.84	Flow Area (sq ft)	1.00	24.01	7.01
E.G. Slope (ft/ft)	0.022367	Area (sq ft)	1.00	24.01	7.01
Q Total (cfs)	151.70	Flow (cfs)	1.73	133.64	16.33

```
  Top Width (ft)              41.58    Top Width (ft)              5.78       12.90
  22.90
  Vel Total (ft/s)             4.74    Avg. Vel. (ft/s)            1.73        5.57
   2.33
  Max Chl Dpth (ft)            2.40    Hydr. Depth (ft)            0.17        1.86
   0.31
  Conv. Total (cfs)          1014.3    Conv. (cfs)                 11.6       893.6
  109.2
  Length Wtd. (ft)           242.27    Wetted Per. (ft)            5.79       14.07
  23.26
  Min Ch El (ft)             374.44    Shear (lb/sq ft)            0.24        2.38
   0.42
  Alpha                        1.24    Stream Power (lb/ft s)    251.86        0.00
   0.00
  Frctn Loss (ft)              2.81    Cum Volume (acre-ft)        0.35        0.42
   0.05
  C & E Loss (ft)              0.11    Cum SA (acres)              0.52        0.18
   0.12
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Yr

```
  E.G. Elev (ft)             377.87    Element                   Left OB    Channel
Right OB
  Vel Head (ft)                0.35    Wt. n-Val.                 0.040       0.057
  0.042
  W.S. Elev (ft)             377.52    Reach Len. (ft)           243.00      242.00
 242.00
  Crit W.S. (ft)             377.52    Flow Area (sq ft)           8.78       32.77
  34.72
  E.G. Slope (ft/ft)       0.015393    Area (sq ft)                8.78       32.77
  34.72
  Q Total (cfs)              322.20    Flow (cfs)                 25.89      186.21
 110.10
  Top Width (ft)              97.87    Top Width (ft)             17.10       12.90
  67.87
  Vel Total (ft/s)             4.22    Avg. Vel. (ft/s)            2.95        5.68
   3.17
  Max Chl Dpth (ft)            3.08    Hydr. Depth (ft)            0.51        2.54
   0.51
  Conv. Total (cfs)          2596.9    Conv. (cfs)                208.7      1500.8
  887.4
  Length Wtd. (ft)           242.35    Wetted Per. (ft)           17.14       14.07
  68.57
  Min Ch El (ft)             374.44    Shear (lb/sq ft)            0.49        2.24
```

```
  0.49
 Alpha                       1.28    Stream Power (lb/ft s)    251.86       0.00
  0.00
 Frctn Loss (ft)             3.23    Cum Volume (acre-ft)        0.81       0.60
  0.32
 C & E Loss (ft)             0.06    Cum SA (acres)              0.84       0.20
  0.45
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
         for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
         water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
         defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Yr

```
 E.G. Elev (ft)            378.41    Element                  Left OB    Channel
Right OB
 Vel Head (ft)               0.40    Wt. n-Val.                0.040      0.057
 0.042
 W.S. Elev (ft)            378.00    Reach Len. (ft)          243.00     242.00
242.00
 Crit W.S. (ft)            377.92    Flow Area (sq ft)         19.06      39.04
 71.83
 E.G. Slope (ft/ft)      0.014773    Area (sq ft)              19.06      39.04
 71.83
 Q Total (cfs)             622.10    Flow (cfs)                71.32     244.22
306.56
 Top Width (ft)            118.54    Top Width (ft)            25.22      12.90
 80.43
 Vel Total (ft/s)            4.79    Avg. Vel. (ft/s)           3.74       6.26
  4.27
 Max Chl Dpth (ft)           3.56    Hydr. Depth (ft)           0.76       3.03
  0.89
 Conv. Total (cfs)         5118.3    Conv. (cfs)               586.7     2009.3
2522.2
 Length Wtd. (ft)          242.38    Wetted Per. (ft)          25.26      14.07
 81.21
 Min Ch El (ft)            374.44    Shear (lb/sq ft)           0.70       2.56
  0.82
 Alpha                       1.13    Stream Power (lb/ft s)    251.86       0.00
  0.00
 Frctn Loss (ft)             4.53    Cum Volume (acre-ft)        1.58       0.79
  0.85
 C & E Loss (ft)             0.00    Cum SA (acres)              1.17       0.20
  0.63
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
         need for additional cross sections.

CROSS SECTION

RIVER: JonesFalls
REACH: SouthTrib RS: 2

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	373.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.	0.053	0.057	0.040
W.S. Elev (ft)	373.05	Reach Len. (ft)	259.00	261.00	263.00
Crit W.S. (ft)		Flow Area (sq ft)	46.87	24.73	0.60
E.G. Slope (ft/ft)	0.007095	Area (sq ft)	46.87	24.73	0.60
Q Total (cfs)	151.70	Flow (cfs)	80.88	70.53	0.28
Top Width (ft)	112.33	Top Width (ft)	86.40	15.88	10.05
Vel Total (ft/s)	2.10	Avg. Vel. (ft/s)	1.73	2.85	0.48
Max Chl Dpth (ft)	2.39	Hydr. Depth (ft)	0.54	1.56	0.06
Conv. Total (cfs)	1801.0	Conv. (cfs)	960.3	837.4	3.4
Length Wtd. (ft)	260.47	Wetted Per. (ft)	86.54	16.70	10.05
Min Ch El (ft)	370.66	Shear (lb/sq ft)	0.24	0.66	0.03
Alpha	1.22	Stream Power (lb/ft s)	249.38	0.00	0.00
Frctn Loss (ft)	3.82	Cum Volume (acre-ft)	0.22	0.29	0.03
C & E Loss (ft)	0.06	Cum SA (acres)	0.26	0.10	0.03

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	373.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.	0.051	0.057	0.040
W.S. Elev (ft)	373.32	Reach Len. (ft)	259.00	261.00	263.00
Crit W.S. (ft)		Flow Area (sq ft)	71.88	28.99	

```
 5.23
 E.G. Slope (ft/ft)      0.011655    Area (sq ft)              71.88       28.99
 5.23
 Q Total (cfs)             322.20    Flow (cfs)               196.88      117.82
 7.49
 Top Width (ft)            141.52    Top Width (ft)           101.13       15.88
24.51
 Vel Total (ft/s)            3.04    Avg. Vel. (ft/s)           2.74        4.06
 1.43
 Max Chl Dpth (ft)           2.66    Hydr. Depth (ft)           0.71        1.83
 0.21
 Conv. Total (cfs)         2984.5    Conv. (cfs)              1823.7      1091.4
 69.4
 Length Wtd. (ft)          260.20    Wetted Per. (ft)         101.29       16.70
24.52
 Min Ch El (ft)            370.66    Shear (lb/sq ft)           0.52        1.26
 0.16
 Alpha                       1.16    Stream Power (lb/ft s)   249.38        0.00
 0.00
 Frctn Loss (ft)             3.70    Cum Volume (acre-ft)       0.59        0.43
 0.21
 C & E Loss (ft)             0.01    Cum SA (acres)             0.51        0.12
 0.19
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Yr

```
  E.G. Elev (ft)           373.88    Element                  Left OB    Channel
Right OB
  Vel Head (ft)              0.39    Wt. n-Val.                0.050       0.057
  0.040
  W.S. Elev (ft)           373.49    Reach Len. (ft)          259.00      261.00
 263.00
  Crit W.S. (ft)           373.49    Flow Area (sq ft)         90.09       31.69
  10.44
  E.G. Slope (ft/ft)     0.024403    Area (sq ft)              90.09       31.69
  10.44
  Q Total (cfs)            622.10    Flow (cfs)               398.87      197.79
  25.44
  Top Width (ft)           167.00    Top Width (ft)           112.72       15.88
  38.40
  Vel Total (ft/s)           4.70    Avg. Vel. (ft/s)           4.43        6.24
   2.44
  Max Chl Dpth (ft)          2.83    Hydr. Depth (ft)           0.80        2.00
   0.27
  Conv. Total (cfs)        3982.4    Conv. (cfs)              2553.3      1266.2
  162.9
  Length Wtd. (ft)         260.11    Wetted Per. (ft)         112.89       16.70
  38.40
  Min Ch El (ft)           370.66    Shear (lb/sq ft)           1.22        2.89
   0.41
  Alpha                      1.14    Stream Power (lb/ft s)   249.38        0.00
   0.00
  Frctn Loss (ft)            1.64    Cum Volume (acre-ft)       1.27        0.59
   0.62
  C & E Loss (ft)            0.09    Cum SA (acres)             0.78        0.12
   0.30
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: JonesFalls
REACH: SouthTrib RS: 1

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	369.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.65	Wt. n-Val.	0.045	0.057	
W.S. Elev (ft)	368.61	Reach Len. (ft)	93.43	93.43	93.43
Crit W.S. (ft)	368.61	Flow Area (sq ft)	0.03	23.53	
E.G. Slope (ft/ft)	0.046497	Area (sq ft)	0.03	23.53	
Q Total (cfs)	151.70	Flow (cfs)	0.01	151.69	
Top Width (ft)	20.08	Top Width (ft)	1.71	18.37	
Vel Total (ft/s)	6.44	Avg. Vel. (ft/s)	0.53	6.45	
Max Chl Dpth (ft)	2.33	Hydr. Depth (ft)	0.02	1.28	
Conv. Total (cfs)	703.5	Conv. (cfs)	0.1	703.4	
Length Wtd. (ft)	93.43	Wetted Per. (ft)	1.73	19.17	
Min Ch El (ft)	366.28	Shear (lb/sq ft)	0.05	3.56	
Alpha	1.00	Stream Power (lb/ft s)	312.19	0.00	0.00
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	0.08	0.14	0.03
C & E Loss (ft)	0.08	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	369.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.30	Wt. n-Val.	0.043	0.057	0.040
W.S. Elev (ft)	369.47	Reach Len. (ft)	93.43	93.43	93.43
Crit W.S. (ft)	369.47	Flow Area (sq ft)	32.46	41.40	10.78
E.G. Slope (ft/ft)	0.017778	Area (sq ft)	32.46	41.40	10.78
Q Total (cfs)	322.20	Flow (cfs)	89.90	209.82	22.48
Top Width (ft)	132.78	Top Width (ft)	70.71	22.65	39.42
Vel Total (ft/s)	3.81	Avg. Vel. (ft/s)	2.77	5.07	2.09
Max Chl Dpth (ft)	3.19	Hydr. Depth (ft)	0.46	1.83	0.27
Conv. Total (cfs)	2416.5	Conv. (cfs)	674.3	1573.6	168.6
Length Wtd. (ft)	93.43	Wetted Per. (ft)	70.87	23.51	39.45
Min Ch El (ft)	366.28	Shear (lb/sq ft)	0.51	1.95	0.30
Alpha	1.32	Stream Power (lb/ft s)	312.19	0.00	0.00
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)	0.28	0.22	0.16
C & E Loss (ft)	0.01	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	370.64	Element	Left OB	Channel

```
Right OB
  Vel Head (ft)              0.08    Wt. n-Val.                0.042      0.057
  0.040
  W.S. Elev (ft)           370.55    Reach Len. (ft)           93.43      93.43
  93.43
  Crit W.S. (ft)                     Flow Area (sq ft)        144.43      65.89
  64.65
  E.G. Slope (ft/ft)     0.002841    Area (sq ft)             144.43      65.89
  64.65
  Q Total (cfs)            622.10    Flow (cfs)               309.04     182.00
 131.06
  Top Width (ft)           236.14    Top Width (ft)           151.12      22.65
  62.37
  Vel Total (ft/s)           2.26    Avg. Vel. (ft/s)           2.14       2.76
   2.03
  Max Chl Dpth (ft)          4.27    Hydr. Depth (ft)           0.96       2.91
   1.04
  Conv. Total (cfs)       11670.5    Conv. (cfs)              5797.5     3414.4
 2458.6
  Length Wtd. (ft)          93.43    Wetted Per. (ft)         151.41      23.51
  62.42
  Min Ch El (ft)           366.28    Shear (lb/sq ft)           0.17       0.50
   0.18
  Alpha                      1.05    Stream Power (lb/ft s)   312.19       0.00
   0.00
  Frctn Loss (ft)            0.54    Cum Volume (acre-ft)       0.58       0.30
   0.39
  C & E Loss (ft)            0.04    Cum SA (acres)


CROSS SECTION


RIVER: JonesFalls
REACH: IntsTrib           RS: 8


CROSS SECTION OUTPUT  Profile #2 Yr


  E.G. Elev (ft)           392.96    Element                  Left OB    Channel
Right OB
  Vel Head (ft)              0.34    Wt. n-Val.                           0.046

  W.S. Elev (ft)           392.61    Reach Len. (ft)          135.00     134.00
 134.00
  Crit W.S. (ft)           392.61    Flow Area (sq ft)                    14.12

  E.G. Slope (ft/ft)     0.035629    Area (sq ft)                         14.12

  Q Total (cfs)             66.30    Flow (cfs)                           66.30

  Top Width (ft)            20.71    Top Width (ft)                       20.71

  Vel Total (ft/s)           4.70    Avg. Vel. (ft/s)                      4.70

  Max Chl Dpth (ft)          1.31    Hydr. Depth (ft)                      0.68

  Conv. Total (cfs)         351.2    Conv. (cfs)                          351.2

  Length Wtd. (ft)         134.00    Wetted Per. (ft)                     20.88
```

```
  Min Ch El (ft)            391.30    Shear (lb/sq ft)                       1.50

  Alpha                       1.00    Stream Power (lb/ft s)    456.60       0.00
   0.00
  Frctn Loss (ft)             4.41    Cum Volume (acre-ft)        0.62       0.73
   0.80
  C & E Loss (ft)             0.02    Cum SA (acres)              0.00       0.45
   0.05
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Yr

```
  E.G. Elev (ft)            393.55    Element                   Left OB    Channel
Right OB
  Vel Head (ft)               0.47    Wt. n-Val.                             0.046

  W.S. Elev (ft)            393.08    Reach Len. (ft)           135.00     134.00
 134.00
  Crit W.S. (ft)            393.08    Flow Area (sq ft)                      25.30

  E.G. Slope (ft/ft)      0.032574    Area (sq ft)                           25.30

  Q Total (cfs)             138.90    Flow (cfs)                            138.90

  Top Width (ft)             27.44    Top Width (ft)                         27.44

  Vel Total (ft/s)            5.49    Avg. Vel. (ft/s)                        5.49

  Max Chl Dpth (ft)           1.78    Hydr. Depth (ft)                        0.92

  Conv. Total (cfs)          769.6    Conv. (cfs)                            769.6

  Length Wtd. (ft)          134.04    Wetted Per. (ft)                       27.67

  Min Ch El (ft)            391.30    Shear (lb/sq ft)                        1.86

  Alpha                       1.00    Stream Power (lb/ft s)    456.60       0.00
   0.00
  Frctn Loss (ft)             0.39    Cum Volume (acre-ft)        1.13       1.20
   1.65
  C & E Loss (ft)             0.13    Cum SA (acres)              0.13       0.52
   0.69
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	394.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.045	0.046	0.045
W.S. Elev (ft)	394.74	Reach Len. (ft)	135.00	134.00	134.00
Crit W.S. (ft)		Flow Area (sq ft)	10.28	87.00	3.85
E.G. Slope (ft/ft)	0.002877	Area (sq ft)	10.28	87.00	3.85
Q Total (cfs)	261.20	Flow (cfs)	9.40	248.28	3.52
Top Width (ft)	78.90	Top Width (ft)	27.71	40.80	10.39
Vel Total (ft/s)	2.58	Avg. Vel. (ft/s)	0.91	2.85	0.91
Max Chl Dpth (ft)	3.44	Hydr. Depth (ft)	0.37	2.13	0.37
Conv. Total (cfs)	4869.5	Conv. (cfs)	175.2	4628.7	65.6
Length Wtd. (ft)	134.12	Wetted Per. (ft)	27.72	41.16	10.41
Min Ch El (ft)	391.30	Shear (lb/sq ft)	0.07	0.38	0.07
Alpha	1.17	Stream Power (lb/ft s)	456.60	0.00	0.00
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	3.09	2.44	4.05
C & E Loss (ft)	0.03	Cum SA (acres)	1.33	0.58	1.21

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: JonesFalls
REACH: IntsTrib RS: 7

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	388.31	Element	Left OB	Channel

```
Right OB
  Vel Head (ft)              0.53    Wt. n-Val.                            0.046
  0.046
  W.S. Elev (ft)           387.79    Reach Len. (ft)          151.00     152.00
 154.00
  Crit W.S. (ft)           387.79    Flow Area (sq ft)                     11.20
   0.50
  E.G. Slope (ft/ft)     0.030520    Area (sq ft)                          11.20
   0.50
  Q Total (cfs)             66.30    Flow (cfs)                            65.53
   0.77
  Top Width (ft)            12.60    Top Width (ft)                         9.11
   3.49
  Vel Total (ft/s)           5.67    Avg. Vel. (ft/s)                       5.85
   1.54
  Max Chl Dpth (ft)          1.59    Hydr. Depth (ft)                       1.23
   0.14
  Conv. Total (cfs)         379.5    Conv. (cfs)                           375.1
     4.4
  Length Wtd. (ft)         152.00    Wetted Per. (ft)                      10.62
   3.50
  Min Ch El (ft)           386.20    Shear (lb/sq ft)                       2.01
   0.27
  Alpha                      1.05    Stream Power (lb/ft s)   292.30        0.00
   0.00
  Frctn Loss (ft)                    Cum Volume (acre-ft)       0.62        0.69
   0.80
  C & E Loss (ft)                    Cum SA (acres)             0.00        0.40
   0.04


Warning: During subcritical analysis, the water surface upstream of culvert went to
critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT  Profile #10 Yr


  E.G. Elev (ft)           390.17    Element                  Left OB    Channel
Right OB
  Vel Head (ft)              0.05    Wt. n-Val.                0.045       0.046
  0.045
  W.S. Elev (ft)           390.12    Reach Len. (ft)          151.00     152.00
 154.00
  Crit W.S. (ft)           388.53    Flow Area (sq ft)         11.46       33.16
  42.54
  E.G. Slope (ft/ft)     0.001015    Area (sq ft)              11.47       33.16
  42.54
  Q Total (cfs)            138.90    Flow (cfs)                10.07       71.55
  57.28
  Top Width (ft)            59.09    Top Width (ft)            17.36        9.40
  32.33
  Vel Total (ft/s)           1.59    Avg. Vel. (ft/s)           0.88        2.16
   1.35
  Max Chl Dpth (ft)          3.92    Hydr. Depth (ft)           0.71        3.53
   1.32
  Conv. Total (cfs)        4359.1    Conv. (cfs)               315.9      2245.5
 1797.7
  Length Wtd. (ft)         152.00    Wetted Per. (ft)          16.42       10.93
  32.44
  Min Ch El (ft)           386.20    Shear (lb/sq ft)           0.04        0.19
```

```
   0.08
  Alpha                          1.26    Stream Power (lb/ft s)    292.30       0.00
   0.00
  Frctn Loss (ft)                        Cum Volume (acre-ft)        1.11       1.11
   1.58
  C & E Loss (ft)                        Cum SA (acres)              0.10       0.46
   0.64
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 Yr

```
  E.G. Elev (ft)               394.81    Element                   Left OB    Channel
Right OB
  Vel Head (ft)                  0.01    Wt. n-Val.                 0.045      0.046
  0.045
  W.S. Elev (ft)               394.81    Reach Len. (ft)           151.00     152.00
 154.00
  Crit W.S. (ft)               389.18    Flow Area (sq ft)          87.25      77.19
301.53
  E.G. Slope (ft/ft)         0.000035    Area (sq ft)              619.25      77.19
301.78
  Q Total (cfs)                261.20    Flow (cfs)                 52.11      54.51
 154.58
  Top Width (ft)               269.77    Top Width (ft)            185.35       9.40
  75.02
  Vel Total (ft/s)               0.56    Avg. Vel. (ft/s)            0.60       0.71
   0.51
  Max Chl Dpth (ft)              8.61    Hydr. Depth (ft)            5.39       8.21
   4.13
  Conv. Total (cfs)           43990.9    Conv. (cfs)               8776.3     9179.8
26034.8
  Length Wtd. (ft)             152.00    Wetted Per. (ft)           16.42      10.93
  73.43
  Min Ch El (ft)               386.20    Shear (lb/sq ft)            0.01       0.02
   0.01
  Alpha                          1.05    Stream Power (lb/ft s)    292.30       0.00
   0.00
  Frctn Loss (ft)                        Cum Volume (acre-ft)        2.11       2.19
   3.58
  C & E Loss (ft)                        Cum SA (acres)              1.00       0.51
   1.08
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: JonesFalls
REACH: IntsTrib   RS: 6.5

CULVERT OUTPUT Profile #2 Yr Culv Group: GrnsprngVal

```
  Q Culv Group (cfs)          66.30    Culv Full Len (ft)
  # Barrels                       1    Culv Vel US (ft/s)          7.54
```

```
  Q Barrel (cfs)             66.30    Culv Vel DS (ft/s)         17.60
  E.G. US. (ft)             388.16    Culv Inv El Up (ft)       384.54
  W.S. US. (ft)             387.79    Culv Inv El Dn (ft)       378.86
  E.G. DS (ft)              381.08    Culv Frctn Ls (ft)          2.81
  W.S. DS (ft)              380.98    Culv Exit Loss (ft)         3.83
  Delta EG (ft)               7.08    Culv Entr Loss (ft)         0.44
  Delta WS (ft)               6.80    Q Weir (cfs)
  E.G. IC (ft)              387.71    Weir Sta Lft (ft)
  E.G. OC (ft)              388.16    Weir Sta Rgt (ft)
  Culvert Control           Outlet    Weir Submerg
  Culv WS Inlet (ft)        386.84    Weir Max Depth (ft)
  Culv WS Outlet (ft)       380.09    Weir Avg Depth (ft)
  Culv Nml Depth (ft)         1.15    Weir Flow Area (sq ft)
  Culv Crt Depth (ft)         2.30    Min El Weir Flow (ft)     395.01
```

Warning: During subcritical analysis, the water surface upstream of culvert went to critical depth.
Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section
downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10 Yr Culv Group: GrnsprngVal

```
  Q Culv Group (cfs)        138.90    Culv Full Len (ft)
  # Barrels                      1    Culv Vel US (ft/s)          9.85
  Q Barrel (cfs)            138.90    Culv Vel DS (ft/s)         20.21
  E.G. US. (ft)             390.17    Culv Inv El Up (ft)       384.54
  W.S. US. (ft)             390.12    Culv Inv El Dn (ft)       378.86
  E.G. DS (ft)              381.88    Culv Frctn Ls (ft)          2.31
  W.S. DS (ft)              381.69    Culv Exit Loss (ft)         5.23
  Delta EG (ft)               8.29    Culv Entr Loss (ft)         0.75
  Delta WS (ft)               8.43    Q Weir (cfs)
  E.G. IC (ft)              389.79    Weir Sta Lft (ft)
  E.G. OC (ft)              390.17    Weir Sta Rgt (ft)
  Culvert Control           Outlet    Weir Submerg
  Culv WS Inlet (ft)        387.92    Weir Max Depth (ft)
  Culv WS Outlet (ft)       380.77    Weir Avg Depth (ft)
  Culv Nml Depth (ft)         1.68    Weir Flow Area (sq ft)
  Culv Crt Depth (ft)         3.38    Min El Weir Flow (ft)     395.01
```

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section
downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100 Yr Culv Group: GrnsprngVal

```
  Q Culv Group (cfs)        261.20    Culv Full Len (ft)
  # Barrels                      1    Culv Vel US (ft/s)         13.30
  Q Barrel (cfs)            261.20    Culv Vel DS (ft/s)         24.10
  E.G. US. (ft)             394.81    Culv Inv El Up (ft)       384.54
  W.S. US. (ft)             394.81    Culv Inv El Dn (ft)       378.86
  E.G. DS (ft)              382.88    Culv Frctn Ls (ft)          2.86
  W.S. DS (ft)              382.54    Culv Exit Loss (ft)         7.70
  Delta EG (ft)              11.93    Culv Entr Loss (ft)         1.37
  Delta WS (ft)              12.27    Q Weir (cfs)
  E.G. IC (ft)              394.81    Weir Sta Lft (ft)
  E.G. OC (ft)              393.63    Weir Sta Rgt (ft)
  Culvert Control            Inlet    Weir Submerg
  Culv WS Inlet (ft)        389.54    Weir Max Depth (ft)
```

```
  Culv WS Outlet (ft)       381.56    Weir Avg Depth (ft)
  Culv Nml Depth (ft)         2.37    Weir Flow Area (sq ft)
  Culv Crt Depth (ft)         4.49    Min El Weir Flow (ft)     395.01
```

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section
         downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: JonesFalls
REACH: IntsTrib   RS: 6

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	381.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.	0.040	0.046	0.040
W.S. Elev (ft)	380.98	Reach Len. (ft)	117.00	118.00	119.00
Crit W.S. (ft)	380.06	Flow Area (sq ft)	0.33	26.60	0.05
E.G. Slope (ft/ft)	0.003314	Area (sq ft)	0.39	26.60	0.05
Q Total (cfs)	66.30	Flow (cfs)	0.36	65.92	0.02
Top Width (ft)	18.43	Top Width (ft)	1.40	16.61	0.42
Vel Total (ft/s)	2.46	Avg. Vel. (ft/s)	1.10	2.48	0.47
Max Chl Dpth (ft)	2.32	Hydr. Depth (ft)	0.40	1.60	0.12
Conv. Total (cfs)	1151.6	Conv. (cfs)	6.2	1145.0	0.4
Length Wtd. (ft)	118.00	Wetted Per. (ft)	0.88	17.29	0.48
Min Ch El (ft)	378.66	Shear (lb/sq ft)	0.08	0.32	0.02
Alpha	1.01	Stream Power (lb/ft s)	318.42	0.00	0.00
Frctn Loss (ft)	0.74	Cum Volume (acre-ft)	0.62	0.66	0.80
C & E Loss (ft)	0.04	Cum SA (acres)	0.00	0.36	0.03

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	381.88	Element	Left OB	Channel

Right OB

Vel Head (ft)	0.19	Wt. n-Val.	0.040	0.046	0.040
W.S. Elev (ft)	381.69	Reach Len. (ft)	117.00	118.00	119.00
Crit W.S. (ft)	380.68	Flow Area (sq ft)	0.91	38.43	0.81
E.G. Slope (ft/ft)	0.004116	Area (sq ft)	2.02	38.43	0.81
Q Total (cfs)	138.90	Flow (cfs)	2.21	135.62	1.07
Top Width (ft)	21.50	Top Width (ft)	3.17	16.61	1.71
Vel Total (ft/s)	3.46	Avg. Vel. (ft/s)	2.43	3.53	1.32
Max Chl Dpth (ft)	3.03	Hydr. Depth (ft)	1.11	2.31	0.47
Conv. Total (cfs)	2165.0	Conv. (cfs)	34.5	2113.8	16.7
Length Wtd. (ft)	117.99	Wetted Per. (ft)	0.88	17.29	1.96
Min Ch El (ft)	378.66	Shear (lb/sq ft)	0.26	0.57	0.11
Alpha	1.02	Stream Power (lb/ft s)	318.42	0.00	0.00
Frctn Loss (ft)	0.87	Cum Volume (acre-ft)	1.11	1.03	1.58
C & E Loss (ft)	0.05	Cum SA (acres)	0.07	0.42	0.58

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	382.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.34	Wt. n-Val.	0.040	0.046	0.040
W.S. Elev (ft)	382.54	Reach Len. (ft)	117.00	118.00	119.00
Crit W.S. (ft)	381.37	Flow Area (sq ft)	1.60	52.48	2.91
E.G. Slope (ft/ft)	0.004894	Area (sq ft)	5.60	52.48	2.91
Q Total (cfs)	261.20	Flow (cfs)	6.20	248.58	6.42
Top Width (ft)	25.14	Top Width (ft)	5.28	16.61	3.25
Vel Total (ft/s)	4.58	Avg. Vel. (ft/s)	3.87	4.74	2.21
Max Chl Dpth (ft)	3.88	Hydr. Depth (ft)	1.96	3.16	0.90
Conv. Total (cfs)	3733.9	Conv. (cfs)	88.6	3553.4	91.8
Length Wtd. (ft)	117.99	Wetted Per. (ft)	0.88	17.29	3.71

```
  Min Ch El (ft)             378.66    Shear (lb/sq ft)            0.55        0.93
   0.24
  Alpha                        1.04    Stream Power (lb/ft s)    318.42        0.00
   0.00
  Frctn Loss (ft)              1.09    Cum Volume (acre-ft)        2.11        1.59
   3.58
  C & E Loss (ft)              0.10    Cum SA (acres)              0.67        0.46
   0.94
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: JonesFalls
REACH: IntsTrib   RS: 5

CROSS SECTION OUTPUT Profile #2 Yr

```
  E.G. Elev (ft)             380.30    Element                   Left OB    Channel
Right OB
  Vel Head (ft)                0.22    Wt. n-Val.                           0.046

  W.S. Elev (ft)             380.08    Reach Len. (ft)           363.00    358.00
 354.00
  Crit W.S. (ft)             379.85    Flow Area (sq ft)                    17.59

  E.G. Slope (ft/ft)       0.015759    Area (sq ft)                         17.59

  Q Total (cfs)               66.30    Flow (cfs)                           66.30

  Top Width (ft)              19.28    Top Width (ft)                       19.28

  Vel Total (ft/s)             3.77    Avg. Vel. (ft/s)                      3.77

  Max Chl Dpth (ft)            1.66    Hydr. Depth (ft)                      0.91

  Conv. Total (cfs)           528.1    Conv. (cfs)                          528.1

  Length Wtd. (ft)           358.00    Wetted Per. (ft)                     19.62

  Min Ch El (ft)             378.42    Shear (lb/sq ft)                      0.88

  Alpha                        1.00    Stream Power (lb/ft s)    285.71      0.00
   0.00
  Frctn Loss (ft)              8.01    Cum Volume (acre-ft)        0.62      0.60
   0.80
  C & E Loss (ft)              0.02    Cum SA (acres)                        0.31
   0.03
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	380.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.36	Wt. n-Val.	0.040	0.046	
W.S. Elev (ft)	380.60	Reach Len. (ft)	363.00	358.00	354.00
Crit W.S. (ft)	380.36	Flow Area (sq ft)	0.28	28.59	
E.G. Slope (ft/ft)	0.016866	Area (sq ft)	0.28	28.59	
Q Total (cfs)	138.90	Flow (cfs)	0.29	138.61	
Top Width (ft)	25.38	Top Width (ft)	2.81	22.58	
Vel Total (ft/s)	4.81	Avg. Vel. (ft/s)	1.04	4.85	
Max Chl Dpth (ft)	2.18	Hydr. Depth (ft)	0.10	1.27	
Conv. Total (cfs)	1069.5	Conv. (cfs)	2.3	1067.3	
Length Wtd. (ft)	358.01	Wetted Per. (ft)	2.81	23.02	
Min Ch El (ft)	378.42	Shear (lb/sq ft)	0.11	1.31	
Alpha	1.01	Stream Power (lb/ft s)	285.71	0.00	0.00
Frctn Loss (ft)	8.00	Cum Volume (acre-ft)	1.11	0.94	1.58
C & E Loss (ft)	0.02	Cum SA (acres)	0.06	0.37	0.58

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	381.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.68	Wt. n-Val.	0.040	0.046	
W.S. Elev (ft)	381.01	Reach Len. (ft)	363.00	358.00	354.00
Crit W.S. (ft)	381.01	Flow Area (sq ft)	2.60	38.07	
E.G. Slope (ft/ft)	0.023771	Area (sq ft)	3.92	38.07	

Q Total (cfs)	261.20	Flow (cfs)	6.50	254.70
Top Width (ft)	54.47	Top Width (ft)	30.53	23.95
Vel Total (ft/s)	6.42	Avg. Vel. (ft/s)	2.50	6.69
Max Chl Dpth (ft)	2.59	Hydr. Depth (ft)	0.29	1.59
Conv. Total (cfs)	1694.1	Conv. (cfs)	42.1	1652.0
Length Wtd. (ft)	358.15	Wetted Per. (ft)	9.03	24.45
Min Ch El (ft)	378.42	Shear (lb/sq ft)	0.43	2.31
Alpha	1.06	Stream Power (lb/ft s)	285.71	0.00
0.00				
Frctn Loss (ft)	7.60	Cum Volume (acre-ft)	2.10	1.47
3.58				
C & E Loss (ft)	0.04	Cum SA (acres)	0.62	0.41
0.93				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: JonesFalls
REACH: IntsTrib RS: 4

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	372.27	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.39	Wt. n-Val.		0.046
W.S. Elev (ft)	371.88	Reach Len. (ft)	188.00	207.00
219.00				
Crit W.S. (ft)	371.88	Flow Area (sq ft)		13.27
E.G. Slope (ft/ft)	0.034227	Area (sq ft)		13.27
Q Total (cfs)	66.30	Flow (cfs)		66.30
Top Width (ft)	17.10	Top Width (ft)		17.10

Vel Total (ft/s)	5.00	Avg. Vel. (ft/s)		5.00
Max Chl Dpth (ft)	1.48	Hydr. Depth (ft)		0.78
Conv. Total (cfs)	358.4	Conv. (cfs)		358.4
Length Wtd. (ft)	207.00	Wetted Per. (ft)		17.37
Min Ch El (ft)	370.40	Shear (lb/sq ft)		1.63
Alpha	1.00	Stream Power (lb/ft s)	253.75	0.00
0.00				
Frctn Loss (ft)	2.52	Cum Volume (acre-ft)	0.62	0.48
0.80				
C & E Loss (ft)	0.06	Cum SA (acres)		0.16
0.03				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	372.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.53	Wt. n-Val.		0.046
W.S. Elev (ft)	372.41	Reach Len. (ft)	188.00	207.00
219.00				
Crit W.S. (ft)	372.41	Flow Area (sq ft)		23.67
E.G. Slope (ft/ft)	0.031022	Area (sq ft)		23.67
Q Total (cfs)	138.90	Flow (cfs)		138.90
Top Width (ft)	22.23	Top Width (ft)		22.23
Vel Total (ft/s)	5.87	Avg. Vel. (ft/s)		5.87
Max Chl Dpth (ft)	2.01	Hydr. Depth (ft)		1.06
Conv. Total (cfs)	788.6	Conv. (cfs)		788.6
Length Wtd. (ft)	206.53	Wetted Per. (ft)		22.61
Min Ch El (ft)	370.40	Shear (lb/sq ft)		2.03

```
  Alpha                        1.00    Stream Power (lb/ft s)    253.75       0.00
   0.00
  Frctn Loss (ft)              1.77    Cum Volume (acre-ft)        1.11       0.72
   1.58
  C & E Loss (ft)              0.11    Cum SA (acres)              0.05       0.18
   0.58
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 Yr

```
  E.G. Elev (ft)             373.70    Element                   Left OB    Channel
Right OB
  Vel Head (ft)                0.54    Wt. n-Val.                 0.040      0.046

  W.S. Elev (ft)             373.15    Reach Len. (ft)           188.00     207.00
 219.00
  Crit W.S. (ft)             373.15    Flow Area (sq ft)           4.67      42.00

  E.G. Slope (ft/ft)       0.019080    Area (sq ft)                4.67      42.00

  Q Total (cfs)              261.20    Flow (cfs)                  8.71     252.49

  Top Width (ft)              47.64    Top Width (ft)             21.24      26.39

  Vel Total (ft/s)             5.60    Avg. Vel. (ft/s)            1.87       6.01

  Max Chl Dpth (ft)            2.75    Hydr. Depth (ft)            0.22       1.59

  Conv. Total (cfs)          1890.9    Conv. (cfs)                 63.1     1827.9

  Length Wtd. (ft)           208.99    Wetted Per. (ft)           21.27      26.86

  Min Ch El (ft)             370.40    Shear (lb/sq ft)            0.26       1.86

  Alpha                        1.12    Stream Power (lb/ft s)    253.75       0.00
   0.00
  Frctn Loss (ft)              0.06    Cum Volume (acre-ft)        2.06       1.14
   3.58
  C & E Loss (ft)              0.16    Cum SA (acres)              0.41       0.20
   0.93
```

Warning: The energy equation could not be balanced within the specified number of

iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: JonesFalls
REACH: IntsTrib   RS: 3

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	367.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.		0.046	
W.S. Elev (ft)	367.28	Reach Len. (ft)	112.00	116.00	119.00
Crit W.S. (ft)	365.59	Flow Area (sq ft)		19.11	
E.G. Slope (ft/ft)	0.006169	Area (sq ft)		19.11	
Q Total (cfs)	66.30	Flow (cfs)		66.30	
Top Width (ft)	6.16	Top Width (ft)		6.16	
Vel Total (ft/s)	3.47	Avg. Vel. (ft/s)		3.47	
Max Chl Dpth (ft)	3.42	Hydr. Depth (ft)		3.10	
Conv. Total (cfs)	844.1	Conv. (cfs)		844.1	
Length Wtd. (ft)	116.00	Wetted Per. (ft)		11.95	
Min Ch El (ft)	363.86	Shear (lb/sq ft)		0.62	
Alpha	1.00	Stream Power (lb/ft s)	446.13	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.62	0.40	0.80
C & E Loss (ft)		Cum SA (acres)		0.11	0.03

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	369.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.	0.046	0.046	0.042
W.S. Elev (ft)	369.31	Reach Len. (ft)	112.00	116.00	119.00
Crit W.S. (ft)	366.65	Flow Area (sq ft)	8.25	31.99	4.36
E.G. Slope (ft/ft)	0.003947	Area (sq ft)	8.32	31.99	30.22
Q Total (cfs)	138.90	Flow (cfs)	13.35	115.24	10.31
Top Width (ft)	91.80	Top Width (ft)	12.73	6.42	72.65
Vel Total (ft/s)	3.11	Avg. Vel. (ft/s)	1.62	3.60	2.36
Max Chl Dpth (ft)	5.45	Hydr. Depth (ft)	0.72	4.98	1.08
Conv. Total (cfs)	2210.8	Conv. (cfs)	212.6	1834.2	164.0
Length Wtd. (ft)	116.00	Wetted Per. (ft)	11.57	13.53	4.03
Min Ch El (ft)	363.86	Shear (lb/sq ft)	0.18	0.58	0.27
Alpha	1.18	Stream Power (lb/ft s)	446.13	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	1.09	0.59	1.50
C & E Loss (ft)		Cum SA (acres)	0.02	0.11	0.40

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	371.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.043	0.046	0.040
W.S. Elev (ft)	371.98	Reach Len. (ft)	112.00	116.00	119.00
Crit W.S. (ft)	368.80	Flow Area (sq ft)	119.72	49.16	334.22
E.G. Slope (ft/ft)	0.000077	Area (sq ft)	119.72	49.16	334.22
Q Total (cfs)	261.20	Flow (cfs)	49.52	32.92	178.76
Top Width (ft)	269.29	Top Width (ft)	104.03	6.42	158.83
Vel Total (ft/s)	0.52	Avg. Vel. (ft/s)	0.41	0.67	0.53
Max Chl Dpth (ft)	8.12	Hydr. Depth (ft)	1.15	7.66	2.10
Conv. Total (cfs)	29777.7	Conv. (cfs)	5645.4	3753.2	20379.1

Length Wtd. (ft)	116.00	Wetted Per. (ft)	104.18	13.53
158.91				
Min Ch El (ft)	363.86	Shear (lb/sq ft)	0.01	0.02
0.01				
Alpha	1.06	Stream Power (lb/ft s)	446.13	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	1.80	0.92
2.74				
C & E Loss (ft)		Cum SA (acres)	0.14	0.12
0.54				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: JonesFalls
REACH: IntsTrib RS: 2.5

CULVERT OUTPUT Profile #2 Yr Culv Group: ParkHgtsAve

Q Culv Group (cfs)	66.30	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	7.54
Q Barrel (cfs)	66.30	Culv Vel DS (ft/s)	8.36
E.G. US. (ft)	367.48	Culv Inv El Up (ft)	363.86
W.S. US. (ft)	367.28	Culv Inv El Dn (ft)	363.47
E.G. DS (ft)	365.83	Culv Frctn Ls (ft)	0.36
W.S. DS (ft)	365.47	Culv Exit Loss (ft)	0.84
Delta EG (ft)	1.65	Culv Entr Loss (ft)	0.44
Delta WS (ft)	1.82	Q Weir (cfs)	
E.G. IC (ft)	367.14	Weir Sta Lft (ft)	
E.G. OC (ft)	367.48	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	366.16	Weir Max Depth (ft)	
Culv WS Outlet (ft)	365.59	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	2.12	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.30	Min El Weir Flow (ft)	371.14

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section
downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal
depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10 Yr Culv Group: ParkHgtsAve

Q Culv Group (cfs)	138.90	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	9.85
Q Barrel (cfs)	138.90	Culv Vel DS (ft/s)	9.97
E.G. US. (ft)	369.49	Culv Inv El Up (ft)	363.86
W.S. US. (ft)	369.31	Culv Inv El Dn (ft)	363.47
E.G. DS (ft)	366.43	Culv Frctn Ls (ft)	0.39
W.S. DS (ft)	366.18	Culv Exit Loss (ft)	1.92
Delta EG (ft)	3.06	Culv Entr Loss (ft)	0.75
Delta WS (ft)	3.12	Q Weir (cfs)	
E.G. IC (ft)	369.22	Weir Sta Lft (ft)	

E.G. OC (ft)	369.49	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	367.24	Weir Max Depth (ft)	
Culv WS Outlet (ft)	366.81	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	3.34	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	3.38	Min El Weir Flow (ft)	371.14

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section
downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal
depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100 Yr Culv Group: ParkHgtsAve

Q Culv Group (cfs)	215.36	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	10.97
Q Barrel (cfs)	215.36	Culv Vel DS (ft/s)	14.14
E.G. US. (ft)	371.99	Culv Inv El Up (ft)	363.86
W.S. US. (ft)	371.98	Culv Inv El Dn (ft)	363.47
E.G. DS (ft)	366.80	Culv Frctn Ls (ft)	0.86
W.S. DS (ft)	366.45	Culv Exit Loss (ft)	3.40
Delta EG (ft)	5.19	Culv Entr Loss (ft)	0.93
Delta WS (ft)	5.53	Q Weir (cfs)	45.84
E.G. IC (ft)	371.99	Weir Sta Lft (ft)	287.89
E.G. OC (ft)	371.50	Weir Sta Rgt (ft)	358.89
Culvert Control	Inlet	Weir Submerg	0.00
Culv WS Inlet (ft)	368.86	Weir Max Depth (ft)	0.85
Culv WS Outlet (ft)	367.09	Weir Avg Depth (ft)	0.37
Culv Nml Depth (ft)	5.00	Weir Flow Area (sq ft)	26.51
Culv Crt Depth (ft)	4.17	Min El Weir Flow (ft)	371.14

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section
downstream of the culvert has supercritical flow.
Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height
of the culvert.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: JonesFalls
REACH: IntsTrib RS: 2

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	365.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.37	Wt. n-Val.		0.046	0.045
W.S. Elev (ft)	365.47	Reach Len. (ft)	209.00	187.00	167.00
Crit W.S. (ft)	365.18	Flow Area (sq ft)		12.50	2.37
E.G. Slope (ft/ft)	0.016488	Area (sq ft)		12.50	

2.37
Q Total (cfs) 66.30 Flow (cfs) 62.49
3.81
Top Width (ft) 17.64 Top Width (ft) 7.44
10.20
Vel Total (ft/s) 4.46 Avg. Vel. (ft/s) 5.00
1.60
Max Chl Dpth (ft) 2.00 Hydr. Depth (ft) 1.68
0.23
Conv. Total (cfs) 516.3 Conv. (cfs) 486.7
29.6
Length Wtd. (ft) 186.43 Wetted Per. (ft) 9.45
10.21
Min Ch El (ft) 363.47 Shear (lb/sq ft) 1.36
0.24
Alpha 1.19 Stream Power (lb/ft s) 321.80 0.00
0.00
Frctn Loss (ft) 4.53 Cum Volume (acre-ft) 0.62 0.38
0.80
C & E Loss (ft) 0.06 Cum SA (acres) 0.09
0.02

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft) 366.43 Element Left OB Channel
Right OB
Vel Head (ft) 0.25 Wt. n-Val. 0.045 0.046
0.045
W.S. Elev (ft) 366.18 Reach Len. (ft) 209.00 187.00
167.00
Crit W.S. (ft) 366.18 Flow Area (sq ft) 0.05 18.10
27.46
E.G. Slope (ft/ft) 0.010415 Area (sq ft) 0.05 18.10
38.15
Q Total (cfs) 138.90 Flow (cfs) 0.03 87.32
51.54
Top Width (ft) 96.30 Top Width (ft) 0.52 8.00
87.77
Vel Total (ft/s) 3.05 Avg. Vel. (ft/s) 0.66 4.82
1.88
Max Chl Dpth (ft) 2.71 Hydr. Depth (ft) 0.09 2.26
0.42
Conv. Total (cfs) 1361.1 Conv. (cfs) 0.3 855.7
505.1
Length Wtd. (ft) 183.21 Wetted Per. (ft) 0.56 10.22
66.06
Min Ch El (ft) 363.47 Shear (lb/sq ft) 0.06 1.15
0.27
Alpha 1.72 Stream Power (lb/ft s) 321.80 0.00
0.00
Frctn Loss (ft) 3.09 Cum Volume (acre-ft) 1.09 0.55

```
  1.50
 C & E Loss (ft)             0.04    Cum SA (acres)              0.00       0.09
  0.18


Warning: The energy equation could not be balanced within the specified number of
iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set
equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates that there is
not a valid subcritical answer.  The program
         defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT  Profile #100 Yr


  E.G. Elev (ft)            366.80    Element                    Left OB    Channel
Right OB
  Vel Head (ft)               0.35    Wt. n-Val.                  0.045      0.046
  0.045
  W.S. Elev (ft)            366.45    Reach Len. (ft)            209.00     187.00
 167.00
  Crit W.S. (ft)            366.45    Flow Area (sq ft)            0.29      20.24
  45.08
  E.G. Slope (ft/ft)      0.014253    Area (sq ft)                 0.29      20.24
  62.06
  Q Total (cfs)             261.20    Flow (cfs)                   0.41     123.02
 137.77
  Top Width (ft)            100.67    Top Width (ft)               1.28       8.00
  91.38
  Vel Total (ft/s)            3.98    Avg. Vel. (ft/s)             1.40       6.08
   3.06
  Max Chl Dpth (ft)           2.98    Hydr. Depth (ft)             0.23       2.53
   0.68
  Conv. Total (cfs)         2187.9    Conv. (cfs)                   3.4     1030.5
 1154.0
  Length Wtd. (ft)          181.36    Wetted Per. (ft)             1.36      10.22
  66.06
  Min Ch El (ft)            363.47    Shear (lb/sq ft)             0.19       1.76
   0.61
  Alpha                       1.41    Stream Power (lb/ft s)     321.80       0.00
   0.00
  Frctn Loss (ft)             3.48    Cum Volume (acre-ft)         1.80       0.77
   2.74
  C & E Loss (ft)             0.04    Cum SA (acres)               0.00       0.10
   0.19


Warning: The energy equation could not be balanced within the specified number of
iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
```

previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: JonesFalls
REACH: IntsTrib   RS: 1

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	361.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.		0.046	
W.S. Elev (ft)	360.99	Reach Len. (ft)	507.00	507.00	507.00
Crit W.S. (ft)	360.99	Flow Area (sq ft)		16.55	
E.G. Slope (ft/ft)	0.039364	Area (sq ft)		16.55	
Q Total (cfs)	66.30	Flow (cfs)		66.30	
Top Width (ft)	33.41	Top Width (ft)		33.41	
Vel Total (ft/s)	4.01	Avg. Vel. (ft/s)		4.01	
Max Chl Dpth (ft)	0.99	Hydr. Depth (ft)		0.50	
Conv. Total (cfs)	334.2	Conv. (cfs)		334.2	
Length Wtd. (ft)	507.00	Wetted Per. (ft)		33.49	
Min Ch El (ft)	360.00	Shear (lb/sq ft)		1.21	
Alpha	1.00	Stream Power (lb/ft s)	371.98	0.00	0.00
Frctn Loss (ft)	5.44	Cum Volume (acre-ft)	0.62	0.32	0.80
C & E Loss (ft)	0.04	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	361.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.37	Wt. n-Val.		0.046	0.045
W.S. Elev (ft)	361.33	Reach Len. (ft)	507.00	507.00	507.00
Crit W.S. (ft)	361.33	Flow Area (sq ft)		28.22	0.69
E.G. Slope (ft/ft)	0.031925	Area (sq ft)		28.22	0.69
Q Total (cfs)	138.90	Flow (cfs)		137.70	1.20
Top Width (ft)	40.43	Top Width (ft)		36.21	4.22
Vel Total (ft/s)	4.80	Avg. Vel. (ft/s)		4.88	1.75
Max Chl Dpth (ft)	1.33	Hydr. Depth (ft)		0.78	0.16
Conv. Total (cfs)	777.4	Conv. (cfs)		770.7	6.7
Length Wtd. (ft)	507.00	Wetted Per. (ft)		36.32	4.23
Min Ch El (ft)	360.00	Shear (lb/sq ft)		1.55	0.32
Alpha	1.02	Stream Power (lb/ft s)	371.98	0.00	0.00
Frctn Loss (ft)	5.26	Cum Volume (acre-ft)	1.09	0.45	1.43
C & E Loss (ft)	0.05	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	362.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.49	Wt. n-Val.		0.046	0.045
W.S. Elev (ft)	361.74	Reach Len. (ft)	507.00	507.00	507.00

```
  Crit W.S. (ft)            361.74    Flow Area (sq ft)                      43.92
   3.55
  E.G. Slope (ft/ft)      0.027244    Area (sq ft)                           43.92
   3.55
  Q Total (cfs)             261.20    Flow (cfs)                            251.23
   9.97
  Top Width (ft)             49.00    Top Width (ft)                         39.40
   9.60
  Vel Total (ft/s)            5.50    Avg. Vel. (ft/s)                        5.72
   2.80
  Max Chl Dpth (ft)           1.74    Hydr. Depth (ft)                        1.11
   0.37
  Conv. Total (cfs)         1582.5    Conv. (cfs)                           1522.1
   60.4
  Length Wtd. (ft)          507.00    Wetted Per. (ft)                       39.53
   9.63
  Min Ch El (ft)            360.00    Shear (lb/sq ft)                        1.89
   0.63
  Alpha                       1.05    Stream Power (lb/ft s)    371.98        0.00
   0.00
  Frctn Loss (ft)             4.95    Cum Volume (acre-ft)        1.80        0.64
   2.61
  C & E Loss (ft)             0.07    Cum SA (acres)
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls3   RS: 10

CROSS SECTION OUTPUT Profile #2 Yr

```
  E.G. Elev (ft)            367.21    Element                   Left OB    Channel
Right OB
  Vel Head (ft)               0.38    Wt. n-Val.                 0.110      0.049
  0.110
  W.S. Elev (ft)            366.83    Reach Len. (ft)           110.95     122.86
 127.14
  Crit W.S. (ft)            365.98    Flow Area (sq ft)          72.54     110.27
   9.13
  E.G. Slope (ft/ft)      0.007744    Area (sq ft)               72.54     110.27
  27.26
  Q Total (cfs)             655.40    Flow (cfs)                 70.93     578.20
   6.27
```

```
  Top Width (ft)             176.92    Top Width (ft)             97.19      37.50
  42.23
  Vel Total (ft/s)             3.41    Avg. Vel. (ft/s)            0.98       5.24
   0.69
  Max Chl Dpth (ft)            4.53    Hydr. Depth (ft)            0.75       2.94
   0.44
  Conv. Total (cfs)          7447.8    Conv. (cfs)                806.1     6570.5
   71.2
  Length Wtd. (ft)           122.02    Wetted Per. (ft)           97.22      40.03
  20.83
  Min Ch El (ft)             362.30    Shear (lb/sq ft)            0.36       1.33
   0.21
  Alpha                        2.09    Stream Power (lb/ft s)    465.75       0.00
   0.00
  Frctn Loss (ft)              1.05    Cum Volume (acre-ft)        3.37       2.98
   4.70
  C & E Loss (ft)              0.02    Cum SA (acres)              2.96       0.99
   4.71
```

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

```
  E.G. Elev (ft)             368.56    Element                   Left OB    Channel
Right OB
  Vel Head (ft)                0.38    Wt. n-Val.                 0.110      0.049
  0.110
  W.S. Elev (ft)             368.18    Reach Len. (ft)           110.95     122.86
 127.14
  Crit W.S. (ft)             367.50    Flow Area (sq ft)         224.71     160.94
 138.34
  E.G. Slope (ft/ft)       0.006274    Area (sq ft)              224.71     160.94
 138.34
  Q Total (cfs)             1520.50    Flow (cfs)                368.66     977.41
 174.43
  Top Width (ft)             263.19    Top Width (ft)            118.24      37.50
 107.45
  Vel Total (ft/s)             2.90    Avg. Vel. (ft/s)            1.64       6.07
   1.26
  Max Chl Dpth (ft)            5.88    Hydr. Depth (ft)            1.90       4.29
   1.29
  Conv. Total (cfs)         19196.7    Conv. (cfs)               4654.4    12340.1
 2202.3
  Length Wtd. (ft)           120.89    Wetted Per. (ft)          118.35      40.03
 108.13
  Min Ch El (ft)             362.30    Shear (lb/sq ft)            0.74       1.57
   0.50
  Alpha                        2.91    Stream Power (lb/ft s)    465.75       0.00
   0.00
  Frctn Loss (ft)              0.99    Cum Volume (acre-ft)       11.95       4.42
  17.00
  C & E Loss (ft)              0.04    Cum SA (acres)              5.45       0.99
   7.60
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	370.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.	0.110	0.049	0.110
W.S. Elev (ft)	369.55	Reach Len. (ft)	110.95	122.86	127.14
Crit W.S. (ft)	368.59	Flow Area (sq ft)	391.79	212.46	300.66
E.G. Slope (ft/ft)	0.006843	Area (sq ft)	391.79	212.46	300.66
Q Total (cfs)	3144.30	Flow (cfs)	935.16	1621.72	587.42
Top Width (ft)	293.43	Top Width (ft)	125.26	37.50	130.68
Vel Total (ft/s)	3.47	Avg. Vel. (ft/s)	2.39	7.63	1.95
Max Chl Dpth (ft)	7.25	Hydr. Depth (ft)	3.13	5.67	2.30
Conv. Total (cfs)	38009.6	Conv. (cfs)	11304.6	19604.0	7101.0
Length Wtd. (ft)	120.54	Wetted Per. (ft)	125.50	40.03	131.43
Min Ch El (ft)	362.30	Shear (lb/sq ft)	1.33	2.27	0.98
Alpha	2.69	Stream Power (lb/ft s)	465.75	0.00	0.00
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)	24.57	7.10	34.82
C & E Loss (ft)	0.02	Cum SA (acres)	6.52	0.99	9.24

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls3 RS: 9

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	366.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.57	Wt. n-Val.	0.110	0.049	0.110
W.S. Elev (ft)	365.57	Reach Len. (ft)	129.00	133.89	139.77
Crit W.S. (ft)	364.46	Flow Area (sq ft)	42.94	89.01	37.85
E.G. Slope (ft/ft)	0.009531	Area (sq ft)	42.94	89.01	37.85

```
  Q Total (cfs)              655.40    Flow (cfs)                 38.76      575.41
  41.23
  Top Width (ft)             149.30    Top Width (ft)             75.30       25.35
  48.66
  Vel Total (ft/s)             3.86    Avg. Vel. (ft/s)            0.90        6.46
   1.09
  Max Chl Dpth (ft)            4.49    Hydr. Depth (ft)            0.57        3.51
   0.78
  Conv. Total (cfs)          6713.3    Conv. (cfs)                397.0      5893.9
  422.3
  Length Wtd. (ft)           132.76    Wetted Per. (ft)           75.84       27.59
  50.43
  Min Ch El (ft)             361.08    Shear (lb/sq ft)            0.34        1.92
   0.45
  Alpha                        2.47    Stream Power (lb/ft s)    486.63        0.00
   0.00
  Frctn Loss (ft)              0.89    Cum Volume (acre-ft)        3.23        2.70
   4.60
  C & E Loss (ft)              0.12    Cum SA (acres)              2.74        0.90
   4.58
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

```
  E.G. Elev (ft)             367.53    Element                   Left OB    Channel
Right OB
  Vel Head (ft)                0.77    Wt. n-Val.                 0.110       0.049
  0.108
  W.S. Elev (ft)             366.76    Reach Len. (ft)           129.00      133.89
 139.77
  Crit W.S. (ft)             366.61    Flow Area (sq ft)         144.54      119.10
 114.92
  E.G. Slope (ft/ft)       0.011233    Area (sq ft)              144.54      119.10
 114.92
  Q Total (cfs)             1520.50    Flow (cfs)                277.80     1014.87
 227.83
  Top Width (ft)             196.27    Top Width (ft)             92.34       25.35
  78.58
  Vel Total (ft/s)             4.02    Avg. Vel. (ft/s)            1.92        8.52
   1.98
  Max Chl Dpth (ft)            5.68    Hydr. Depth (ft)            1.57        4.70
   1.46
  Conv. Total (cfs)         14346.5    Conv. (cfs)               2621.1      9575.7
 2149.7
  Length Wtd. (ft)           132.73    Wetted Per. (ft)           92.93       27.59
  80.38
  Min Ch El (ft)             361.08    Shear (lb/sq ft)            1.09        3.03
   1.00
  Alpha                        3.08    Stream Power (lb/ft s)    486.63        0.00
   0.00
  Frctn Loss (ft)              1.38    Cum Volume (acre-ft)       11.48        4.02
  16.63
  C & E Loss (ft)              0.12    Cum SA (acres)              5.18        0.90
   7.32
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	369.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.75	Wt. n-Val.	0.110	0.049	0.092
W.S. Elev (ft)	368.31	Reach Len. (ft)	129.00	133.89	139.77
Crit W.S. (ft)	367.88	Flow Area (sq ft)	298.75	158.50	271.68
E.G. Slope (ft/ft)	0.009655	Area (sq ft)	298.75	158.50	271.68
Q Total (cfs)	3144.30	Flow (cfs)	799.38	1515.11	829.81
Top Width (ft)	249.33	Top Width (ft)	103.65	25.35	120.32
Vel Total (ft/s)	4.31	Avg. Vel. (ft/s)	2.68	9.56	3.05
Max Chl Dpth (ft)	7.23	Hydr. Depth (ft)	2.88	6.25	2.26
Conv. Total (cfs)	31999.9	Conv. (cfs)	8135.4	15419.5	8445.0
Length Wtd. (ft)	132.94	Wetted Per. (ft)	104.38	27.59	122.15
Min Ch El (ft)	361.08	Shear (lb/sq ft)	1.73	3.46	1.34
Alpha	2.60	Stream Power (lb/ft s)	486.63	0.00	0.00
Frctn Loss (ft)	1.91	Cum Volume (acre-ft)	23.69	6.58	33.98
C & E Loss (ft)	0.03	Cum SA (acres)	6.23	0.90	8.87

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls3 RS: 8

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	365.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.	0.091	0.049	0.040

W.S. Elev (ft)	364.96	Reach Len. (ft)	491.90	504.10	506.12
Crit W.S. (ft)	364.31	Flow Area (sq ft)	210.89	58.80	15.09
E.G. Slope (ft/ft)	0.004963	Area (sq ft)	210.89	58.80	15.09
Q Total (cfs)	655.40	Flow (cfs)	347.72	278.92	28.76
Top Width (ft)	165.06	Top Width (ft)	125.05	15.73	24.27
Vel Total (ft/s)	2.30	Avg. Vel. (ft/s)	1.65	4.74	1.91
Max Chl Dpth (ft)	5.01	Hydr. Depth (ft)	1.69	3.74	0.62
Conv. Total (cfs)	9302.8	Conv. (cfs)	4935.6	3959.1	408.2
Length Wtd. (ft)	500.33	Wetted Per. (ft)	125.86	17.77	24.30
Min Ch El (ft)	359.95	Shear (lb/sq ft)	0.52	1.03	0.19
Alpha	2.11	Stream Power (lb/ft s)	514.52	0.00	0.00
Frctn Loss (ft)	4.81	Cum Volume (acre-ft)	2.85	2.48	4.52
C & E Loss (ft)	0.10	Cum SA (acres)	2.45	0.84	4.46

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	366.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.	0.088	0.049	0.040
W.S. Elev (ft)	365.65	Reach Len. (ft)	491.90	504.10	506.12
Crit W.S. (ft)	365.13	Flow Area (sq ft)	299.93	69.75	36.45
E.G. Slope (ft/ft)	0.009597	Area (sq ft)	299.93	69.75	36.45
Q Total (cfs)	1520.50	Flow (cfs)	873.59	515.48	131.43
Top Width (ft)	183.18	Top Width (ft)	130.54	15.73	36.90
Vel Total (ft/s)	3.74	Avg. Vel. (ft/s)	2.91	7.39	3.61
Max Chl Dpth (ft)	5.70	Hydr. Depth (ft)	2.30	4.43	0.99
Conv. Total (cfs)	15520.9	Conv. (cfs)	8917.4	5261.9	1341.6
Length Wtd. (ft)	500.31	Wetted Per. (ft)	131.39	17.77	36.95

```
  Min Ch El (ft)            359.95    Shear (lb/sq ft)          1.37       2.35
   0.59
  Alpha                       1.75    Stream Power (lb/ft s)  514.52       0.00
   0.00
  Frctn Loss (ft)             5.00    Cum Volume (acre-ft)     10.82       3.73
  16.39
  C & E Loss (ft)             0.01    Cum SA (acres)            4.85       0.84
   7.14
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Yr

```
  E.G. Elev (ft)            367.12    Element                 Left OB    Channel
Right OB
  Vel Head (ft)               1.03    Wt. n-Val.               0.087      0.049
  0.040
  W.S. Elev (ft)            366.09    Reach Len. (ft)         491.90     504.10
 506.12
  Crit W.S. (ft)            366.09    Flow Area (sq ft)       358.17      76.69
  54.46
  E.G. Slope (ft/ft)      0.023572    Area (sq ft)            358.17      76.69
  54.46
  Q Total (cfs)            3144.30    Flow (cfs)             1844.41     946.23
 353.66
  Top Width (ft)            193.98    Top Width (ft)          133.50      15.73
  44.76
  Vel Total (ft/s)            6.43    Avg. Vel. (ft/s)          5.15      12.34
   6.49
  Max Chl Dpth (ft)           6.14    Hydr. Depth (ft)          2.68       4.88
   1.22
  Conv. Total (cfs)        20479.7    Conv. (cfs)            12013.1     6163.1
 2303.5
  Length Wtd. (ft)          499.63    Wetted Per. (ft)        134.38      17.77
  44.82
  Min Ch El (ft)            359.95    Shear (lb/sq ft)          3.92       6.35
   1.79
  Alpha                       1.60    Stream Power (lb/ft s)  514.52       0.00
   0.00
  Frctn Loss (ft)             1.16    Cum Volume (acre-ft)     22.71       6.22
  33.46
  C & E Loss (ft)             0.28    Cum SA (acres)            5.88       0.84
   8.60
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set

equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls3 RS: 7

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	360.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.16	Wt. n-Val.	0.110	0.049	0.110
W.S. Elev (ft)	359.06	Reach Len. (ft)	469.28	475.20	444.49
Crit W.S. (ft)	359.06	Flow Area (sq ft)	22.71	65.43	2.14
E.G. Slope (ft/ft)	0.026068	Area (sq ft)	22.71	65.43	2.14
Q Total (cfs)	655.40	Flow (cfs)	62.42	591.43	1.55
Top Width (ft)	48.71	Top Width (ft)	14.22	23.27	11.22
Vel Total (ft/s)	7.26	Avg. Vel. (ft/s)	2.75	9.04	0.72
Max Chl Dpth (ft)	4.01	Hydr. Depth (ft)	1.60	2.81	0.19
Conv. Total (cfs)	4059.3	Conv. (cfs)	386.6	3663.1	9.6
Length Wtd. (ft)	467.10	Wetted Per. (ft)	16.05	26.09	11.22
Min Ch El (ft)	355.05	Shear (lb/sq ft)	2.30	4.08	0.31
Alpha	1.41	Stream Power (lb/ft s)	670.42	0.00	0.00
Frctn Loss (ft)	2.09	Cum Volume (acre-ft)	1.53	1.76	4.42
C & E Loss (ft)	0.32	Cum SA (acres)	1.66	0.61	4.25

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	361.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.	0.085	0.049	0.049
W.S. Elev (ft)	360.51	Reach Len. (ft)	469.28	475.20	444.49
Crit W.S. (ft)	360.51	Flow Area (sq ft)	88.57	99.08	183.70
E.G. Slope (ft/ft)	0.010430	Area (sq ft)	88.57	99.08	183.70
Q Total (cfs)	1520.50	Flow (cfs)	189.20	747.07	584.23
Top Width (ft)	284.18	Top Width (ft)	84.87	23.27	176.05
Vel Total (ft/s)	4.09	Avg. Vel. (ft/s)	2.14	7.54	3.18
Max Chl Dpth (ft)	5.46	Hydr. Depth (ft)	1.04	4.26	1.04
Conv. Total (cfs)	14888.0	Conv. (cfs)	1852.6	7314.9	5720.5
Length Wtd. (ft)	459.84	Wetted Per. (ft)	86.81	26.09	176.11
Min Ch El (ft)	355.05	Shear (lb/sq ft)	0.66	2.47	0.68
Alpha	1.93	Stream Power (lb/ft s)	670.42	0.00	0.00
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	8.63	2.76	15.11
C & E Loss (ft)	0.15	Cum SA (acres)	3.63	0.61	5.90

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	363.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.	0.056	0.049	0.047
W.S. Elev (ft)	363.77	Reach Len. (ft)	469.28	475.20	444.49
Crit W.S. (ft)	361.16	Flow Area (sq ft)	462.99	174.91	802.15

```
  E.G. Slope (ft/ft)      0.000813    Area (sq ft)              462.99     174.91
 802.15
  Q Total (cfs)            3144.30    Flow (cfs)                813.43     537.69
1793.17
  Top Width (ft)            361.39    Top Width (ft)            134.79      23.27
 203.33
  Vel Total (ft/s)            2.18    Avg. Vel. (ft/s)            1.76       3.07
  2.24
  Max Chl Dpth (ft)           8.72    Hydr. Depth (ft)            3.44       7.52
  3.94
  Conv. Total (cfs)       110290.8    Conv. (cfs)              28532.3    18860.4
62898.1
  Length Wtd. (ft)          455.79    Wetted Per. (ft)          136.85      26.09
 203.59
  Min Ch El (ft)            355.05    Shear (lb/sq ft)            0.17       0.34
  0.20
  Alpha                       1.10    Stream Power (lb/ft s)    670.42       0.00
  0.00
  Frctn Loss (ft)             0.13    Cum Volume (acre-ft)       18.08       4.76
 28.48
  C & E Loss (ft)             0.02    Cum SA (acres)              4.37       0.61
  7.16
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls3   RS: 6

CROSS SECTION OUTPUT Profile #2 Yr

```
  E.G. Elev (ft)            356.81    Element                   Left OB    Channel
Right OB
  Vel Head (ft)               0.09    Wt. n-Val.                 0.110      0.049
  0.110
  W.S. Elev (ft)            356.72    Reach Len. (ft)           121.97      81.55
 93.44
  Crit W.S. (ft)            355.74    Flow Area (sq ft)          43.67      90.44
 404.42
  E.G. Slope (ft/ft)      0.001777    Area (sq ft)               85.98      90.44
 519.04
  Q Total (cfs)             655.40    Flow (cfs)                 24.65     303.16
 327.59
  Top Width (ft)            442.46    Top Width (ft)            105.60      18.63
 318.23
  Vel Total (ft/s)            1.22    Avg. Vel. (ft/s)            0.56       3.35
  0.81
  Max Chl Dpth (ft)           5.20    Hydr. Depth (ft)            0.99       4.85
  1.70
  Conv. Total (cfs)        15547.9    Conv. (cfs)                584.9     7191.8
 7771.3
  Length Wtd. (ft)           86.14    Wetted Per. (ft)           44.23      21.30
 238.36
  Min Ch El (ft)            351.52    Shear (lb/sq ft)            0.11       0.47
  0.19
```

```
  Alpha                        3.74    Stream Power (lb/ft s)    760.76       0.00
   0.00
  Frctn Loss (ft)              0.17    Cum Volume (acre-ft)        0.95       0.91
   1.76
  C & E Loss (ft)              0.00    Cum SA (acres)              1.01       0.39
   2.57
```

Warning: Divided flow computed for this cross-section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

```
  E.G. Elev (ft)             360.42    Element                   Left OB    Channel
Right OB
  Vel Head (ft)                0.01    Wt. n-Val.                 0.110      0.049
  0.110
  W.S. Elev (ft)             360.40    Reach Len. (ft)           121.97      81.55
  93.44
  Crit W.S. (ft)             356.50    Flow Area (sq ft)         835.52     159.06
1281.92
  E.G. Slope (ft/ft)       0.000238    Area (sq ft)              835.52     159.06
1763.58
  Q Total (cfs)             1520.50    Flow (cfs)                415.87     284.36
 820.27
  Top Width (ft)             598.93    Top Width (ft)            225.89      18.63
 354.40
  Vel Total (ft/s)             0.67    Avg. Vel. (ft/s)            0.50       1.79
   0.64
  Max Chl Dpth (ft)            8.88    Hydr. Depth (ft)            3.70       8.54
   5.38
  Conv. Total (cfs)         98532.6    Conv. (cfs)              26949.8    18427.3
53155.5
  Length Wtd. (ft)            93.69    Wetted Per. (ft)          226.44      21.30
 238.36
  Min Ch El (ft)             351.52    Shear (lb/sq ft)            0.05       0.11
   0.08
  Alpha                        1.99    Stream Power (lb/ft s)    760.76       0.00
   0.00
  Frctn Loss (ft)              0.04    Cum Volume (acre-ft)        3.65       1.35
   5.17
  C & E Loss (ft)              0.01    Cum SA (acres)              1.96       0.39
   3.19
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 Yr

```
  E.G. Elev (ft)             363.69    Element                   Left OB    Channel
Right OB
  Vel Head (ft)                0.01    Wt. n-Val.                 0.110      0.049
  0.110
  W.S. Elev (ft)             363.68    Reach Len. (ft)           121.97      81.55
```

93.44

Crit W.S. (ft)	357.34	Flow Area (sq ft)	1634.94	220.17
2995.42				
E.G. Slope (ft/ft)	0.000150	Area (sq ft)	1634.94	220.17
2995.42				
Q Total (cfs)	3144.30	Flow (cfs)	907.68	387.38
1849.24				
Top Width (ft)	697.26	Top Width (ft)	264.57	18.63
414.05				
Vel Total (ft/s)	0.65	Avg. Vel. (ft/s)	0.56	1.76
0.62				
Max Chl Dpth (ft)	12.16	Hydr. Depth (ft)	6.18	11.82
7.23				
Conv. Total (cfs)	257141.2	Conv. (cfs)	74230.2	31680.3
151230.7				
Length Wtd. (ft)	98.84	Wetted Per. (ft)	265.33	21.30
414.56				
Min Ch El (ft)	351.52	Shear (lb/sq ft)	0.06	0.10
0.07				
Alpha	1.65	Stream Power (lb/ft s)	760.76	0.00
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	6.78	2.60
9.11				
C & E Loss (ft)	0.00	Cum SA (acres)	2.22	0.39
4.01				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls3 RS: 5

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	356.63	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.12	Wt. n-Val.	0.110	0.054
0.110				
W.S. Elev (ft)	356.51	Reach Len. (ft)	131.69	149.00
230.44				
Crit W.S. (ft)	354.52	Flow Area (sq ft)	7.81	189.24
95.78				
E.G. Slope (ft/ft)	0.002172	Area (sq ft)	24.71	189.24
415.97				
Q Total (cfs)	655.40	Flow (cfs)	3.09	568.47
83.83				
Top Width (ft)	399.72	Top Width (ft)	45.21	57.39
297.12				
Vel Total (ft/s)	2.24	Avg. Vel. (ft/s)	0.40	3.00
0.88				
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)	0.50	3.30
1.64				
Conv. Total (cfs)	14061.8	Conv. (cfs)	66.4	12196.8
1798.6				
Length Wtd. (ft)	149.00	Wetted Per. (ft)	15.67	59.99
58.43				

Min Ch El (ft)	351.18	Shear (lb/sq ft)	0.07	0.43	0.22
Alpha	1.58	Stream Power (lb/ft s)	953.07	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.79	0.64	0.75
C & E Loss (ft)		Cum SA (acres)	0.80	0.32	1.91

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	360.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.	0.110	0.059	0.110
W.S. Elev (ft)	360.30	Reach Len. (ft)	131.69	149.00	230.44
Crit W.S. (ft)	356.04	Flow Area (sq ft)	156.89	407.03	317.40
E.G. Slope (ft/ft)	0.000743	Area (sq ft)	727.47	407.03	1645.52
Q Total (cfs)	1520.50	Flow (cfs)	150.06	1009.29	361.14
Top Width (ft)	619.46	Top Width (ft)	214.94	57.39	347.13
Vel Total (ft/s)	1.73	Avg. Vel. (ft/s)	0.96	2.48	1.14
Max Chl Dpth (ft)	9.12	Hydr. Depth (ft)	4.35	7.09	5.43
Conv. Total (cfs)	55781.9	Conv. (cfs)	5505.3	37027.5	13249.1
Length Wtd. (ft)	149.00	Wetted Per. (ft)	37.47	59.99	58.43
Min Ch El (ft)	351.18	Shear (lb/sq ft)	0.19	0.31	0.25
Alpha	1.50	Stream Power (lb/ft s)	953.07	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	1.46	0.82	1.52
C & E Loss (ft)		Cum SA (acres)	1.34	0.32	2.44

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	363.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.110	0.061	0.110
W.S. Elev (ft)	363.67	Reach Len. (ft)	131.69	149.00	230.44
Crit W.S. (ft)	357.39	Flow Area (sq ft)	1471.00	600.18	

2944.61

E.G. Slope (ft/ft)	0.000123	Area (sq ft)	1471.00	600.18	2944.61
Q Total (cfs)	3144.30	Flow (cfs)	757.08	751.20	1636.01
Top Width (ft)	756.66	Top Width (ft)	239.07	57.39	460.20
Vel Total (ft/s)	0.63	Avg. Vel. (ft/s)	0.51	1.25	0.56
Max Chl Dpth (ft)	12.49	Hydr. Depth (ft)	6.15	10.46	6.40
Conv. Total (cfs)	283597.0	Conv. (cfs)	68284.3	67754.1	147558.6
Length Wtd. (ft)	149.00	Wetted Per. (ft)	241.60	59.99	460.55
Min Ch El (ft)	351.18	Shear (lb/sq ft)	0.05	0.08	0.05
Alpha	1.52	Stream Power (lb/ft s)	953.07	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	2.43	1.84	2.74
C & E Loss (ft)		Cum SA (acres)	1.51	0.32	3.08

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: JonesFalls
REACH: JonesFalls3 RS: 4.5

CULVERT OUTPUT Profile #2 Yr Culv Group: Culvert #4

Q Culv Group (cfs)	16.16	Culv Full Len (ft)	8.37
# Barrels	1	Culv Vel US (ft/s)	6.63
Q Barrel (cfs)	16.16	Culv Vel DS (ft/s)	5.14
E.G. US. (ft)	356.64	Culv Inv El Up (ft)	354.16
W.S. US. (ft)	356.51	Culv Inv El Dn (ft)	353.23
E.G. DS (ft)	355.37	Culv Frctn Ls (ft)	0.62
W.S. DS (ft)	355.26	Culv Exit Loss (ft)	0.30
Delta EG (ft)	1.26	Culv Entr Loss (ft)	0.34
Delta WS (ft)	1.25	Q Weir (cfs)	
E.G. IC (ft)	356.54	Weir Sta Lft (ft)	
E.G. OC (ft)	356.63	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	355.61	Weir Max Depth (ft)	
Culv WS Outlet (ft)	355.23	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.30	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.45	Min El Weir Flow (ft)	363.01

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CULVERT OUTPUT Profile #10 Yr Culv Group: Culvert #4

Q Culv Group (cfs)	31.68	Culv Full Len (ft)	103.71
# Barrels	1	Culv Vel US (ft/s)	10.08
Q Barrel (cfs)	31.68	Culv Vel DS (ft/s)	10.08
E.G. US. (ft)	360.37	Culv Inv El Up (ft)	354.16
W.S. US. (ft)	360.30	Culv Inv El Dn (ft)	353.23
E.G. DS (ft)	356.22	Culv Frctn Ls (ft)	2.03
W.S. DS (ft)	355.97	Culv Exit Loss (ft)	1.33
Delta EG (ft)	4.16	Culv Entr Loss (ft)	0.79
Delta WS (ft)	4.33	Q Weir (cfs)	
E.G. IC (ft)	359.54	Weir Sta Lft (ft)	
E.G. OC (ft)	360.37	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	356.16	Weir Max Depth (ft)	
Culv WS Outlet (ft)	355.23	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	2.00	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.00	Min El Weir Flow (ft)	363.01

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.
Note: Culvert critical depth exceeds the height of the culvert.

CULVERT OUTPUT Profile #100 Yr Culv Group: Culvert #4

Q Culv Group (cfs)	39.63	Culv Full Len (ft)	103.71
# Barrels	1	Culv Vel US (ft/s)	12.62
Q Barrel (cfs)	39.63	Culv Vel DS (ft/s)	12.62
E.G. US. (ft)	363.68	Culv Inv El Up (ft)	354.16
W.S. US. (ft)	363.67	Culv Inv El Dn (ft)	353.23
E.G. DS (ft)	357.31	Culv Frctn Ls (ft)	3.19
W.S. DS (ft)	356.78	Culv Exit Loss (ft)	1.95
Delta EG (ft)	6.37	Culv Entr Loss (ft)	1.24
Delta WS (ft)	6.89	Q Weir (cfs)	699.30
E.G. IC (ft)	361.83	Weir Sta Lft (ft)	323.17
E.G. OC (ft)	363.68	Weir Sta Rgt (ft)	850.70
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	356.16	Weir Max Depth (ft)	0.68
Culv WS Outlet (ft)	355.23	Weir Avg Depth (ft)	0.63
Culv Nml Depth (ft)	2.00	Weir Flow Area (sq ft)	333.53
Culv Crt Depth (ft)	2.00	Min El Weir Flow (ft)	363.01

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.
Note: Culvert critical depth exceeds the height of the culvert.

CULVERT OUTPUT Profile #2 Yr Culv Group: PHAve 24 N

Q Culv Group (cfs)	622.36	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	9.62
Q Barrel (cfs)	622.36	Culv Vel DS (ft/s)	6.84
E.G. US. (ft)	356.64	Culv Inv El Up (ft)	351.75
W.S. US. (ft)	356.51	Culv Inv El Dn (ft)	351.22
E.G. DS (ft)	355.37	Culv Frctn Ls (ft)	0.07
W.S. DS (ft)	355.26	Culv Exit Loss (ft)	0.62
Delta EG (ft)	1.26	Culv Entr Loss (ft)	0.57
Delta WS (ft)	1.25	Q Weir (cfs)	
E.G. IC (ft)	356.25	Weir Sta Lft (ft)	
E.G. OC (ft)	356.64	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	

Culv WS Inlet (ft)	354.62	Weir Max Depth (ft)	
Culv WS Outlet (ft)	355.26	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.80	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.87	Min El Weir Flow (ft)	363.01

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CULVERT OUTPUT Profile #10 Yr Culv Group: PHAve 24 N

Q Culv Group (cfs)	1458.74	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	12.78
Q Barrel (cfs)	1458.74	Culv Vel DS (ft/s)	15.66
E.G. US. (ft)	360.37	Culv Inv El Up (ft)	351.75
W.S. US. (ft)	360.30	Culv Inv El Dn (ft)	351.22
E.G. DS (ft)	356.22	Culv Frctn Ls (ft)	0.19
W.S. DS (ft)	355.97	Culv Exit Loss (ft)	2.95
Delta EG (ft)	4.16	Culv Entr Loss (ft)	1.01
Delta WS (ft)	4.33	Q Weir (cfs)	
E.G. IC (ft)	359.87	Weir Sta Lft (ft)	
E.G. OC (ft)	360.37	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	356.82	Weir Max Depth (ft)	
Culv WS Outlet (ft)	355.36	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	3.12	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	5.07	Min El Weir Flow (ft)	363.01

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section
downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100 Yr Culv Group: PHAve 24 N

Q Culv Group (cfs)	2367.72	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	15.02
Q Barrel (cfs)	2367.72	Culv Vel DS (ft/s)	17.90
E.G. US. (ft)	363.68	Culv Inv El Up (ft)	351.75
W.S. US. (ft)	363.67	Culv Inv El Dn (ft)	351.22
E.G. DS (ft)	357.31	Culv Frctn Ls (ft)	0.18
W.S. DS (ft)	356.78	Culv Exit Loss (ft)	4.77
Delta EG (ft)	6.37	Culv Entr Loss (ft)	1.42
Delta WS (ft)	6.89	Q Weir (cfs)	699.30
E.G. IC (ft)	363.68	Weir Sta Lft (ft)	323.17
E.G. OC (ft)	363.66	Weir Sta Rgt (ft)	850.70
Culvert Control	Inlet	Weir Submerg	0.00
Culv WS Inlet (ft)	358.76	Weir Max Depth (ft)	0.68
Culv WS Outlet (ft)	357.10	Weir Avg Depth (ft)	0.63
Culv Nml Depth (ft)	4.31	Weir Flow Area (sq ft)	333.53
Culv Crt Depth (ft)	7.01	Min El Weir Flow (ft)	363.01

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section
downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #2 Yr Culv Group: PHAve 24 S

Q Culv Group (cfs)	16.88	Culv Full Len (ft)	128.15
# Barrels	1	Culv Vel US (ft/s)	5.37

Q Barrel (cfs)	16.88	Culv Vel DS (ft/s)	5.37
E.G. US. (ft)	356.64	Culv Inv El Up (ft)	352.71
W.S. US. (ft)	356.51	Culv Inv El Dn (ft)	352.35
E.G. DS (ft)	355.37	Culv Frctn Ls (ft)	0.70
W.S. DS (ft)	355.26	Culv Exit Loss (ft)	0.34
Delta EG (ft)	1.26	Culv Entr Loss (ft)	0.22
Delta WS (ft)	1.25	Q Weir (cfs)	
E.G. IC (ft)	355.19	Weir Sta Lft (ft)	
E.G. OC (ft)	356.65	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	354.71	Weir Max Depth (ft)	
Culv WS Outlet (ft)	354.35	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.48	Min El Weir Flow (ft)	363.01

CULVERT OUTPUT Profile #10 Yr Culv Group: PHAve 24 S

Q Culv Group (cfs)	30.08	Culv Full Len (ft)	128.15
# Barrels	1	Culv Vel US (ft/s)	9.58
Q Barrel (cfs)	30.08	Culv Vel DS (ft/s)	9.58
E.G. US. (ft)	360.37	Culv Inv El Up (ft)	352.71
W.S. US. (ft)	360.30	Culv Inv El Dn (ft)	352.35
E.G. DS (ft)	356.22	Culv Frctn Ls (ft)	2.27
W.S. DS (ft)	355.97	Culv Exit Loss (ft)	1.18
Delta EG (ft)	4.16	Culv Entr Loss (ft)	0.71
Delta WS (ft)	4.33	Q Weir (cfs)	
E.G. IC (ft)	357.70	Weir Sta Lft (ft)	
E.G. OC (ft)	360.37	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	354.71	Weir Max Depth (ft)	
Culv WS Outlet (ft)	354.35	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.86	Min El Weir Flow (ft)	363.01

CULVERT OUTPUT Profile #100 Yr Culv Group: PHAve 24 S

Q Culv Group (cfs)	37.65	Culv Full Len (ft)	128.15
# Barrels	1	Culv Vel US (ft/s)	11.98
Q Barrel (cfs)	37.65	Culv Vel DS (ft/s)	11.98
E.G. US. (ft)	363.68	Culv Inv El Up (ft)	352.71
W.S. US. (ft)	363.67	Culv Inv El Dn (ft)	352.35
E.G. DS (ft)	357.31	Culv Frctn Ls (ft)	3.55
W.S. DS (ft)	356.78	Culv Exit Loss (ft)	1.70
Delta EG (ft)	6.37	Culv Entr Loss (ft)	1.12
Delta WS (ft)	6.89	Q Weir (cfs)	699.30
E.G. IC (ft)	359.76	Weir Sta Lft (ft)	323.17
E.G. OC (ft)	363.68	Weir Sta Rgt (ft)	850.70
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	354.71	Weir Max Depth (ft)	0.68
Culv WS Outlet (ft)	354.35	Weir Avg Depth (ft)	0.63
Culv Nml Depth (ft)	2.00	Weir Flow Area (sq ft)	333.53
Culv Crt Depth (ft)	2.00	Min El Weir Flow (ft)	363.01

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.
Note: Culvert critical depth exceeds the height of the culvert.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls3   RS: 4

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	355.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.	0.045	0.045	0.049
W.S. Elev (ft)	355.26	Reach Len. (ft)	31.99	41.27	41.76
Crit W.S. (ft)	354.43	Flow Area (sq ft)	39.33	114.91	127.18
E.G. Slope (ft/ft)	0.002391	Area (sq ft)	53.55	114.91	201.86
Q Total (cfs)	655.40	Flow (cfs)	46.74	366.17	242.49
Top Width (ft)	380.61	Top Width (ft)	129.10	41.00	210.51
Vel Total (ft/s)	2.33	Avg. Vel. (ft/s)	1.19	3.19	1.91
Max Chl Dpth (ft)	3.26	Hydr. Depth (ft)	0.64	2.80	1.47
Conv. Total (cfs)	13402.4	Conv. (cfs)	955.8	7487.9	4958.6
Length Wtd. (ft)	39.57	Wetted Per. (ft)	62.28	41.45	87.24
Min Ch El (ft)	352.00	Shear (lb/sq ft)	0.09	0.41	0.22
Alpha	1.31	Stream Power (lb/ft s)	1040.91	0.00	0.00
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.79	0.53	0.75
C & E Loss (ft)	0.02	Cum SA (acres)	0.54	0.15	0.57

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	356.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.	0.045	0.045	0.049
W.S. Elev (ft)	355.97	Reach Len. (ft)	31.99	41.27	41.76
Crit W.S. (ft)	355.00	Flow Area (sq ft)	82.89	143.92	188.62
E.G. Slope (ft/ft)	0.004092	Area (sq ft)	172.28	143.92	376.68
Q Total (cfs)	1520.50	Flow (cfs)	211.54	697.15	611.81
Top Width (ft)	538.37	Top Width (ft)	213.87	41.00	283.50
Vel Total (ft/s)	3.66	Avg. Vel. (ft/s)	2.55	4.84	3.24

```
  Max Chl Dpth (ft)             3.97    Hydr. Depth (ft)             1.35       3.51
   2.17
  Conv. Total (cfs)          23768.9    Conv. (cfs)                3306.8    10898.0
 9564.0
  Length Wtd. (ft)             39.05    Wetted Per. (ft)            62.41      41.45
 87.24
  Min Ch El (ft)              352.00    Shear (lb/sq ft)             0.34       0.89
   0.55
  Alpha                         1.19    Stream Power (lb/ft s)    1040.91       0.00
   0.00
  Frctn Loss (ft)               0.14    Cum Volume (acre-ft)         1.46       0.68
   1.52
  C & E Loss (ft)               0.05    Cum SA (acres)               0.69       0.15
   0.77
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 Yr

```
  E.G. Elev (ft)              357.31    Element                    Left OB    Channel
Right OB
  Vel Head (ft)                 0.53    Wt. n-Val.                  0.045      0.045
  0.049
  W.S. Elev (ft)              356.78    Reach Len. (ft)             31.99      41.27
  41.76
  Crit W.S. (ft)              356.02    Flow Area (sq ft)          132.97     177.29
 259.26
  E.G. Slope (ft/ft)        0.006518    Area (sq ft)               355.68     177.29
 629.96
  Q Total (cfs)              3144.30    Flow (cfs)                 586.92    1245.39
1311.99
  Top Width (ft)              612.62    Top Width (ft)             233.69      41.00
 337.93
  Vel Total (ft/s)              5.52    Avg. Vel. (ft/s)             4.41       7.02
   5.06
  Max Chl Dpth (ft)             4.78    Hydr. Depth (ft)             2.16       4.32
   2.99
  Conv. Total (cfs)          38946.9    Conv. (cfs)                7269.9    15426.0
16251.0
  Length Wtd. (ft)             38.72    Wetted Per. (ft)            62.41      41.45
 87.24
  Min Ch El (ft)              352.00    Shear (lb/sq ft)             0.87       1.74
   1.21
  Alpha                         1.11    Stream Power (lb/ft s)    1040.91       0.00
   0.00
  Frctn Loss (ft)               0.20    Cum Volume (acre-ft)         2.43       0.86
   2.74
  C & E Loss (ft)               0.12    Cum SA (acres)               0.80       0.15
   0.96
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: JonesFalls

REACH: JonesFalls3 RS: 3.5

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	355.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.	0.045	0.049	0.045
W.S. Elev (ft)	355.19	Reach Len. (ft)	129.00	124.00	114.00
Crit W.S. (ft)	354.61	Flow Area (sq ft)	130.94	95.87	112.97
E.G. Slope (ft/ft)	0.002228	Area (sq ft)	150.11	95.87	135.08
Q Total (cfs)	655.40	Flow (cfs)	216.18	257.10	182.12
Top Width (ft)	371.32	Top Width (ft)	159.17	37.04	175.11
Vel Total (ft/s)	1.93	Avg. Vel. (ft/s)	1.65	2.68	1.61
Max Chl Dpth (ft)	3.19	Hydr. Depth (ft)	1.09	2.59	1.05
Conv. Total (cfs)	13883.6	Conv. (cfs)	4579.4	5446.2	3858.0
Length Wtd. (ft)	123.62	Wetted Per. (ft)	120.13	37.40	107.41
Min Ch El (ft)	352.00	Shear (lb/sq ft)	0.15	0.36	0.15
Alpha	1.19	Stream Power (lb/ft s)	879.65	0.00	0.00
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	0.72	0.43	0.59
C & E Loss (ft)	0.02	Cum SA (acres)	0.43	0.11	0.38

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	356.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.	0.045	0.049	0.045
W.S. Elev (ft)	355.89	Reach Len. (ft)	129.00	124.00	114.00
Crit W.S. (ft)	355.06	Flow Area (sq ft)	214.32	121.59	187.53
E.G. Slope (ft/ft)	0.003061	Area (sq ft)	274.04	121.59	281.61
Q Total (cfs)	1520.50	Flow (cfs)	576.00	447.73	496.77
Top Width (ft)	481.97	Top Width (ft)	197.86	37.04	247.06
Vel Total (ft/s)	2.90	Avg. Vel. (ft/s)	2.69	3.68	

```
  2.65
  Max Chl Dpth (ft)            3.89    Hydr. Depth (ft)          1.78        3.28
  1.75
  Conv. Total (cfs)         27481.5    Conv. (cfs)            10410.7      8092.2
 8978.6
  Length Wtd. (ft)           123.09    Wetted Per. (ft)         120.13       37.40
 107.41
  Min Ch El (ft)             352.00    Shear (lb/sq ft)           0.34        0.62
  0.33
  Alpha                        1.07    Stream Power (lb/ft s)   879.65        0.00
  0.00
  Frctn Loss (ft)              0.73    Cum Volume (acre-ft)       1.30        0.55
  1.20
  C & E Loss (ft)              0.02    Cum SA (acres)             0.54        0.11
  0.52
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 Yr

```
  E.G. Elev (ft)             356.99    Element                   Left OB    Channel
Right OB
  Vel Head (ft)                0.29    Wt. n-Val.                 0.045       0.049
  0.045
  W.S. Elev (ft)             356.70    Reach Len. (ft)          129.00      124.00
 114.00
  Crit W.S. (ft)             355.65    Flow Area (sq ft)        312.18      151.76
 275.03
  E.G. Slope (ft/ft)       0.004257    Area (sq ft)             449.75      151.76
 508.59
  Q Total (cfs)             3144.30    Flow (cfs)              1271.31      763.97
1109.02
  Top Width (ft)             575.75    Top Width (ft)           231.95       37.04
 306.76
  Vel Total (ft/s)             4.26    Avg. Vel. (ft/s)           4.07        5.03
  4.03
  Max Chl Dpth (ft)            4.70    Hydr. Depth (ft)           2.60        4.10
  2.56
  Conv. Total (cfs)         48190.7    Conv. (cfs)            19484.5     11708.9
16997.3
  Length Wtd. (ft)           122.83    Wetted Per. (ft)         120.13       37.40
 107.41
  Min Ch El (ft)             352.00    Shear (lb/sq ft)           0.69        1.08
  0.68
  Alpha                        1.03    Stream Power (lb/ft s)   879.65        0.00
  0.00
  Frctn Loss (ft)              0.96    Cum Volume (acre-ft)       2.13        0.70
  2.19
  C & E Loss (ft)              0.03    Cum SA (acres)             0.63        0.11
  0.66
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls3 RS: 3

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	354.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.	0.045	0.049	0.045
W.S. Elev (ft)	354.44	Reach Len. (ft)	170.00	170.00	170.00
Crit W.S. (ft)	353.99	Flow Area (sq ft)	83.08	65.24	45.69
E.G. Slope (ft/ft)	0.014080	Area (sq ft)	83.08	65.24	45.69
Q Total (cfs)	655.40	Flow (cfs)	237.68	323.21	94.50
Top Width (ft)	292.32	Top Width (ft)	133.10	40.11	119.11
Vel Total (ft/s)	3.38	Avg. Vel. (ft/s)	2.86	4.95	2.07
Max Chl Dpth (ft)	2.44	Hydr. Depth (ft)	0.62	1.63	0.38
Conv. Total (cfs)	5523.4	Conv. (cfs)	2003.1	2723.9	796.4
Length Wtd. (ft)	170.00	Wetted Per. (ft)	133.17	40.38	119.11
Min Ch El (ft)	352.00	Shear (lb/sq ft)	0.55	1.42	0.34
Alpha	1.37	Stream Power (lb/ft s)	882.29	0.00	0.00
Frctn Loss (ft)	1.97	Cum Volume (acre-ft)	0.37	0.20	0.36
C & E Loss (ft)	0.04	Cum SA (acres)			

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	355.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.36	Wt. n-Val.	0.045	0.049	0.045
W.S. Elev (ft)	354.91	Reach Len. (ft)	170.00	170.00	170.00
Crit W.S. (ft)	354.84	Flow Area (sq ft)	154.53	84.21	109.42

E.G. Slope (ft/ft)	0.016323	Area (sq ft)	154.53	84.21	109.42
Q Total (cfs)	1520.50	Flow (cfs)	614.26	532.63	373.61
Top Width (ft)	359.27	Top Width (ft)	168.89	40.11	150.28
Vel Total (ft/s)	4.37	Avg. Vel. (ft/s)	3.98	6.32	3.41
Max Chl Dpth (ft)	2.91	Hydr. Depth (ft)	0.91	2.10	0.73
Conv. Total (cfs)	11901.0	Conv. (cfs)	4807.8	4169.0	2924.3
Length Wtd. (ft)	170.00	Wetted Per. (ft)	168.96	40.38	150.28
Min Ch El (ft)	352.00	Shear (lb/sq ft)	0.93	2.13	0.74
Alpha	1.22	Stream Power (lb/ft s)	882.29	0.00	0.00
Frctn Loss (ft)	2.08	Cum Volume (acre-ft)	0.67	0.26	0.69
C & E Loss (ft)	0.05	Cum SA (acres)			

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft)	356.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.56	Wt. n-Val.	0.045	0.049	0.045
W.S. Elev (ft)	355.45	Reach Len. (ft)	170.00	170.00	170.00
Crit W.S. (ft)	355.39	Flow Area (sq ft)	251.66	105.71	199.39
E.G. Slope (ft/ft)	0.018691	Area (sq ft)	251.66	105.71	201.25
Q Total (cfs)	3144.30	Flow (cfs)	1367.58	832.45	944.27
Top Width (ft)	424.49	Top Width (ft)	190.46	40.11	193.92
Vel Total (ft/s)	5.65	Avg. Vel. (ft/s)	5.43	7.88	4.74
Max Chl Dpth (ft)	3.45	Hydr. Depth (ft)	1.32	2.64	1.07
Conv. Total (cfs)	22999.0	Conv. (cfs)	10003.2	6089.0	6906.9
Length Wtd. (ft)	170.00	Wetted Per. (ft)	190.54	40.38	185.58
Min Ch El (ft)	352.00	Shear (lb/sq ft)	1.54	3.05	1.25
Alpha	1.13	Stream Power (lb/ft s)	882.29	0.00	0.00
Frctn Loss (ft)	2.13	Cum Volume (acre-ft)	1.09	0.33	1.26
C & E Loss (ft)	0.09	Cum SA (acres)			

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls4 RS: 2

CROSS SECTION OUTPUT Profile #2 Yr

E.G. Elev (ft)	352.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.	0.041	0.049	0.042
W.S. Elev (ft)	352.56	Reach Len. (ft)	261.00	248.00	241.00
Crit W.S. (ft)	352.42	Flow Area (sq ft)	106.72	38.29	136.94
E.G. Slope (ft/ft)	0.009853	Area (sq ft)	106.72	38.29	136.94
Q Total (cfs)	721.70	Flow (cfs)	257.43	139.97	324.30
Top Width (ft)	479.35	Top Width (ft)	195.90	28.32	255.12
Vel Total (ft/s)	2.56	Avg. Vel. (ft/s)	2.41	3.66	2.37
Max Chl Dpth (ft)	2.33	Hydr. Depth (ft)	0.54	1.35	0.54
Conv. Total (cfs)	7270.5	Conv. (cfs)	2593.4	1410.1	3267.0
Length Wtd. (ft)	247.24	Wetted Per. (ft)	195.92	28.62	255.19
Min Ch El (ft)	350.23	Shear (lb/sq ft)	0.34	0.82	0.33
Alpha	1.10	Stream Power (lb/ft s)	857.88	0.00	0.00
Frctn Loss (ft)	1.89	Cum Volume (acre-ft)	0.52	0.19	1.06
C & E Loss (ft)	0.01	Cum SA (acres)	0.94	0.15	1.76

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Yr

E.G. Elev (ft)	353.15	Element	Left OB	Channel

```
Right OB
  Vel Head (ft)              0.19    Wt. n-Val.                 0.041      0.049
  0.042
  W.S. Elev (ft)           352.96    Reach Len. (ft)           261.00     248.00
 241.00
  Crit W.S. (ft)                     Flow Area (sq ft)         186.99      49.75
 244.75
  E.G. Slope (ft/ft)     0.009669    Area (sq ft)              186.99      49.75
 244.75
  Q Total (cfs)           1659.40    Flow (cfs)                637.71     214.46
 807.23
  Top Width (ft)           517.87    Top Width (ft)            201.35      28.32
 288.20
  Vel Total (ft/s)           3.45    Avg. Vel. (ft/s)            3.41       4.31
   3.30
  Max Chl Dpth (ft)          2.73    Hydr. Depth (ft)            0.93       1.76
   0.85
  Conv. Total (cfs)       16875.6    Conv. (cfs)               6485.3     2181.0
 8209.3
  Length Wtd. (ft)         247.34    Wetted Per. (ft)          201.38      28.62
 288.31
  Min Ch El (ft)           350.23    Shear (lb/sq ft)            0.56       1.05
   0.51
  Alpha                      1.02    Stream Power (lb/ft s)    857.88       0.00
   0.00
  Frctn Loss (ft)            1.88    Cum Volume (acre-ft)        0.93       0.25
   1.84
  C & E Loss (ft)            0.02    Cum SA (acres)              1.03       0.15
   1.90


Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate the
         need for additional cross sections.

CROSS SECTION OUTPUT  Profile #100 Yr


  E.G. Elev (ft)           353.79    Element                   Left OB    Channel
Right OB
  Vel Head (ft)              0.27    Wt. n-Val.                 0.041      0.049
  0.041
  W.S. Elev (ft)           353.51    Reach Len. (ft)           261.00     248.00
 241.00
  Crit W.S. (ft)                     Flow Area (sq ft)         308.50      65.45
 445.05
  E.G. Slope (ft/ft)     0.009184    Area (sq ft)              308.50      65.45
 445.05
  Q Total (cfs)           3405.50    Flow (cfs)               1332.89     330.16
1742.45
  Top Width (ft)           624.06    Top Width (ft)            224.43      28.32
 371.31
  Vel Total (ft/s)           4.16    Avg. Vel. (ft/s)            4.32       5.04
   3.92
  Max Chl Dpth (ft)          3.28    Hydr. Depth (ft)            1.37       2.31
   1.20
  Conv. Total (cfs)       35535.0    Conv. (cfs)              13908.2     3445.1
18181.7
  Length Wtd. (ft)         247.41    Wetted Per. (ft)          224.48      28.62
 371.43
  Min Ch El (ft)           350.23    Shear (lb/sq ft)            0.79       1.31
```

```
 0.69
 Alpha                      1.02    Stream Power (lb/ft s)   857.88       0.00
 0.00
 Frctn Loss (ft)            1.84    Cum Volume (acre-ft)       1.57       0.34
 3.05
 C & E Loss (ft)            0.02    Cum SA (acres)             1.18       0.15
 2.19
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
         need for additional cross sections.

CROSS SECTION

RIVER: JonesFalls
REACH: JonesFalls4   RS: 1

CROSS SECTION OUTPUT Profile #2 Yr

```
  E.G. Elev (ft)          350.76    Element                   Left OB    Channel
Right OB
  Vel Head (ft)             0.07    Wt. n-Val.                  0.045      0.049
 0.041
  W.S. Elev (ft)          350.69    Reach Len. (ft)

  Crit W.S. (ft)          350.42    Flow Area (sq ft)           66.92      28.51
 247.55
  E.G. Slope (ft/ft)    0.006131    Area (sq ft)                66.92      28.51
 247.55
  Q Total (cfs)           721.70    Flow (cfs)                 118.22      74.43
 529.05
  Top Width (ft)          523.08    Top Width (ft)             118.50      24.61
 379.97
  Vel Total (ft/s)          2.10    Avg. Vel. (ft/s)             1.77       2.61
  2.14
  Max Chl Dpth (ft)         1.81    Hydr. Depth (ft)             0.56       1.16
  0.65
  Conv. Total (cfs)       9217.1    Conv. (cfs)                1509.8      950.6
 6756.7
  Length Wtd. (ft)                  Wetted Per. (ft)           118.51      24.73
 379.99
  Min Ch El (ft)          348.88    Shear (lb/sq ft)             0.22       0.44
  0.25
  Alpha                     1.03    Stream Power (lb/ft s)     821.31       0.00
  0.00
  Frctn Loss (ft)                   Cum Volume (acre-ft)

  C & E Loss (ft)                   Cum SA (acres)
```

CROSS SECTION OUTPUT Profile #10 Yr

```
  E.G. Elev (ft)          351.26    Element                   Left OB    Channel
Right OB
  Vel Head (ft)             0.13    Wt. n-Val.                  0.045      0.049
```

0.041
W.S. Elev (ft) 351.13 Reach Len. (ft)

Crit W.S. (ft) 350.72 Flow Area (sq ft) 125.08 39.38
419.04
E.G. Slope (ft/ft) 0.006135 Area (sq ft) 125.08 39.38
419.04
Q Total (cfs) 1659.40 Flow (cfs) 295.10 127.52
1236.78
Top Width (ft) 565.06 Top Width (ft) 143.56 24.61
396.89
Vel Total (ft/s) 2.84 Avg. Vel. (ft/s) 2.36 3.24
2.95
Max Chl Dpth (ft) 2.25 Hydr. Depth (ft) 0.87 1.60
1.06
Conv. Total (cfs) 21186.1 Conv. (cfs) 3767.6 1628.1
15790.4
Length Wtd. (ft) Wetted Per. (ft) 143.57 24.73
396.92
Min Ch El (ft) 348.88 Shear (lb/sq ft) 0.33 0.61
0.40
Alpha 1.02 Stream Power (lb/ft s) 821.31 0.00
0.00
Frctn Loss (ft) Cum Volume (acre-ft)

C & E Loss (ft) Cum SA (acres)

CROSS SECTION OUTPUT Profile #100 Yr

E.G. Elev (ft) 351.93 Element Left OB Channel
Right OB
Vel Head (ft) 0.21 Wt. n-Val. 0.045 0.049
0.041
W.S. Elev (ft) 351.71 Reach Len. (ft)

Crit W.S. (ft) 351.13 Flow Area (sq ft) 217.08 53.80
658.20
E.G. Slope (ft/ft) 0.006131 Area (sq ft) 217.08 53.80
658.20
Q Total (cfs) 3405.50 Flow (cfs) 659.43 214.45
2531.62
Top Width (ft) 614.41 Top Width (ft) 170.44 24.61
419.35
Vel Total (ft/s) 3.67 Avg. Vel. (ft/s) 3.04 3.99
3.85
Max Chl Dpth (ft) 2.83 Hydr. Depth (ft) 1.27 2.19
1.57
Conv. Total (cfs) 43493.2 Conv. (cfs) 8421.9 2738.8
32332.4
Length Wtd. (ft) Wetted Per. (ft) 170.46 24.73
419.39
Min Ch El (ft) 348.88 Shear (lb/sq ft) 0.49 0.83
0.60
Alpha 1.03 Stream Power (lb/ft s) 821.31 0.00
0.00
Frctn Loss (ft) Cum Volume (acre-ft)

C & E Loss (ft) Cum SA (acres)

SUMMARY OF MANNING'S N VALUES

River:JonesFalls

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7
JonesFalls	15	.11	.049	.11	.04			
JonesFalls	14	.11	.049	.11	.04			
JonesFalls	13	.04	.11	.049	.04			
NorthTrib	2	.04	.061	.04				
NorthTrib	1	.04	.061	.04				
JonesFalls2	12	.04	.11	.04	.11	.049	.11	.04
JonesFalls2	11	.04	.11	.04	.11	.049	.11	.04
SouthTrib	8	.045	.057	.045				
SouthTrib	7	.045	.057	.045				
SouthTrib	6.5	Bridge						
SouthTrib	6	.045	.057	.045				
SouthTrib	5	.04	.045	.057	.045	.04		
SouthTrib	4	.04	.057	.04	.045			
SouthTrib	3	.04	.057	.04	.057	.04		
SouthTrib	2	.04	.057	.04	.057	.04		
SouthTrib	1	.04	.057	.04	.057	.04		
IntsTrib	8	.013	.045	.046	.045	.013	.045	
IntsTrib	7	.013	.045	.046	.045			
IntsTrib	6.5	Culvert						
IntsTrib	6	.013	.04	.046	.04			
IntsTrib	5	.013	.04	.046	.04			
IntsTrib	4	.013	.04	.046	.04			
IntsTrib	3	.04	.046	.04				
IntsTrib	2.5	Culvert						
IntsTrib	2	.045	.046	.045	.013			

IntsTrib	1	.04	.046	.045		
JonesFalls3	10	.04	.11	.049	.11	.04
JonesFalls3	9	.04	.11	.049	.11	.04
JonesFalls3	8	.04	.11	.049	.04	
JonesFalls3	7	.04	.11	.049	.11	.04
JonesFalls3	6	.04	.11	.049	.11	
JonesFalls3	5	.04	.11	.049	.11	.045
JonesFalls3	4.5	Culvert				
JonesFalls3	4	.045	.045	.049	.045	
JonesFalls3	3.5	.045	.049	.045		
JonesFalls3	3	.045	.049	.045		
JonesFalls4	2	.04	.045	.049	.045	.04
JonesFalls4	1	.045	.049	.045	.04	

SUMMARY OF REACH LENGTHS

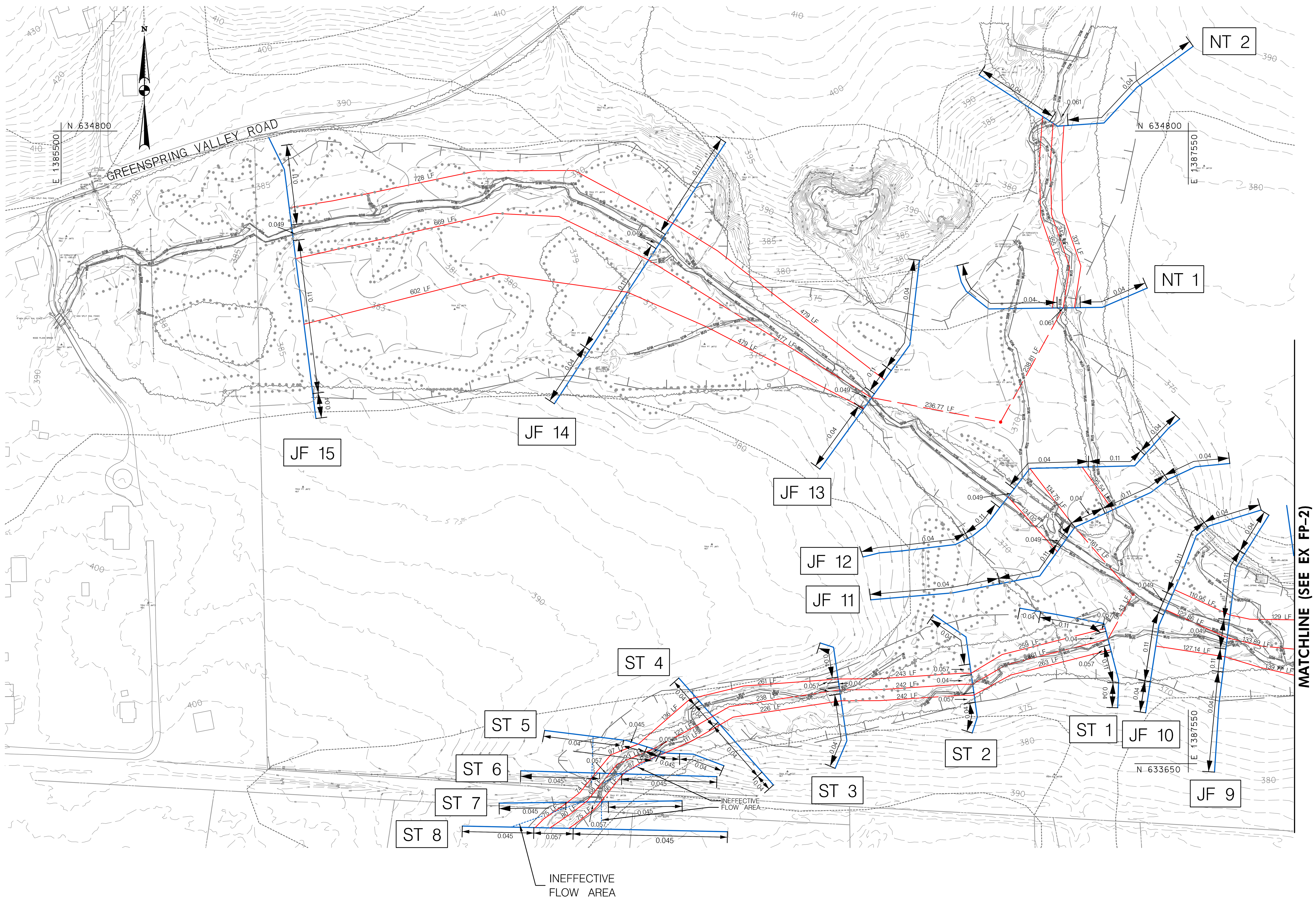
River: JonesFalls

Reach	River Sta.	Left	Channel	Right
JonesFalls	15	728	669	602
JonesFalls	14	479	477	479
JonesFalls	13	306	307	306
NorthTrib	2	337.47	342.24	354.84
NorthTrib	1			
JonesFalls2	12	95.54	134.75	134.02
JonesFalls2	11			
SouthTrib	8	75	80	75
SouthTrib	7	74.34	67.83	65.615
SouthTrib	6.5	Bridge		
SouthTrib	6	96.56	93.29	86.62
SouthTrib	5	136.21	123.08	111.2
SouthTrib	4	261.13	237.95	226.16
SouthTrib	3	243	242	242
SouthTrib	2	259	261	263
SouthTrib	1			
IntsTrib	8	135	134	134
IntsTrib	7	151	152	154
IntsTrib	6.5	Culvert		
IntsTrib	6	117	118	119
IntsTrib	5	363	358	354
IntsTrib	4	188	207	219
IntsTrib	3	112	116	119
IntsTrib	2.5	Culvert		
IntsTrib	2	209	187	167

IntsTrib	1				
JonesFalls3	10		110.95	122.86	127.14
JonesFalls3	9		129	133.89	139.77
JonesFalls3	8		491.9	504.1	506.12
JonesFalls3	7		469.28	475.2	444.49
JonesFalls3	6		121.97	81.55	93.44
JonesFalls3	5		131.69	149	230.44
JonesFalls3	4.5	Culvert			
JonesFalls3	4		31.99	41.27	41.76
JonesFalls3	3.5		129	124	114
JonesFalls3	3				
JonesFalls4	2		261	248	241
JonesFalls4	1				

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: JonesFalls

Reach	River Sta.		Contr.	Expan.
JonesFalls	15		.1	.3
JonesFalls	14		.1	.3
JonesFalls	13		.1	.3
NorthTrib	2		.1	.3
NorthTrib	1		.1	.3
JonesFalls2	12		.1	.3
JonesFalls2	11		.1	.3
SouthTrib	8		.1	.3
SouthTrib	7		.3	.5
SouthTrib	6.5	Bridge		
SouthTrib	6		.3	.5
SouthTrib	5		.1	.3
SouthTrib	4		.1	.3
SouthTrib	3		.1	.3
SouthTrib	2		.1	.3
SouthTrib	1		.1	.3
IntsTrib	8		.1	.3
IntsTrib	7		.3	.5
IntsTrib	6.5	Culvert		
IntsTrib	6		.3	.5
IntsTrib	5		.1	.3
IntsTrib	4		.1	.3
IntsTrib	3		.3	.5
IntsTrib	2.5	Culvert		
IntsTrib	2		.3	.5
IntsTrib	1		.1	.3
JonesFalls3	10		.1	.3
JonesFalls3	9		.1	.3
JonesFalls3	8		.1	.3
JonesFalls3	7		.1	.3
JonesFalls3	6		.1	.3
JonesFalls3	5		.3	.5
JonesFalls3	4.5	Culvert		
JonesFalls3	4		.3	.5
JonesFalls3	3.5		.1	.3
JonesFalls3	3		.1	.3
JonesFalls4	2		.1	.3
JonesFalls4	1		.1	.3



LEGEND

REACH LENGTHS

EXISTING HEC-RAS CROSS SECTIONS

EXISTING FLOODPLAIN

INEFFECTIVE FLOW AREA

PLAN
SCALE: 1"=100'

100' 0 100' 200'
SCALE: 1"=100'

BY: PCrawford -

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future®

ECCLESTON MITIGATION BANK

REVISIONS

FLOODPLAIN MAP – EXISTING CONDITIONS

SCALE AS SHOWN	DATE OCTOBER, 2018	PROJECT NO. 17-10977-001	
DESIGNED BY PVC		COUNTY BALTIMORE COUNTY	
DRAWN BY PVC		LOGMILE	
CHECKED BY MRG		HORIZONTAL SCALE N/A	
F.A.P. NO. SEE TITLE SHEET		VERTICAL SCALE N/A	
DRAWING NO. EX. FP – 1	OF 2	SHEET NO. xx OF xx	

Q:\2017\17-10977_001_Eccleston_Mitigation\CADD\pFP_E001_ECCLESTON_20.dgn
Monday, November 05, 2018 AT 02:27 PM

PLAN
SCALE: 1"=100'

LEGEND

REACH LENGTHS

EXISTING HEC-RAS CROSS SECTIONS

EXISTING FLOODPLAIN

INEFFECTIVE FLOW AREA

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future®

BY: PCrawford –

ECCLESTON MITIGATION BANK

REVISIONS

FLOODPLAIN MAP – EXISTING CONDITIONS

SCALE AS SHOWN DATE OCTOBER, 2018 PROJECT NO. 17-10977-001

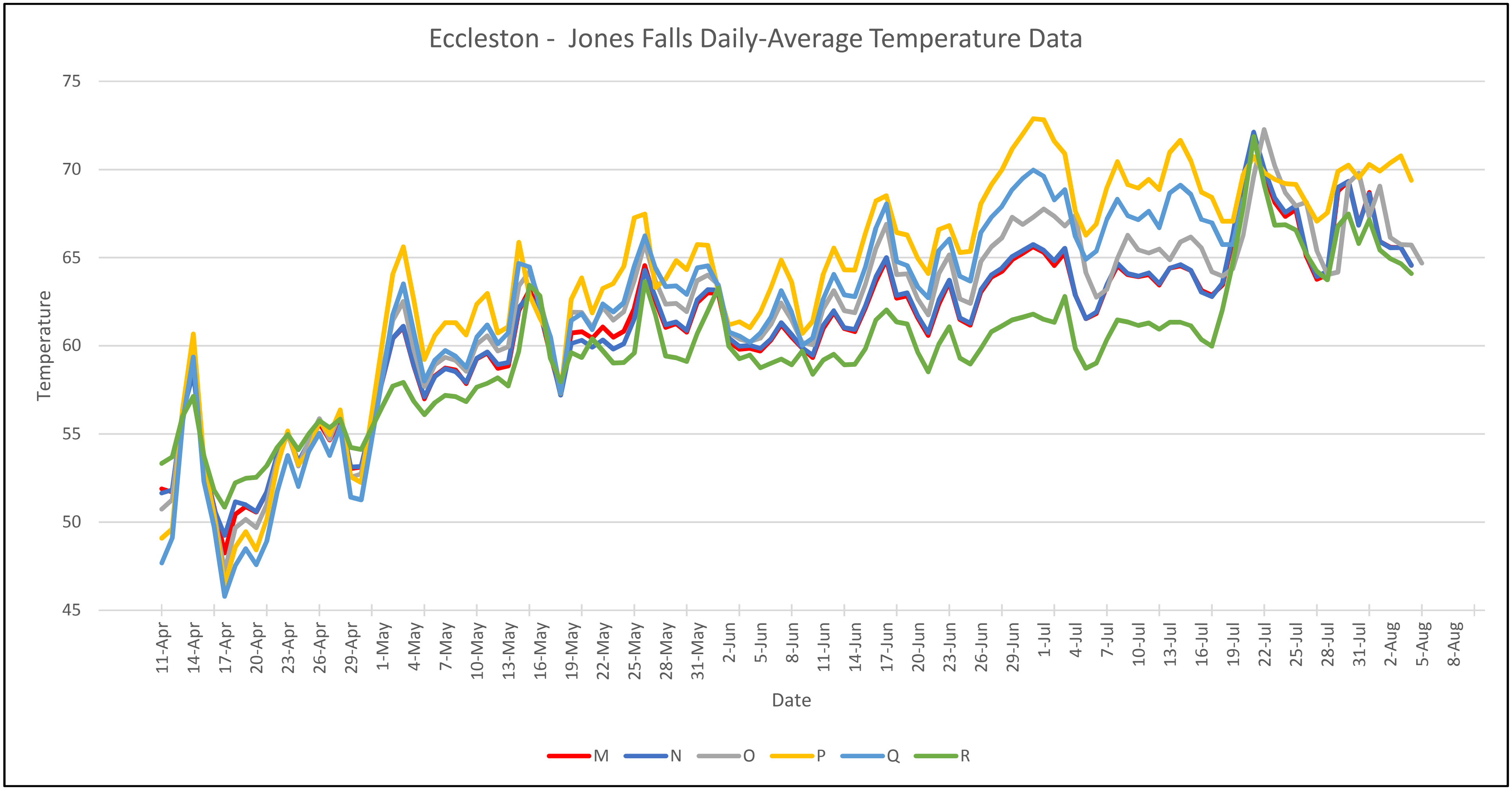
DESIGNED BY PVC
DRAWN BY PVC
CHECKED BY MRG
F.A.P. NO. SEE TITLE SHEET

COUNTY BALTIMORE COUNTY
LOGMILE
HORIZONTAL SCALE N/A
VERTICAL SCALE N/A

DRAWING NO. EX. FP – 2 OF 2
SHEET NO. xx OF xx

Monday, November 05, 2018 AT 02:52 PM

APPENDIX I
Temperature Gauge Locations Map and Data


Eccleston - Jones Falls Daily-Average Temperature Data
Temperature
75
70
65
60
55
50
45
11-Apr
14-Apr
17-Apr
20-Apr
23-Apr
26-Apr
29-Apr
1-May
4-May
7-May
10-May
13-May
16-May
19-May
22-May
25-May
28-May
31-May
2-Jun
5-Jun
8-Jun
11-Jun
14-Jun
17-Jun
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23-Jun
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7-Jul
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13-Jul
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N
O
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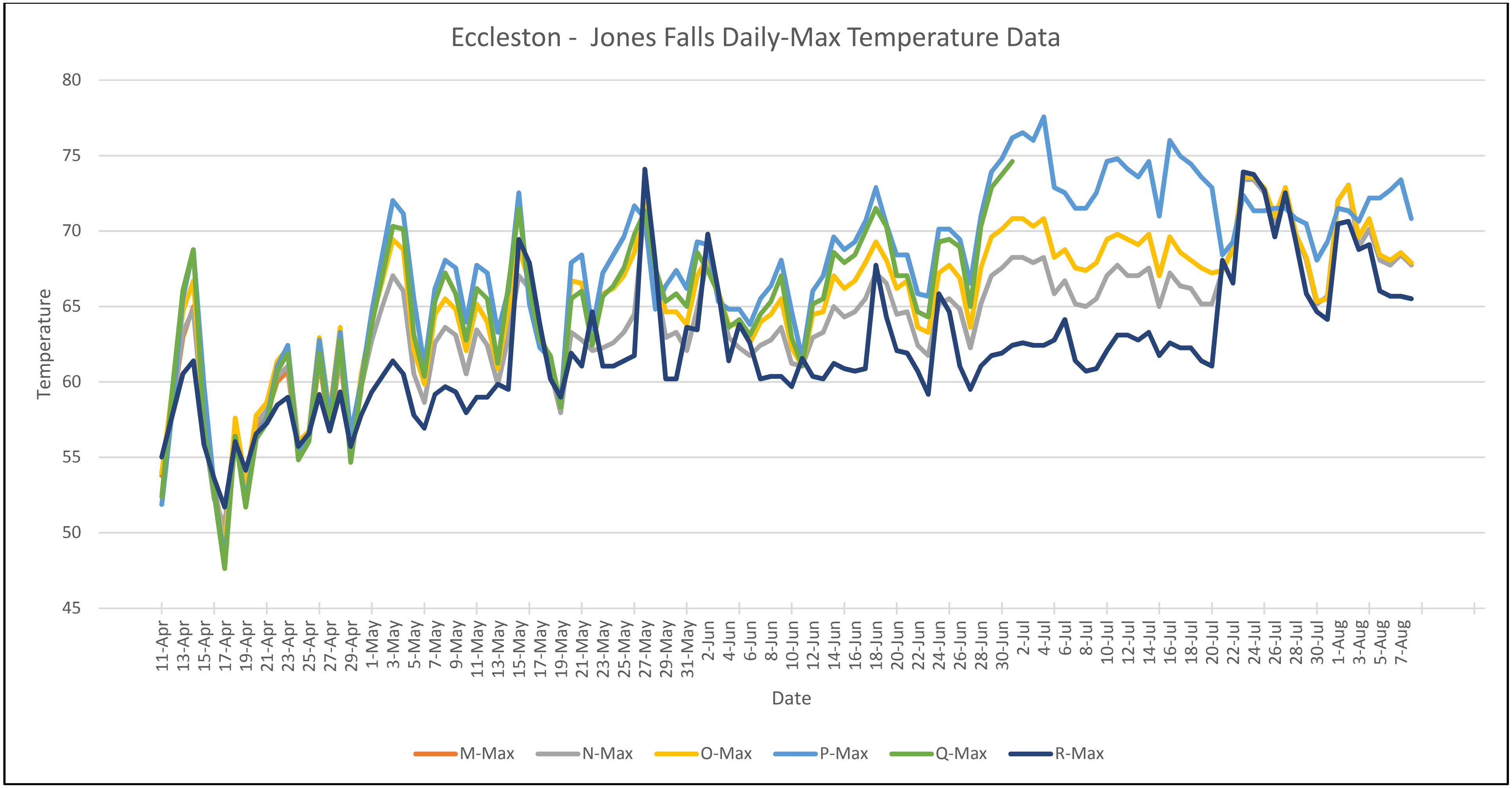
R


Eccleston - Jones Falls Daily-Max Temperature Data
Temperature
80
75
70
65
60
55
50
45
Date
11-Apr
13-Apr
15-Apr
17-Apr
19-Apr
21-Apr
23-Apr
25-Apr
27-Apr
29-Apr
1-May
3-May
5-May
7-May
9-May
11-May
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4-Jun
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8-Jun
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18-Jun
20-Jun
22-Jun
24-Jun
26-Jun
28-Jun
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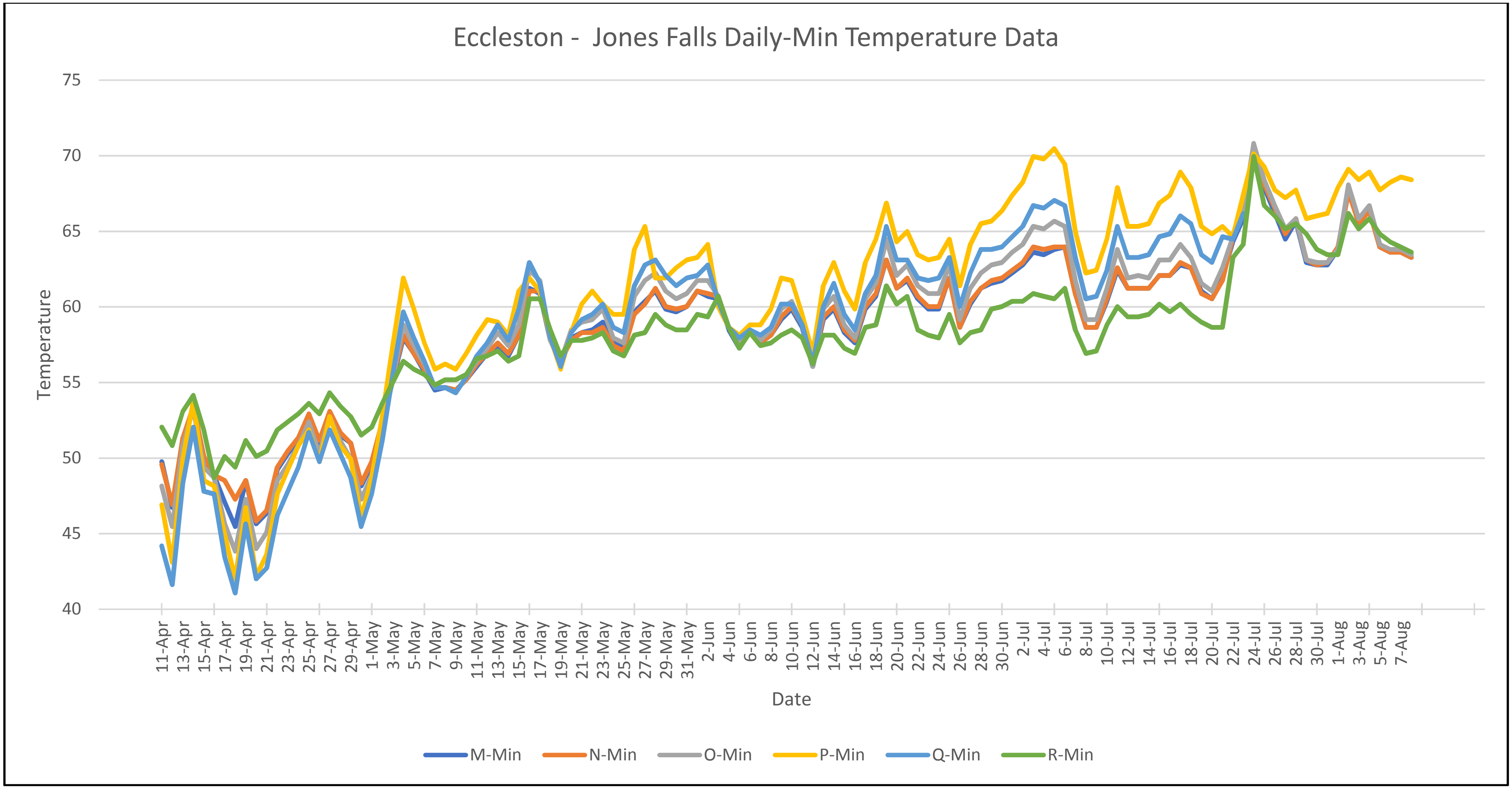
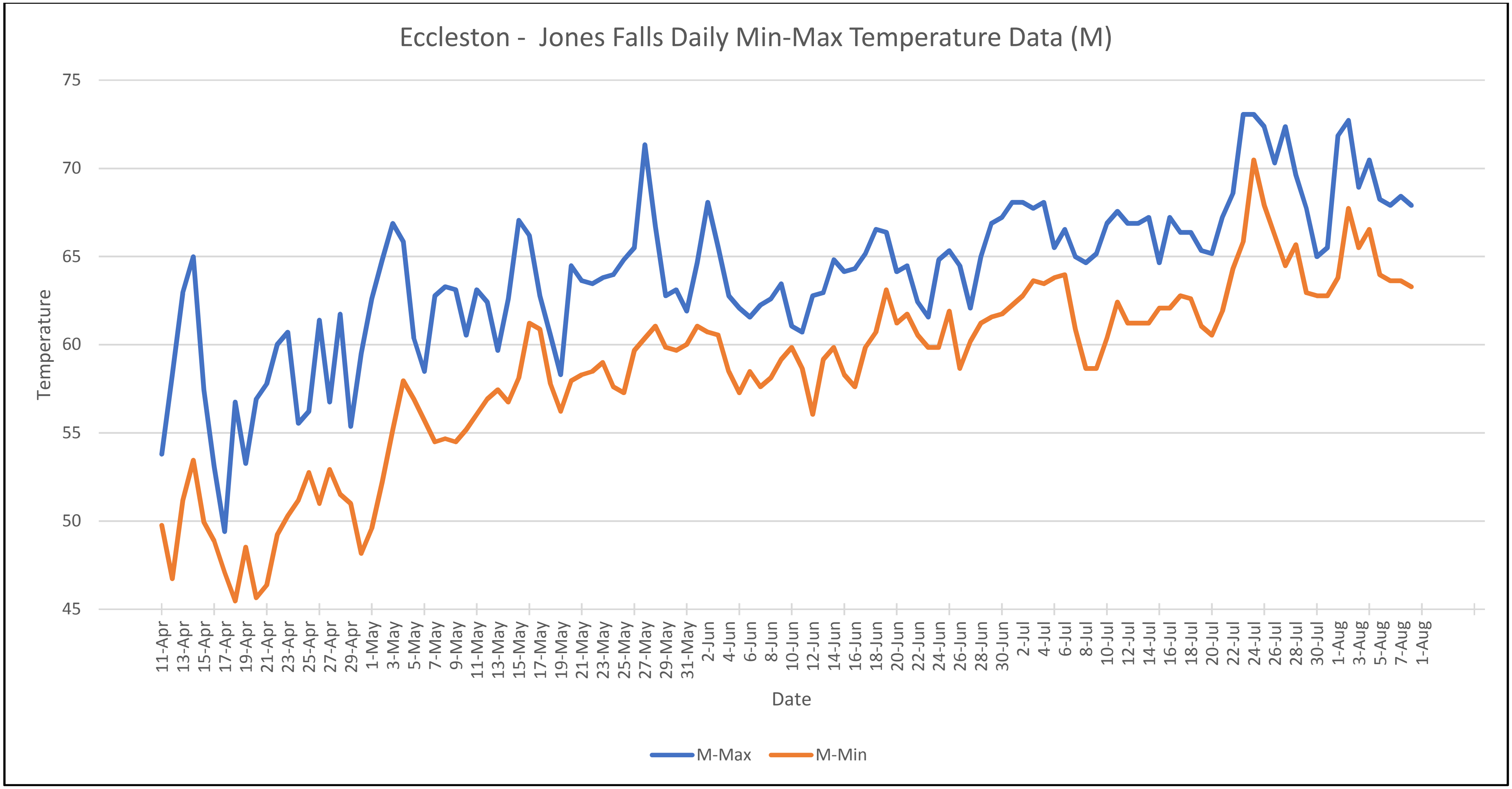
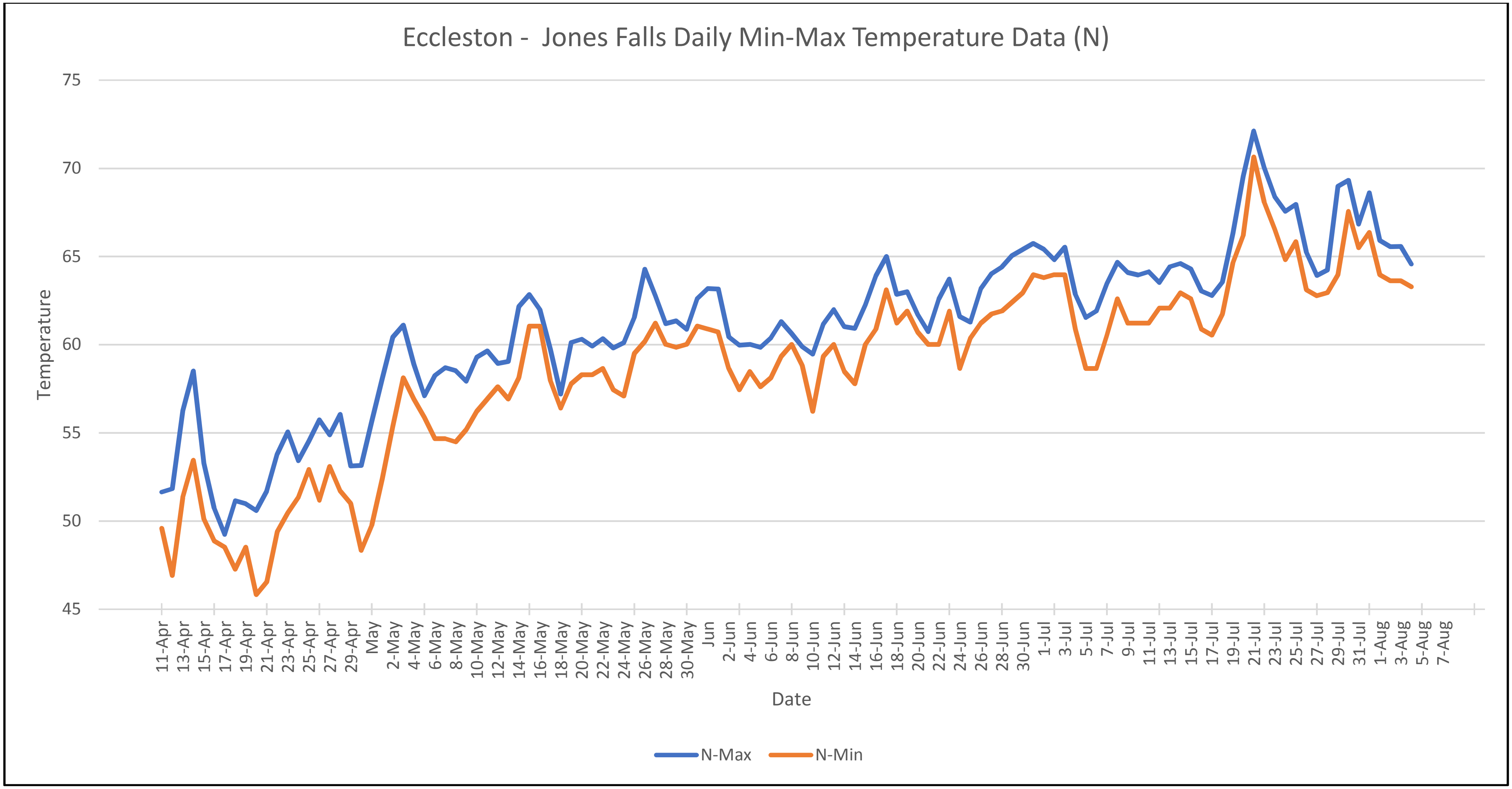
2-Jul
4-Jul
6-Jul
8-Jul
10-Jul
12-Jul
14-Jul
16-Jul
18-Jul
20-Jul
22-Jul
24-Jul
26-Jul
28-Jul
30-Jul
1-Aug
3-Aug
5-Aug
7-Aug
M-Max
N-Max
O-Max
P-Max
Q-Max
R-Max


Eccleston - Jones Falls Daily-Min Temperature Data
75
70
65
60
55
50
45
40
Temperature
11-Apr
13-Apr
15-Apr
17-Apr
19-Apr
21-Apr
23-Apr
25-Apr
27-Apr
29-Apr
1-May
3-May
5-May
7-May
9-May
11-May
13-May
15-May
17-May
19-May
21-May
23-May
25-May
27-May
29-May
31-May
2-Jun
4-Jun
6-Jun
8-Jun
10-Jun
12-Jun
14-Jun
16-Jun
18-Jun
20-Jun
22-Jun
24-Jun
26-Jun
28-Jun
30-Jun
2-Jul
4-Jul
6-Jul
8-Jul
10-Jul
12-Jul
14-Jul
16-Jul
18-Jul
20-Jul
22-Jul
24-Jul
26-Jul
28-Jul
30-Jul
1-Aug
3-Aug
5-Aug
7-Aug
Date
M-Min
N-Min
O-Min
P-Min
Q-Min
R-Min


Eccleston - Jones Falls Daily Min-Max Temperature Data (M)
Temperature
75
70
65
60
55
50
45
11-Apr
13-Apr
15-Apr
17-Apr
19-Apr
21-Apr
23-Apr
25-Apr
27-Apr
29-Apr
1-May
3-May
5-May
7-May
9-May
11-May
13-May
15-May
17-May
19-May
21-May
23-May
25-May
27-May
29-May
31-May
2-Jun
4-Jun
6-Jun
8-Jun
10-Jun
12-Jun
14-Jun
16-Jun
18-Jun
20-Jun
22-Jun
24-Jun
26-Jun
28-Jun
30-Jun
2-Jul
4-Jul
6-Jul
8-Jul
10-Jul
12-Jul
14-Jul
16-Jul
18-Jul
20-Jul
22-Jul
24-Jul
26-Jul
28-Jul
30-Jul
1-Aug
3-Aug
5-Aug
7-Aug
1-Aug
Date
M-Max
M-Min



Eccleston - Jones Falls Daily Min-Max Temperature Data (N)
75
70
65
60
55
50
45
Temperature
11-Apr
13-Apr
15-Apr
17-Apr
19-Apr
21-Apr
23-Apr
25-Apr
27-Apr
29-Apr
May
2-May
4-May
6-May
8-May
10-May
12-May
14-May
16-May
18-May
20-May
22-May
24-May
26-May
28-May
30-May
Jun
2-Jun
4-Jun
6-Jun
8-Jun
10-Jun
12-Jun
14-Jun
16-Jun
18-Jun
20-Jun
22-Jun
24-Jun
26-Jun
28-Jun
30-Jun
1-Jul
3-Jul
5-Jul
7-Jul
9-Jul
11-Jul
13-Jul
15-Jul
17-Jul
19-Jul
21-Jul
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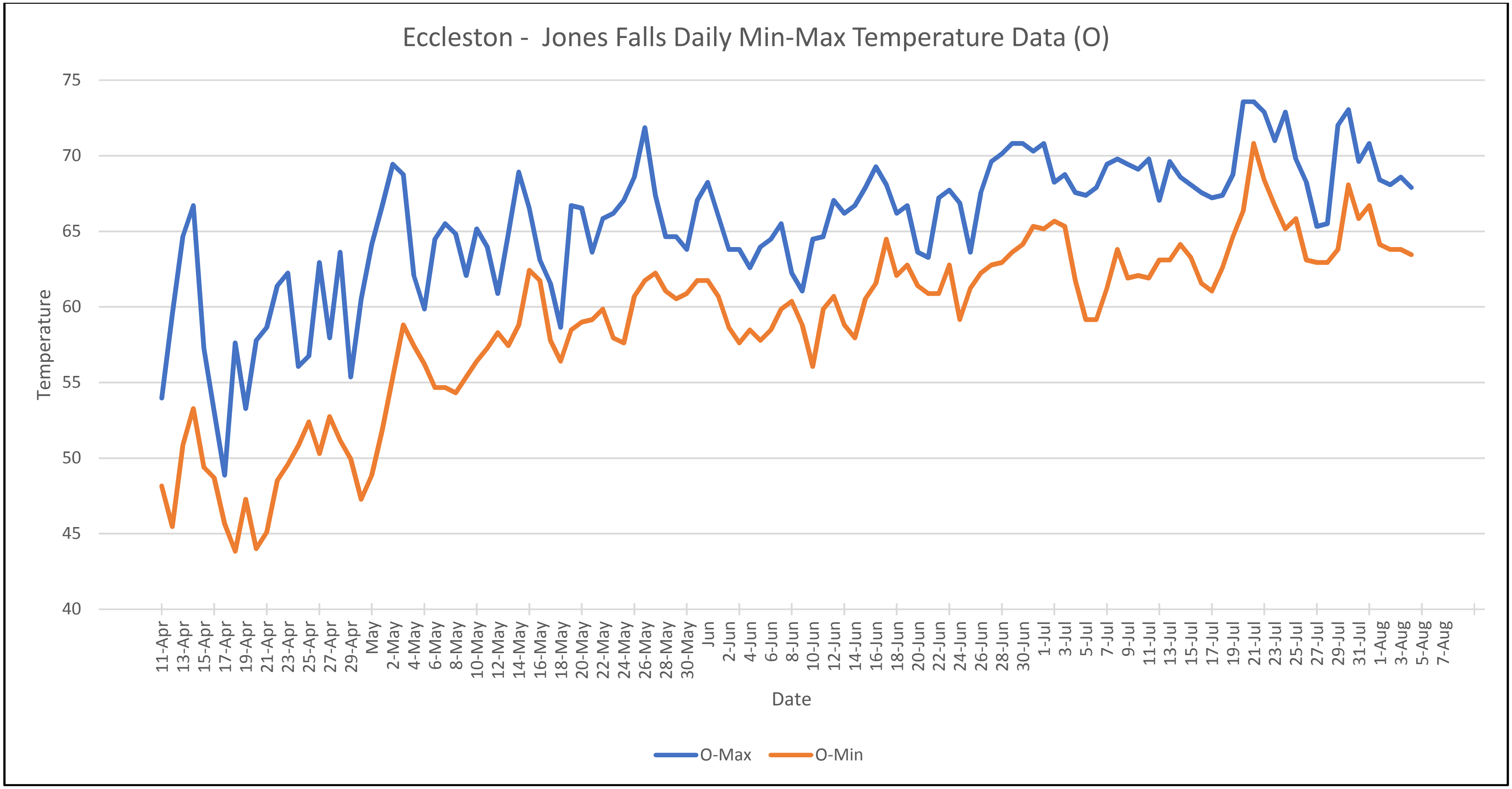
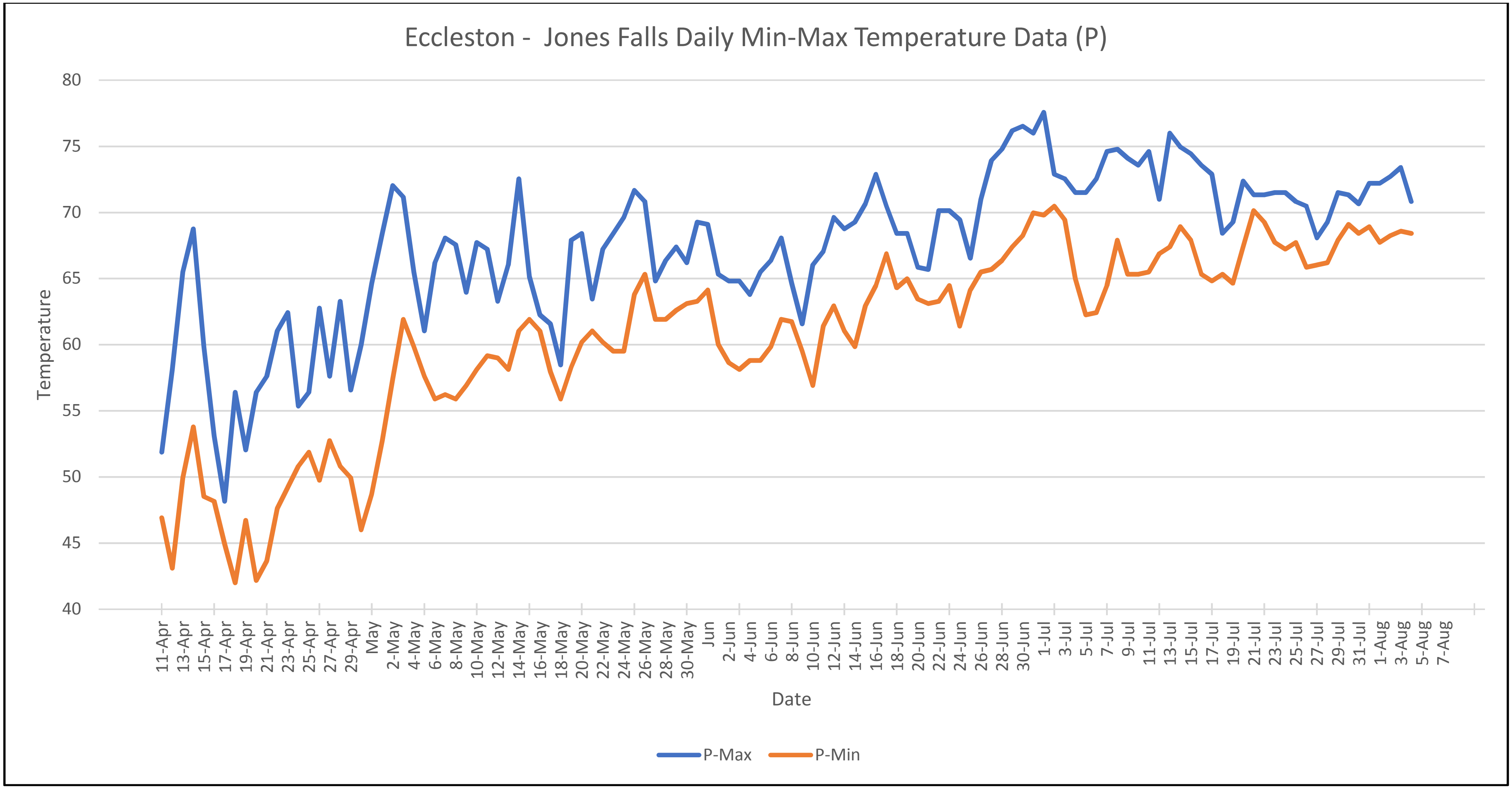
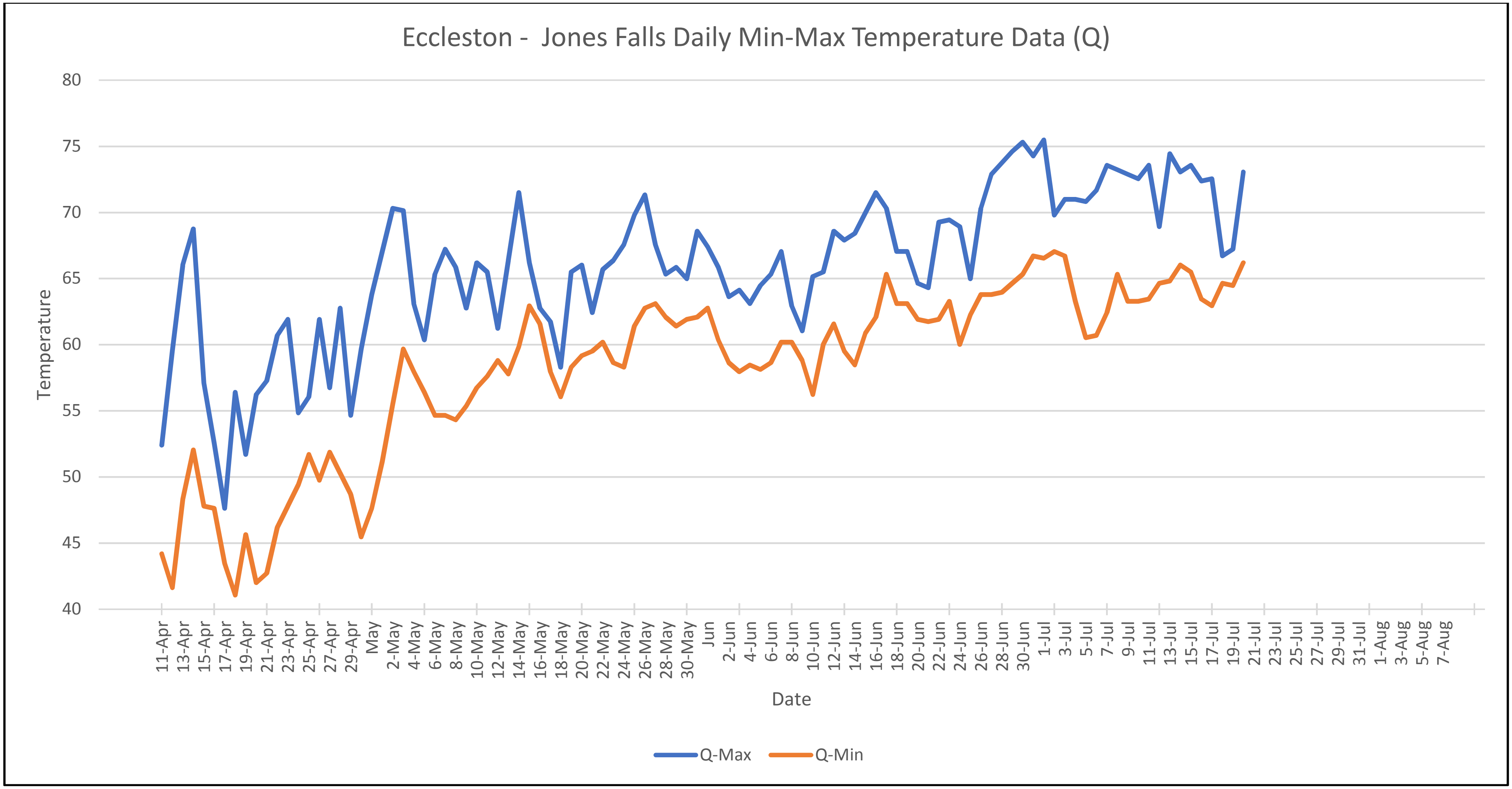
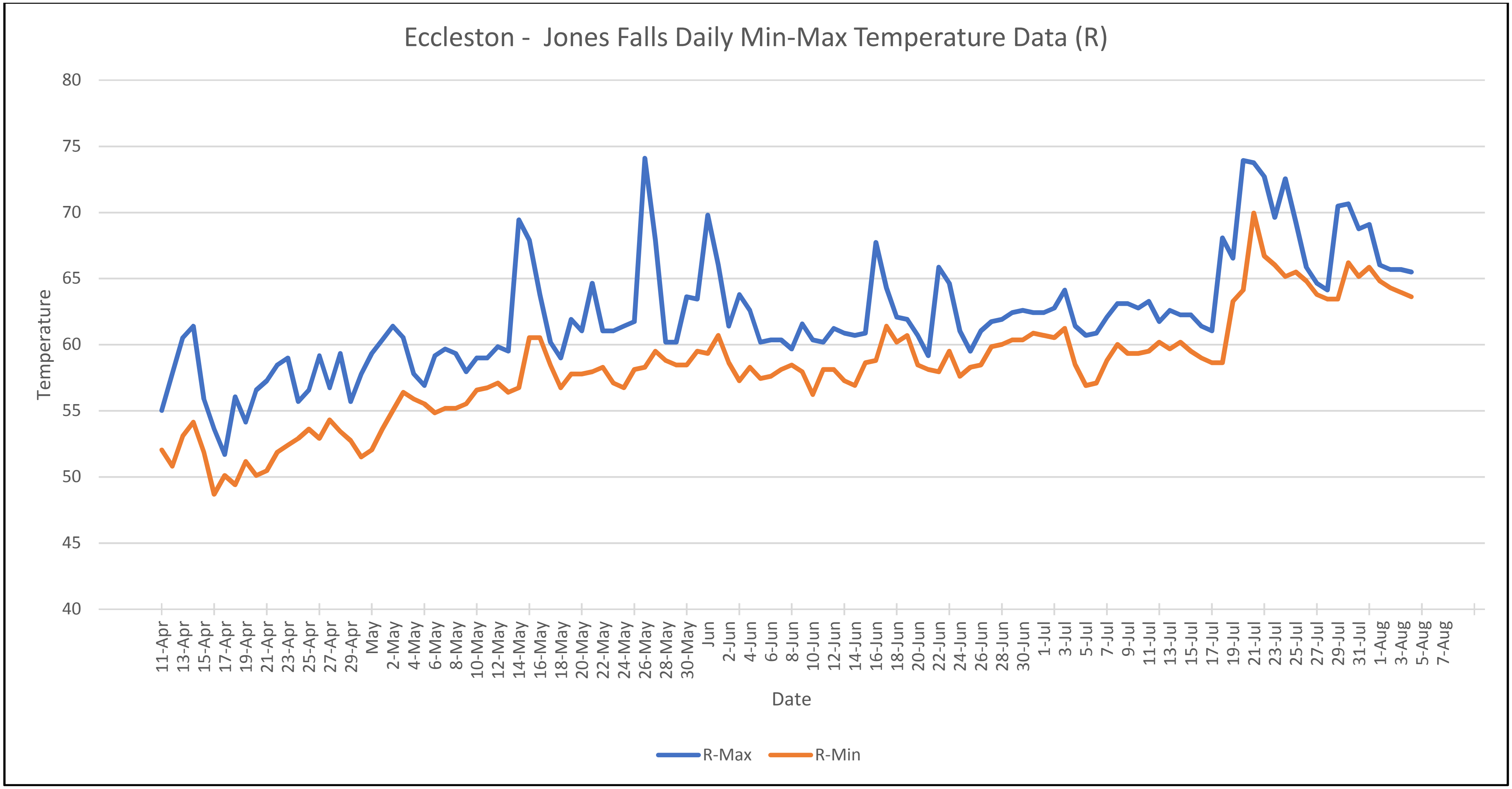
27-Jul
29-Jul
31-Jul
1-Aug
3-Aug
5-Aug
7-Aug
Date
N-Max
N-Min



Eccleston - Jones Falls Daily Min-Max Temperature Data (O)
Temperature
Date
O-Max
O-Min


Eccleston - Jones Falls Daily Min-Max Temperature Data (P)
Temperature
Date
P-Max
P-Min


Eccleston - Jones Falls Daily Min-Max Temperature Data (Q)
Temperature
80
75
70
65
60
55
50
45
40
11-Apr
13-Apr
15-Apr
17-Apr
19-Apr
21-Apr
23-Apr
25-Apr
27-Apr
29-Apr
May
2-May
4-May
6-May
8-May
10-May
12-May
14-May
16-May
18-May
20-May
22-May
24-May
26-May
28-May
30-May
Jun
2-Jun
4-Jun
6-Jun
8-Jun
10-Jun
12-Jun
14-Jun
16-Jun
18-Jun
20-Jun
22-Jun
24-Jun
26-Jun
28-Jun
30-Jun
1-Jul
3-Jul
5-Jul
7-Jul
9-Jul
11-Jul
13-Jul
15-Jul
17-Jul
19-Jul
21-Jul
23-Jul
25-Jul
27-Jul
29-Jul
31-Jul
1-Aug
3-Aug
5-Aug
7-Aug
Date
Q-Max
Q-Min


Eccleston - Jones Falls Daily Min-Max Temperature Data (R)
80
75
70
65
60
55
50
45
40
Temperature
Date
R-Max
R-Min


Eccleston Temperature Gauge Locations
P
R
O
Q
N
M
MD iMAP, DoIT

APPENDIX J
Preliminary Design Plans
(under separate cover)