# GRE-68-12.85 PID 115388

## Temporary Access Fill Report

### Bridge No. GRE-BK80020-0.492 SFN 2926107

**Pedestrian Bridge over US-68 and Oldtown Creek**

*The environmental review, consultation, and other actions required by applicable federal environmental laws for these projects are being, or have been, carried out by ODOT pursuant to 23 U.S.C. 327 and a memorandum of understanding dated December 11, 2015, and executed by FHWA and ODOT.*

Submitted to *Ohio Department of Transportation District 8*
*January 2024*

Prepared by

WOOLPERT

OHIO DEPARTMENT OF TRANSPORTATION

Appendices ..... ii
Introduction and Project Description ..... 1
Design Criteria ..... 2
Hydrologic Analysis ..... 2
Hydraulic Analysis - Existing Conditions ..... 4
Hydraulic Analysis - Proposed Condition ..... 6
Flood Hazard Evaluation ..... 8
Risk Assessment ..... 8

## APPENDICES

APPENDIX 1: STRUCTURE PLANS
APPENDIX 2: USGS STREAMSTATS OUTPUT
APPENDIX 3: FIRM DATA
APPENDIX 4: HEC-RAS OUTPUT – EXISTING CONDITIONS
APPENDIX 5: HEC-RAS OUTPUT – PROPOSED CONDITIONS
APPENDIX 6: ODOT TAF CHECKLIST AND WORKSHEET

# INTRODUCTION AND PROJECT DESCRIPTION

Woolpert has prepared a Temporary Access Fill (TAF) model and report for the Ohio Department of Transportation (ODOT) and Fishbeck in support of the GRE-68-12.65 PID 115388. The project involves the construction of a shared use path bridge over US 68 and Oldtown Creek and re-grading of a portion of the existing Little Miami Scenic Trail.

The purpose of this report is to determine the impacts of the TAF on the water surface elevations of Oldtown Creek, determine the hydraulic adequacy of the proposed temporary solution, and evaluate the flood hazard potential.

This report was prepared after completion of the Feasibility Study, dated December 1, 2023, and included hydraulic models for the existing conditions and the proposed TAF solution.

Oldtown Creek is a perennial, low sinuous waterway with a sinuosity of approximately 1.01 in the region near the site, shown in Figure 1. The channel bottom is a mixture of silty sand and gravel. The banks of the channels are steeply sloped with vegetation. Oldtown Creek has a nearby confluence with Massies Creek and outlets to the Little Miami River.

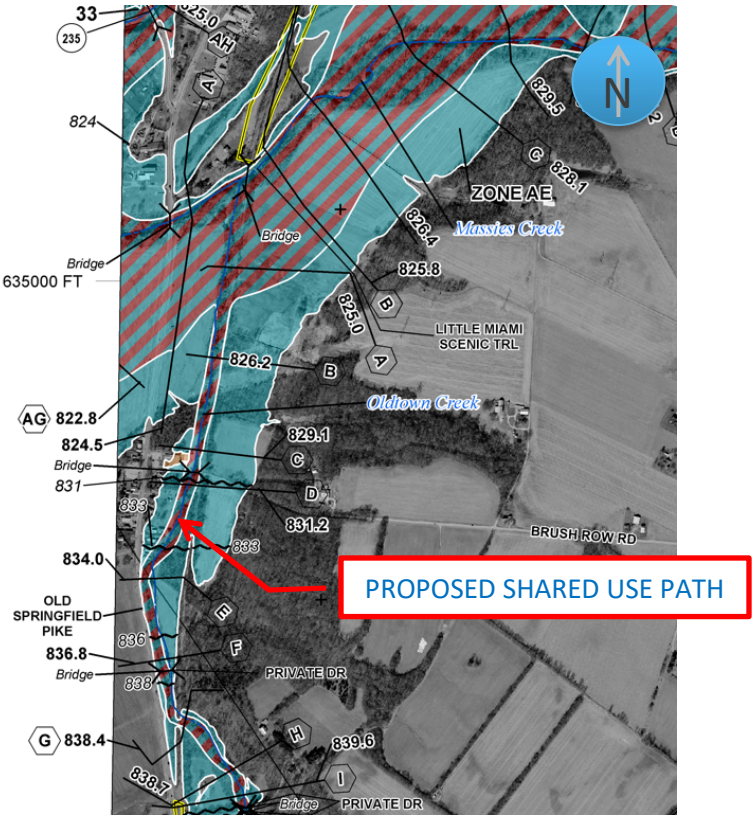



Figure 1: FEMA Floodplain

*Existing Conditions* – The proposed shared use path bridge is located over Oldtown Creek within a Federal Emergency Management Agency (FEMA) regulated floodplain (Zone AE) with a regulatory flood elevation of approximately 831.8 at the proposed structure. The proposed crossing is close to an existing structure on Brush Row Road and upstream of the confluence with Massies Creek. The Flood Insurance Rate Map (FIRM) and portions of the FIS can be seen in Figure 1 and Appendix 3 of this report.

*Proposed Conditions* - The project will require the use of a TAF over Oldtown Creek during the construction process of the shared use path connection and modifications of the existing Little Miami Scenic Trail to the Great Council State Park Interpretive Center. The path will consist of a 17-ft out-to-out four-span bridge with hammerhead piers and stub abutments. A single alternative for the TAF was evaluated for the construction site.

## DESIGN CRITERIA

The proposed crossing is in a FEMA regulated floodplain (Zone AE) and the requirements of the National Flood Insurance Program (NFIP) will apply. The FEMA Engineering Library was consulted for electronic files, and it was determined that no files for the effective model were available. Therefore, the existing conditions model is used for determining if the proposed conditions result in an increase in water surface elevations and impacts to other parameters such as velocity.

## HYDROLOGIC ANALYSIS

Peak discharge rates used in the analysis were obtained from the FEMA Flood Insurance Study (FIS) for Oldtown Creek for the 100-yr design frequency. The FIS has a drainage basin area of 10.6 square miles which corresponds for the flow used in the modeling. The USGS StreamStats report showed similar peak-flow statistics, with a drainage basin of 9.62 square miles and approximately 9.02-percent forest. An aerial view of the drainage basin is shown in Figure 2. Flood volumetric flow rates used for this report are given in Table 1. The flow rates provided in the FIS were used to develop a trendline equation to calculate a corresponding 25-yr flow rate. For the hydraulic models, flow rates were selected from the various sources as appropriate.

Table 1: Flood Flow Rates

| Frequency | StreamStats Peak-Flow Statistics (cfs) | FIS Peak Discharge from mouth at Oldtown Creek (cfs) | Calculated Peak Flow (cfs) | Modeled Peak Flow (cfs) |
|---|---|---|---|---|
| 2xHMMF | 38.6 | --- | | 38.6 |
| 2 Year | 620 | --- | | 620 |
| 5 Year | 1,070 | --- | | 1,070 |
| 10 Year | 1,430 | 1,180 | | 1,180 |
| 25 Year | 1,950 | --- | 1,465 | 1,465 |
| 50 Year | 2,380 | 1,740 | | 1,740 |
| 100 Year | 2,840 * | 2,000 | | 2,000 |

* The FIS discharge used in accordance with L&D 1003.1.2

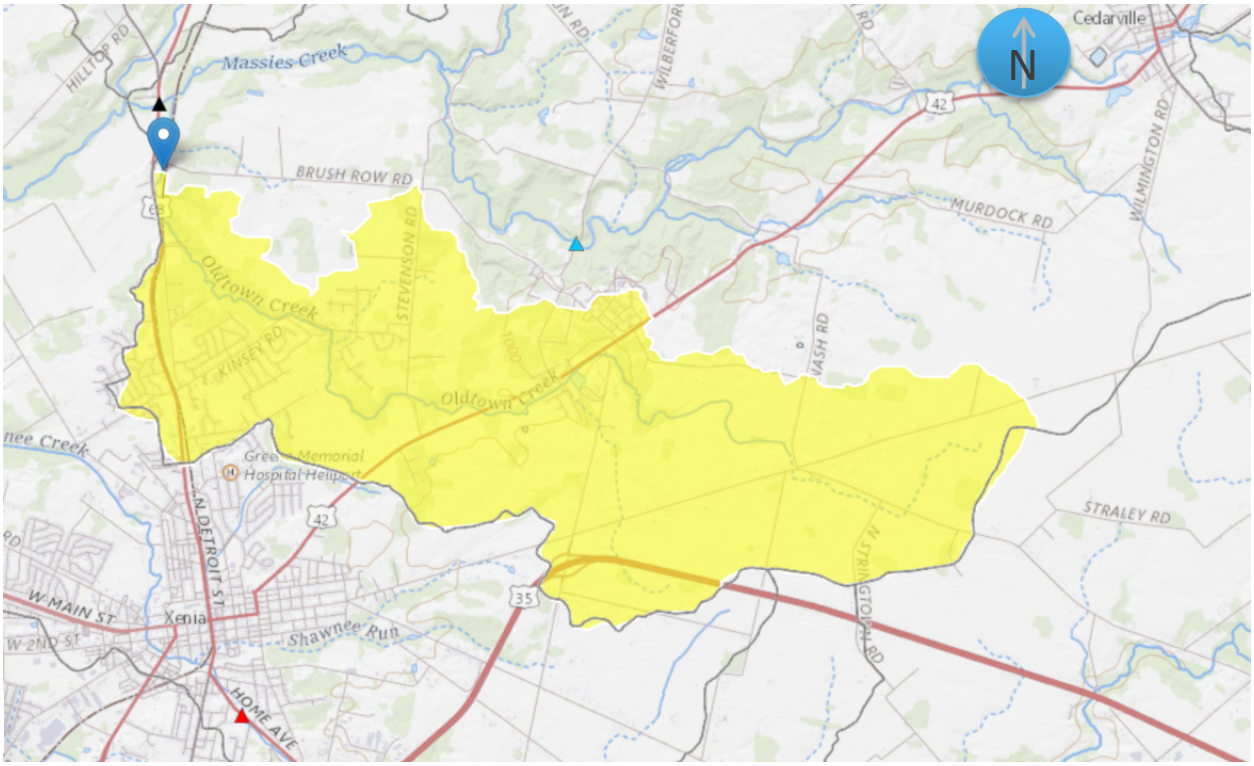



Figure 2: Drainage Basin from USGS StreamStats

## HYDRAULIC ANALYSIS - EXISTING CONDITIONS

Structure hydraulics for the existing conditions have been calculated using HEC-RAS. The crossing is within a FEMA floodplain with a base flood elevation of 831 at the downstream section and 831.2 at Section D-D as seen in Figure 1 and from the Floodway Data (Table 23) in the FIS. The hydraulic model was built using a combined surface of survey data and lidar scans. This was performed due to stream elevations of the lidar surface providing inaccurate elevations at lower volumetric flow rates. The existing conditions combined surface can be seen in Figure 3. One boundary condition was used for each of the profiles to analyze steady flow data. The 10-yr, 25-yr, 50-yr, and 100-yr profiles used the known FIS water surface elevation boundary condition for the downstream cross section and the FIS volumetric flow rate. For the 2xHMMF (highest monthly mean flow), 2-yr, and 5-yr profiles, the use of a normal depth boundary condition was used with the StreamStats volumetric flow rate. Due to the nature of the existing stream conditions and importance of meeting FEMA floodway requirements, the calculated energy grade slope for the downstream most section from the 100-yr model was used for the 2XHMMF, 2-yr, and 5-yr boundary condition.

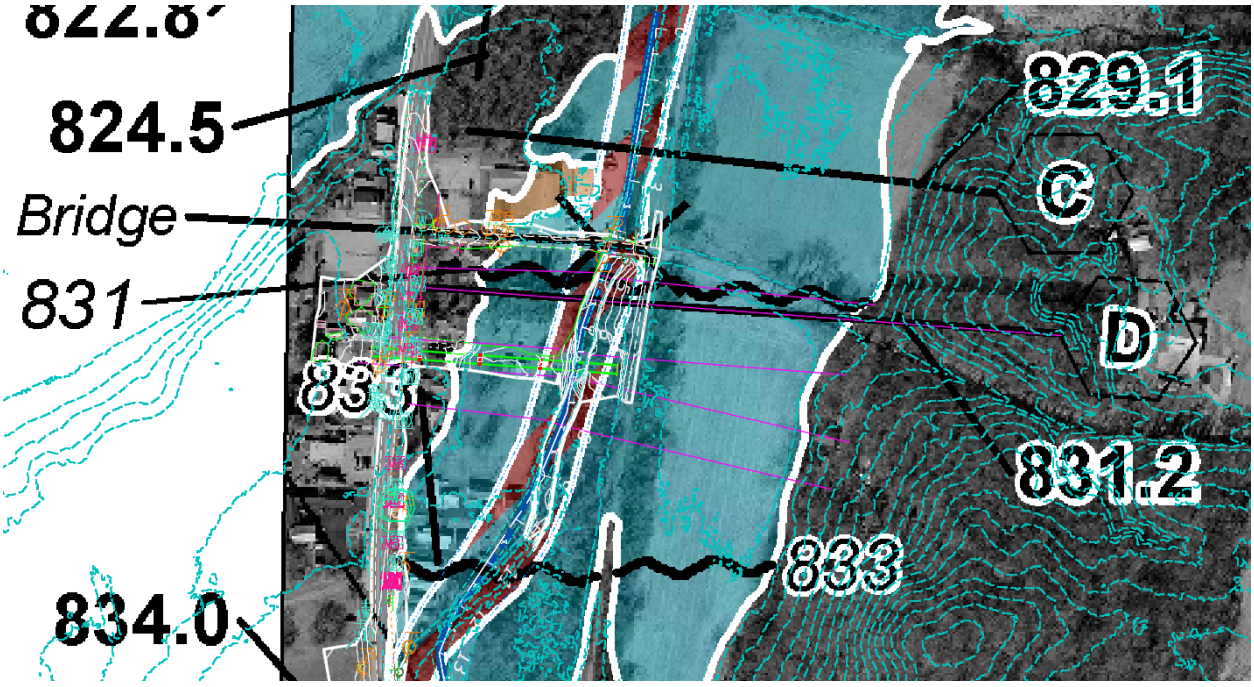



Figure 3: Existing Conditions Combined Surface

OpenRoads Designer (ORD) was used to create a complex terrain from OSIP imagery, lidar data, and survey data. This created the most accurate representation of the waterway and overbanks. Slope break lines were placed to match the 100-year base flood cross section D-D, two known water surface elevations from the FEMA floodplain as shown in Figure 1, and additional cross sections upstream and downstream of the proposed bridge. The ORD model was exported to HEC-RAS to create the geometric data. The HEC-RAS geometry plan view can be seen in Figure 4.

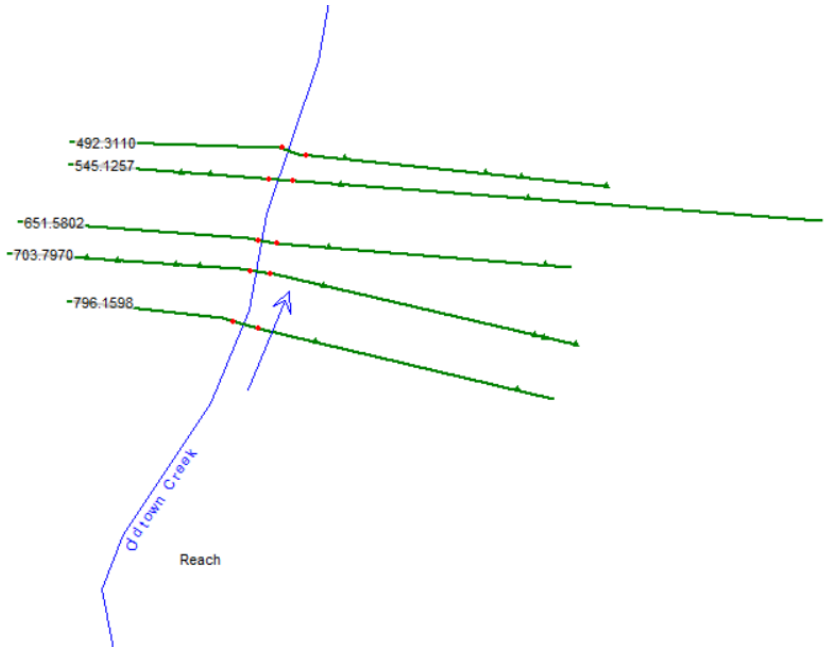



Figure 4: Existing Conditions HEC-RAS Geometry

Manning's "n" values for channel roughness were determined from the FIS for Oldtown Creek. These values ranged from 0.06 at the channel bottom to 0.07 at the left and right overbanks. Additional Manning's values were also used for asphalt pavement (0.031), low grass (0.03), and crops (0.035) as needed per the aerial imagery.

Once the existing condition model was completed, it was then used for comparison with the proposed condition model. The proposed condition model for the TAF can be seen in Figure 5.

# HYDRAULIC ANALYSIS - PROPOSED CONDITION

The TAF is expected to be installed along the profile of the proposed superstructure. The TAF will be installed to elevation 827.96 which is 1-ft above the Ordinary Highwater Mark (OHWM).

In accordance with ODOT L&D Manual 1010.1, the proposed TAF allowable water surface elevation at twice the highest month flow is the ordinary highwater mark elevation. Two 30" conduits were found to meet this allowable headwater elevation at twice the highest mean monthly flow.

HEC-RAS results showing water surface elevations and velocities have been tabulated in **Error! Reference source not found.** (FIS D-D). Table 3 includes the results in the cross section upstream of the proposed bridge. For the 2xHMMF and 2-yr profiles there is an increase in water surface elevation while the 5-yr, 10-yr, and 100-yr profiles experience a slight decrease.

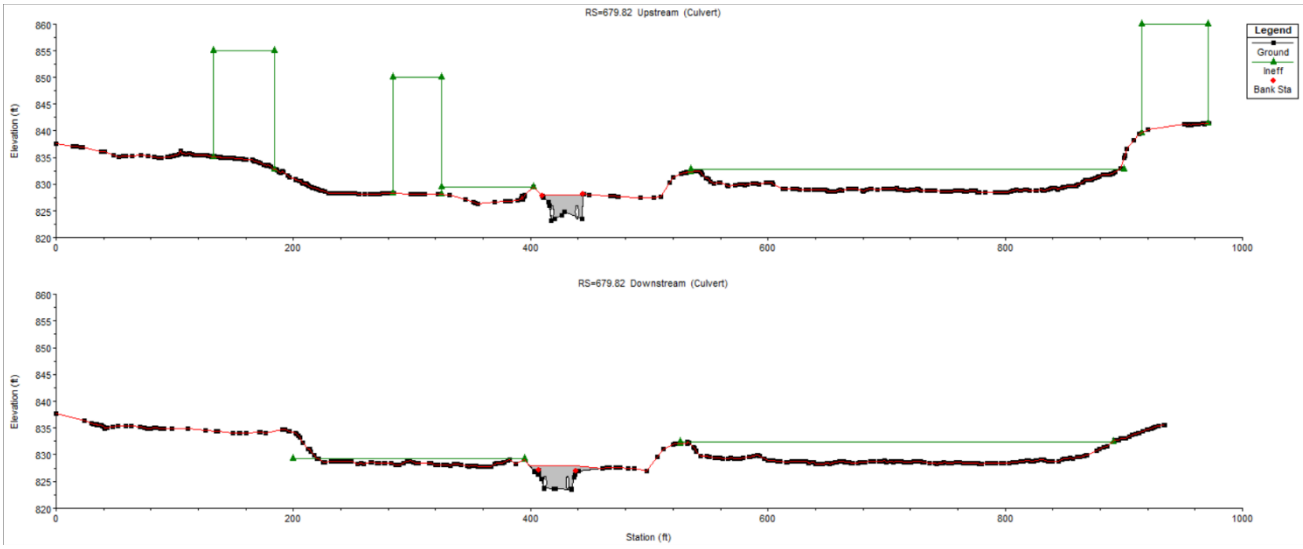



Figure 5: Proposed TAF Cross Section

Table 2: Hydraulic Results – FIS D-D

| Location | Storm Event | WS Elev (ft) | Vel. Channel (ft/s) |
|---|---|---|---|
| **FIS Floodway Table** | 100-yr | 831.2 | 3.3 |
| **Existing Conditions** | 100-Yr | 831.26 | 4.24 |
| | 50-yr | 830.99 | 3.98 |
| | 25-yr | 830.63 | 3.75 |
| | 10-yr | 830.22 | 3.47 |
| | 5-yr | 830.05 | 3.34 |
| | 2-yr | 829.28 | 2.57 |
| | 2xHMMF | 825.02 | 0.94 |
| **Proposed Conditions** | 100-Yr | 831.26 | 4.24 |
| | 50-yr | 830.99 | 3.98 |
| | 25-yr | 830.63 | 3.75 |
| | 10-yr | 830.22 | 3.47 |
| | 5-yr | 830.05 | 3.34 |
| | 2-yr | 829.28 | 2.57 |
| | 2xHMMF | 825.02 | 0.94 |

Table 3: Hydraulic Results – Upstream of Bridge RS 7+03

| Location | Storm Event | WS Elev (ft) | Vel. Channel (ft/s) |
|---|---|---|---|
| **Existing Conditions** | 100-Yr | 831.55 | 1.67 |
| | 50-yr | 831.27 | 1.59 |
| | 25-yr | 830.90 | 1.51 |
| | 10-yr | 830.48 | 1.43 |
| | 5-yr | 830.31 | 1.40 |
| | 2-yr | 829.49 | 1.21 |
| | 2xHMMF | 825.22 | 1.14 |
| **Proposed Conditions** | 100-Yr | 831.54 | 1.67 |
| | 50-yr | 831.27 | 1.59 |
| | 25-yr | 830.90 | 1.51 |
| | 10-yr | 830.46 | 1.44 |
| | 5-yr | 830.30 | 1.40 |
| | 2-yr | 829.50 | 1.20 |
| | 2xHMMF | 826.17 | 0.64 |

## FLOOD HAZARD EVALUATION

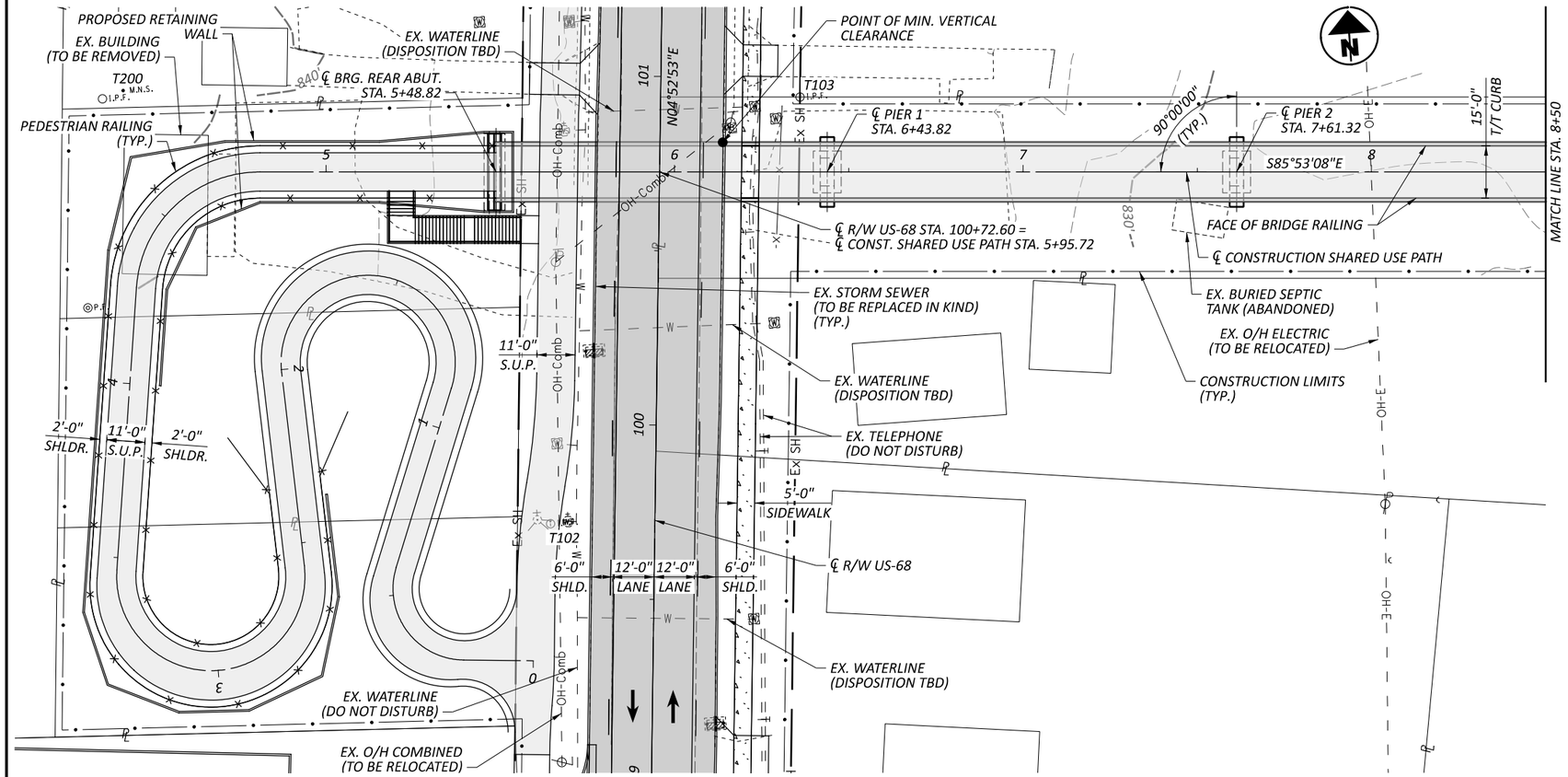
The Flood Insurance Rate Map (FIRM) indicates that some inhabitable structures are inside of the floodplain limits. The hydraulic modeling of the existing and proposed conditions indicates that the modifications associated with the structure construction will not have an adverse effect on the water surface elevations within the study area.

## RISK ASSESSMENT

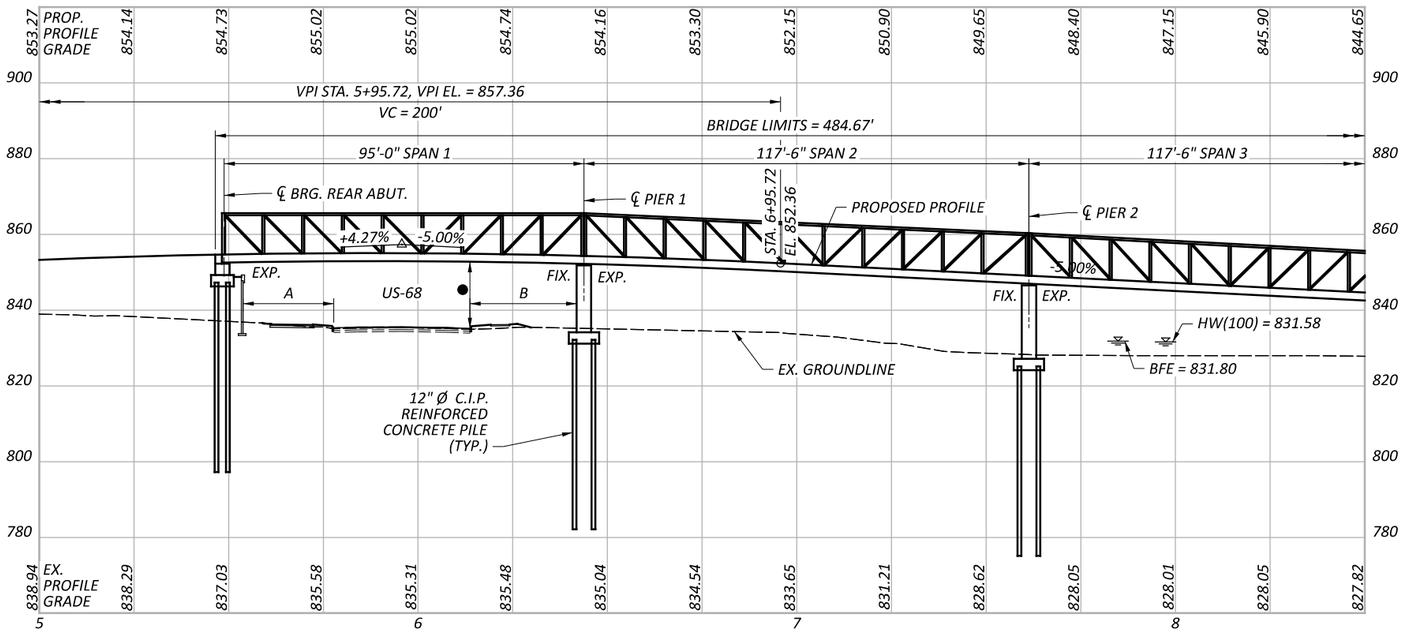
Risks of flooding have been defined by the FEMA assessment previously completed, and this project will have a no-rise impact to the floodplain as determined by modeling in HECRAS. The shared use path is of minor risk as a bicycle pathway, however none of the water profiles cause inundation of the structure, including the 100-year. If fully inundated during large storm events the proposed structures will be structurally sound due to deep foundations.

Resiliency of structures due to changing climatic conditions has been assessed. The 2014 "Climate Change Impacts in the United States", regional impacts of the Third National Climate Assessment indicates a 60-100% increase in number of days exceeding 1.25" of precipitation per year and 20% increase in total precipitation and 32% increase in the number of heavy precipitation events in the 1951-2012 assessment period. If this continues at the same rate as the past 60 years, the likelihood of larger storms will impact the structure by reducing the return period of the storm currently considered as the 100-year event, and correspondingly increasing the flow rates that should be considered for each event. While this will have impacts, given the fact that the 100-year event does not overtop the bridge, the design consideration for scour, and the deep foundations, the risk to human life and for capital costs due to this structure replacement is limited.

# APPENDIX 1: STRUCTURE PLANS




## PLAN




## PROFILE ALONG ℄ CONSTRUCTION SHARED USE PATH

### BENCHMARK DATA

*T102 STA. 99+71.31, EL. 835.661, OFFSET 29.95' LT., IRON PIN FOUND*
*T103 STA. 100+94.64, EL. 835.180, OFFSET 40.01' RT., IRON PIN FOUND*
*T110 STA. 100+72.99, EL. 831.871, OFFSET 457.01' RT., IRON PIN SET*
*T200 STA. 100+93.88, EL. 840.801, OFFSET 154.24' LT., MAG NAIL SET*

HORIZONTAL SCALE IN FEET
0 10 20 40

### NOTES:

1. *EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.*
2. *SEE ROADWAY PLANS FOR ADDITIONAL SHARED USE PATH HORIZONTAL AND VERTICAL CURVE INFORMATION.*
3. *CONCEPTUAL TRUSS STYLE SHOWN IN THE PROFILE VIEW.*
4. *FRICTION PILES WERE THE ASSUMED FOUNDATION TYPE BASED ON GEOTECHNICAL INFORMATION FOR THE NEARBY INTERPRETIVE CENTER AND HISTORIC BORING LOGS FOR GRE-68-13.40 BRIDGE OVER MASSIES CREEK NORTH OF THE PROJECT LOCATION.*

*US-68 DESIGN TRAFFIC:*
*2026 ADT = 8,600* *2026 ADTT = 602*
*2046 ADT = 8,800* *2046 ADTT = 616*
*DIRECTIONAL DISTRIBUTION = 0.50*

### LEGEND:

- *17'-6" REQUIRED MINIMUM VERTICAL CLEARANCE*
  *17'-10¼" ACTUAL MINIMUM VERTICAL CLEARANCE*

*A - REQUIRED HORIZONTAL CLEARANCE = 19'-0"*
*MIN. HORIZONTAL CLEARANCE = 23'-9½"*

*B - REQUIRED HORIZONTAL CLEARANCE = 19'-0"*
*MIN. HORIZONTAL CLEARANCE = 27'-11¾"*

*PROP. SHARED USE PATH*
*PROP. PAVEMENT*
*PROP. WALK*

### HYDRAULIC DATA:

*DRAINAGE AREA = 10.6 SQ. MILES*
*Q (100) = 2000 CFS* *V (100) = 1.7 FT/S*
*STRUCTURE CLEARS THE 100 YEAR DESIGN HW BY 2.09 FEET.*

### EXISTING STRUCTURE - NONE

### PROPOSED STRUCTURE

*TYPE: FOUR SPAN PREFABRICATED PAINTED STEEL TRUSS SUPERSTRUCTURE WITH REINFORCED CONCRETE DECK ON REINFORCED CONCRETE ABUTMENTS AND PIERS SUPPORTED ON CAST-IN-PLACE REINFORCED CONCRETE PILES*

*SPANS: 95'-0", 117'-6", 117'-6", 150'-0" (SEE PLAN)*
*ROADWAY: 15'-0" TOE/TOE CURB*
*LOADING: 0.090 KSF PEDESTRIAN LOAD AND H15-44 VEHICULAR LOAD*
*SKEW: NONE*
*WEARING SURFACE: 1" MONOLITHIC CONCRETE*
*APPROACH SLABS: NONE*
*ALIGNMENT: TANGENT*
*CROWN: 0.0156 FT/FT*
*DECK AREA: 8,180 SF*

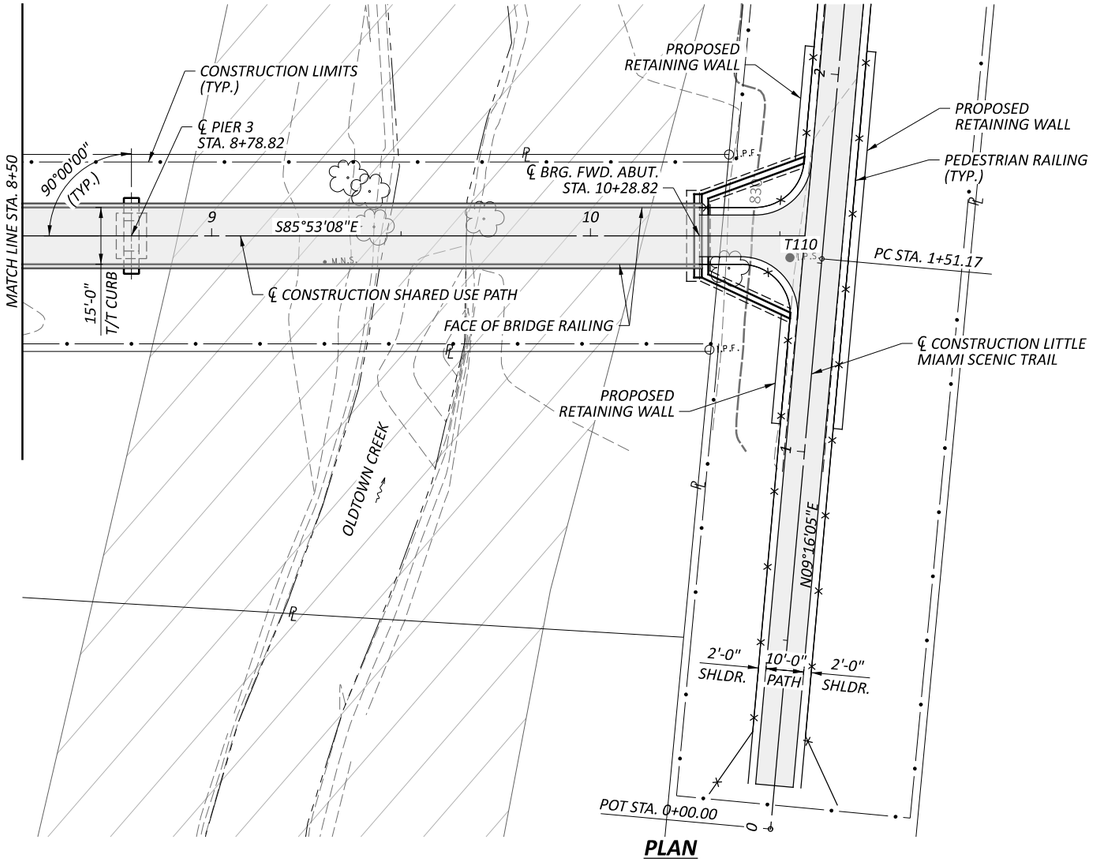
*COORDINATES: LATITUDE N39°43'46.65"*
*LONGITUDE W83°56'12.36"*

# ALTERNATIVE 2A - SITE PLAN (1 OF 2)
## BRIDGE NO. GRE-BK80020-00.492
## PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

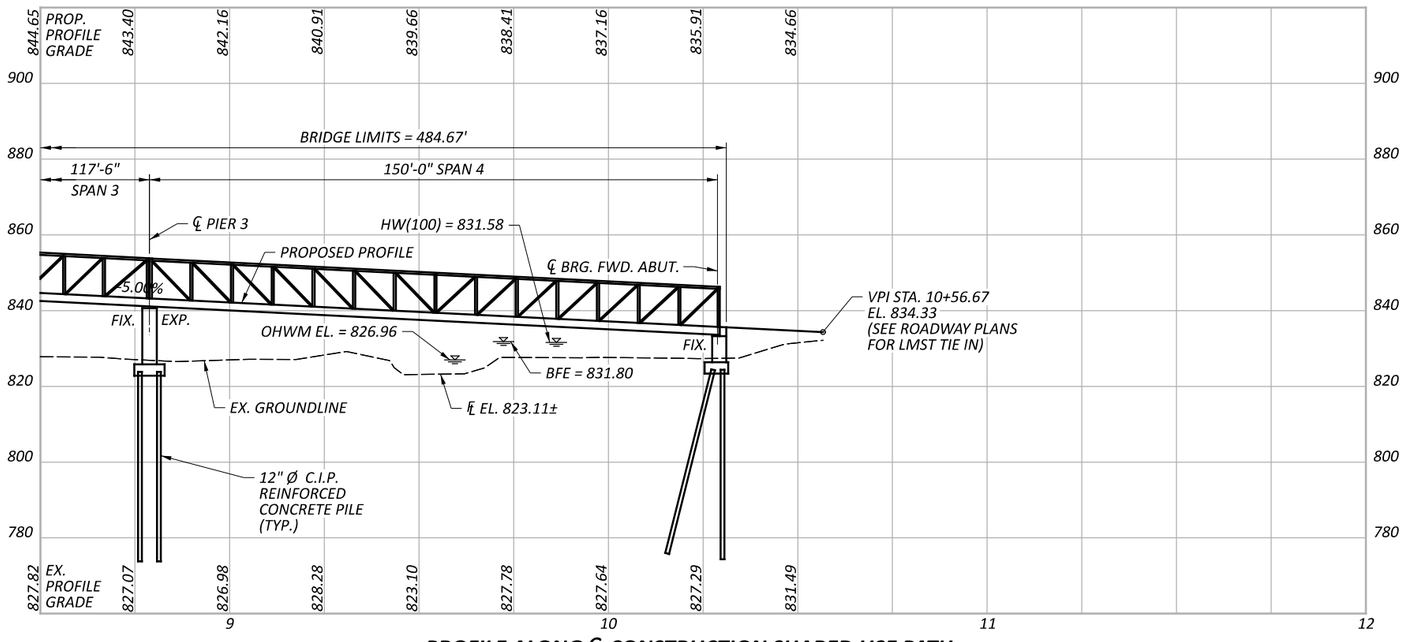
| | |
|---|---|
| SFN | 2926107 |
| DESIGN AGENCY | fishbeck |
| DESIGNER | BMG |
| CHECKER | TLC |
| REVIEWER | JPC 11/27/23 |
| PROJECT ID | 115388 |
| SUBSET | S1.1 |
| TOTAL | 5 |
| SHEET | P.12 |
| TOTAL | 22 |

GRE-68-12.65

MODEL: CLP_SUP_MAIN-1 - Plan 1 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:45 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\400-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_SP001.dgn




**PLAN**




**PROFILE ALONG ℄ CONSTRUCTION SHARED USE PATH**

## LEGEND:

- LIMITS OF FLOODWAY
- PROP. SHARED USE PATH

## NOTES:

1. FOR ADDITIONAL NOTES AND INFORMATION, SEE SHEET S1.1 / 5 .

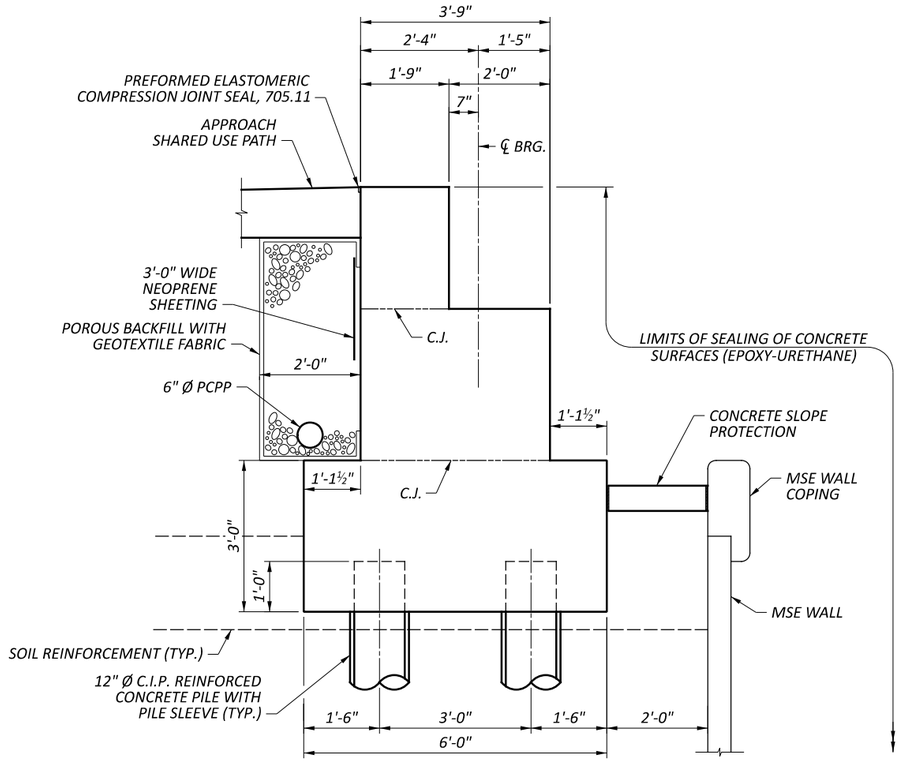
HORIZONTAL SCALE IN FEET
0 10 20 40

# ALTERNATIVE 2A - SITE PLAN (2 OF 2)
## BRIDGE NO. GRE-BK80020-00.492
## PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

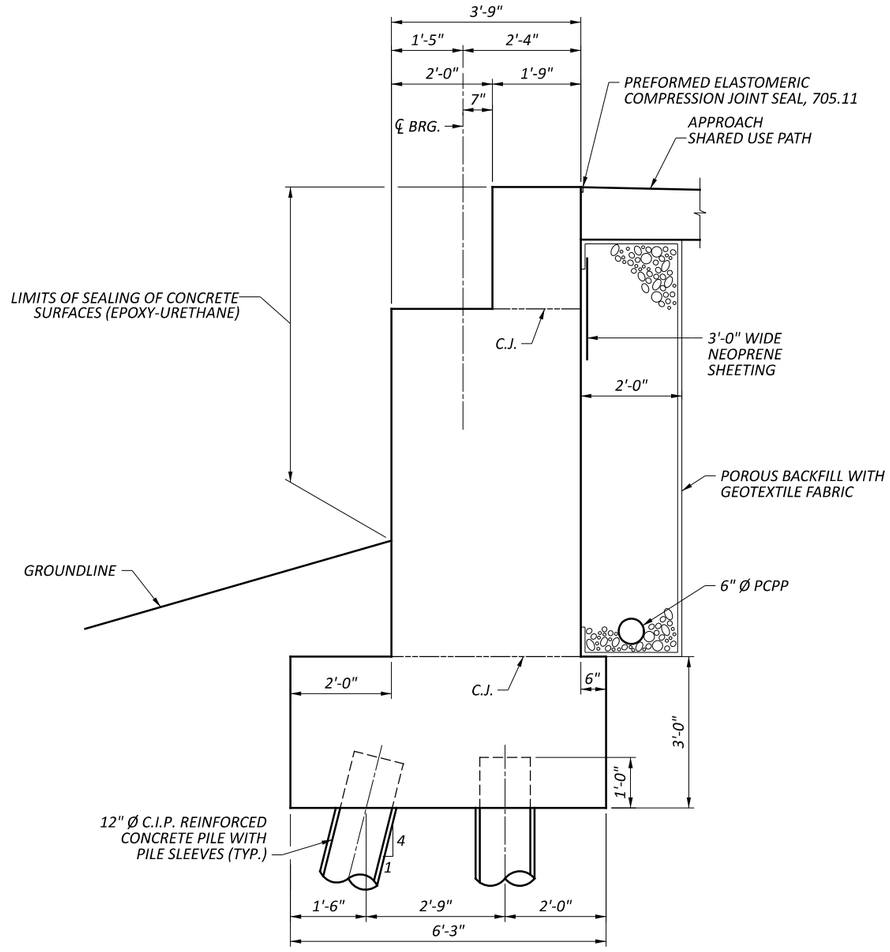
| | |
|---|---|
| SFN | 2926107 |
| DESIGN AGENCY | fishbeck |
| DESIGNER | BMG |
| CHECKER | TLC |
| REVIEWER | JPC 11/27/23 |
| PROJECT ID | 115388 |
| SUBSET | S1.2 |
| TOTAL | 5 |
| SHEET | P.13 |
| TOTAL | 22 |

GRE-68-12.65

MODEL: CLP_SUP_MAIN-1 - Plan 2 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:47 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\400-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_SP001.dgn




***REAR ABUTMENT SECTION***




***FORWARD ABUTMENT SECTION***

***NOTES:***

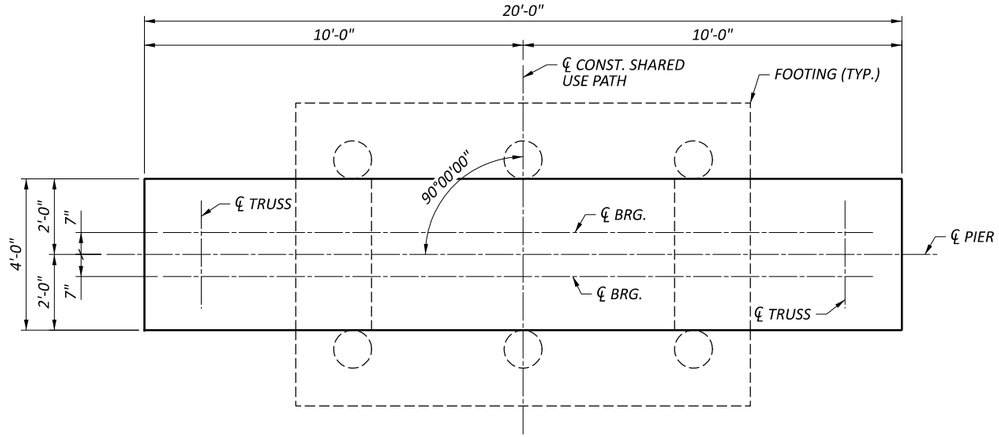
1. *SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.*

ALTERNATIVE 2A- ABUTMENT DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

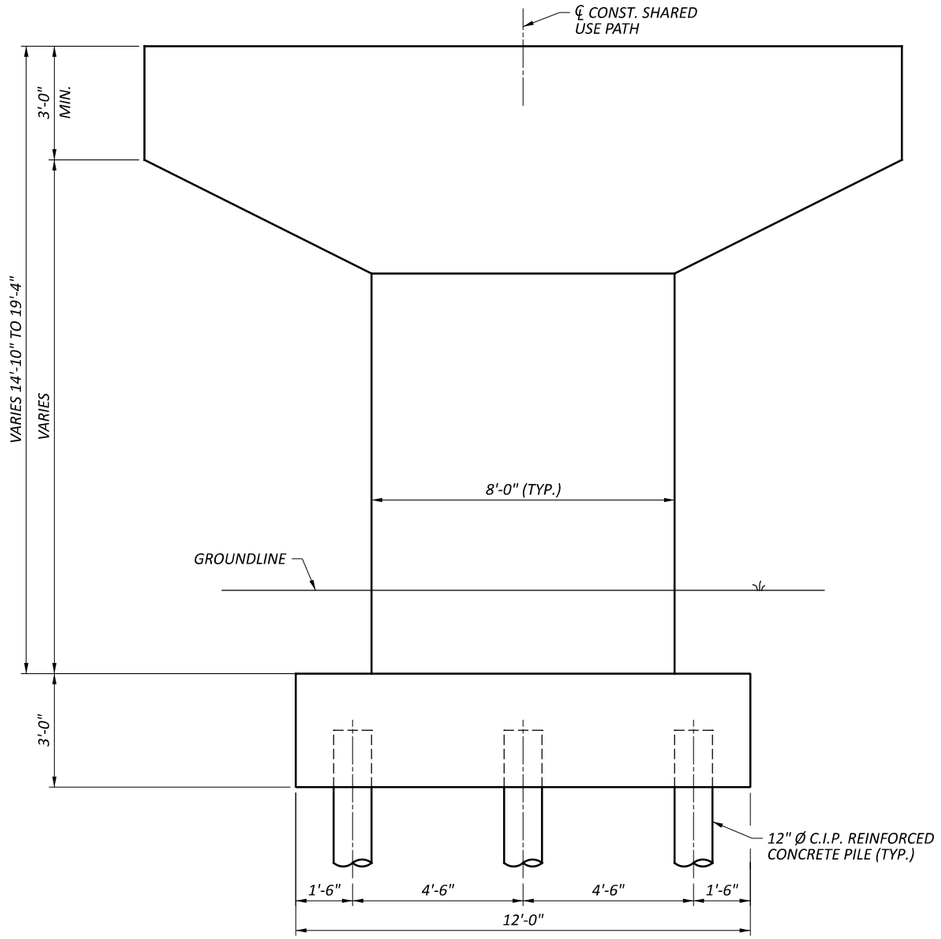
SFN 2926107
DESIGN AGENCY fishbeck
DESIGNER TLC | CHECKER BMG
REVIEWER JPC 11/27/23
PROJECT ID 115388
SUBSET S1.3 | TOTAL 5
SHEET P.14 | TOTAL 22

GRE-68-12.65

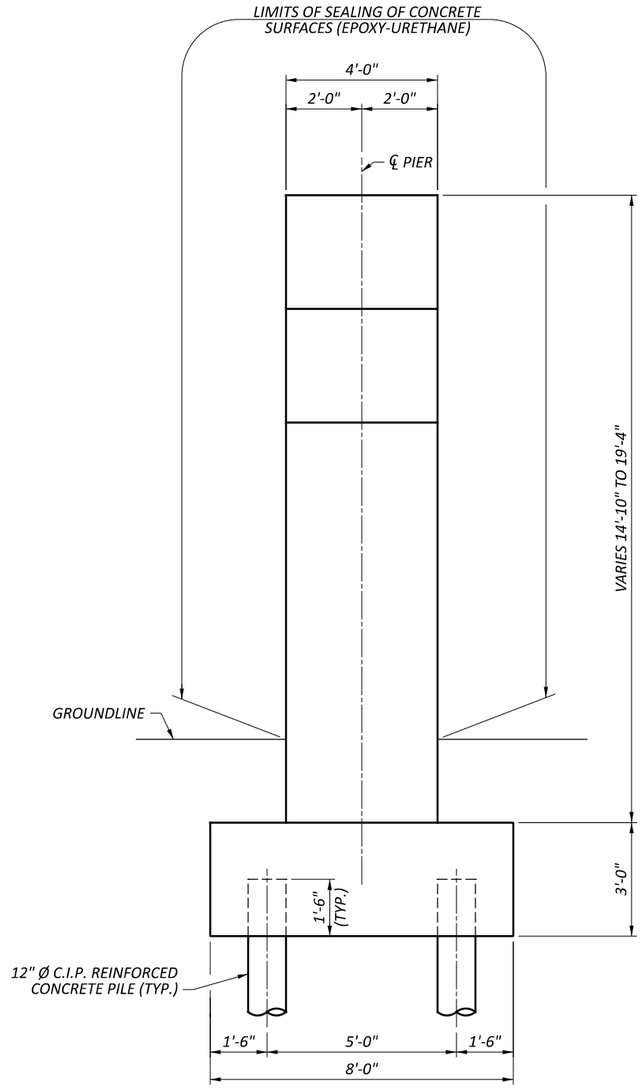
MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:48 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\400-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_SR001.dgn




**PLAN**




**ELEVATION**




**PIER SECTION**

**NOTES:**

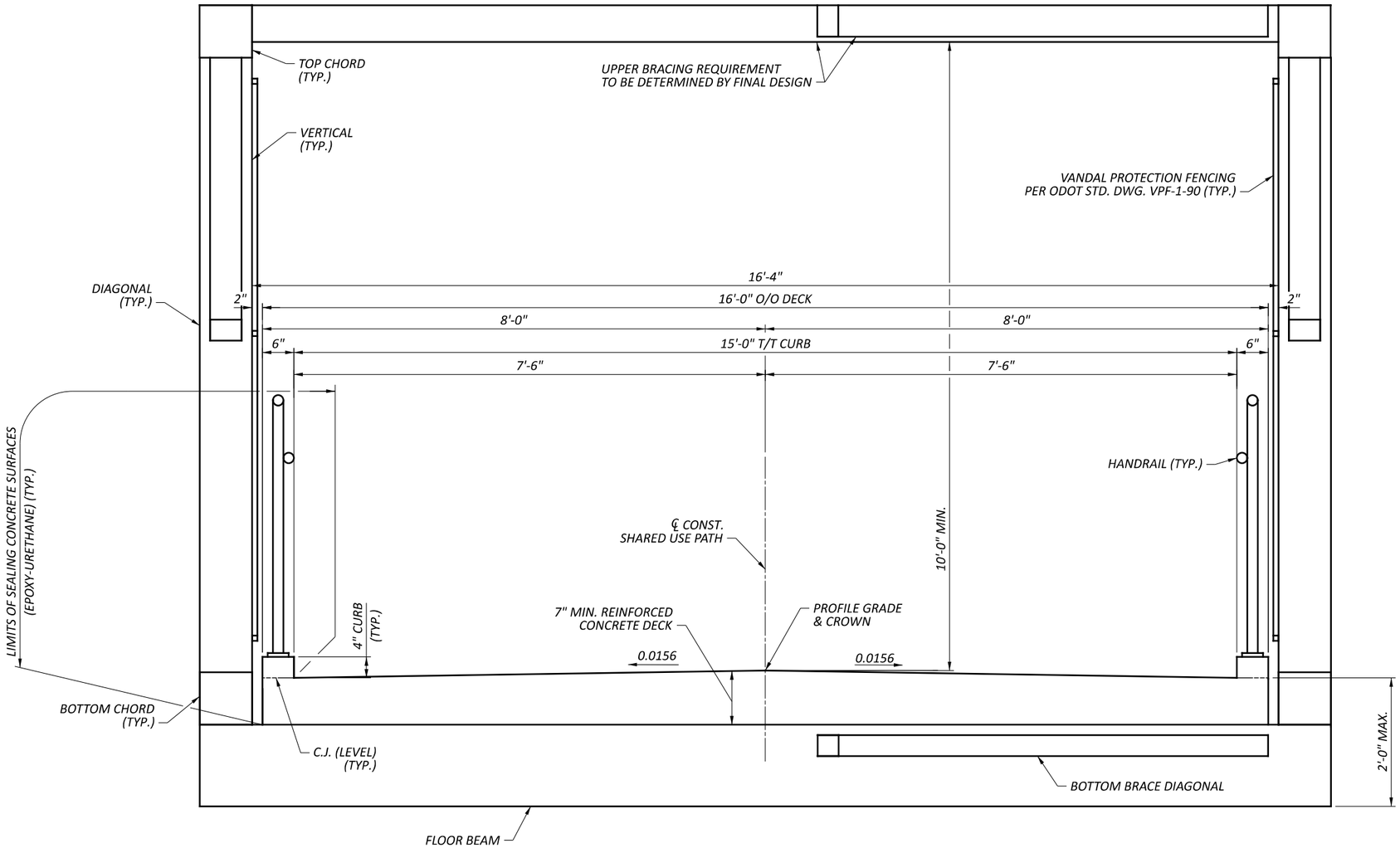
1. *SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.*

ALTERNATIVE 2A - PIER DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

| | |
|---|---|
| SFN | 2926107 |
| DESIGN AGENCY | fishbeck |
| DESIGNER | TLC |
| CHECKER | BMG |
| REVIEWER | JPC 11/27/23 |
| PROJECT ID | 115388 |
| SUBSET | S1.4 |
| TOTAL | 5 |
| SHEET | P.15 |
| TOTAL | 22 |

GRE-68-12.65

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:48 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\400-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_S001.dgn




## ***TRANSVERSE SECTION***

*(PREFABRICATED PAINTED STEEL TRUSS DESIGNED BY OTHERS)*
*(VANDAL PROTECTION FENCING EXCLUDED ON SPANS 2, 3 & 4)*

### ***NOTES:***

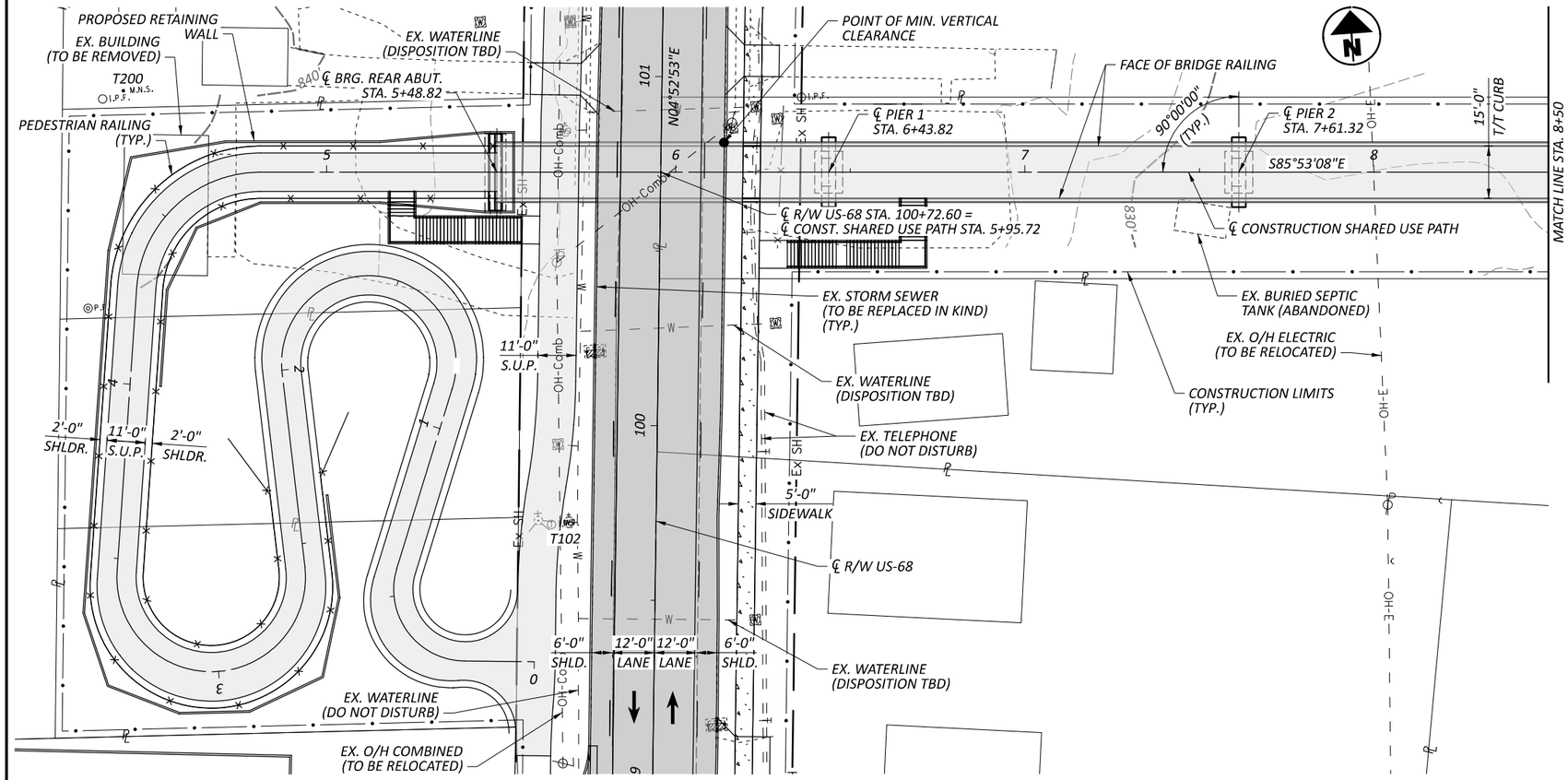
1. *CONCEPTUAL TRUSS STYLE SHOWN IN THE TRANSVERSE SECTION.*

ALTERNATIVE 2A- TRANSVERSE SECTION
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

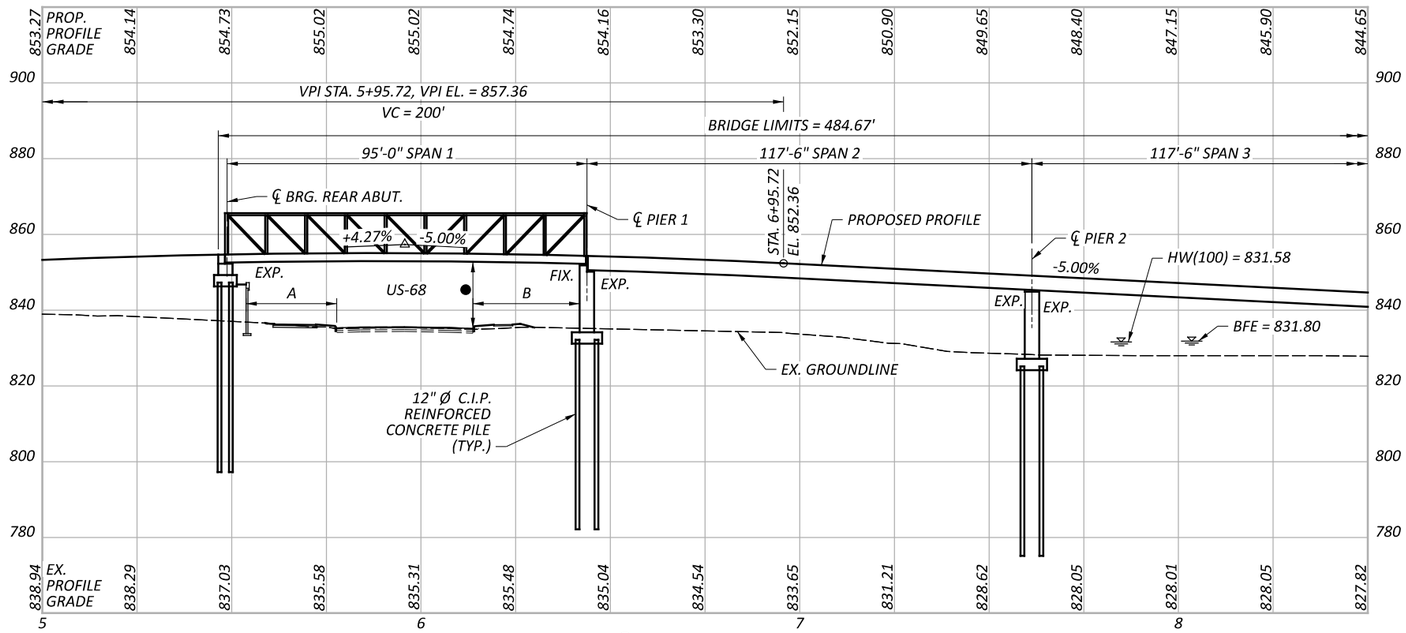
| | |
|---|---|
| SFN | 2926107 |
| DESIGN AGENCY | fishbeck |
| DESIGNER / CHECKER | NCS / BMG |
| REVIEWER | JPC 11/27/23 |
| PROJECT ID | 115388 |
| SUBSET / TOTAL | S1.5 / 5 |
| SHEET / TOTAL | P.16 / 22 |

GRE-68-12.65

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:49 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\V00-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_ST002.dgn




## PLAN




## PROFILE ALONG ℄ CONSTRUCTION SHARED USE PATH

### BENCHMARK DATA

T102 STA. 99+71.31, EL. 835.661, OFFSET 29.95' LT., IRON PIN FOUND
T103 STA. 100+94.64, EL. 835.180, OFFSET 40.01' RT., IRON PIN FOUND
T110 STA. 100+72.99, EL. 831.871, OFFSET 457.01' RT., IRON PIN SET
T200 STA. 100+93.88, EL. 840.801, OFFSET 154.24' LT., MAG NAIL SET

HORIZONTAL SCALE IN FEET
0 10 20 40

### NOTES:

1. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.
2. SEE ROADWAY PLANS FOR ADDITIONAL SHARED USE PATH HORIZONTAL AND VERTICAL CURVE INFORMATION.
3. CONCEPTUAL TRUSS STYLE SHOWN IN THE PROFILE VIEW.
4. FRICTION PILES WERE THE ASSUMED FOUNDATION TYPE BASED ON GEOTECHNICAL INFORMATION FOR THE NEARBY INTERPRETIVE CENTER AND HISTORIC BORING LOGS FOR GRE-68-13.40 BRIDGE OVER MASSIES CREEK NORTH OF THE PROJECT LOCATION.

US-68 DESIGN TRAFFIC:
2026 ADT = 8,600 2026 ADTT = 602
2046 ADT = 8,800 2046 ADTT = 616
DIRECTIONAL DISTRIBUTION = 0.50

### LEGEND:

● 17'-6" REQUIRED MINIMUM VERTICAL CLEARANCE
17'-10¼" ACTUAL MINIMUM VERTICAL CLEARANCE

A - REQUIRED HORIZONTAL CLEARANCE = 19'-0"
MIN. HORIZONTAL CLEARANCE = 23'-9½"

B - REQUIRED HORIZONTAL CLEARANCE = 19'-0"
MIN. HORIZONTAL CLEARANCE = 27'-11¾"

PROP. SHARED USE PATH
PROP. PAVEMENT
PROP. WALK

### HYDRAULIC DATA:

DRAINAGE AREA = 10.6 SQ. MILES
Q (100) = 2000 CFS V (100) = 1.7 FT/S
STRUCTURE CLEARS THE 100 YEAR DESIGN HW BY 2.09 FEET.

### EXISTING STRUCTURE - NONE

### PROPOSED STRUCTURE

TYPE: FOUR SPAN PREFABRICATED PAINTED STEEL TRUSS AND WIDE FLANGE BEAM SUPERSTRUCTURE WITH REINFORCED CONCRETE DECK ON REINFORCED CONCRETE ABUTMENTS AND PIERS SUPPORTED ON CAST-IN-PLACE REINFORCED CONCRETE PILES

SPANS: 95'-0", 117'-6", 117'-6", 150'-0" (SEE PLAN)
ROADWAY: 15'-0" TOE/TOE CURB
LOADING: 0.090 KSF PEDESTRIAN LOAD AND H15-44 VEHICULAR LOAD
SKEW: NONE
WEARING SURFACE: 1" MONOLITHIC CONCRETE
APPROACH SLABS: NONE
ALIGNMENT: TANGENT
CROWN: 0.0156 FT/FT
DECK AREA: 8,180 SF

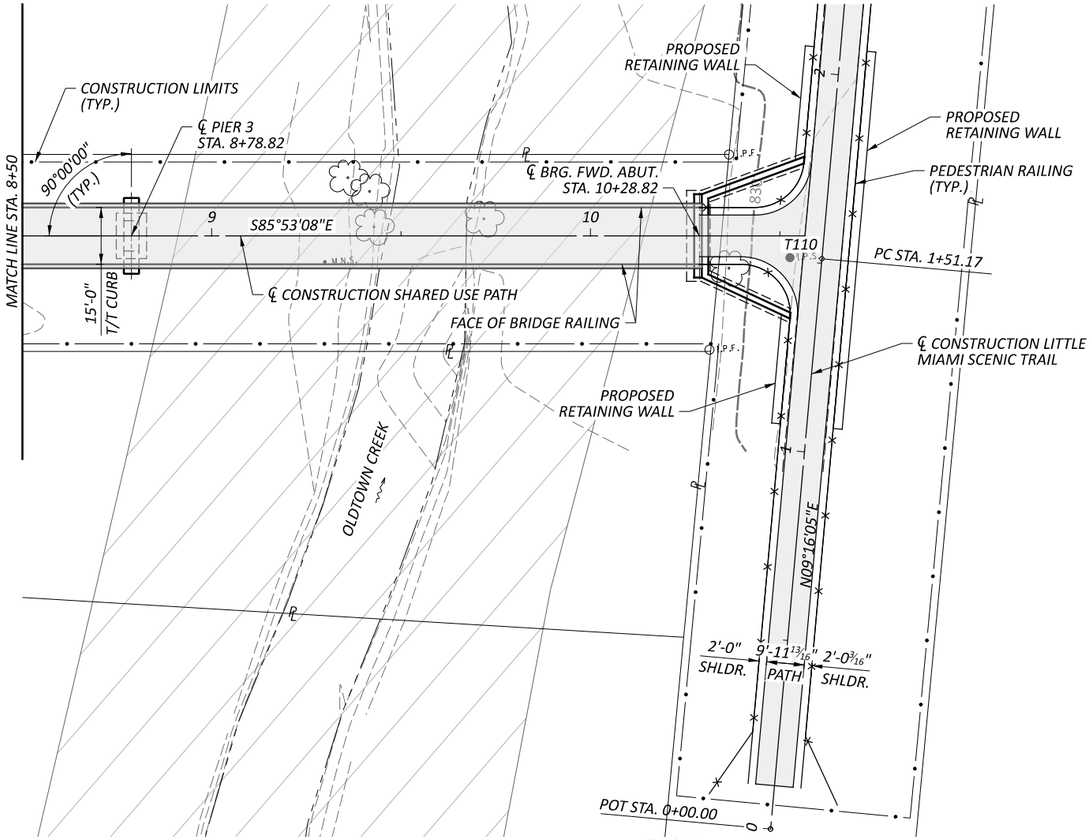
COORDINATES: LATITUDE N39°43'46.65"
LONGITUDE W83°56'12.36"

# ALTERNATIVE 2B - SITE PLAN (1 OF 2)
# BRIDGE NO. GRE-BK80020-00.492
# PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

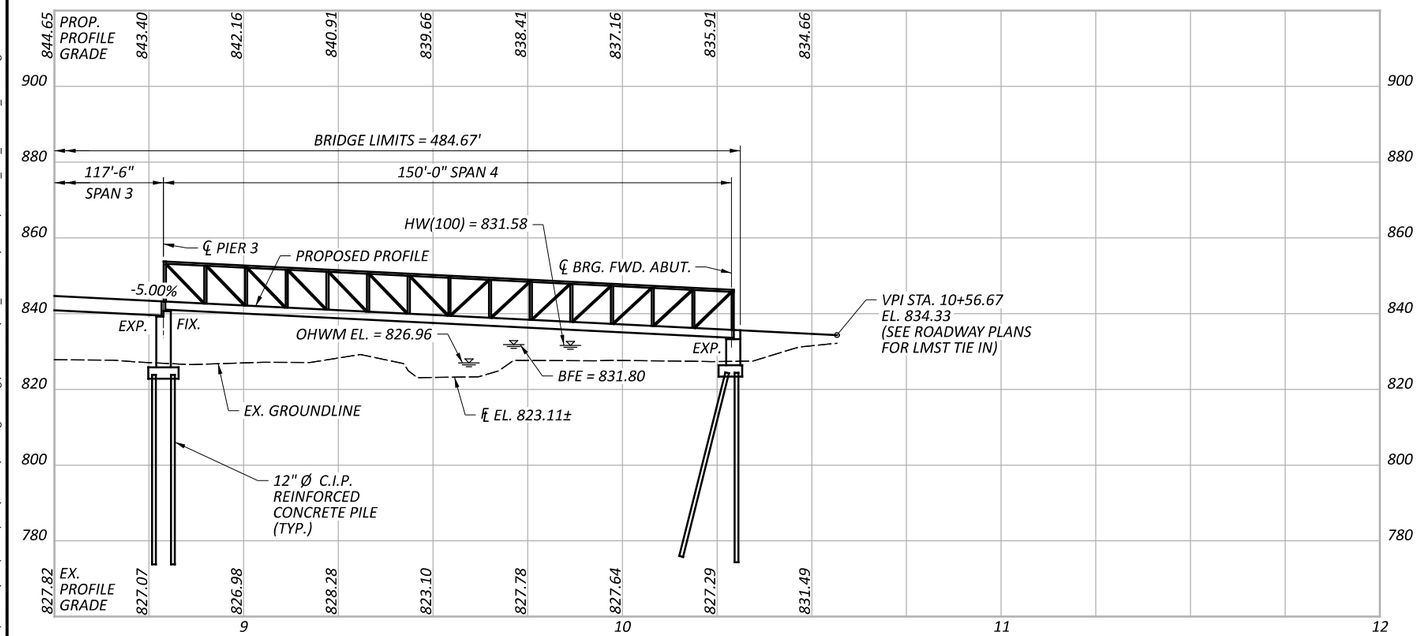
| | |
|---|---|
| SFN | 2926107 |
| DESIGN AGENCY | fishbeck |
| DESIGNER | BMG |
| CHECKER | TLC |
| REVIEWER | JPC 11/27/23 |
| PROJECT ID | 115388 |
| SUBSET | S2.1 |
| TOTAL | 6 |
| SHEET | P.17 |
| TOTAL | 22 |

GRE-68-12.65

MODEL: CLP_SUP_MAIN-1 - Plan 1 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:52 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\400-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_SP002.dgn




**PLAN**




**PROFILE ALONG ℄ CONSTRUCTION SHARED USE PATH**

**LEGEND:**

- LIMITS OF FLOODWAY
- PROP. SHARED USE PATH

**NOTES:**

1. FOR ADDITIONAL NOTES AND INFORMATION, SEE SHEET S2.1 / 6 .

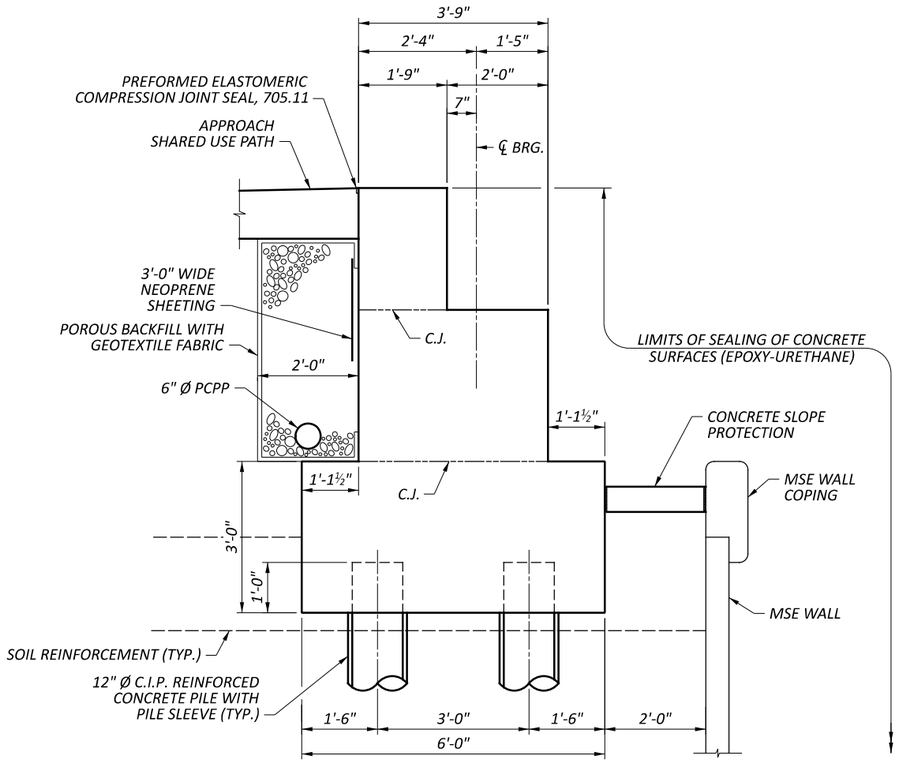
HORIZONTAL SCALE IN FEET
0 10 20 40

# ALTERNATIVE 2B - SITE PLAN (2 OF 2)
## BRIDGE NO. GRE-BK80020-00.492
## PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

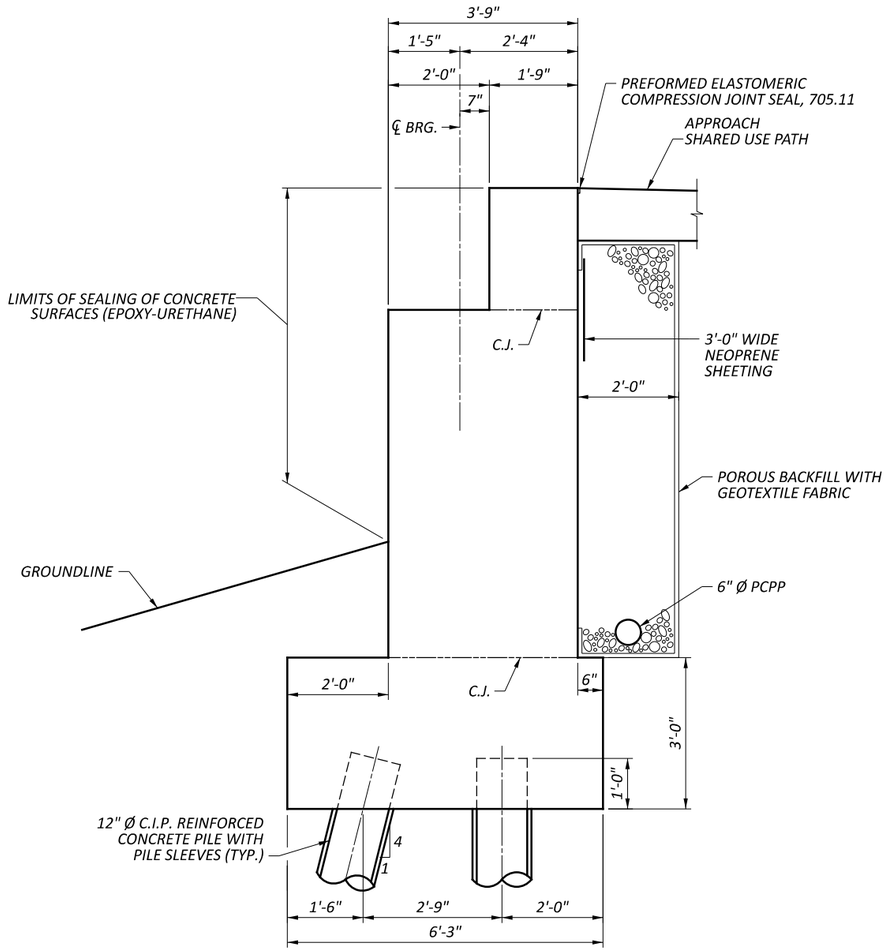
SFN 2926107
DESIGN AGENCY fishbeck
DESIGNER BMG | CHECKER TLC
REVIEWER JPC 11/27/23
PROJECT ID 115388
SUBSET S2.2 | TOTAL 6
SHEET P.18 | TOTAL 22

GRE-68-12.65

MODEL: CLP_SUP_MAIN-1 - Plan 2 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:53 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\400-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_SP002.dgn




***REAR ABUTMENT SECTION***




***FORWARD ABUTMENT SECTION***

***NOTES:***

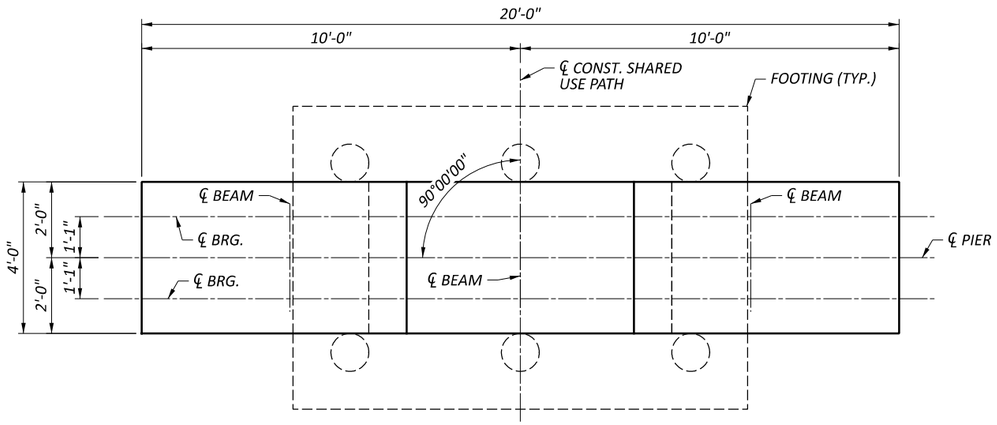
1. *SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.*

ALTERNATIVE 2B - ABUTMENT DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

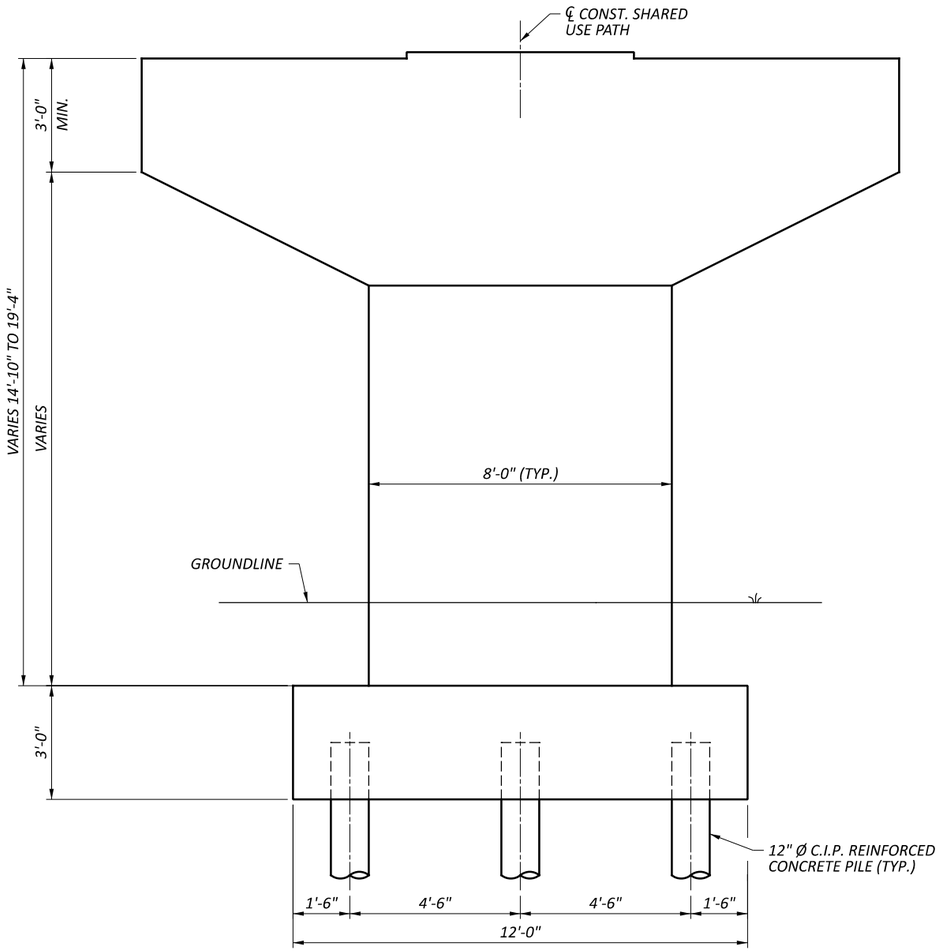
SFN 2926107
DESIGN AGENCY fishbeck
DESIGNER TLC | CHECKER BMG
REVIEWER JPC 11/27/23
PROJECT ID 115388
SUBSET S2.3 | TOTAL 6
SHEET P.19 | TOTAL 22

GRE-68-12.65

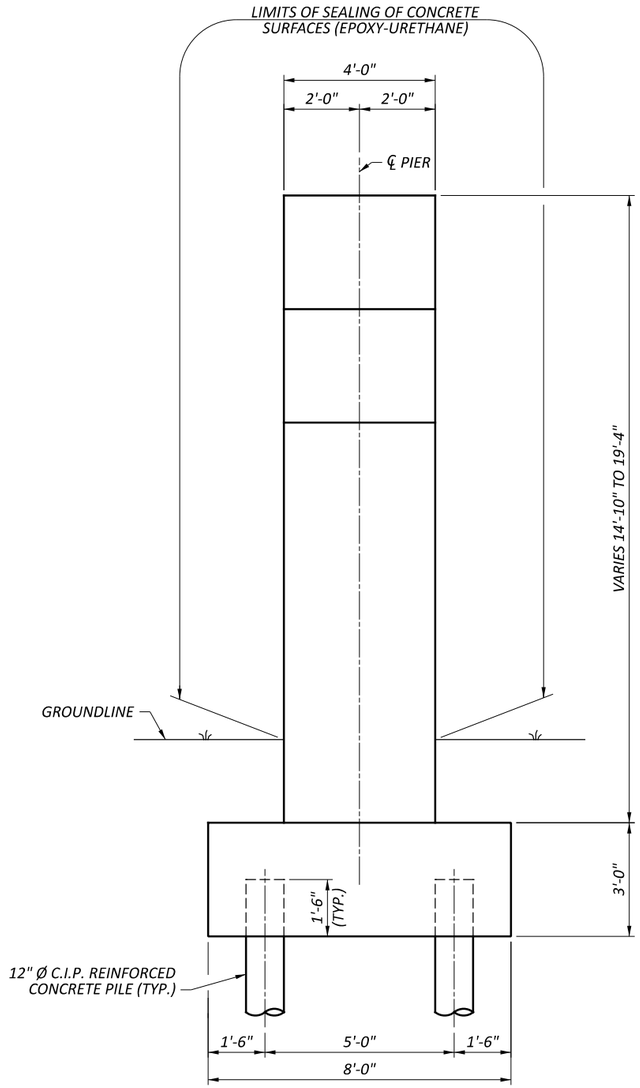
MODEL: Sheet - ALT 2 PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:54 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\400-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_SR001.dgn




**PLAN**
*(PIER 2 SHOWN)*




**ELEVATION**
*(PIER 2 SHOWN)*




**PIER SECTION**

## NOTES:

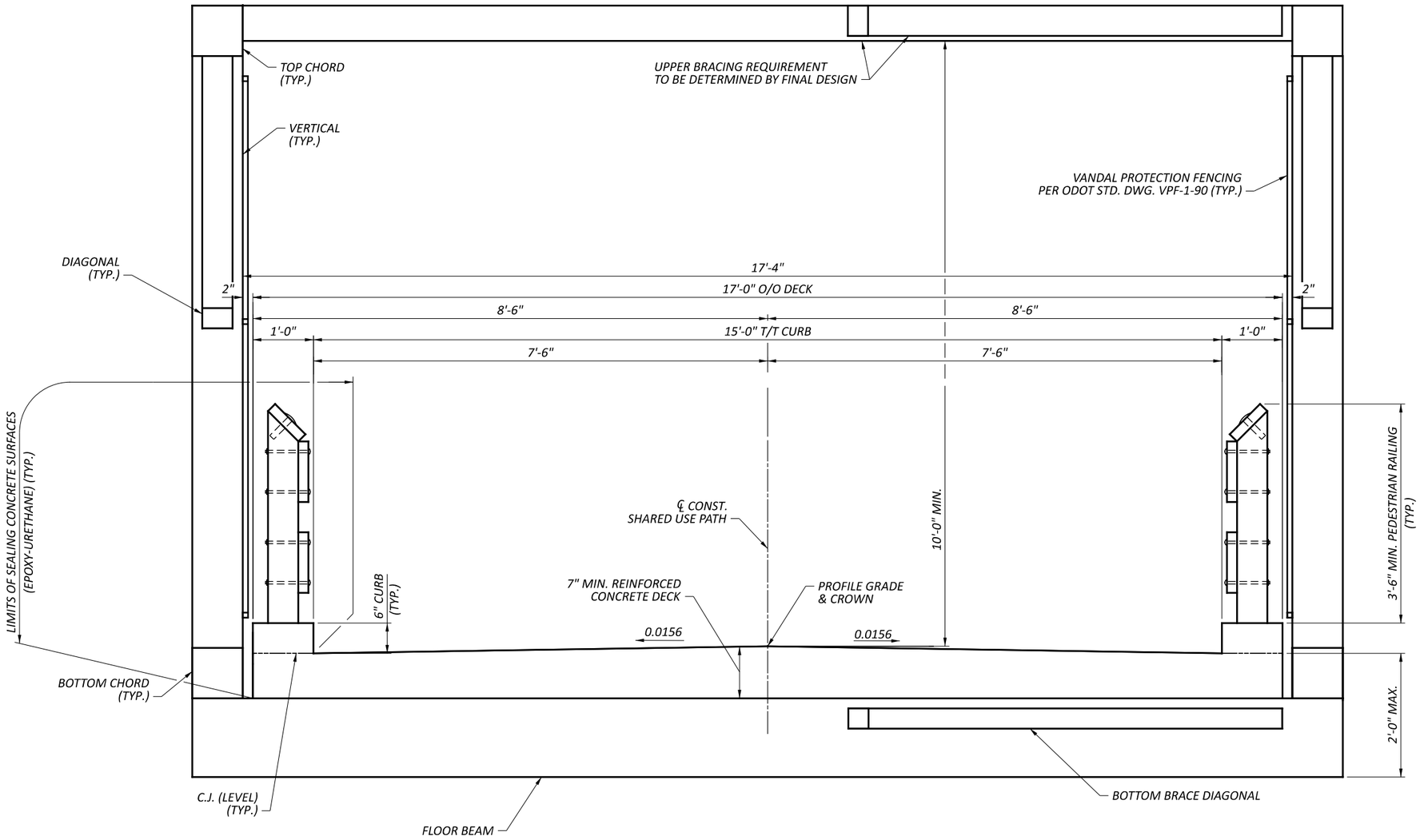
1. *SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.*
2. *PIERS 1 AND 3 SHALL HAVE A STEP IN THE CAP TO ACCOMMODATE DIFFERENCE IN SUPERSTRUCTURE DEPTH.*

ALTERNATIVE 2B - PIER DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

| | |
|---|---|
| SFN | 2926107 |
| DESIGN AGENCY | fishbeck |
| DESIGNER | TLC |
| CHECKER | BMG |
| REVIEWER | JPC 11/27/23 |
| PROJECT ID | 115388 |
| SUBSET | S2.4 |
| TOTAL | 6 |
| SHEET | P.20 |
| TOTAL | 22 |

GRE-68-12.65

MODEL: Sheet - ALT 2 PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:55 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\400-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_S001.dgn




## TRANSVERSE SECTION

*(PREFABRICATED PAINTED STEEL TRUSS DESIGNED BY OTHERS)*
*(SPANS 1 AND 4)*
*(VANDAL PROTECTION FENCING EXCLUDED ON SPANS 2, 3, & 4)*

## NOTES:

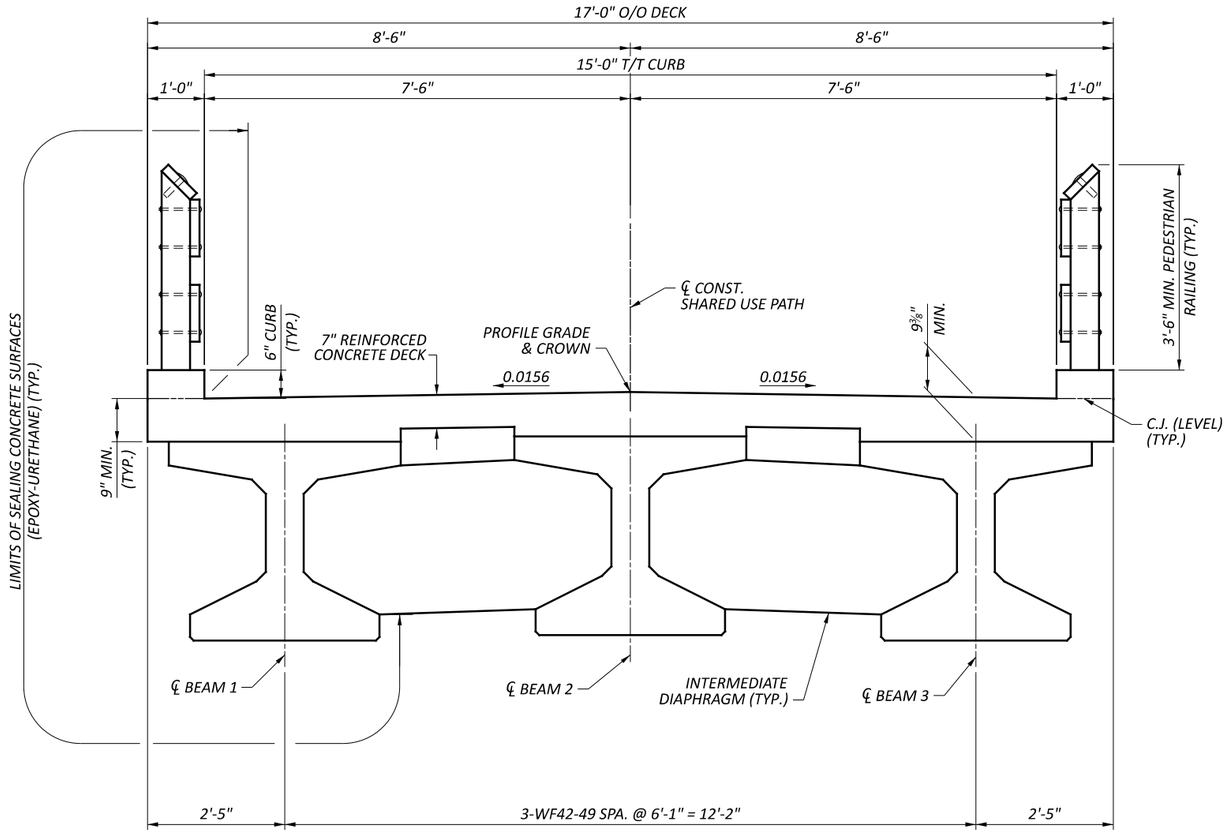
1. CONCEPTUAL TRUSS STYLE SHOWN IN THE TRANSVERSE SECTION.

ALTERNATIVE 2B - TRANSVERSE SECTION (1 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

| | |
|---|---|
| SFN | 2926107 |
| DESIGN AGENCY | fishbeck |
| DESIGNER | NCS |
| CHECKER | BMG |
| REVIEWER | JPC 11/27/23 |
| PROJECT ID | 115388 |
| SUBSET | S2.5 |
| TOTAL | 6 |
| SHEET | P.21 |
| TOTAL | 22 |

GRE-68-12.65

MODEL: Truss Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:55 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\400-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_ST001.dgn




***TRANSVERSE SECTION***

*(SPANS 2 AND 3)*

GRE-68-12.65

MODEL: Transverse Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:56 PM USER: jpcarroll
Z:\2023\231473\CAD\ODOT\GRE\115388\400-Engineering\Structures\SFN_2926107\Sheets\115388_SFN_2926107_ST001.dgn

ALTERNATIVE 2B - TRANSVERSE SECTION (2 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

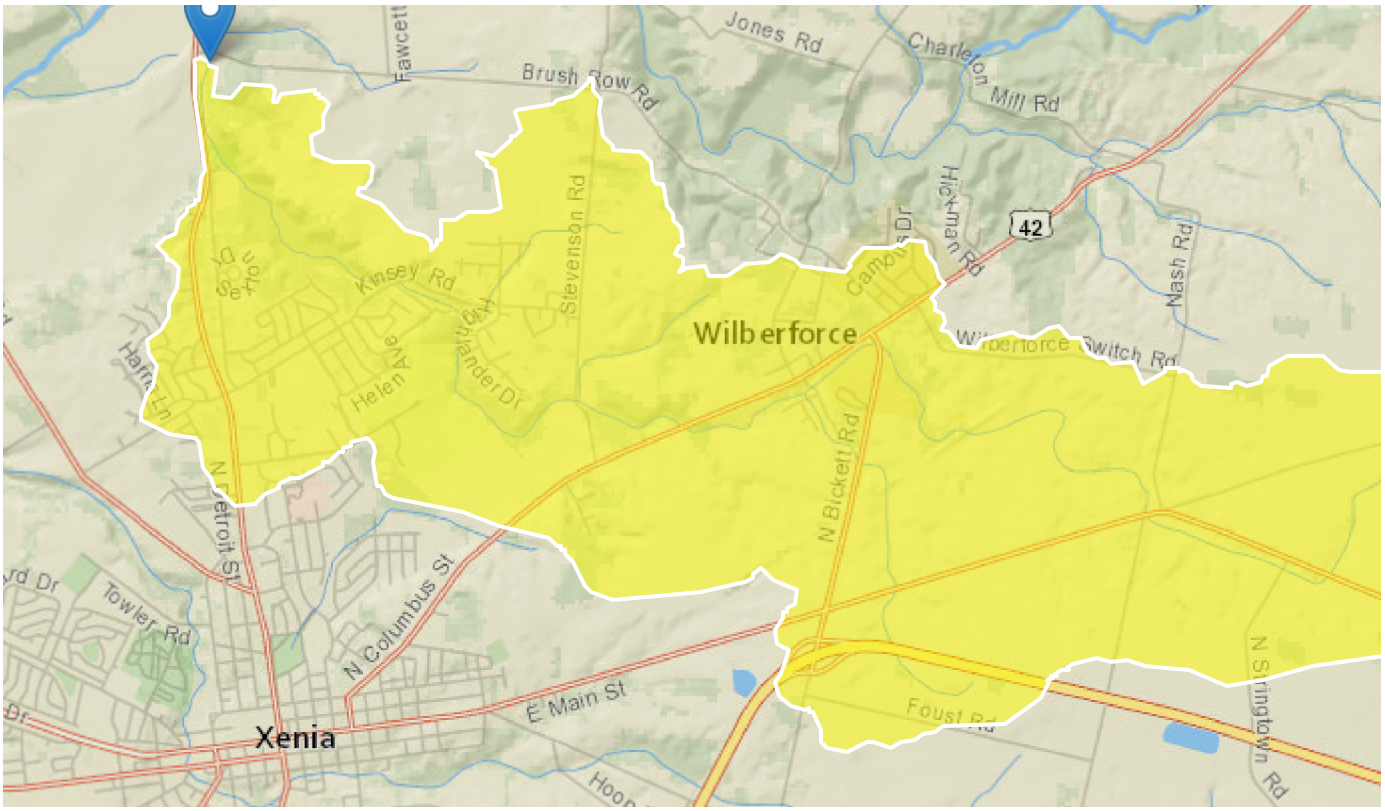
| | |
|---|---|
| SFN | 2926107 |
| DESIGN AGENCY | fishbeck |
| DESIGNER | NCS |
| CHECKER | BMG |
| REVIEWER | JPC 11/27/23 |
| PROJECT ID | 115388 |
| SUBSET | S2.6 |
| TOTAL | 6 |
| SHEET | P.22 |
| TOTAL | 22 |

# APPENDIX 2: USGS STREAMSTATS OUTPUT

# GRE-68 StreamStats Report

**Region ID:** OH
**Workspace ID:** OH20231128174939768000
**Clicked Point (Latitude, Longitude):** 39.72957, -83.93561
**Time:** 2023-11-28 12:50:04 -0500

SEE PAGE 7 FOR IMAGE OF FULL BASIN




GRE-68 Shared Use Path

Collapse All

## Basin Characteristics

| Parameter Code | Parameter Description | Value | Unit |
|---|---|---|---|
| CSL1085LFP | Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid | 29.7 | feet per mi |
| DRNAREA | Area that drains to a point on a stream | 9.62 | square miles |

| Parameter Code | Parameter Description | Value | Unit |
|---|---|---|---|
| FOREST | Percentage of area covered by forest | 9.02 | percent |
| LAT_CENT | Latitude of Basin Centroid | 39.7052 | decimal degrees |
| LC92STOR | Percentage of water bodies and wetlands determined from the NLCD | 0.18 | percent |
| LONG_CENT | Longitude Basin Centroid | 83.8849 | decimal degrees |
| OHREGA | Ohio Region A Indicator | 1 | dimensionless |
| OHREGC | Ohio Region C Indicator | 0 | dimensionless |
| PRECIPCENT | Mean Annual Precip at Basin Centroid | 39 | inches |
| STREAM_VARG | Streamflow variability index as defined in WRIR 02-4068, computed from regional grid | 0.44 | dimensionless |

## Peak-Flow Statistics

### Peak-Flow Statistics Parameters [Peak Flow Full Model Reg A SIR2019 5018]

| Parameter Code | Parameter Name | Value | Units | Min Limit | Max Limit |
|---|---|---|---|---|---|
| DRNAREA | Drainage Area | 9.62 | square miles | 0.04 | 5989 |
| OHREGC | Ohio Region C Indicator 1 if in C else 0 | 0 | dimensionless | 0 | 1 |
| OHREGA | Ohio Region A Indicator 1 if in A else 0 | 1 | dimensionless | 0 | 1 |
| CSL1085LFP | Stream Slope 10 and 85 Longest Flow Path | 29.7 | feet per mi | 1.53 | 516 |
| LC92STOR | Percent Storage from NLCD1992 | 0.18 | percent | 0 | 25.35 |

### Peak-Flow Statistics Flow Report [Peak Flow Full Model Reg A SIR2019 5018]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic | Value | Unit | PIL | PIU | ASEp |
|---|---|---|---|---|---|
| 50-percent AEP flood | 620 | ft^3/s | 328 | 1170 | 40.1 |
| 20-percent AEP flood | 1070 | ft^3/s | 592 | 1930 | 37.2 |
| 10-percent AEP flood | 1430 | ft^3/s | 786 | 2600 | 37.6 |
| 4-percent AEP flood | 1950 | ft^3/s | 1070 | 3570 | 38.1 |
| 2-percent AEP flood | 2380 | ft^3/s | 1290 | 4400 | 37.8 |
| 1-percent AEP flood | 2840 | ft^3/s | 1520 | 5310 | 39.6 |
| 0.2-percent AEP flood | 4040 | ft^3/s | 2140 | 7630 | 40.3 |

*Peak-Flow Statistics Citations*

**Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, 25 p. (https://dx.doi.org/10.3133/sir20195018)**

## Monthly Flow Statistics

### Monthly Flow Statistics Parameters [Low Flow LatLE 41.2 wri02 4068]

| Parameter Code | Parameter Name | Value | Units | Min Limit | Max Limit |
|---|---|---|---|---|---|
| DRNAREA | Drainage Area | 9.62 | square miles | 0.12 | 7422 |
| LC92STOR | Percent Storage from NLCD1992 | 0.18 | percent | 0 | 19 |
| PRECIPCENT | Mean Annual Precip at Basin Centroid | 39 | inches | 34 | 43.2 |
| FOREST | Percent Forest | 9.02 | percent | 0 | 99.1 |
| LAT_CENT | Latitude of Basin Centroid | 39.7052 | decimal degrees | 38.68 | 41.2 |
| STREAM_VARG | Streamflow Variability Index from Grid | 0.44 | dimensionless | 0.25 | 1.13 |

### Monthly Flow Statistics Flow Report [Low Flow LatLE 41.2 wri02 4068]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic | Value | Unit | SE | ASEp |
|---|---|---|---|---|
| January Mean Flow | 14.1 | ft^3/s | 16.6 | 16.6 |
| February Mean Flow | 17.1 | ft^3/s | 11.9 | 11.9 |
| March Mean Flow | 19.3 | ft^3/s | 14 | 14 |
| April Mean Flow | 17.6 | ft^3/s | 11.2 | 11.2 |
| May Mean Flow | 12 | ft^3/s | 19.5 | 19.5 |
| June Mean Flow | 8.5 | ft^3/s | 27 | 27 |
| July Mean Flow | 5.32 | ft^3/s | 28.2 | 28.2 |
| August Mean Flow | 4.16 | ft^3/s | 36.8 | 36.8 |
| September Mean Flow | 2.52 | ft^3/s | 43.6 | 43.6 |
| October Mean Flow | 2.5 | ft^3/s | 50.8 | 50.8 |
| November Mean Flow | 5.02 | ft^3/s | 37.5 | 37.5 |
| December Mean Flow | 9.83 | ft^3/s | 21.8 | 21.8 |

*Monthly Flow Statistics Citations*

**Koltun, G. F., and Whitehead, M. T.,2002, Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio: U. S. Geological Survey Water-Resources Investigations Report 02-4068, 50 p (https://pubs.er.usgs.gov/publication/wri024068)**

## General Flow Statistics

### General Flow Statistics Parameters [Low Flow LatLE 41.2 wri02 4068]

| Parameter Code | Parameter Name | Value | Units | Min Limit | Max Limit |
|---|---|---|---|---|---|
| DRNAREA | Drainage Area | 9.62 | square miles | 0.12 | 7422 |
| LC92STOR | Percent Storage from NLCD1992 | 0.18 | percent | 0 | 19 |
| STREAM_VARG | Streamflow Variability Index from Grid | 0.44 | dimensionless | 0.25 | 1.13 |
| LAT_CENT | Latitude of Basin Centroid | 39.7052 | decimal degrees | 38.68 | 41.2 |

### General Flow Statistics Flow Report [Low Flow LatLE 41.2 wri02 4068]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic | Value | Unit | SE | ASEp |
|---|---|---|---|---|
| Harmonic Mean Streamflow | 2.27 | ft^3/s | 65.9 | 65.9 |

*General Flow Statistics Citations*

**Koltun, G. F., and Whitehead, M. T.,2002, Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio: U. S. Geological Survey Water-Resources Investigations Report 02-4068, 50 p (https://pubs.er.usgs.gov/publication/wri024068)**

## Bankfull Statistics

### Bankfull Statistics Parameters [Interior Plains D Bieger 2015]

| Parameter Code | Parameter Name | Value | Units | Min Limit | Max Limit |
|---|---|---|---|---|---|
| DRNAREA | Drainage Area | 9.62 | square miles | 0.19305 | 59927.7393 |

### Bankfull Statistics Parameters [Central Lowland P Bieger 2015]

| Parameter Code | Parameter Name | Value | Units | Min Limit | Max Limit |
|---|---|---|---|---|---|
| DRNAREA | Drainage Area | 9.62 | square miles | 0.200772 | 59927.66594 |

### Bankfull Statistics Parameters [USA Bieger 2015]

| Parameter Code | Parameter Name | Value | Units | Min Limit | Max Limit |
|---|---|---|---|---|---|
| DRNAREA | Drainage Area | 9.62 | square miles | 0.07722 | 59927.7393 |

### Bankfull Statistics Flow Report [Interior Plains D Bieger 2015]

| Statistic | Value | Unit |
|---|---|---|
| Bieger_D_channel_width | 26 | ft |
| Bieger_D_channel_depth | 2.3 | ft |
| Bieger_D_channel_cross_sectional_area | 62.8 | ft^2 |

## Bankfull Statistics Flow Report [Central Lowland P Bieger 2015]

| Statistic | Value | Unit |
|---|---|---|
| Bieger_P_channel_width | 29.2 | ft |
| Bieger_P_channel_depth | 2.72 | ft |
| Bieger_P_channel_cross_sectional_area | 59 | ft^2 |

## Bankfull Statistics Flow Report [USA Bieger 2015]

| Statistic | Value | Unit |
|---|---|---|
| Bieger_USA_channel_width | 27.5 | ft |
| Bieger_USA_channel_depth | 1.95 | ft |
| Bieger_USA_channel_cross_sectional_area | 58 | ft^2 |

## Bankfull Statistics Flow Report [Area-Averaged]

| Statistic | Value | Unit |
|---|---|---|
| Bieger_D_channel_width | 26 | ft |
| Bieger_D_channel_depth | 2.3 | ft |
| Bieger_D_channel_cross_sectional_area | 62.8 | ft^2 |
| Bieger_P_channel_width | 29.2 | ft |
| Bieger_P_channel_depth | 2.72 | ft |
| Bieger_P_channel_cross_sectional_area | 59 | ft^2 |
| Bieger_USA_channel_width | 27.5 | ft |
| Bieger_USA_channel_depth | 1.95 | ft |
| Bieger_USA_channel_cross_sectional_area | 58 | ft^2 |

*Bankfull Statistics Citations*

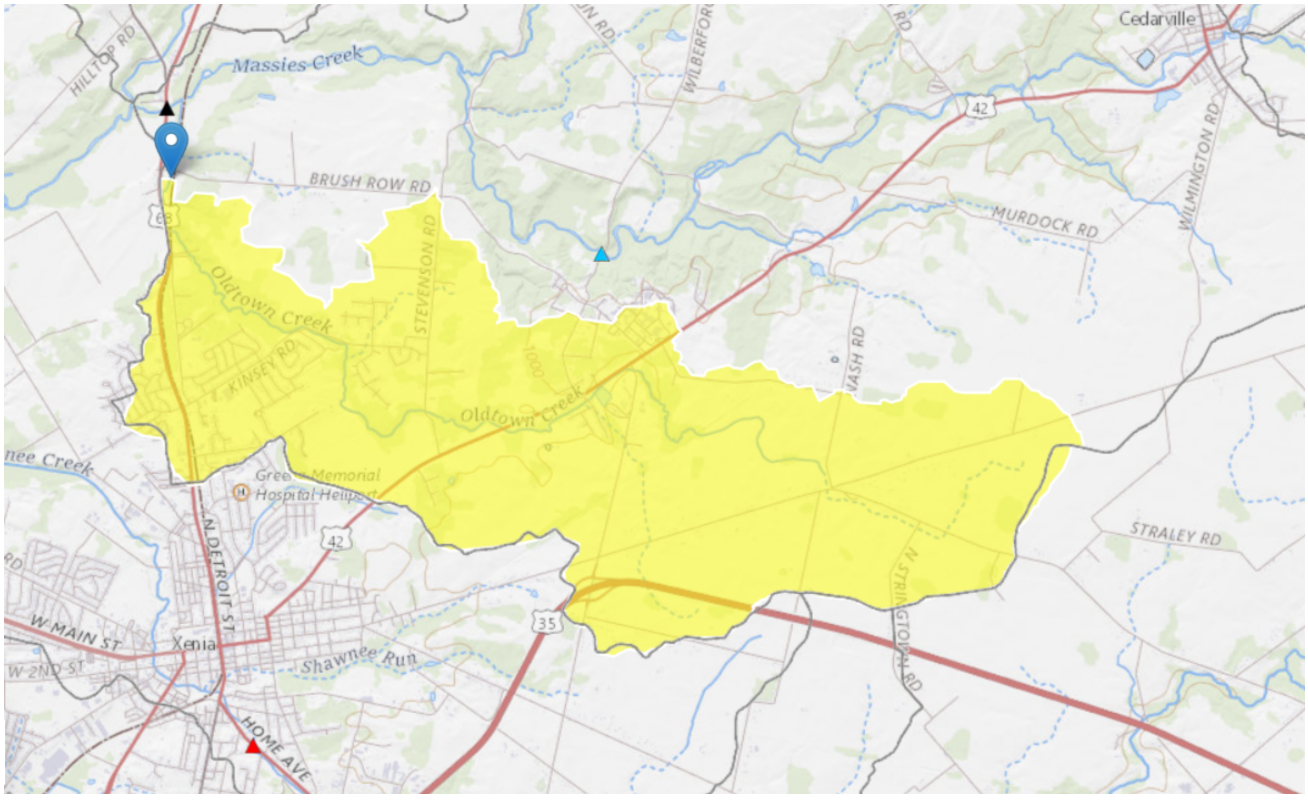
**Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G.,2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_**

expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.18.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

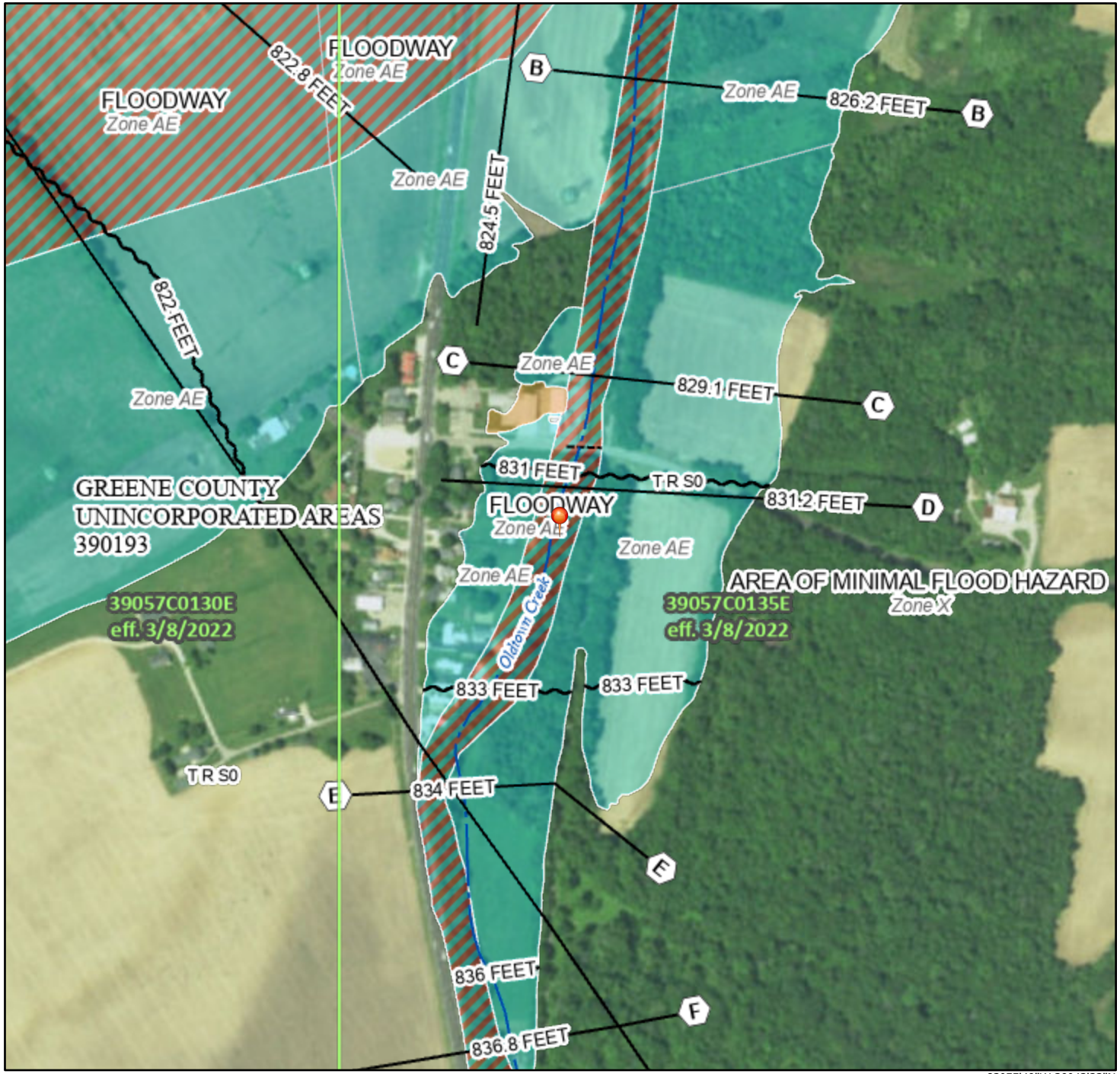


# APPENDIX 3: FIRM DATA

# National Flood Hazard Layer FIRMette

FEMA

83°56'26"W 39°44'N




83°55'49"W 39°43'33"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

*Basemap Imagery Source: USGS National Map 2023*

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

**SPECIAL FLOOD HAZARD AREAS**
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

**OTHER AREAS OF FLOOD HAZARD**
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

**OTHER AREAS**
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

**GENERAL STRUCTURES**
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

**OTHER FEATURES**
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

**MAP PANELS**
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/30/2023 at 2:03 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

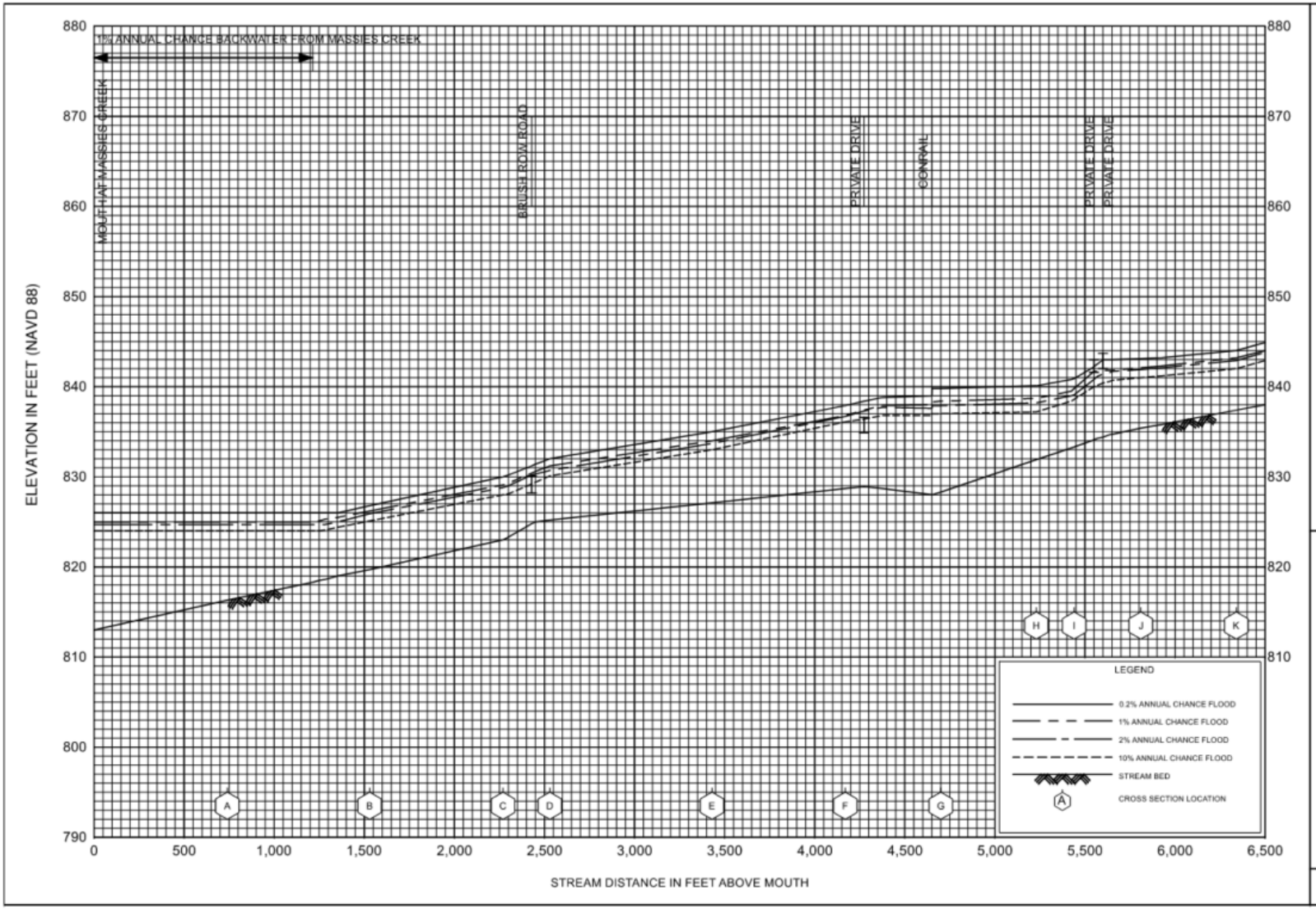
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

**Table 9: Summary of Discharges (*continued*)**

| Flooding Source | Location | Drainage Area (Square Miles) | Peak Discharge (cfs) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 10% Annual Chance | 4% Annual Chance | 2% Annual Chance | 1% Annual Chance Existing | 1% Annual Chance Future | 0.2% Annual Chance |
| North Fork Massies Creek | At mouth | 30.4 | 2,100 | * | 3,360 | 4,150 | * | 6,300 |
| North Wilberforce Brook | At mouth | 3.8 | 835 | * | 1,245 | 1,420 | * | 1,880 |
| Oldtown Creek | At mouth | 10.6 | 1,180 | * | 1,740 | 2,000 | * | 2,980 |
| Oldtown Creek | Approximately 600 feet downstream of Kinsey Road | 7.9 | 1,060 | * | 1,550 | 1,790 | * | 2,550 |
| Painters Creek | Approximately 400 feet upstream of Spring Valley Paintersville Road | 5.8 | 955 | * | 1,420 | 1,630 | * | 2,240 |
| Possum Run | At mouth | 2.4 | 400[1] | * | 600[1] | 700[1] | * | 2,000[1] |
| Possum Run | Approximately 200 feet upstream of Belleview Drive | 1.4 | 300 | * | 400 | 450 | * | 1,300 |
| Ripple Road Brook | At mouth | 3.8 | 820 | * | 1,220 | 1,400 | * | 1,830 |
| Shawnee Creek | At confluence with Little Miami River | 11.5 | 1,205 | 1,535 | 1,805 | 2,105 | * | 2,865 |
| Shawnee Creek | Approximatley 1,100 feet downstream of Towler Road | 9.0 | 1,475 | 1,985 | 2,455 | 2,935 | * | 4,090 |
| Shawnee Creek | Approximatley 170 feet downstream of the confluence with Shawnee Creek Park Tributary | 8.6 | 1,455 | 1,960 | 2,405 | 2,875 | * | 4,015 |

[1] Discharge values for Possum Creek were estimated from Figure 7 which was taken from the 1976 City of Bellbrook Flood Insurance Study

* Data not available




FLOOD PROFILES

OLDTOWN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GREENE COUNTY, OH

AND INCORPORATED AREAS

| LOCATION | | FLOODWAY | | | 1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION ( FEET NAVD88) | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQ. FEET) | MEAN VELOCITY (FEET/ SEC) | REGULATORY | WITHOUT FLOODWAY | WITH FLOODWAY | INCREASE |
| A | 740 | 66 | 343 | 5.8 | 825.6 | 823.2 [2] | 824.0 | 0.8 |
| B | 1,530 | 106 | 488 | 4.1 | 826.2 | 826.2 | 827.1 | 0.9 |
| C | 2,270 | 85 | 343 | 5.8 | 829.1 | 829.1 | 829.9 | 0.8 |
| D | 2,530 | 120 | 605 | 3.3 | 831.2 | 831.2 | 832.0 | 0.8 |
| E | 3,430 | 62 | 293 | 6.8 | 834.0 | 834.0 | 834.8 | 0.8 |
| F | 4,170 | 105 | 595 | 3.4 | 836.8 | 836.8 | 837.8 | 1.0 |
| G | 4,700 | 122 | 887 | 2.3 | 838.4 | 838.4 | 839.3 | 0.9 |
| H | 5,230 | 70 | 417 | 4.8 | 838.7 | 838.7 | 839.6 | 0.9 |
| I | 5,440 | 56 | 234 | 8.5 | 839.6 | 839.6 | 840.2 | 0.6 |
| J | 5,810 | 65 | 421 | 4.7 | 842.0 | 842.0 | 842.5 | 0.5 |
| K | 6,340 | 65 | 382 | 5.2 | 843.2 | 843.2 | 843.9 | 0.7 |
| L | 6,860 | 45 | 248 | 8.1 | 845.7 | 845.7 | 846.4 | 0.7 |
| M | 8,180 | 46 | 305 | 6.5 | 851.8 | 851.8 | 852.8 | 1.0 |
| N | 9,080 | 44 | 237 | 8.4 | 859.9 | 859.9 | 860.4 | 0.5 |
| O | 11,040 | 54 | 247 | 7.5 | 878.4 | 878.4 | 879.2 | 0.8 |
| P | 11,190 | 38 | 188 | 9.5 | 882.3 | 882.3 | 882.3 | 0.0 |
| Q | 14,470 | 55 | 279 | 6.4 | 907.9 | 907.9 | 908.7 | 0.8 |
| R | 18,220 | 60 | 266 | 6.1 | 932.4 | 932.4 | 932.4 | 0.0 |
| S | 18,320 | 63 | 351 | 4.6 | 933.1 | 933.1 | 933.9 | 0.8 |
| T | 18,900 | 65 | 228 | 7.1 | 936.6 | 936.6 | 936.7 | 0.1 |
| U | 21,170 | 40 | 185 | 8.8 | 969.6 | 969.6 | 969.8 | 0.2 |
| V | 21,810 | 42 | 266 | 6.1 | 978.9 | 978.9 | 979.7 | 0.8 |
| W | 21,960 | 118 | 465 | 3.5 | 980.0 | 980.0 | 980.8 | 0.8 |
| X | 24,600 | 113 | 431 | 3.2 | 987.0 | 987.0 | 987.9 | 0.9 |
| Y | 24,760 | 68 | 358 | 3.9 | 987.4 | 987.4 | 988.3 | 0.9 |
| Z | 26,660 | 46 | 237 | 5.9 | 994.9 | 994.9 | 995.9 | 1.0 |

[1] FEET ABOVE MOUTH
[2] WATER SURFACE ELEVATION COMPUTED WITHOUT CONSIDERATION OF 1% ANNUAL CHANCE BACKWATER FROM MASSIES CREEK

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

**GREENE COUNTY, OHIO**

AND INCORPORATED AREAS

**FLOODWAY DATA**

**FLOODING SOURCE: OLDTOWN CREEK**

**Table 13: Roughness Coefficients**

| Flooding Source | Channel "n" | Overbank "n" |
|---|---|---|
| Anderson Fork | 0.035 | 0.06-0.8 |
| Beaver Creek | 0.04-0.06 | 0.05-0.07 |
| Brewsters Run | 0.03-0.06 | 0.025-0.15 |
| Caesar Creek | 0.06 | 0.045-0.14 |
| Caesar Creek | 0.03-0.06 | 0.03-0.15 |
| Caeser Creek Tributary No. 2 | 0.055 | 0.08-0.15 |
| Estate Brook | 0.04 | 0.06 |
| Fairbrook School Tributary | 0.05 | 0.06 |
| Fairgrounds Road Tributary | 0.05 | 0.06 |
| Glady Run | 0.05 | 0.07 |
| Little Beaver Creek | 0.04-0.06 | 0.06-0.07 |
| Little Miami River | 0.045-0.055 | 0.08-0.12 |
| Little Miami River | 0.02-0.07 | 0.03-0.08 |
| Little Sugar Creek | 0.03-0.06 | 0.025-0.15 |
| Ludlow Creek | 0.05-0.06 | 0.06-0.07 |
| Massies Creek | 0.03-0.06 | 0.025-0.15 |
| New Germany Branch | 0.045-0.05 | 0.05-0.06 |
| North Fork Massies Creek | 0.05 | 0.07 |
| North Wilberforce Brook | 0.05 | 0.07 |
| Oldtown Creek | 0.05-0.06 | 0.06-0.07 |
| Painters Creek | 0.03-0.05 | 0.05-0.07 |
| Possum Run | 0.025-0.06 | 0.035-0.075 |
| Ripple Road Brook | 0.05 | 0.07 |
| Shawnee Creek | 0.045-0.07 | 0.03-0.14 |
| Shawnee Creek Tributary | 0.04-0.06 | 0.04-0.14 |
| Shawnee Park Tributary | 0.05-0.07 | 0.03-0.12 |
| Shawnee Park Tributary | 0.035 | 0.07-0.08 |
| South Branch Caesar Creek | 0.035 | 0.06-0.1 |
| South Branch Caesar Creek | 0.045-0.05 | 0.07 |
| South Fork Massies Creek | 0.035 | 0.06 |
| South Fork Massies Creek | 0.05 | 0.07 |
| South Fork Massies Creek Tributary | 0.035 | 0.06 |

# APPENDIX 4: HEC-RAS OUTPUT – EXISTING CONDITIONS

HEC-RAS HEC-RAS 6.4.1 June 2023
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
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: GRE-68-12.65 TAF
Project File : GRE-68TAF.prj
Run Date and Time: 1/2/2024 5:09:21 PM

Project in English units

PLAN DATA

Plan Title: Existing
Plan File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\TAF\HEC-RAS\GRE-68TAF.p01

Geometry Title: ExistingTAF2
Geometry File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\TAF\HEC-RAS\GRE-68TAF.g02

Flow Title : TAF
Flow File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\TAF\HEC-RAS\GRE-68TAF.f01

Plan Summary Information:

| | | | | | |
|---|---|---|---|---|---|
| Number of: | Cross Sections | = 5 | Multiple Openings | = | 0 |
| | Culverts | = 0 | Inline Structures | = | 0 |
| | Bridges | = 0 | 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: TAF
Flow File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\TAF\HEC-RAS\GRE-68TAF.f01

Flow Data (cfs)

| River | Reach | RS | 2xHMMF | 2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr |
|---|---|---|---|---|---|---|---|---|---|
| Oldtown Creek | Reach | 796.1598 | 38.6 | 620 | 1070 | 1180 | 1465 | 1740 | 2000 |

Boundary Conditions

| River | Reach | Profile | Upstream | Downstream |
|---|---|---|---|---|
| Oldtown Creek | Reach | 2xHMMF | Normal S = 0.000457 | |
| Oldtown Creek | Reach | 2-yr | Normal S = 0.000457 | |
| Oldtown Creek | Reach | 5-yr | Normal S = 0.000457 | |
| Oldtown Creek | Reach | 10-yr | Normal S = 0.000457 | |
| Oldtown Creek | Reach | 25-yr | Normal S = 0.000457 | |

```
  Oldtown Creek   Reach           50-yr
Normal S = 0.000457
  Oldtown Creek   Reach           100-yr
 Known WS = 831.3
```

GEOMETRY DATA

Geometry Title: ExistingTAF2
Geometry File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\TAF\HEC-RAS\GRE-68TAF.g02

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 796.1598

INPUT
Description:
Station Elevation Data num= 433

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 836.01 | 1.45 | 836.07 | 2.69 | 836 | 3.2 | 835.99 | 6.46 | 836.1 |
| 7.7 | 836.01 | 8.73 | 835.91 | 10.73 | 836.09 | 12.12 | 836.25 | 12.72 | 836.27 |
| 14.25 | 836.26 | 15.61 | 836.29 | 18.8 | 836.08 | 20.26 | 836.05 | 24.07 | 836.11 |
| 27.45 | 836.21 | 36.65 | 836.08 | 38.65 | 836.12 | 43.25 | 835.87 | 47.57 | 836.07 |
| 50.18 | 836.08 | 62.2 | 835.63 | 63.21 | 835.5 | 66.04 | 835.32 | 67.52 | 835.15 |
| 72.05 | 834.6 | 73.39 | 834.48 | 74.27 | 834.32 | 74.99 | 834.29 | 76.28 | 834.22 |
| 79.4 | 833.75 | 79.91 | 833.69 | 80.29 | 833.54 | 81.87 | 833.07 | 85.04 | 831.89 |
| 85.44 | 831.76 | 85.6 | 831.72 | 87.41 | 831.45 | 90.35 | 831.1 | 91.17 | 831.01 |
| 91.51 | 830.99 | 93 | 830.86 | 95.35 | 830.53 | 98.65 | 830.04 | 101.16 | 829.86 |
| 102.53 | 829.86 | 103.13 | 829.76 | 104.27 | 829.69 | 107.27 | 829.69 | 108.09 | 829.65 |
| 108.53 | 829.61 | 110.04 | 829.36 | 112.22 | 829.42 | 114.32 | 829.3 | 115.62 | 829.21 |
| 117.99 | 829.15 | 119.49 | 829.05 | 120.88 | 829.09 | 121.2 | 829.11 | 121.97 | 829.1 |
| 125.2 | 829.04 | 126.64 | 828.97 | 130.7 | 829.02 | 132.48 | 829.04 | 132.69 | 829.04 |
| 138.23 | 829.01 | 139.81 | 828.98 | 141.93 | 828.94 | 142.96 | 828.94 | 143.86 | 828.93 |
| 146.49 | 828.94 | 147.55 | 828.93 | 148.97 | 828.95 | 149.27 | 828.95 | 150.04 | 828.93 |
| 153.19 | 828.93 | 154.68 | 829.14 | 154.86 | 829.15 | 157.28 | 829.12 | 158.66 | 829.1 |
| 158.73 | 829.09 | 160.48 | 828.77 | 161.95 | 828.86 | 164.21 | 828.93 | 165.63 | 828.94 |
| 166.11 | 828.9 | 166.81 | 828.93 | 169.73 | 829.1 | 171.68 | 829.14 | 171.72 | 829.15 |
| 171.81 | 829.14 | 177.2 | 828.42 | 177.77 | 828.43 | 181.06 | 828.58 | 181.4 | 828.58 |
| 182.74 | 828.51 | 184.17 | 828.51 | 186.63 | 828.52 | 187.65 | 828.42 | 190.82 | 828.41 |
| 192.23 | 828.38 | 192.53 | 828.35 | 194.04 | 828.27 | 197.24 | 828.37 | 197.86 | 828.34 |
| 199.42 | 828.12 | 199.57 | 828.12 | 200.11 | 828.14 | 203.47 | 828.19 | 204.95 | 828.04 |
| 205.1 | 828.03 | 205.31 | 828.03 | 207.07 | 828.06 | 210.7 | 828.16 | 210.87 | 828.15 |
| 211.29 | 828.15 | 214.54 | 828.18 | 215.31 | 828.17 | 216.42 | 828.23 | 217.69 | 828.14 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 220.1 | 828.15 | 221.35 | 828.01 | 222 | 828.02 | 225.45 | 827.9 | 226.18 | 827.9 |
| 227.54 | 827.97 | 228.37 | 828.02 | 231.44 | 828.2 | 231.49 | 828.2 | 232.68 | 828.24 |
| 233.03 | 828.22 | 234.79 | 828.13 | 237.74 | 828.09 | 238.94 | 828.12 | 241.14 | 827.9 |
| 242.45 | 827.87 | 243.93 | 827.87 | 244.44 | 827.85 | 247.35 | 827.82 | 248.08 | 827.84 |
| 249.75 | 827.92 | 249.98 | 827.94 | 251.03 | 827.97 | 253.85 | 828.07 | 254.46 | 828.1 |
| 255.56 | 828.03 | 260.86 | 828.29 | 261.35 | 828.3 | 262.29 | 828.32 | 264.03 | 828.36 |
| 269.19 | 828.5 | 270.84 | 828.64 | 272.62 | 828.79 | 272.63 | 828.79 | 276.57 | 829.85 |
| 277.23 | 829.88 | 278.33 | 830 | 280.67 | 829.06 | 282.02 | 828.75 | 282.39 | 828.37 |
| 282.61 | 828.14 | 283.42 | 827.31 | 283.77 | 826.95 | 284.12 | 826.59 | 284.48 | 826.22 |
| 284.6 | 826.09 | 284.98 | 825.7 | 285.01 | 825.68 | 285.09 | 825.59 | 285.85 | 823.48 |
| 290.56 | 823.6 | 301.27 | 823.88 | 305.92 | 823.99 | 310.63 | 823.91 | 312.07 | 824.9 |
| 313.03 | 825.57 | 313.39 | 825.8 | 313.57 | 825.92 | 314.61 | 826.59 | 314.64 | 826.6 |
| 315.39 | 827.09 | 317.02 | 828.13 | 317.55 | 828.2 | 326.57 | 829.14 | 327.07 | 829.19 |
| 328.71 | 829.18 | 330.77 | 829.09 | 338.31 | 829.33 | 341.05 | 829.38 | 342.33 | 829.19 |
| 345.84 | 828.86 | 351.07 | 828.5 | 351.16 | 828.49 | 352.09 | 828.44 | 353.87 | 828.42 |
| 357.9 | 828.31 | 358.86 | 828.22 | 359.77 | 828.16 | 362.84 | 828.22 | 365.64 | 828.27 |
| 370.99 | 828.96 | 371.65 | 829.01 | 371.79 | 829.01 | 377.07 | 828.82 | 377.48 | 828.84 |
| 381.11 | 829.14 | 381.65 | 829.12 | 384 | 829.15 | 393.33 | 828.95 | 397.1 | 829.11 |
| 398.65 | 829.25 | 399.44 | 829.47 | 400.22 | 829.58 | 402.19 | 830.19 | 404.65 | 830.84 |
| 406.18 | 831.49 | 406.23 | 831.52 | 406.7 | 831.62 | 409.71 | 832.3 | 411.42 | 832.54 |
| 412.23 | 832.6 | 412.78 | 832.62 | 417.56 | 832.65 | 418.01 | 832.69 | 420.47 | 833.11 |
| 421.92 | 833.34 | 422.64 | 833.35 | 423.82 | 833.29 | 427.54 | 833.42 | 427.79 | 833.43 |
| 427.95 | 833.42 | 429.57 | 833.28 | 433.37 | 832.75 | 433.59 | 832.71 | 433.88 | 832.64 |
| 435.51 | 832.23 | 436.59 | 832.03 | 439.31 | 831.4 | 440.83 | 830.96 | 441.32 | 830.83 |
| 444.18 | 830.59 | 444.97 | 830.53 | 445.19 | 830.51 | 445.83 | 830.52 | 447.82 | 830.52 |
| 456.36 | 830.61 | 457.07 | 830.51 | 458.72 | 830.45 | 458.95 | 830.44 | 462.02 | 830.61 |
| 468.45 | 830.47 | 468.8 | 830.48 | 470.64 | 830.67 | 472.4 | 830.53 | 475.19 | 830.37 |
| 479.22 | 830.47 | 487.09 | 830.65 | 488.27 | 830.57 | 491.08 | 830.47 | 492.79 | 830.45 |
| 494.23 | 830.35 | 495.46 | 830.21 | 498.31 | 830.01 | 499.03 | 829.94 | 500.2 | 829.96 |
| 502.52 | 829.92 | 505.08 | 829.8 | 506.1 | 829.7 | 508.44 | 829.79 | 510.16 | 829.85 |
| 511.83 | 829.84 | 512.13 | 829.85 | 512.83 | 829.83 | 516.21 | 829.73 | 517.08 | 829.68 |
| 518.13 | 829.67 | 520.59 | 829.6 | 522.2 | 829.54 | 523.11 | 829.58 | 523.97 | 829.61 |
| 525.22 | 829.59 | 529.74 | 829.35 | 530.06 | 829.34 | 530.12 | 829.34 | 531.02 | 829.33 |
| 535.96 | 829.3 | 536.14 | 829.29 | 539.57 | 829.5 | 540.12 | 829.5 | 541.15 | 829.35 |
| 542.06 | 829.22 | 544.88 | 829.19 | 547.62 | 829.18 | 547.92 | 829.16 | 548.6 | 829.18 |
| 549.33 | 829.2 | 554 | 829.42 | 557.62 | 829.33 | 560.09 | 829.29 | 561.54 | 829.4 |
| 564.12 | 829.51 | 565.65 | 829.63 | 566.04 | 829.58 | 566.98 | 829.59 | 570.01 | 829.52 |
| 571.01 | 829.54 | 572.05 | 829.54 | 575.19 | 829.49 | 576.08 | 829.52 | 576.62 | 829.5 |
| 577.92 | 829.44 | 581.55 | 829.47 | 581.98 | 829.5 | 582.17 | 829.49 | 583.97 | 829.55 |
| 585.16 | 829.52 | 588 | 829.61 | 589.43 | 829.58 | 590.09 | 829.56 | 593.62 | 829.57 |
| 594.14 | 829.56 | 596.1 | 829.7 | 599.56 | 829.6 | 600.13 | 829.6 | 600.67 | 829.54 |
| 602.12 | 829.31 | 604.34 | 829.35 | 606.2 | 829.36 | 607.23 | 829.26 | 608.12 | 829.17 |
| 612 | 829.37 | 612.12 | 829.38 | 612.17 | 829.38 | 614.16 | 829.46 | 614.62 | 829.43 |
| 618.23 | 829.38 | 619.34 | 829.3 | 620.23 | 829.18 | 620.99 | 829.15 | 621.79 | 829.18 |
| 626.34 | 829.21 | 630.03 | 829.04 | 632.32 | 828.96 | 636.34 | 828.94 | 638.39 | 828.94 |
| 641.03 | 829.17 | 643.22 | 829.13 | 644.41 | 829.07 | 648.19 | 829.02 | 650.41 | 829.06 |
| 654.3 | 828.98 | 656.57 | 828.92 | 657.3 | 828.95 | 660.64 | 829.07 | 662.31 | 829.03 |
| 662.67 | 829.03 | 663.36 | 829 | 666.64 | 828.98 | 667.26 | 828.91 | 668.76 | 828.91 |
| 670.39 | 828.9 | 674.89 | 828.85 | 676.79 | 828.9 | 680.05 | 828.84 | 681.09 | 828.77 |
| 685.03 | 829.08 | 685.1 | 829.08 | 685.16 | 829.07 | 687.22 | 828.88 | 690.44 | 828.93 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 691.22 | 828.95 | 692.29 | 828.9 | 693.28 | 828.88 | 693.94 | 828.91 | 695.9 | 828.89 |
| 699.27 | 828.91 | 703.92 | 828.9 | 705.45 | 828.91 | 705.82 | 828.9 | 711.63 | 829.1 |
| 712.01 | 829.12 | 716.65 | 829.18 | 717.59 | 829.21 | 721.68 | 829.24 | 723.48 | 829.31 |
| 727.29 | 829.29 | 727.54 | 829.3 | 727.68 | 829.29 | 729.55 | 829.34 | 733.42 | 829.42 |
| 733.62 | 829.42 | 735.58 | 829.58 | 738.61 | 829.66 | 739.51 | 829.69 | 741.12 | 829.82 |
| 741.5 | 829.88 | 742.41 | 829.9 | 745.42 | 830.07 | 747.72 | 830.44 | 752.27 | 831.04 |
| 755.93 | 831.3 | 758.41 | 831.59 | 764.71 | 832.06 | 768.01 | 832.68 | 770.53 | 833.31 |
| 773.95 | 833.75 | 780.53 | 834.76 | 784.11 | 835.13 | 785.35 | 835.34 | 786.34 | 835.58 |
| 787.38 | 835.73 | 789.58 | 836.24 | 796.26 | 837.31 | 799.36 | 838.14 | 800.54 | 838.34 |
| 811.87 | 839.81 | 814.27 | 840.22 | 814.97 | 840.22 | 816.1 | 840.37 | 820.41 | 840.88 |
| 821.37 | 840.84 | 822.2 | 840.83 | 823.27 | 841.04 | 825.87 | 841.62 | 827.33 | 841.74 |
| 827.68 | 841.8 | 829.27 | 842.1 | 832.13 | 842.53 | 833.19 | 842.6 | 836.52 | 843.34 |
| 837.05 | 843.43 | 837.44 | 843.4 | 837.81 | 843.38 | | | | |

Manning's n Values num= 11

| Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|---|---|---|---|
| 0 | .03 | 237.74 | .1 | 282.39 | .07 | 290.56 | .06 | 312.07 | .07 |
| 326.57 | .1 | 418.01 | .013 | 427.95 | .1 | 492.79 | .035 | 727.29 | .1 |
| 837.81 | .1 | | | | | | | | |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 282.39 | 326.57 | 96.02 | 92.36 | 85.26 | .1 | .3 |

Ineffective Flow num= 3

| Sta L | Sta R | Elev | Permanent |
|---|---|---|---|
| 20 | 73 | 855 | T |
| 95 | 279 | 829.8 | F |
| 425 | 775 | 833.5 | F |

CROSS SECTION OUTPUT Profile #2xHMMF

| | | | | |
|---|---|---|---|---|
| E.G. Elev (ft) | 825.36 | Element | Left OB | Channel |
| Vel Head (ft) | 0.01 | Wt. n-Val. | | 0.063 |
| W.S. Elev (ft) | 825.35 | Reach Len. (ft) | 96.02 | 92.36 |
| Crit W.S. (ft) | 824.19 | Flow Area (sq ft) | | 40.99 |
| E.G. Slope (ft/ft) | 0.001007 | Area (sq ft) | | 40.99 |
| Q Total (cfs) | 38.60 | Flow (cfs) | | 38.60 |
| Top Width (ft) | 27.53 | Top Width (ft) | | 27.53 |
| Vel Total (ft/s) | 0.94 | Avg. Vel. (ft/s) | | 0.94 |
| Max Chl Dpth (ft) | 1.87 | Hydr. Depth (ft) | | 1.49 |
| Conv. Total (cfs) | 1216.7 | Conv. (cfs) | | 1216.7 |

| | |
|---|---|
| 85.26 | |

| | | | |
|---|---|---|---|
| Length Wtd. (ft) | 92.36 | Wetted Per. (ft) | 29.30 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.09 |
| Alpha | 1.00 | Stream Power (lb/ft s) | 0.08 |
| Frctn Loss (ft) | 0.12 | Cum Volume (acre-ft) | 0.28 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.20 |

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #2-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 829.64 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.16 | Wt. n-Val. | 0.100 | 0.066 | 0.100 |
| W.S. Elev (ft) | 829.48 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 826.38 | Flow Area (sq ft) | 1.34 | 181.77 | 44.41 |
| E.G. Slope (ft/ft) | 0.003507 | Area (sq ft) | 156.26 | 181.77 | 103.70 |
| Q Total (cfs) | 620.00 | Flow (cfs) | 0.68 | 591.29 | 28.02 |
| Top Width (ft) | 459.16 | Top Width (ft) | 168.67 | 44.18 | 246.31 |
| Vel Total (ft/s) | 2.73 | Avg. Vel. (ft/s) | 0.51 | 3.25 | 0.63 |
| Max Chl Dpth (ft) | 6.00 | Hydr. Depth (ft) | 0.48 | 4.11 | 0.61 |
| Conv. Total (cfs) | 10469.7 | Conv. (cfs) | 11.6 | 9985.0 | 473.2 |
| Length Wtd. (ft) | 92.93 | Wetted Per. (ft) | 3.05 | 48.17 | 73.13 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.10 | 0.83 | 0.13 |
| Alpha | 1.36 | Stream Power (lb/ft s) | 0.05 | 2.69 | 0.08 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 1.52 | 1.28 | 1.58 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 1.32 | 0.26 | |

1.92

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.41 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.038 | 0.066 | 0.100 |
| W.S. Elev (ft) | 830.36 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 827.49 | Flow Area (sq ft) | 312.88 | 220.41 | 109.76 |
| E.G. Slope (ft/ft) | 0.001040 | Area (sq ft) | 312.88 | 220.41 | 372.72 |
| Q Total (cfs) | 1070.00 | Flow (cfs) | 559.09 | 444.02 | 66.89 |
| Top Width (ft) | 559.38 | Top Width (ft) | 185.87 | 44.18 | 329.33 |
| Vel Total (ft/s) | 1.66 | Avg. Vel. (ft/s) | 1.79 | 2.01 | 0.61 |
| Max Chl Dpth (ft) | 6.88 | Hydr. Depth (ft) | 1.68 | 4.99 | 1.44 |
| Conv. Total (cfs) | 33176.7 | Conv. (cfs) | 17335.3 | 13767.3 | 2074.1 |
| Length Wtd. (ft) | 93.89 | Wetted Per. (ft) | 186.70 | 48.17 | 76.54 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.11 | 0.30 | 0.09 |
| Alpha | 1.22 | Stream Power (lb/ft s) | 0.19 | 0.60 | 0.06 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 2.62 | 1.49 | 3.35 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.37 | 0.26 | 2.37 |

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.
Note: Manning's n values were composited to a single value in the main channel.
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) | 830.58 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.038 | 0.066 | 0.100 |
| W.S. Elev (ft) | 830.53 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 827.72 | Flow Area (sq ft) | 344.54 | 227.91 | 122.77 |
| E.G. Slope (ft/ft) | 0.000996 | Area (sq ft) | 344.54 | 227.91 | 430.12 |
| Q Total (cfs) | 1180.00 | Flow (cfs) | 642.19 | 459.38 | 78.43 |
| Top Width (ft) | 586.65 | Top Width (ft) | 187.02 | 44.18 | 355.46 |
| Vel Total (ft/s) | 1.70 | Avg. Vel. (ft/s) | 1.86 | 2.02 | 0.64 |
| Max Chl Dpth (ft) | 7.05 | Hydr. Depth (ft) | 1.84 | 5.16 | 1.60 |
| Conv. Total (cfs) | 37392.5 | Conv. (cfs) | 20350.1 | 14557.1 | 2485.2 |
| Length Wtd. (ft) | 93.93 | Wetted Per. (ft) | 187.85 | 48.17 | 77.20 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.11 | 0.29 | 0.10 |
| Alpha | 1.21 | Stream Power (lb/ft s) | 0.21 | 0.59 | 0.06 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 2.85 | 1.54 | 3.75 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.37 | 0.26 | 2.43 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #25-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 831.01 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.038 | 0.066 | 0.100 |
| W.S. Elev (ft) | 830.95 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 828.48 | Flow Area (sq ft) | 424.68 | 246.68 | 155.78 |
| E.G. Slope (ft/ft) | 0.000896 | Area (sq ft) | 424.68 | 246.68 | 592.53 |
| Q Total (cfs) | 1465.00 | Flow (cfs) | 858.67 | 497.13 | 109.20 |
| Top Width (ft) | 623.70 | Top Width (ft) | 190.44 | 44.18 | 389.08 |
| Vel Total (ft/s) | 1.77 | Avg. Vel. (ft/s) | 2.02 | 2.02 | 0.70 |
| Max Chl Dpth (ft) | 7.47 | Hydr. Depth (ft) | 2.23 | 5.58 | 1.99 |
| Conv. Total (cfs) | 48949.1 | Conv. (cfs) | 28690.1 | 16610.3 | 3648.6 |
| Length Wtd. (ft) | 93.99 | Wetted Per. (ft) | 191.30 | 48.17 | 78.72 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.12 | 0.29 | 0.11 |
| Alpha | 1.21 | Stream Power (lb/ft s) | 0.25 | 0.58 | 0.08 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 3.43 | 1.65 | 4.81 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.40 | 0.26 | 2.55 |

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.
Note:  Manning's n values were composited to a single value in the main channel.
Note:  Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #50-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 831.38 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.037 | 0.066 | |

| | | | | | |
|---|---|---|---|---|---|
| 0.100 | | | | | |
| W.S. Elev (ft) | 831.32 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 829.47 | Flow Area (sq ft) | 495.41 | 262.93 | 184.75 |
| E.G. Slope (ft/ft) | 0.000838 | Area (sq ft) | 495.41 | 262.93 | 736.79 |
| Q Total (cfs) | 1740.00 | Flow (cfs) | 1065.83 | 534.89 | 139.28 |
| Top Width (ft) | 633.78 | Top Width (ft) | 193.88 | 44.18 | 395.72 |
| Vel Total (ft/s) | 1.84 | Avg. Vel. (ft/s) | 2.15 | 2.03 | 0.75 |
| Max Chl Dpth (ft) | 7.84 | Hydr. Depth (ft) | 2.56 | 5.95 | 2.33 |
| Conv. Total (cfs) | 60094.5 | Conv. (cfs) | 36810.7 | 18473.6 | 4810.2 |
| Length Wtd. (ft) | 94.03 | Wetted Per. (ft) | 194.77 | 48.17 | 79.66 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.13 | 0.29 | 0.12 |
| Alpha | 1.22 | Stream Power (lb/ft s) | 0.29 | 0.58 | 0.09 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 3.95 | 1.74 | 5.76 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.42 | 0.26 | 2.62 |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
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) | 831.68 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.037 | 0.066 | 0.100 |
| W.S. Elev (ft) | 831.61 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 829.80 | Flow Area (sq ft) | 551.40 | 275.62 | 207.60 |
| E.G. Slope (ft/ft) | 0.000826 | Area (sq ft) | 551.40 | 275.62 | 851.02 |
| Q Total (cfs) | 2000.00 | Flow (cfs) | 1259.16 | 574.23 | 166.61 |

| | | | | | |
|---|---|---|---|---|---|
| Top Width (ft) | 640.49 | Top Width (ft) | 196.03 | 44.18 | 400.28 |
| Vel Total (ft/s) | 1.93 | Avg. Vel. (ft/s) | 2.28 | 2.08 | 0.80 |
| Max Chl Dpth (ft) | 8.13 | Hydr. Depth (ft) | 2.81 | 6.24 | 2.59 |
| Conv. Total (cfs) | 69598.2 | Conv. (cfs) | 43817.7 | 19982.8 | 5797.7 |
| Length Wtd. (ft) | 94.07 | Wetted Per. (ft) | 196.93 | 48.17 | 80.57 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.14 | 0.29 | 0.13 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.33 | 0.61 | 0.11 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 4.35 | 1.82 | 6.51 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.43 | 0.26 | 2.71 |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 703.7970

INPUT
Description:
Station Elevation Data num= 466

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 837.63 | 14.52 | 837.16 | 17.4 | 837.14 | 20.94 | 836.95 | 22.37 | 836.92 |
| 37.71 | 836.17 | 41.1 | 836.03 | 48.57 | 835.39 | 52.88 | 835.09 | 56.33 | 835.19 |
| 58.83 | 835.24 | 64.25 | 835.33 | 71.44 | 835.38 | 77.8 | 835.27 | 82.69 | 835.16 |
| 86.27 | 835.01 | 88.91 | 834.91 | 94.17 | 835.06 | 94.22 | 835.07 | 94.25 | 835.07 |
| 94.89 | 835.1 | 95.2 | 835.12 | 95.56 | 835.14 | 95.79 | 835.15 | 95.97 | 835.16 |
| 96.25 | 835.17 | 97.13 | 835.22 | 98.86 | 835.31 | 99.35 | 835.33 | 99.99 | 835.37 |
| 101.82 | 835.46 | 103.93 | 835.58 | 104.95 | 836.19 | 104.97 | 836.2 | 104.99 | 836.2 |
| 105.93 | 835.81 | 106.69 | 835.79 | 107.62 | 835.77 | 108.83 | 835.58 | 110.47 | 835.55 |
| 111.98 | 835.78 | 112.24 | 835.78 | 114.49 | 835.54 | 115.97 | 835.51 | 116.63 | 835.49 |
| 117.45 | 835.37 | 117.7 | 835.37 | 119.38 | 835.5 | 119.68 | 835.49 | 121.62 | 835.45 |
| 122.32 | 835.43 | 122.96 | 835.41 | 123.23 | 835.41 | 125.36 | 835.47 | 126.62 | 835.44 |
| 127.06 | 835.43 | 127.29 | 835.43 | 127.49 | 835.42 | 128.37 | 835.29 | 128.91 | 835.29 |
| 130.29 | 835.27 | 131.38 | 835.13 | 132.57 | 835.11 | 133.21 | 835.2 | 133.68 | 835.19 |
| 134.5 | 835.18 | 135.65 | 835.16 | 136.78 | 835.15 | 138.23 | 835.13 | 138.53 | 835.01 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 139.07 | 835 | 139.61 | 835 | 140.64 | 834.99 | 141.09 | 834.97 | 141.85 | 834.96 |
| 145.01 | 834.92 | 148.71 | 834.86 | 149.44 | 834.87 | 150.65 | 834.85 | 151.99 | 834.82 |
| 153.99 | 834.79 | 156.97 | 834.75 | 158.33 | 834.66 | 159.9 | 834.63 | 165.32 | 834.56 |
| 166.36 | 834.44 | 167.19 | 834.35 | 168.24 | 834.32 | 170.48 | 834.08 | 171.99 | 833.91 |
| 174.87 | 833.59 | 176.32 | 833.6 | 177.71 | 833.45 | 178.72 | 833.59 | 179.18 | 833.55 |
| 179.52 | 833.51 | 181.06 | 833.35 | 183.17 | 832.72 | 183.34 | 832.7 | 184.32 | 832.83 |
| 184.36 | 832.82 | 185.28 | 832.72 | 186.31 | 832.61 | 187.86 | 832.23 | 188.97 | 832.11 |
| 190.73 | 832.37 | 190.81 | 832.36 | 190.88 | 832.35 | 191.14 | 832.35 | 194.87 | 831.62 |
| 196.38 | 831.29 | 196.39 | 831.28 | 196.43 | 831.27 | 201.59 | 830.88 | 201.92 | 830.84 |
| 202.02 | 830.83 | 202.04 | 830.83 | 202.11 | 830.82 | 205.27 | 830.63 | 205.91 | 830.57 |
| 206.08 | 830.55 | 206.99 | 830.24 | 207.71 | 830.17 | 210.55 | 830.11 | 211.25 | 830.03 |
| 211.63 | 829.99 | 211.78 | 829.98 | 212.44 | 829.74 | 213.33 | 829.66 | 215.57 | 829.47 |
| 216.2 | 829.37 | 217.2 | 829.29 | 217.41 | 829.3 | 217.82 | 829.27 | 219.08 | 829.16 |
| 219.74 | 829.11 | 221.56 | 828.96 | 223.05 | 828.85 | 224.13 | 828.77 | 226.52 | 828.6 |
| 229.69 | 828.36 | 230.17 | 828.33 | 230.47 | 828.31 | 230.91 | 828.3 | 231.96 | 828.3 |
| 234.35 | 828.29 | 235.45 | 828.28 | 236.75 | 828.28 | 239.43 | 828.27 | 240.61 | 828.26 |
| 241.66 | 828.26 | 244.34 | 828.25 | 245.08 | 828.24 | 245.91 | 828.24 | 248.31 | 828.23 |
| 249.29 | 828.23 | 250.5 | 828.22 | 251.71 | 828.22 | 254.69 | 828.21 | 255.85 | 828.2 |
| 259.95 | 828.16 | 264.16 | 828.19 | 266.43 | 828.19 | 266.96 | 828.2 | 269.36 | 828.2 |
| 271.29 | 828.21 | 272.8 | 828.21 | 275.17 | 828.22 | 277.39 | 828.22 | 279.79 | 828.23 |
| 281.69 | 828.23 | 283.94 | 828.24 | 284.53 | 828.24 | 298.46 | 828.21 | 299.23 | 828.21 |
| 299.34 | 828.2 | 301.17 | 828.19 | 301.4 | 828.18 | 302.36 | 828.18 | 303.99 | 828.16 |
| 305.03 | 828.15 | 305.76 | 828.14 | 306.45 | 828.14 | 306.71 | 828.13 | 307.18 | 828.13 |
| 308.17 | 828.12 | 308.72 | 828.11 | 309.19 | 828.11 | 309.93 | 828.1 | 310.52 | 828.1 |
| 321.99 | 828.13 | 331.27 | 828.02 | 344.85 | 827.12 | 351.49 | 826.68 | 353.32 | 826.53 |
| 355.1 | 826.38 | 369.47 | 826.61 | 378.87 | 826.79 | 378.97 | 826.79 | 379.32 | 826.8 |
| 380.19 | 826.8 | 380.33 | 826.81 | 380.88 | 826.81 | 381.08 | 826.82 | 381.23 | 826.82 |
| 382.03 | 826.84 | 382.38 | 826.85 | 383.27 | 826.87 | 388.63 | 827 | 391.7 | 827.08 |
| 392.05 | 827.28 | 392.77 | 827.71 | 392.91 | 827.75 | 392.98 | 827.6 | 393.18 | 827.18 |
| 393.57 | 827.33 | 394.53 | 827.71 | 394.68 | 827.77 | 395.18 | 827.96 | 402.62 | 829.42 |
| 409.74 | 827.79 | 410.85 | 827.54 | 415.29 | 826.7 | 415.33 | 826.65 | 415.73 | 826.03 |
| 417.35 | 823.18 | 420.29 | 823.48 | 426.47 | 824.15 | 428.51 | 824.77 | 443.35 | 823.43 |
| 443.52 | 823.54 | 444.18 | 828.05 | 444.66 | 828.15 | 444.85 | 828.11 | 449.6 | 828.04 |
| 467.2 | 827.78 | 470.55 | 827.76 | 473.4 | 827.67 | 474.13 | 827.66 | 492.65 | 827.39 |
| 503.61 | 827.55 | 509.44 | 827.68 | 517.09 | 830.37 | 519.88 | 831.29 | 527.1 | 831.9 |
| 529.41 | 832.15 | 529.7 | 832.16 | 530.03 | 832.16 | 530.18 | 832.17 | 530.8 | 832.18 |
| 531.12 | 832.18 | 531.44 | 832.19 | 531.61 | 832.2 | 531.79 | 832.2 | 532.11 | 832.21 |
| 532.42 | 832.22 | 532.93 | 832.24 | 533.52 | 832.25 | 534.43 | 832.28 | 535.9 | 832.33 |
| 538.42 | 832.4 | 540 | 832.45 | 540.61 | 832.45 | 541.92 | 832.47 | 542.94 | 832.28 |
| 543.76 | 832.12 | 544.89 | 831.82 | 547.63 | 831.16 | 548.2 | 831.12 | 549.58 | 830.89 |
| 551.56 | 830.4 | 554.39 | 830.1 | 559.1 | 830.27 | 559.56 | 830.29 | 559.73 | 830.27 |
| 565.39 | 829.85 | 566.53 | 829.64 | 572.13 | 829.72 | 575.67 | 829.89 | 577.49 | 829.9 |
| 578.84 | 829.94 | 580.71 | 829.83 | 582.93 | 830 | 587.17 | 830.12 | 589.85 | 830.12 |
| 592.29 | 830.01 | 598.55 | 830.25 | 601.4 | 830.34 | 603.33 | 830.22 | 604.06 | 830 |
| 612.3 | 829.18 | 612.58 | 829.19 | 614.31 | 829.2 | 614.61 | 829.2 | 620.38 | 829.12 |
| 623.85 | 829.15 | 624.56 | 829.16 | 626.32 | 828.96 | 626.39 | 828.95 | 626.52 | 828.94 |
| 631.96 | 828.98 | 634.34 | 829.01 | 638.33 | 829.01 | 640.14 | 828.94 | 643.42 | 828.88 |
| 644.41 | 828.93 | 646.79 | 828.89 | 648.46 | 828.93 | 649.44 | 828.72 | 650.33 | 828.62 |
| 653.5 | 828.63 | 654.6 | 828.67 | 654.85 | 828.67 | 656.21 | 828.65 | 659.59 | 828.85 |
| 660.85 | 828.88 | 662.28 | 828.78 | 662.52 | 828.8 | 667.91 | 829.11 | 668.39 | 829.07 |

```
  672.39  829.07  672.49  829.06  672.55  829.07  674.34  829.06  679.27  828.73
  680.11   828.7  680.33  828.69  681.02  828.75  683.51  828.88  686.23  829.05
  686.95  829.05  692.28  829.03   697.4  829.06   698.4  829.08   699.4  829.09
  700.87   829.1  704.41  829.13  705.39   829.2  708.52  829.26  709.68  829.02
  710.43  828.94  712.35   828.9   714.6  828.95  715.37  828.82  716.45  828.74
  718.03  828.78  720.52  828.95  721.69  828.98  722.49  829.01  725.74  829.05
  726.65  829.06  727.28  828.96  728.57  828.73  733.79  828.75  734.67  828.77
  735.22   828.8  738.73  828.85   739.3  828.85   740.4   828.8  746.51  828.71
  746.75   828.7  747.27  828.65  750.78  828.57  752.13   828.6  752.77  828.61
   754.3  828.64  758.04  828.86  758.78  828.78  761.18  828.79  763.07  828.81
  763.49  828.77  764.93  828.59  765.99  828.64   767.2  828.68  771.05  828.82
  773.74  828.81   775.1  828.74  776.74  828.54  777.15  828.53   778.1  828.52
  782.98  828.54  791.56  828.54  795.12  828.53  795.63  828.52  796.37  828.53
  799.69  828.42  800.55  828.41  801.69  828.46  804.76  828.66  805.91  828.72
  806.64  828.81   807.7  828.86  809.06  828.89  811.85  828.85  812.76  828.81
  816.34  828.98  818.29     829  820.06  828.85  825.31  828.81  825.93  828.82
  826.02  828.82  826.61  828.83  830.95  828.88  831.91  828.81  833.17  828.84
  836.07  828.95  837.67  829.17  838.01  829.16  838.92  829.22  842.11  829.27
  843.63  829.08  844.03  829.04  844.63  829.08  848.05  829.36   848.6  829.42
  849.97  829.48  853.55  829.61  853.96  829.61   854.2  829.63  855.87  829.55
  859.66  829.69  860.11  829.72  861.77  829.89  865.02  830.22  865.72  830.41
  866.11  830.45  867.61  830.79     870  830.71  872.38  830.84  873.44  830.98
   875.3  831.04  877.47  831.25  878.63  831.38  879.32  831.46   882.6  831.74
  883.31  831.79   883.8  831.81  885.14  831.83   888.1  831.85  889.08  831.87
  890.43  831.99  891.48  832.08   892.5  832.26  896.83  832.94  900.24  834.95
  900.65  835.23  900.94  835.44  902.53  836.57  908.38  838.21  912.51  839.35
  914.83   839.6  920.35  840.33  950.62  841.26  954.03   841.1  954.85   841.2
  956.48  841.09  957.87  841.17   958.1   841.2  959.55  841.21  961.58  841.21
  962.32  841.22  963.07  841.22  966.13  841.33  968.09  841.29  968.91  841.33
  971.47  841.33

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013  184.32     .03  392.91      .1  409.74     .07  415.29     .06
  443.35     .07   467.2      .1  530.18    .013     540      .1   601.4    .035
  848.05      .1  971.47      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        409.74  444.18            56.86   52.22   53.96             .1       .3
Ineffective Flow     num=       5
   Sta L   Sta R    Elev  Permanent
     133     184     855       T
     284     325     850       T
     325   402.5   829.4       F
     535     900  832.73       T
     915     970     860       T

CROSS SECTION OUTPUT  Profile #2xHMMF
```

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 825.24 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.02 | Wt. n-Val. | | 0.061 | |
| W.S. Elev (ft) | 825.22 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 824.25 | Flow Area (sq ft) | | 34.01 | |
| E.G. Slope (ft/ft) | 0.001852 | Area (sq ft) | | 34.01 | |
| Q Total (cfs) | 38.60 | Flow (cfs) | | 38.60 | |
| Top Width (ft) | 27.57 | Top Width (ft) | | 27.57 | |
| Vel Total (ft/s) | 1.14 | Avg. Vel. (ft/s) | | 1.14 | |
| Max Chl Dpth (ft) | 2.04 | Hydr. Depth (ft) | | 1.23 | |
| Conv. Total (cfs) | 897.0 | Conv. (cfs) | | 897.0 | |
| Length Wtd. (ft) | 52.22 | Wetted Per. (ft) | | 30.44 | |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | | 0.13 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | | 0.15 | |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | | 0.20 | |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | | 0.14 | |

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #2-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 829.52 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.031 | 0.063 | 0.090 |
| W.S. Elev (ft) | 829.49 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 826.49 | Flow Area (sq ft) | 261.82 | 168.85 | 121.98 |
| E.G. Slope (ft/ft) | 0.000390 | Area (sq ft) | 316.27 | 168.85 | 270.70 |

| | | | | | |
|---|---|---|---|---|---|
| Q Total (cfs) | 620.00 | Flow (cfs) | 358.20 | 204.22 | 57.58 |
| Top Width (ft) | 540.50 | Top Width (ft) | 194.45 | 34.44 | 311.61 |
| Vel Total (ft/s) | 1.12 | Avg. Vel. (ft/s) | 1.37 | 1.21 | 0.47 |
| Max Chl Dpth (ft) | 6.31 | Hydr. Depth (ft) | 1.71 | 4.90 | 1.73 |
| Conv. Total (cfs) | 31398.2 | Conv. (cfs) | 18140.1 | 10342.0 | 2916.1 |
| Length Wtd. (ft) | 54.57 | Wetted Per. (ft) | 154.58 | 40.70 | 70.75 |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.04 | 0.10 | 0.04 |
| Alpha | 1.26 | Stream Power (lb/ft s) | 0.06 | 0.12 | 0.02 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.00 | 0.91 | 1.21 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.92 | 0.18 | 1.37 |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.35 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.031 | 0.063 | 0.089 |
| W.S. Elev (ft) | 830.31 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 828.50 | Flow Area (sq ft) | 389.83 | 196.87 | 180.22 |
| E.G. Slope (ft/ft) | 0.000423 | Area (sq ft) | 477.65 | 196.87 | 551.24 |
| Q Total (cfs) | 1070.00 | Flow (cfs) | 682.32 | 274.66 | 113.02 |
| Top Width (ft) | 621.47 | Top Width (ft) | 202.95 | 34.44 | 384.08 |
| Vel Total (ft/s) | 1.40 | Avg. Vel. (ft/s) | 1.75 | 1.40 | 0.63 |
| Max Chl Dpth (ft) | 7.13 | Hydr. Depth (ft) | 2.41 | 5.72 | 2.48 |
| Conv. Total (cfs) | 52040.5 | Conv. (cfs) | 33185.2 | 13358.4 | |

5496.9

| | | | | | |
|---|---|---|---|---|---|
| Length Wtd. (ft) | 55.07 | Wetted Per. (ft) | 163.15 | 40.70 | 73.20 |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.06 | 0.13 | 0.06 |
| Alpha | 1.28 | Stream Power (lb/ft s) | 0.11 | 0.18 | 0.04 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.74 | 1.05 | 2.45 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.94 | 0.18 | 1.67 |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
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) | 830.52 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.031 | 0.063 | 0.089 |
| W.S. Elev (ft) | 830.48 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 828.63 | Flow Area (sq ft) | 417.31 | 202.71 | 192.58 |
| E.G. Slope (ft/ft) | 0.000426 | Area (sq ft) | 512.06 | 202.71 | 616.76 |
| Q Total (cfs) | 1180.00 | Flow (cfs) | 764.09 | 289.61 | 126.29 |
| Top Width (ft) | 626.10 | Top Width (ft) | 203.44 | 34.44 | 388.21 |
| Vel Total (ft/s) | 1.45 | Avg. Vel. (ft/s) | 1.83 | 1.43 | 0.66 |
| Max Chl Dpth (ft) | 7.30 | Hydr. Depth (ft) | 2.57 | 5.89 | 2.63 |
| Conv. Total (cfs) | 57141.5 | Conv. (cfs) | 37001.2 | 14024.6 | 6115.8 |
| Length Wtd. (ft) | 55.14 | Wetted Per. (ft) | 163.67 | 40.70 | 73.73 |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.07 | 0.13 | 0.07 |
| Alpha | 1.29 | Stream Power (lb/ft s) | 0.12 | 0.19 | 0.05 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.90 | 1.08 | 2.73 |

| | | | | | |
|---|---|---|---|---|---|
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.94 | 0.18 | 1.70 |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #25-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.95 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.032 | 0.063 | 0.089 |
| W.S. Elev (ft) | 830.90 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 828.87 | Flow Area (sq ft) | 487.18 | 217.33 | 223.94 |
| E.G. Slope (ft/ft) | 0.000436 | Area (sq ft) | 599.35 | 217.33 | 783.24 |
| Q Total (cfs) | 1465.00 | Flow (cfs) | 973.73 | 328.77 | 162.50 |
| Top Width (ft) | 640.72 | Top Width (ft) | 208.43 | 34.44 | 397.85 |
| Vel Total (ft/s) | 1.58 | Avg. Vel. (ft/s) | 2.00 | 1.51 | 0.73 |
| Max Chl Dpth (ft) | 7.72 | Hydr. Depth (ft) | 2.91 | 6.31 | 3.01 |
| Conv. Total (cfs) | 70183.6 | Conv. (cfs) | 46648.4 | 15750.6 | 7784.7 |
| Length Wtd. (ft) | 55.29 | Wetted Per. (ft) | 168.69 | 40.70 | 75.09 |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.08 | 0.15 | 0.08 |
| Alpha | 1.30 | Stream Power (lb/ft s) | 0.16 | 0.22 | 0.06 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 2.30 | 1.16 | 3.47 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.96 | 0.18 | 1.78 |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #50-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 831.33 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.032 | 0.063 | 0.088 |
| W.S. Elev (ft) | 831.27 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 829.07 | Flow Area (sq ft) | 549.54 | 229.97 | 251.51 |
| E.G. Slope (ft/ft) | 0.000446 | Area (sq ft) | 676.76 | 229.97 | 930.89 |
| Q Total (cfs) | 1740.00 | Flow (cfs) | 1176.74 | 365.53 | 197.73 |
| Top Width (ft) | 653.81 | Top Width (ft) | 213.29 | 34.44 | 406.09 |
| Vel Total (ft/s) | 1.69 | Avg. Vel. (ft/s) | 2.14 | 1.59 | 0.79 |
| Max Chl Dpth (ft) | 8.09 | Hydr. Depth (ft) | 3.19 | 6.68 | 3.33 |
| Conv. Total (cfs) | 82386.3 | Conv. (cfs) | 55716.8 | 17307.3 | 9362.2 |
| Length Wtd. (ft) | 55.38 | Wetted Per. (ft) | 173.56 | 40.70 | 76.26 |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.09 | 0.16 | 0.09 |
| Alpha | 1.30 | Stream Power (lb/ft s) | 0.19 | 0.25 | 0.07 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 2.65 | 1.22 | 4.13 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.97 | 0.18 | 1.84 |

Warning: Divided flow computed for this cross-section.
Note:  Manning's n values were composited to a single value in the main channel.
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) | 831.62 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.032 | 0.063 | 0.088 |
| W.S. Elev (ft) | 831.55 | Reach Len. (ft) | 56.86 | 52.22 | |

| | | | | | |
|---|---|---|---|---|---|
| 53.96 | | | | | |
| Crit W.S. (ft) | 829.22 | Flow Area (sq ft) | 598.82 | 239.78 | 273.49 |
| E.G. Slope (ft/ft) | 0.000463 | Area (sq ft) | 737.72 | 239.78 | 1047.58 |
| Q Total (cfs) | 2000.00 | Flow (cfs) | 1374.39 | 399.39 | 226.21 |
| Top Width (ft) | 662.24 | Top Width (ft) | 214.56 | 34.44 | 413.23 |
| Vel Total (ft/s) | 1.80 | Avg. Vel. (ft/s) | 2.30 | 1.67 | 0.83 |
| Max Chl Dpth (ft) | 8.37 | Hydr. Depth (ft) | 3.45 | 6.96 | 3.47 |
| Conv. Total (cfs) | 92919.3 | Conv. (cfs) | 63853.9 | 18555.7 | 10509.7 |
| Length Wtd. (ft) | 55.45 | Wetted Per. (ft) | 174.87 | 40.70 | 79.46 |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.10 | 0.17 | 0.10 |
| Alpha | 1.31 | Stream Power (lb/ft s) | 0.23 | 0.28 | 0.08 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 2.93 | 1.27 | 4.65 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.98 | 0.18 | 1.91 |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 651.5802

INPUT
Description:
Station Elevation Data num= 382

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 837.66 | 23.61 | 836.41 | 23.99 | 836.42 | 29.77 | 835.87 | 31.57 | 835.7 |
| 31.87 | 835.7 | 32.1 | 835.71 | 34.22 | 835.63 | 34.44 | 835.62 | 34.45 | 835.62 |
| 34.62 | 835.61 | 34.98 | 835.6 | 38.26 | 835.48 | 38.9 | 835.36 | 40.51 | 835.27 |
| 40.91 | 835.04 | 40.98 | 835.01 | 41.14 | 834.9 | 41.27 | 834.98 | 41.34 | 835 |
| 41.48 | 835 | 41.58 | 835.01 | 41.81 | 835.02 | 42.2 | 835.04 | 43.44 | 835.1 |
| 47.46 | 835.24 | 51.88 | 835.31 | 58.9 | 835.41 | 63.41 | 835.3 | 70.49 | 835.15 |
| 74.44 | 834.97 | 77.03 | 834.86 | 79 | 834.91 | 79.88 | 834.95 | 82.96 | 835.02 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 83.9 | 835.04 | 83.97 | 835.01 | 87.67 | 834.9 | 90.8 | 834.93 | 97.73 | 834.9 |
| 111.4 | 834.81 | 125.83 | 834.5 | 134.86 | 834.35 | 136.1 | 834.33 | 148.95 | 834.07 |
| 154.14 | 834.05 | 154.81 | 834.11 | 160.1 | 834.09 | 171.28 | 834.16 | 172.35 | 834.16 |
| 176.92 | 833.98 | 191.05 | 834.76 | 192.25 | 834.76 | 192.78 | 834.74 | 196.11 | 834.46 |
| 196.87 | 834.44 | 202.06 | 834.04 | 202.74 | 833.88 | 204.07 | 833.57 | 205.77 | 833.18 |
| 207.94 | 832.15 | 212.3 | 831.14 | 213.49 | 831.1 | 214.81 | 830.66 | 217.27 | 829.97 |
| 219.65 | 829.27 | 220.96 | 829.18 | 224.95 | 828.67 | 226.73 | 828.54 | 232 | 828.69 |
| 232.18 | 828.73 | 235.83 | 828.81 | 236.35 | 828.81 | 237.87 | 828.74 | 239.1 | 828.72 |
| 242.82 | 828.77 | 243.48 | 828.75 | 246.98 | 828.74 | 247.35 | 828.74 | 248.89 | 828.73 |
| 249.04 | 828.74 | 254.47 | 828.34 | 257.06 | 828.37 | 259.18 | 828.23 | 265.14 | 828.52 |
| 265.42 | 828.53 | 265.95 | 828.53 | 270.85 | 828.45 | 272.32 | 828.49 | 276.52 | 828.46 |
| 277.47 | 828.45 | 282.21 | 828.36 | 282.35 | 828.36 | 286.25 | 828.16 | 286.43 | 828.15 |
| 289 | 828.18 | 292.51 | 828.45 | 296.15 | 828.84 | 297.56 | 828.82 | 297.93 | 828.87 |
| 301.25 | 828.65 | 303.17 | 828.46 | 305.22 | 828.48 | 314.23 | 828.42 | 315.96 | 828.45 |
| 316.02 | 828.45 | 316.25 | 828.43 | 319.78 | 828.12 | 321.19 | 828.07 | 321.58 | 828.07 |
| 321.86 | 828.08 | 326.54 | 828.13 | 329.33 | 828.02 | 332.6 | 827.99 | 335.55 | 828.2 |
| 336.66 | 828.3 | 337.04 | 828.27 | 338.52 | 828.24 | 340.98 | 828.08 | 346.63 | 827.91 |
| 348.27 | 827.85 | 349.54 | 827.92 | 351.43 | 827.89 | 351.82 | 827.89 | 353.51 | 827.93 |
| 354.14 | 827.93 | 355.1 | 827.84 | 358.59 | 827.79 | 359.28 | 827.77 | 360.77 | 827.72 |
| 360.83 | 827.72 | 364.75 | 827.78 | 364.86 | 827.79 | 366.39 | 827.82 | 369.89 | 828.28 |
| 370.42 | 828.3 | 370.76 | 828.35 | 372.08 | 828.47 | 374.6 | 828.43 | 376.04 | 828.48 |
| 377.41 | 828.55 | 377.67 | 828.57 | 380.99 | 828.94 | 382.07 | 829.04 | 387.32 | 828.34 |
| 394.87 | 829.08 | 402.89 | 826.86 | 403.31 | 826.75 | 406.18 | 826.24 | 406.56 | 826.27 |
| 407.14 | 827.12 | 409.03 | 825.48 | 411.51 | 823.71 | 411.6 | 823.77 | 419.38 | 823.64 |
| 420.78 | 823.62 | 434.17 | 823.44 | 434.37 | 823.63 | 436.99 | 825.8 | 437.6 | 826.3 |
| 438.42 | 826.95 | 440.53 | 826.98 | 460.6 | 827.46 | 464.08 | 827.6 | 466.79 | 827.68 |
| 471.83 | 827.62 | 475.29 | 827.58 | 481.99 | 827.5 | 487.56 | 827.36 | 497.94 | 826.97 |
| 506.69 | 829.56 | 511.62 | 831.08 | 520.34 | 831.87 | 521.87 | 832.01 | 523.03 | 832.02 |
| 531.91 | 832.09 | 531.95 | 832.09 | 532.06 | 832.38 | 532.28 | 832.37 | 533.85 | 832.24 |
| 537.35 | 831.4 | 537.75 | 831.28 | 539.31 | 830.77 | 539.63 | 830.65 | 539.75 | 830.63 |
| 543.58 | 829.76 | 548.77 | 829.68 | 549.57 | 829.63 | 550.39 | 829.6 | 555.43 | 829.49 |
| 556.24 | 829.37 | 559.28 | 829.35 | 561.88 | 829.33 | 566.53 | 829.29 | 568.55 | 829.34 |
| 571.23 | 829.29 | 574.41 | 829.27 | 576.46 | 829.31 | 578.84 | 829.39 | 584.31 | 829.54 |
| 584.64 | 829.54 | 584.91 | 829.55 | 587.97 | 829.74 | 590.68 | 829.91 | 591.37 | 829.87 |
| 592.54 | 829.79 | 593.47 | 829.69 | 596.92 | 829.33 | 599.98 | 829 | 602.47 | 828.88 |
| 603.39 | 828.96 | 604.17 | 828.86 | 608.15 | 828.73 | 608.35 | 828.72 | 608.4 | 828.72 |
| 610.18 | 828.69 | 615.74 | 828.63 | 616.19 | 828.62 | 620.16 | 828.69 | 620.39 | 828.68 |
| 620.52 | 828.68 | 622.02 | 828.75 | 624.51 | 828.82 | 628.08 | 828.83 | 628.12 | 828.83 |
| 632.22 | 828.75 | 634.09 | 828.52 | 634.15 | 828.51 | 638.02 | 828.62 | 638.4 | 828.58 |
| 640.03 | 828.32 | 644.17 | 828.23 | 645.91 | 828.23 | 649.41 | 828.38 | 650.66 | 828.38 |
| 651.97 | 828.31 | 654.12 | 828.48 | 656.21 | 828.63 | 656.77 | 828.65 | 658.05 | 828.63 |
| 660.47 | 828.68 | 663.68 | 828.71 | 663.98 | 828.69 | 664.5 | 828.66 | 668.07 | 828.54 |
| 669.53 | 828.51 | 669.95 | 828.51 | 671.14 | 828.49 | 675.83 | 828.49 | 677.47 | 828.58 |
| 680.03 | 828.58 | 681.21 | 828.66 | 681.87 | 828.67 | 686.62 | 828.72 | 687.97 | 828.73 |
| 688.9 | 828.76 | 693.96 | 828.81 | 697.01 | 828.84 | 698.13 | 828.87 | 698.85 | 828.78 |
| 699.96 | 828.62 | 703.26 | 828.77 | 704.59 | 828.76 | 705.98 | 828.64 | 708.57 | 828.73 |
| 710.12 | 828.77 | 711.03 | 828.73 | 712 | 828.7 | 714.56 | 828.65 | 718.07 | 828.62 |
| 720.83 | 828.61 | 723.09 | 828.71 | 724.15 | 828.73 | 726.94 | 828.8 | 728.28 | 828.77 |
| 728.69 | 828.79 | 730.13 | 828.66 | 731.78 | 828.59 | 736.2 | 828.51 | 740.35 | 828.51 |
| 742.2 | 828.34 | 744.69 | 828.36 | 747.31 | 828.5 | 748.2 | 828.52 | 752.15 | 828.43 |

```
  752.54  828.42  754.22  828.43  754.33  828.44  754.64  828.44  758.57  828.56
  759.79  828.54  760.43  828.53   761.5  828.52  764.57  828.45  765.29  828.43
  766.53  828.37  768.86   828.4     772   828.4  772.66  828.42  775.62  828.38
  776.97  828.36  778.19  828.33  778.84  828.31  779.23  828.31  779.88  828.34
  784.96  828.41  786.94  828.41   789.1  828.35  790.77  828.37  791.01  828.37
  791.92  828.38   796.5  828.43  797.02  828.43  798.94  828.45  803.18   828.5
  805.92  828.56  809.34  828.65  813.32  828.74  814.95  828.77   815.3  828.78
  818.53  828.87   819.4  828.87  821.16  828.73  823.93  828.82  825.42  828.88
  826.05  828.85  827.27  828.93   830.2  829.07  831.44  829.08  832.35  829.05
  833.28  828.96  835.98  828.84  837.36  828.78  838.99  828.78  839.18  828.79
  840.08  828.77  845.06   828.8  848.27  829.12  849.17  829.18  850.17  829.22
  850.96  829.23   852.4  829.29     855  829.37  856.66  829.32  856.79  829.31
  856.87  829.31  860.84  829.57  861.89  829.62  862.61  829.63  863.21  829.64
   866.7  829.75  868.19  829.86  868.46  829.89  869.03  829.96  876.83  830.82
  879.25  831.01  882.65  831.45  885.84  831.57  885.96  831.57  886.17   831.6
  891.58  832.72  891.97  832.75  895.61  832.71  897.18  833.01  897.65  833.05
  901.18  833.05  901.31  833.06  904.82   833.4   906.6  833.66  909.57  833.91
  912.42  834.04  912.93   834.1  916.04  834.39   919.4  834.66  919.75   834.7
  920.57   834.7  923.55  834.88  924.87  834.98  926.38  835.13  929.49  835.43
   933.8  835.46  934.24  835.46

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013  191.05     .03  349.54      .1  407.14     .07  411.44     .06
  438.42     .07  440.53      .1  520.34    .013  531.91      .1  584.31    .035
  850.17      .1  934.24      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        407.14  438.42           111.44  106.45  103.86             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     200     395   829.1       F
     526     891  832.46       F

CROSS SECTION OUTPUT  Profile #2xHMMF


  E.G. Elev (ft)            825.16    Element                  Left OB    Channel
Right OB
  Vel Head (ft)               0.02    Wt. n-Val.                           0.061

  W.S. Elev (ft)            825.15    Reach Len. (ft)          111.44     106.45
 103.86
  Crit W.S. (ft)            824.04    Flow Area (sq ft)                    38.24

  E.G. Slope (ft/ft)      0.001118    Area (sq ft)                         38.24

  Q Total (cfs)               38.60    Flow (cfs)                           38.60

  Top Width (ft)              26.70    Top Width (ft)                       26.70
```

| | | | |
|---|---|---|---|
| Vel Total (ft/s) | 1.01 | Avg. Vel. (ft/s) | 1.01 |
| Max Chl Dpth (ft) | 1.71 | Hydr. Depth (ft) | 1.43 |
| Conv. Total (cfs) | 1154.2 | Conv. (cfs) | 1154.2 |
| Length Wtd. (ft) | 106.45 | Wetted Per. (ft) | 27.80 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.10 |
| Alpha | 1.00 | Stream Power (lb/ft s) | 0.10 |
| Frctn Loss (ft) | 0.12 | Cum Volume (acre-ft) | 0.15 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.11 |

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #2-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 829.49 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.03 | Wt. n-Val. | 0.042 | 0.062 | 0.098 |
| W.S. Elev (ft) | 829.45 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 826.29 | Flow Area (sq ft) | 210.10 | 168.73 | 135.49 |
| E.G. Slope (ft/ft) | 0.000716 | Area (sq ft) | 210.10 | 168.73 | 349.25 |
| Q Total (cfs) | 620.00 | Flow (cfs) | 215.15 | 318.06 | 86.79 |
| Top Width (ft) | 576.15 | Top Width (ft) | 188.12 | 31.28 | 356.76 |
| Vel Total (ft/s) | 1.21 | Avg. Vel. (ft/s) | 1.02 | 1.89 | 0.64 |
| Max Chl Dpth (ft) | 6.01 | Hydr. Depth (ft) | 1.12 | 5.39 | 2.00 |
| Conv. Total (cfs) | 23172.6 | Conv. (cfs) | 8041.1 | 11887.5 | 3243.9 |
| Length Wtd. (ft) | 107.36 | Wetted Per. (ft) | 189.29 | 33.74 | 68.29 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.05 | 0.22 | |

| | | | | | |
|---|---|---|---|---|---|
| 0.09 | | | | | |
| Alpha | 1.54 | Stream Power (lb/ft s) | 0.05 | 0.42 | |
| 0.06 | | | | | |
| Frctn Loss (ft) | 0.11 | Cum Volume (acre-ft) | 0.66 | 0.71 | |
| 0.83 | | | | | |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.67 | 0.14 | |
| 0.96 | | | | | |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.32 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.040 | 0.062 | 0.098 |
| W.S. Elev (ft) | 830.28 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 827.83 | Flow Area (sq ft) | 366.00 | 194.46 | 192.46 |
| E.G. Slope (ft/ft) | 0.000664 | Area (sq ft) | 366.00 | 194.46 | 667.56 |
| Q Total (cfs) | 1070.00 | Flow (cfs) | 536.10 | 388.09 | 145.81 |
| Top Width (ft) | 623.43 | Top Width (ft) | 190.96 | 31.28 | 401.19 |
| Vel Total (ft/s) | 1.42 | Avg. Vel. (ft/s) | 1.46 | 2.00 | 0.76 |
| Max Chl Dpth (ft) | 6.84 | Hydr. Depth (ft) | 1.92 | 6.22 | 2.73 |
| Conv. Total (cfs) | 41522.1 | Conv. (cfs) | 20803.8 | 15059.9 | 5658.4 |
| Length Wtd. (ft) | 107.94 | Wetted Per. (ft) | 192.26 | 33.74 | 71.10 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.08 | 0.24 | 0.11 |
| Alpha | 1.29 | Stream Power (lb/ft s) | 0.12 | 0.48 | 0.09 |
| Frctn Loss (ft) | 0.12 | Cum Volume (acre-ft) | 1.19 | 0.82 | 1.69 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.68 | 0.14 | |

1.19

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.
Note: Manning's n values were composited to a single value in the main channel.
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) | 830.49 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.040 | 0.062 | 0.098 |
| W.S. Elev (ft) | 830.45 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 828.03 | Flow Area (sq ft) | 398.68 | 199.80 | 204.57 |
| E.G. Slope (ft/ft) | 0.000657 | Area (sq ft) | 398.68 | 199.80 | 736.34 |
| Q Total (cfs) | 1180.00 | Flow (cfs) | 616.30 | 403.99 | 159.71 |
| Top Width (ft) | 626.90 | Top Width (ft) | 191.57 | 31.28 | 404.05 |
| Vel Total (ft/s) | 1.47 | Avg. Vel. (ft/s) | 1.55 | 2.02 | 0.78 |
| Max Chl Dpth (ft) | 7.01 | Hydr. Depth (ft) | 2.08 | 6.39 | 2.88 |
| Conv. Total (cfs) | 46020.6 | Conv. (cfs) | 24036.0 | 15756.0 | 6228.6 |
| Length Wtd. (ft) | 108.03 | Wetted Per. (ft) | 192.89 | 33.74 | 71.68 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.08 | 0.24 | 0.12 |
| Alpha | 1.26 | Stream Power (lb/ft s) | 0.13 | 0.49 | 0.09 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.31 | 0.84 | 1.89 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.69 | 0.14 | 1.21 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #25-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.92 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.040 | 0.062 | 0.098 |
| W.S. Elev (ft) | 830.87 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 828.44 | Flow Area (sq ft) | 480.73 | 213.15 | 235.23 |
| E.G. Slope (ft/ft) | 0.000633 | Area (sq ft) | 480.73 | 213.15 | 910.24 |
| Q Total (cfs) | 1465.00 | Flow (cfs) | 828.48 | 441.48 | 195.03 |
| Top Width (ft) | 635.31 | Top Width (ft) | 192.97 | 31.28 | 411.06 |
| Vel Total (ft/s) | 1.58 | Avg. Vel. (ft/s) | 1.72 | 2.07 | 0.83 |
| Max Chl Dpth (ft) | 7.43 | Hydr. Depth (ft) | 2.49 | 6.81 | 3.24 |
| Conv. Total (cfs) | 58233.6 | Conv. (cfs) | 32932.0 | 17549.0 | 7752.6 |
| Length Wtd. (ft) | 108.22 | Wetted Per. (ft) | 194.35 | 33.74 | 73.13 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.10 | 0.25 | 0.13 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.17 | 0.52 | 0.11 |
| Frctn Loss (ft) | 0.12 | Cum Volume (acre-ft) | 1.60 | 0.90 | 2.42 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.70 | 0.14 | 1.28 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #50-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 831.30 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.040 | 0.062 | 0.098 |
| W.S. Elev (ft) | 831.24 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 828.78 | Flow Area (sq ft) | 552.09 | 224.66 | 262.24 |
| E.G. Slope (ft/ft) | 0.000626 | Area (sq ft) | 552.09 | 224.66 | 1062.79 |
| Q Total (cfs) | 1740.00 | Flow (cfs) | 1033.58 | 479.15 | 227.27 |
| Top Width (ft) | 644.73 | Top Width (ft) | 195.28 | 31.28 | 418.17 |
| Vel Total (ft/s) | 1.67 | Avg. Vel. (ft/s) | 1.87 | 2.13 | 0.87 |
| Max Chl Dpth (ft) | 7.80 | Hydr. Depth (ft) | 2.83 | 7.18 | 3.50 |
| Conv. Total (cfs) | 69567.9 | Conv. (cfs) | 41324.3 | 19157.0 | 9086.6 |
| Length Wtd. (ft) | 108.35 | Wetted Per. (ft) | 196.71 | 33.74 | 75.62 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.11 | 0.26 | 0.14 |
| Alpha | 1.22 | Stream Power (lb/ft s) | 0.21 | 0.55 | 0.12 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.85 | 0.95 | 2.89 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.71 | 0.14 | 1.33 |

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.
Note:  Manning's n values were composited to a single value in the main channel.
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) | 831.59 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.039 | 0.062 | |

| | | | | | |
|---|---|---|---|---|---|
| 0.098 | | | | | |
| W.S. Elev (ft) | 831.53 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 829.17 | Flow Area (sq ft) | 607.96 | 233.58 | 284.08 |
| E.G. Slope (ft/ft) | 0.000641 | Area (sq ft) | 607.96 | 233.58 | 1182.99 |
| Q Total (cfs) | 2000.00 | Flow (cfs) | 1226.90 | 517.35 | 255.74 |
| Top Width (ft) | 653.82 | Top Width (ft) | 196.51 | 31.28 | 426.03 |
| Vel Total (ft/s) | 1.78 | Avg. Vel. (ft/s) | 2.02 | 2.21 | 0.90 |
| Max Chl Dpth (ft) | 8.09 | Hydr. Depth (ft) | 3.09 | 7.47 | 3.64 |
| Conv. Total (cfs) | 79022.7 | Conv. (cfs) | 48476.6 | 20441.3 | 10104.8 |
| Length Wtd. (ft) | 108.43 | Wetted Per. (ft) | 197.97 | 33.74 | 78.78 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.12 | 0.28 | 0.14 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.25 | 0.61 | 0.13 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 2.05 | 0.99 | 3.27 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.71 | 0.14 | 1.39 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 545.1257

INPUT
Description:
Station Elevation Data num= 497

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 834.56 | 2.59 | 834.64 | 2.98 | 834.65 | 3.42 | 834.66 | 6.59 | 834.79 |
| 14.07 | 834.9 | 20.59 | 835.19 | 25 | 835.78 | 25.3 | 835.78 | 30.33 | 835.8 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 31.09 | 835.82 | 34.68 | 836.03 | 36.23 | 835.92 | 36.42 | 835.92 | 40.34 | 835.98 |
| 41.58 | 835.97 | 41.84 | 835.99 | 42.43 | 835.98 | 48.72 | 835.97 | 51.24 | 835.87 |
| 52.16 | 835.83 | 54.76 | 835.72 | 56.87 | 835.51 | 57.39 | 835.39 | 58.55 | 835.25 |
| 60.21 | 834.95 | 69.67 | 834.27 | 77.73 | 833.03 | 83.36 | 833.52 | 89.24 | 833.57 |
| 91.35 | 833.49 | 92.14 | 833.47 | 93.68 | 833.39 | 96.23 | 833.13 | 97.73 | 833.15 |
| 97.92 | 833.13 | 98.92 | 833.07 | 101.84 | 832.84 | 102.68 | 832.78 | 103.67 | 832.73 |
| 105.05 | 832.69 | 107.46 | 832.58 | 109 | 832.52 | 109.25 | 832.5 | 109.62 | 832.52 |
| 113.02 | 832.47 | 113.17 | 832.45 | 120.4 | 832.16 | 120.42 | 832.16 | 123.91 | 832.25 |
| 125.56 | 832.33 | 130.52 | 832.65 | 135 | 832.22 | 135.71 | 832.15 | 135.74 | 832.14 |
| 135.8 | 832.14 | 147.04 | 831.57 | 147.79 | 831.55 | 148.28 | 831.41 | 149.78 | 831.32 |
| 152.77 | 831 | 153.53 | 830.86 | 154.2 | 830.74 | 157.7 | 830.04 | 158.21 | 829.97 |
| 158.53 | 829.92 | 159.47 | 829.78 | 163.42 | 829.18 | 163.79 | 829.19 | 169.74 | 829.26 |
| 173.31 | 829.04 | 176.37 | 828.89 | 182.09 | 828.73 | 182.74 | 828.83 | 187.72 | 829.36 |
| 192.47 | 828.69 | 200.72 | 829.06 | 208.28 | 829.09 | 210.13 | 829 | 214.83 | 829.12 |
| 218.49 | 829.18 | 223.71 | 828.8 | 225.86 | 828.63 | 229.93 | 828.77 | 233.82 | 828.42 |
| 235.45 | 828.19 | 239.95 | 827.75 | 243.14 | 827.88 | 243.7 | 827.89 | 245.06 | 827.95 |
| 248.94 | 828.08 | 249.48 | 828.07 | 252.99 | 828.36 | 253.82 | 828.45 | 259.55 | 828.18 |
| 262.68 | 827.88 | 264.21 | 827.94 | 264.69 | 828 | 266.96 | 828.1 | 269.68 | 828.32 |
| 271.12 | 828.5 | 271.49 | 828.5 | 272.28 | 828.56 | 278.43 | 828.5 | 283.72 | 828.59 |
| 287.73 | 828.49 | 288.26 | 828.49 | 292.22 | 828.35 | 292.29 | 828.35 | 292.37 | 828.34 |
| 293.85 | 828.15 | 294.36 | 828.16 | 297.75 | 828.21 | 298.03 | 828.21 | 299.51 | 828.12 |
| 301.73 | 828.11 | 303.54 | 828.13 | 304.85 | 828.08 | 305.08 | 828.06 | 307.61 | 828.02 |
| 310.29 | 827.9 | 310.8 | 827.92 | 311.89 | 828.01 | 314.89 | 828.15 | 315.52 | 828.21 |
| 316.54 | 828.18 | 319.26 | 828.11 | 320.65 | 828.14 | 321.48 | 828.01 | 322.32 | 827.94 |
| 325.96 | 828.18 | 326.42 | 828.18 | 326.87 | 828.2 | 327.77 | 828.18 | 330.32 | 828.49 |
| 333.77 | 827.99 | 335.39 | 827.76 | 337.97 | 828.86 | 338.01 | 828.94 | 339.82 | 826.54 |
| 340.42 | 825.6 | 342.39 | 827.13 | 342.86 | 824.13 | 343.56 | 824.09 | 349.28 | 823.83 |
| 350.77 | 823.8 | 361.33 | 823.58 | 371.76 | 823.35 | 371.82 | 823.55 | 374.28 | 824.94 |
| 379.35 | 827.04 | 407.06 | 828.78 | 427.33 | 829.98 | 452.06 | 831.44 | 456.72 | 831.47 |
| 461.46 | 831.5 | 462.46 | 831.51 | 462.61 | 831.49 | 465.2 | 831.37 | 466.64 | 831.03 |
| 467 | 831.01 | 468.59 | 830.75 | 471.04 | 830.28 | 471.95 | 830.17 | 472.74 | 829.95 |
| 473.81 | 829.8 | 477.72 | 829.35 | 483.11 | 829.32 | 485.23 | 829.32 | 488.78 | 828.76 |
| 490.92 | 828.81 | 495.92 | 828.88 | 496.05 | 828.88 | 496.14 | 828.89 | 496.18 | 828.89 |
| 496.66 | 828.86 | 500.35 | 828.69 | 500.75 | 828.66 | 504.25 | 828.77 | 508.03 | 828.85 |
| 512.44 | 828.98 | 513.48 | 828.98 | 513.79 | 828.99 | 514.83 | 828.97 | 518.13 | 828.79 |
| 523.55 | 828.52 | 523.75 | 828.5 | 524 | 828.49 | 524.17 | 828.49 | 525.69 | 828.4 |
| 528.42 | 828.41 | 529.94 | 828.49 | 531.22 | 828.37 | 531.55 | 828.33 | 532.97 | 828.39 |
| 535.83 | 828.56 | 536.66 | 828.54 | 537.57 | 828.56 | 539.79 | 828.3 | 541.88 | 828.19 |
| 543.03 | 828.15 | 543.59 | 828.12 | 544.93 | 828.13 | 547.89 | 828.21 | 548.64 | 828.13 |
| 549.42 | 828.08 | 553.16 | 828.13 | 553.79 | 828.12 | 553.92 | 828.12 | 555.5 | 827.93 |
| 556.91 | 827.95 | 559.71 | 828.05 | 560.98 | 827.99 | 561.56 | 828.01 | 562.87 | 828 |
| 565.73 | 828.02 | 566.65 | 828.01 | 567.45 | 827.96 | 569.74 | 828.01 | 572.38 | 827.93 |
| 573.34 | 827.91 | 575.74 | 828.17 | 578.62 | 828.32 | 579.41 | 828.28 | 582.56 | 828.38 |
| 583.74 | 828.44 | 584.28 | 828.44 | 585.49 | 828.34 | 589.35 | 828.18 | 591.41 | 828.13 |
| 596.37 | 828.23 | 597.39 | 828.27 | 598.52 | 828.31 | 601.7 | 828.38 | 603.24 | 828.39 |
| 603.3 | 828.38 | 609.24 | 828.43 | 609.46 | 828.43 | 613.59 | 828.68 | 614.35 | 828.74 |
| 615.44 | 828.78 | 618.54 | 828.68 | 620.88 | 828.6 | 621.43 | 828.56 | 624.62 | 828.61 |
| 625.69 | 828.63 | 625.82 | 828.61 | 627.44 | 828.43 | 629.97 | 828.38 | 631.8 | 828.48 |
| 632.47 | 828.52 | 635.03 | 828.57 | 637.71 | 828.66 | 639.45 | 828.62 | 639.51 | 828.63 |
| 639.73 | 828.63 | 643.81 | 828.75 | 645.42 | 828.75 | 645.58 | 828.76 | 647.2 | 828.74 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 649.95 | 828.7 | 650.38 | 828.68 | 651.67 | 828.63 | 653.75 | 828.6 | 655.87 | 828.6 |
| 657.45 | 828.59 | 657.65 | 828.59 | 658.09 | 828.61 | 663.64 | 828.62 | 663.74 | 828.62 |
| 664.08 | 828.63 | 667.94 | 828.75 | 669.6 | 828.62 | 669.75 | 828.62 | 673.95 | 828.87 |
| 674.09 | 828.87 | 675.74 | 828.82 | 676.83 | 828.82 | 681.14 | 828.73 | 681.9 | 828.77 |
| 684.52 | 828.91 | 686.22 | 828.92 | 687.2 | 828.97 | 688 | 829.1 | 690.4 | 829.09 |
| 692.26 | 829.13 | 693.88 | 829.18 | 694.13 | 829.19 | 697.39 | 829.26 | 698.67 | 829.3 |
| 700.27 | 829.36 | 701.71 | 829.34 | 705.06 | 829.39 | 708.67 | 829.46 | 711.58 | 829.56 |
| 712.6 | 829.61 | 713.31 | 829.65 | 717.93 | 829.95 | 722.37 | 830.09 | 722.65 | 830.11 |
| 723.58 | 830.15 | 726.27 | 830.26 | 729.01 | 830.4 | 730.32 | 830.43 | 730.86 | 830.48 |
| 732.33 | 830.49 | 735.31 | 830.5 | 736.66 | 830.5 | 737.03 | 830.58 | 737.25 | 830.57 |
| 742.33 | 831.1 | 749.29 | 831.17 | 754.99 | 831.08 | 758.09 | 831.31 | 759.83 | 831.36 |
| 761.49 | 831.37 | 765.2 | 831.84 | 765.78 | 831.91 | 768.21 | 832.02 | 773.44 | 832.32 |
| 776.44 | 832.29 | 777.02 | 832.34 | 782.35 | 832.09 | 784.43 | 832.36 | 786.72 | 832.66 |
| 789.66 | 832.82 | 793.25 | 833 | 796.27 | 833.07 | 797.42 | 833.15 | 800.43 | 833.35 |
| 801.39 | 833.45 | 802.1 | 833.47 | 803.24 | 833.53 | 806.23 | 833.91 | 807.23 | 834.01 |
| 810.93 | 834.16 | 812.04 | 834.17 | 813.78 | 834.1 | 817.35 | 834.41 | 817.72 | 834.42 |
| 819.4 | 834.52 | 821.16 | 834.6 | 824.48 | 834.68 | 825.18 | 834.73 | 827.12 | 834.77 |
| 829.09 | 834.9 | 830.31 | 834.81 | 830.73 | 834.78 | 834.51 | 835 | 834.78 | 835.01 |
| 835.04 | 835.02 | 836.52 | 835.06 | 839.49 | 835.09 | 840.35 | 835.13 | 841.94 | 835.22 |
| 842.06 | 835.22 | 842.87 | 835.24 | 847.12 | 835.34 | 847.59 | 835.35 | 850.47 | 835.47 |
| 851.47 | 835.44 | 851.92 | 835.44 | 853.04 | 835.42 | 857.07 | 835.56 | 857.08 | 835.56 |
| 858.54 | 835.65 | 859.27 | 835.66 | 862.66 | 835.69 | 864.13 | 835.64 | 864.38 | 835.64 |
| 868.55 | 835.79 | 869.77 | 835.83 | 872.03 | 835.74 | 874.92 | 835.7 | 878.74 | 835.91 |
| 878.92 | 835.9 | 878.95 | 835.9 | 880.39 | 835.67 | 883.74 | 835.48 | 885.68 | 835.31 |
| 889.11 | 835.12 | 891.27 | 835.01 | 892.12 | 834.97 | 894.86 | 835.12 | 896.07 | 835.04 |
| 896.56 | 835.06 | 897.48 | 835.14 | 900.24 | 835.43 | 902.16 | 835.54 | 905.76 | 835.76 |
| 910.04 | 835.96 | 912.24 | 836.15 | 916 | 836.66 | 916.66 | 836.73 | 917.93 | 836.73 |
| 919.12 | 836.71 | 921.73 | 836.92 | 922.47 | 836.92 | 924.88 | 837.22 | 928.02 | 837.06 |
| 929.63 | 837.33 | 933.16 | 838.3 | 936.11 | 839.19 | 939.63 | 839.76 | 942.57 | 840.34 |
| 943.74 | 840.56 | 945.77 | 840.98 | 948.76 | 841.61 | 949.61 | 841.87 | 952.25 | 842.43 |
| 953.57 | 842.55 | 954.34 | 842.63 | 955.93 | 842.89 | 960.09 | 843.84 | 960.25 | 843.87 |
| 960.64 | 843.97 | 968.39 | 845.24 | 969.76 | 845.46 | 970.83 | 845.63 | 972.38 | 846.14 |
| 974.61 | 846.8 | 975.58 | 846.96 | 977.6 | 847.33 | 979.93 | 847.48 | 983.98 | 848.08 |
| 985.27 | 848.35 | 986.27 | 848.76 | 989.68 | 849.51 | 993.21 | 850.33 | 995.91 | 850.9 |
| 996.36 | 850.93 | 997.27 | 851.14 | 1001.07 | 852.19 | 1004.1 | 853.34 | 1006.36 | 854.03 |
| 1012.45 | 855.56 | 1013.54 | 855.77 | 1020.29 | 856.1 | 1022.19 | 855.93 | 1023.73 | 856.06 |
| 1026.29 | 856.29 | 1028.73 | 856.55 | 1030.44 | 856.71 | 1035.65 | 857.34 | 1037.95 | 857.73 |
| 1040.91 | 857.95 | 1044.34 | 858.34 | 1046.43 | 858.49 | 1053.17 | 859.26 | 1058.5 | 860.19 |
| 1064.29 | 860.12 | 1068.84 | 860.34 | 1072.23 | 860.9 | 1074.42 | 861.29 | 1084.7 | 862.22 |
| 1089.34 | 862.6 | 1090.78 | 862.71 | 1097.41 | 863.36 | 1098.17 | 863.5 | 1110.09 | 864.83 |
| 1113.04 | 865.27 | 1115.69 | 865.68 | 1118.35 | 866.07 | 1121.42 | 866.65 | 1123.47 | 867.02 |
| 1125.44 | 867.71 | 1126.79 | 867.97 | 1130.76 | 868.51 | 1136.15 | 868.65 | 1136.41 | 868.66 |
| 1136.74 | 868.66 | 1136.78 | 868.67 | 1142.24 | 869.26 | 1144.57 | 869.64 | 1149.06 | 869.73 |
| 1150.88 | 869.82 | 1153.02 | 869.96 | 1157.05 | 870.4 | 1159.92 | 870.86 | 1163.91 | 870.94 |
| 1165.89 | 870.57 | 1167.19 | 870.68 | 1177.05 | 871.86 | 1180.83 | 872.07 | 1183 | 872.17 |
| 1190.26 | 872.37 | 1191.27 | 872.47 | 1192.48 | 872.44 | 1205.65 | 873.38 | 1206.05 | 873.44 |
| 1208.67 | 873.86 | 1261.29 | 874.02 | 1262.86 | 874.28 | 1265.34 | 874.22 | 1265.6 | 874.1 |
| 1268.11 | 874.25 | 1269.72 | 874.37 | | | | | | |

Manning's n Values num= 13

| Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|---|---|---|---|
| 0 | .03 | 93.68 | .1 | 338.01 | .07 | 349.28 | .06 | 374.28 | .07 |
| 379.35 | .1 | 452.06 | .013 | 461.46 | .1 | 514.83 | .035 | 713.31 | .1 |
| 817.35 | .013 | 885.68 | .1 | 1269.72 | .1 | | | | |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 338.01 | 379.35 | 46.6 | 52.81 | 53.82 | .1 | .3 |

Ineffective Flow num= 4

| Sta L | Sta R | Elev | Permanent |
|---|---|---|---|
| 59 | 93 | 855 | T |
| 190 | 239 | 850 | T |
| 239 | 338 | 829.1 | F |
| 460 | 775 | 831.9 | F |

CROSS SECTION OUTPUT Profile #2xHMMF

| | | | | |
|---|---|---|---|---|
| E.G. Elev (ft) | 825.04 | Element | Left OB | Channel |
| Right OB | | | | |
| Vel Head (ft) | 0.01 | Wt. n-Val. | | 0.062 |
| W.S. Elev (ft) | 825.02 | Reach Len. (ft) | 46.60 | 52.81 |
| 53.82 | | | | |
| Crit W.S. (ft) | 824.04 | Flow Area (sq ft) | | 40.96 |
| E.G. Slope (ft/ft) | 0.001176 | Area (sq ft) | | 40.96 |
| Q Total (cfs) | 38.60 | Flow (cfs) | | 38.60 |
| Top Width (ft) | 31.76 | Top Width (ft) | | 31.76 |
| Vel Total (ft/s) | 0.94 | Avg. Vel. (ft/s) | | 0.94 |
| Max Chl Dpth (ft) | 1.67 | Hydr. Depth (ft) | | 1.29 |
| Conv. Total (cfs) | 1125.7 | Conv. (cfs) | | 1125.7 |
| Length Wtd. (ft) | 52.81 | Wetted Per. (ft) | | 33.07 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | | 0.09 |
| Alpha | 1.00 | Stream Power (lb/ft s) | | 0.09 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | | 0.06 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | | 0.04 |

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: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #2-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 829.37 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.09 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 829.28 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 826.05 | Flow Area (sq ft) | 112.85 | 203.53 | 40.13 |
| E.G. Slope (ft/ft) | 0.001772 | Area (sq ft) | 134.62 | 203.53 | 197.38 |
| Q Total (cfs) | 620.00 | Flow (cfs) | 70.87 | 522.27 | 26.86 |
| Top Width (ft) | 464.10 | Top Width (ft) | 173.97 | 41.34 | 248.79 |
| Vel Total (ft/s) | 1.74 | Avg. Vel. (ft/s) | 0.63 | 2.57 | 0.67 |
| Max Chl Dpth (ft) | 5.93 | Hydr. Depth (ft) | 0.90 | 4.92 | 1.11 |
| Conv. Total (cfs) | 14729.6 | Conv. (cfs) | 1683.7 | 12407.7 | 638.2 |
| Length Wtd. (ft) | 50.92 | Wetted Per. (ft) | 125.52 | 47.09 | 36.25 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.10 | 0.48 | 0.12 |
| Alpha | 1.86 | Stream Power (lb/ft s) | 0.06 | 1.23 | 0.08 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.22 | 0.25 | 0.18 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 0.20 | 0.05 | 0.23 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #5-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.18 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.13 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.05 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 827.04 | Flow Area (sq ft) | 212.10 | 235.40 | 73.05 |
| E.G. Slope (ft/ft) | 0.002466 | Area (sq ft) | 271.65 | 235.40 | 412.77 |
| Q Total (cfs) | 1070.00 | Flow (cfs) | 214.72 | 785.23 | 70.06 |
| Top Width (ft) | 519.74 | Top Width (ft) | 180.37 | 41.34 | 298.02 |
| Vel Total (ft/s) | 2.06 | Avg. Vel. (ft/s) | 1.01 | 3.34 | 0.96 |
| Max Chl Dpth (ft) | 6.70 | Hydr. Depth (ft) | 1.61 | 5.69 | 1.48 |
| Conv. Total (cfs) | 21547.1 | Conv. (cfs) | 4323.8 | 15812.5 | 1410.8 |
| Length Wtd. (ft) | 50.28 | Wetted Per. (ft) | 131.99 | 47.09 | 49.30 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.25 | 0.77 | 0.23 |
| Alpha | 2.00 | Stream Power (lb/ft s) | 0.25 | 2.57 | 0.22 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.38 | 0.29 | 0.40 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.21 | 0.05 | 0.35 |

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.
Note:  Manning's n values were composited to a single value in the main channel.
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) | 830.36 | Element | Left OB | Channel | Right OB |

| | | | | | |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.14 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.22 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 827.25 | Flow Area (sq ft) | 233.67 | 242.17 | 81.33 |
| E.G. Slope (ft/ft) | 0.002573 | Area (sq ft) | 301.23 | 242.17 | 462.16 |
| Q Total (cfs) | 1180.00 | Flow (cfs) | 256.65 | 840.84 | 82.51 |
| Top Width (ft) | 528.15 | Top Width (ft) | 181.19 | 41.34 | 305.61 |
| Vel Total (ft/s) | 2.12 | Avg. Vel. (ft/s) | 1.10 | 3.47 | 1.01 |
| Max Chl Dpth (ft) | 6.87 | Hydr. Depth (ft) | 1.77 | 5.86 | 1.56 |
| Conv. Total (cfs) | 23263.5 | Conv. (cfs) | 5059.8 | 16577.0 | 1626.7 |
| Length Wtd. (ft) | 50.18 | Wetted Per. (ft) | 132.83 | 47.09 | 52.08 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.28 | 0.83 | 0.25 |
| Alpha | 1.99 | Stream Power (lb/ft s) | 0.31 | 2.87 | 0.25 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.41 | 0.30 | 0.46 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.21 | 0.05 | 0.36 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #25-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.79 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.15 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.63 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 827.79 | Flow Area (sq ft) | 289.19 | 259.39 | 104.46 |

| | | | | | |
|---|---|---|---|---|---|
| E.G. Slope (ft/ft) | 0.002738 | Area (sq ft) | 377.18 | 259.39 | 594.03 |
| Q Total (cfs) | 1465.00 | Flow (cfs) | 373.71 | 972.62 | 118.67 |
| Top Width (ft) | 552.31 | Top Width (ft) | 183.28 | 41.34 | 327.69 |
| Vel Total (ft/s) | 2.24 | Avg. Vel. (ft/s) | 1.29 | 3.75 | 1.14 |
| Max Chl Dpth (ft) | 7.28 | Hydr. Depth (ft) | 2.15 | 6.27 | 1.77 |
| Conv. Total (cfs) | 27999.3 | Conv. (cfs) | 7142.5 | 18588.9 | 2268.0 |
| Length Wtd. (ft) | 49.98 | Wetted Per. (ft) | 134.95 | 47.09 | 59.15 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.37 | 0.94 | 0.30 |
| Alpha | 1.96 | Stream Power (lb/ft s) | 0.47 | 3.53 | 0.34 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.50 | 0.32 | 0.62 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.21 | 0.05 | 0.40 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 831.16 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.17 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.99 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 828.26 | Flow Area (sq ft) | 337.76 | 274.24 | 126.76 |
| E.G. Slope (ft/ft) | 0.002868 | Area (sq ft) | 443.35 | 274.24 | 713.81 |
| Q Total (cfs) | 1740.00 | Flow (cfs) | 490.71 | 1092.23 | 157.06 |
| Top Width (ft) | 565.85 | Top Width (ft) | 185.20 | 41.34 | 339.31 |

| | | | | | |
|---|---|---|---|---|---|
| Vel Total (ft/s) | 2.36 | Avg. Vel. (ft/s) | 1.45 | 3.98 | 1.24 |
| Max Chl Dpth (ft) | 7.64 | Hydr. Depth (ft) | 2.48 | 6.63 | 1.95 |
| Conv. Total (cfs) | 32492.3 | Conv. (cfs) | 9163.4 | 20396.0 | 2932.8 |
| Length Wtd. (ft) | 49.83 | Wetted Per. (ft) | 136.91 | 47.09 | 65.24 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.44 | 1.04 | 0.35 |
| Alpha | 1.93 | Stream Power (lb/ft s) | 0.64 | 4.15 | 0.43 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.58 | 0.34 | 0.77 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.22 | 0.05 | 0.43 |

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.
Note: Manning's n values were composited to a single value in the main channel.
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) | 831.44 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.18 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 831.26 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 828.69 | Flow Area (sq ft) | 374.75 | 285.37 | 144.91 |
| E.G. Slope (ft/ft) | 0.003076 | Area (sq ft) | 493.53 | 285.37 | 808.08 |
| Q Total (cfs) | 2000.00 | Flow (cfs) | 597.05 | 1208.65 | 194.31 |
| Top Width (ft) | 590.48 | Top Width (ft) | 187.68 | 41.34 | 361.46 |
| Vel Total (ft/s) | 2.48 | Avg. Vel. (ft/s) | 1.59 | 4.24 | 1.34 |
| Max Chl Dpth (ft) | 7.91 | Hydr. Depth (ft) | 2.70 | 6.90 | 2.08 |
| Conv. Total (cfs) | 36063.2 | Conv. (cfs) | 10765.7 | 21793.9 | 3503.7 |

| | | | | | |
|---|---|---|---|---|---|
| Length Wtd. (ft) | 49.74 | Wetted Per. (ft) | 139.41 | 47.09 | 69.81 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.52 | 1.16 | 0.40 |
| Alpha | 1.91 | Stream Power (lb/ft s) | 0.82 | 4.93 | 0.53 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.64 | 0.35 | 0.89 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 0.22 | 0.05 | 0.46 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 492.3110

INPUT
Description:
Station Elevation Data num= 399

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 834.39 | 1.35 | 834.33 | 1.77 | 834.31 | 2.54 | 834.34 | 5.02 | 834.43 |
| 5.98 | 834.46 | 8.57 | 834.53 | 12.06 | 834.58 | 24.38 | 834.78 | 125 | 832.23 |
| 125.86 | 832.23 | 129.82 | 831.86 | 130.64 | 831.85 | 132.34 | 831.45 | 135.5 | 831.05 |
| 136.25 | 830.79 | 146.31 | 830.59 | 150.08 | 830.39 | 151.64 | 829.95 | 152.92 | 829.6 |
| 153.69 | 829.55 | 155.56 | 829.28 | 158.79 | 828.88 | 159.87 | 828.71 | 164.47 | 828.29 |
| 165.33 | 828.27 | 168.46 | 828.13 | 169.04 | 828.06 | 170.16 | 827.95 | 172.72 | 827.74 |
| 174.6 | 827.66 | 175.77 | 827.64 | 177.71 | 827.65 | 179.66 | 827.68 | 180.14 | 827.68 |
| 181.2 | 827.61 | 182.75 | 827.64 | 185.34 | 827.55 | 186.63 | 827.43 | 186.79 | 827.44 |
| 187.04 | 827.45 | 190.8 | 827.69 | 191.39 | 827.68 | 192.42 | 827.78 | 193.71 | 827.82 |
| 197.84 | 827.59 | 198.02 | 827.59 | 200.42 | 827.64 | 201.85 | 827.69 | 201.96 | 827.71 |
| 203.62 | 827.97 | 206.47 | 828.13 | 208.65 | 827.9 | 209.33 | 827.89 | 214.61 | 828.2 |
| 215.35 | 828.14 | 218.81 | 827.88 | 219.78 | 827.93 | 221.05 | 827.97 | 224.59 | 828.08 |
| 226.03 | 828.09 | 226.28 | 828.09 | 230.73 | 827.99 | 233.62 | 828.08 | 235.67 | 828.13 |
| 236.95 | 828.15 | 237.14 | 828.16 | 237.5 | 828.17 | 241.3 | 828.28 | 242 | 828.26 |
| 242.89 | 828.24 | 246.71 | 828.21 | 246.78 | 828.2 | 246.87 | 828.21 | 252.33 | 828.13 |
| 255.58 | 828 | 257.97 | 827.95 | 262.08 | 827.94 | 263.66 | 827.88 | 263.97 | 827.87 |
| 267.6 | 827.79 | 269.39 | 827.73 | 270.97 | 827.68 | 276.47 | 827.68 | 278.49 | 827.79 |
| 281.04 | 827.83 | 282.01 | 827.86 | 285.15 | 827.81 | 286.45 | 827.8 | 287.59 | 827.94 |
| 291.73 | 827.83 | 291.9 | 827.84 | 292.14 | 827.85 | 293.31 | 827.91 | 293.77 | 827.91 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 297.41 | 827.89 | 297.55 | 827.89 | 298.93 | 827.92 | 302.75 | 827.77 | 303.06 | 827.76 |
| 303.35 | 827.76 | 305.3 | 827.78 | 307.21 | 827.82 | 309.27 | 827.86 | 309.94 | 827.83 |
| 310.2 | 827.84 | 310.83 | 827.85 | 314.45 | 828.06 | 315.72 | 828.01 | 315.94 | 828 |
| 316.42 | 827.99 | 320.94 | 827.86 | 321.69 | 827.78 | 325.26 | 827.85 | 325.85 | 827.86 |
| 326.03 | 827.85 | 327.5 | 827.84 | 329.99 | 827.85 | 331.64 | 827.88 | 333.21 | 828 |
| 333.3 | 828.01 | 334.08 | 827.98 | 337.34 | 827.9 | 337.87 | 827.93 | 341.96 | 827.76 |
| 344.79 | 827.68 | 345.67 | 827.7 | 349.79 | 827.93 | 350.64 | 827.95 | 353.26 | 828.16 |
| 354.6 | 828.26 | 355.05 | 828.32 | 356.25 | 828.5 | 358.33 | 829.15 | 359.66 | 828.85 |
| 359.78 | 828.82 | 361.75 | 828.38 | 362.99 | 827.08 | 366.71 | 823.68 | 368.06 | 823.76 |
| 376.48 | 823.36 | 376.59 | 823.35 | 387.72 | 822.82 | 390.68 | 822.68 | 394.2 | 822.61 |
| 399 | 826.03 | 400.8 | 827.26 | 413.83 | 828.41 | 445.92 | 830.56 | 458.72 | 831.42 |
| 465.05 | 831.45 | 469.24 | 831.48 | 469.26 | 831.48 | 469.38 | 831.47 | 469.57 | 831.46 |
| 469.69 | 831.46 | 469.97 | 831.44 | 470.22 | 831.43 | 470.92 | 831.39 | 471.05 | 831.38 |
| 471.51 | 831.35 | 472.29 | 831.28 | 472.81 | 831.26 | 475.06 | 830.73 | 476.87 | 830.36 |
| 477.63 | 830.04 | 478.53 | 829.9 | 481.88 | 829.73 | 482.84 | 829.69 | 484.06 | 829.52 |
| 484.34 | 829.51 | 484.78 | 829.49 | 489.27 | 829.22 | 490.33 | 829.06 | 492.66 | 828.73 |
| 495.02 | 828.26 | 496.09 | 827.76 | 501.13 | 828.19 | 506.14 | 828.62 | 506.98 | 828.55 |
| 507.83 | 828.52 | 509.38 | 828.56 | 512.07 | 828.61 | 513.32 | 828.6 | 513.78 | 828.58 |
| 518.03 | 828.6 | 518.08 | 828.59 | 518.33 | 828.58 | 519.54 | 828.55 | 520.99 | 828.48 |
| 523.89 | 828.36 | 524.53 | 828.29 | 525.46 | 828.23 | 526.14 | 828.24 | 529.77 | 828.33 |
| 530.53 | 828.25 | 531.42 | 828.19 | 532.53 | 828.23 | 535.7 | 828.37 | 536.43 | 828.4 |
| 537.28 | 828.32 | 540.86 | 828.4 | 541.58 | 828.39 | 541.79 | 828.38 | 543.29 | 828.3 |
| 547.18 | 828.45 | 547.65 | 828.48 | 548.61 | 828.47 | 549.22 | 828.48 | 549.61 | 828.49 |
| 553.66 | 828.6 | 553.67 | 828.6 | 555.16 | 828.63 | 557.14 | 828.81 | 559.56 | 829.01 |
| 561.04 | 828.96 | 561.62 | 828.97 | 565.49 | 829.14 | 565.5 | 829.14 | 567.29 | 829.26 |
| 571.16 | 829.27 | 571.94 | 829.21 | 573.18 | 829.11 | 575.48 | 829.15 | 577.63 | 829.21 |
| 579 | 829.19 | 579.08 | 829.18 | 579.31 | 829.17 | 583.62 | 829.19 | 585.1 | 829.21 |
| 585.3 | 829.21 | 589.48 | 829.05 | 591.13 | 829.21 | 591.2 | 829.22 | 591.7 | 829.24 |
| 595.46 | 829.36 | 595.98 | 829.42 | 597.13 | 829.4 | 599.25 | 829.45 | 601.34 | 829.46 |
| 602.18 | 829.47 | 603.1 | 829.48 | 606.79 | 829.72 | 607.43 | 829.73 | 607.8 | 829.74 |
| 609.01 | 829.8 | 612.96 | 830.03 | 613.39 | 829.97 | 613.67 | 829.97 | 619.92 | 829.72 |
| 621.13 | 829.8 | 623.95 | 829.71 | 628.03 | 829.45 | 634.06 | 829.99 | 637.52 | 830.01 |
| 638.92 | 830.17 | 640.38 | 830.25 | 643.33 | 830.57 | 645.04 | 830.66 | 646.27 | 830.84 |
| 649.54 | 830.89 | 653.64 | 831.14 | 655.68 | 831.17 | 656.64 | 831.26 | 657.36 | 831.26 |
| 660.56 | 830.57 | 663.05 | 830.06 | 663.31 | 830 | 667.14 | 829.52 | 667.64 | 829.51 |
| 669.39 | 829.56 | 669.41 | 829.56 | 673.63 | 830.01 | 675.3 | 829.83 | 675.41 | 829.85 |
| 675.5 | 829.85 | 679.68 | 830.35 | 679.75 | 830.33 | 681.4 | 830.43 | 682.82 | 830.61 |
| 685.88 | 830.88 | 686.69 | 830.95 | 687.56 | 831.07 | 689.76 | 831.19 | 691.91 | 831.24 |
| 695.53 | 831.39 | 697.96 | 831.55 | 699.25 | 831.65 | 699.79 | 831.71 | 703.79 | 831.96 |
| 704.28 | 831.99 | 705.93 | 832.02 | 705.94 | 832.02 | 710.37 | 832.08 | 711.73 | 832.21 |
| 712.13 | 832.24 | 716.03 | 832.31 | 716.41 | 832.32 | 718.25 | 832.32 | 721.63 | 832.47 |
| 722.51 | 832.5 | 724.21 | 832.64 | 724.64 | 832.65 | 728.74 | 832.73 | 730.26 | 832.81 |
| 730.34 | 832.81 | 731.02 | 832.82 | 734.67 | 832.83 | 735.07 | 832.83 | 736.49 | 832.82 |
| 740.56 | 832.9 | 740.74 | 832.9 | 740.88 | 832.89 | 742.65 | 832.84 | 745.07 | 832.92 |
| 746.75 | 833.02 | 747.19 | 833 | 748.61 | 833.02 | 752.46 | 833.03 | 752.67 | 833.04 |
| 752.79 | 833.02 | 754.5 | 832.87 | 757.03 | 832.99 | 758.86 | 833.03 | 759.63 | 833.1 |
| 762.15 | 833.12 | 764.89 | 833.19 | 765.82 | 833.14 | 766.61 | 833.06 | 769.37 | 833.15 |
| 770.81 | 833.13 | 772.51 | 833.07 | 772.53 | 833.07 | 772.54 | 833.06 | 778.38 | 832.84 |
| 782.44 | 832.95 | 782.6 | 832.95 | 782.74 | 832.92 | 784.3 | 832.48 | 787.27 | 832.51 |
| 788.44 | 832.45 | 789.17 | 832.41 | 790.12 | 832.26 | 790.98 | 832.21 | 794.27 | 831.85 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 795.63 | 831.51 | 798.54 | 831.32 | 800.11 | 831.29 | 800.78 | 831.08 | 801.75 | 830.88 |
| 802.27 | 830.83 | 805.93 | 831.13 | 806.37 | 831.06 | 807.57 | 830.93 | 809.99 | 830.89 |
| 812.86 | 830.49 | 813.48 | 830.36 | 815.89 | 830.27 | 817.5 | 830.28 | 819.12 | 830.28 |
| 821.89 | 830.26 | 824.81 | 829.94 | 827.35 | 829.88 | 829.51 | 829.77 | 830.57 | 829.77 |
| 832.11 | 829.7 | 834.51 | 829.61 | 835.98 | 829.51 | 836.32 | 829.51 | 841.15 | 829.8 |
| 845.92 | 829.49 | 856.83 | 829.8 | 856.85 | 829.8 | 858.39 | 829.66 | 860.02 | 829.74 |
| 862.45 | 829.73 | 863.61 | 829.7 | 863.88 | 829.72 | 866.64 | 829.77 | 868.02 | 829.8 |
| 869.53 | 829.8 | 874.51 | 829.72 | 874.97 | 829.7 | 875.1 | 829.71 | 875.48 | 829.75 |
| 878.82 | 830.06 | 879.55 | 829.99 | 880.26 | 829.97 | 884.56 | 830.13 | 885.59 | 830.2 |
| 885.73 | 830.23 | 885.96 | 830.22 | 890.95 | 830.34 | 893.54 | 831.17 | 894.35 | 831.14 |
| 897.91 | 831.25 | 901.17 | 831.56 | 902.88 | 831.63 | 907.63 | 831.79 | | |

Manning's n Values num= 13

| Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|---|---|---|---|
| 0 | .03 | 327.5 | .1 | 359.78 | .07 | 366.71 | .06 | 390.68 | .07 |
| 400.8 | .1 | 458.72 | .013 | 471.51 | .1 | 513.78 | .035 | 649.54 | .1 |
| 703.79 | .013 | 782.74 | .1 | 907.63 | .1 | | | | |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 359.78 | 400.8 | 0 | 0 | 0 | .1 | .3 |

Ineffective Flow num= 2

| Sta L | Sta R | Elev | Permanent |
|---|---|---|---|
| 465 | 705 | 831.8 | F |
| 765 | 907.82 | 833.2 | T |

CROSS SECTION OUTPUT Profile #2xHMMF

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 825.00 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.01 | Wt. n-Val. | | 0.063 | |
| W.S. Elev (ft) | 824.99 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 823.47 | Flow Area (sq ft) | | 54.99 | |
| E.G. Slope (ft/ft) | 0.000458 | Area (sq ft) | | 54.99 | |
| Q Total (cfs) | 38.60 | Flow (cfs) | | 38.60 | |
| Top Width (ft) | 32.27 | Top Width (ft) | | 32.27 | |
| Vel Total (ft/s) | 0.70 | Avg. Vel. (ft/s) | | 0.70 | |
| Max Chl Dpth (ft) | 2.38 | Hydr. Depth (ft) | | 1.70 | |
| Conv. Total (cfs) | 1804.5 | Conv. (cfs) | | 1804.5 | |
| Length Wtd. (ft) | | Wetted Per. (ft) | | 33.57 | |

| | | | |
|---|---|---|---|
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.05 |
| Alpha | 1.00 | Stream Power (lb/ft s) | 0.03 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | |
| C & E Loss (ft) | | Cum SA (acres) | |

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #2-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 829.31 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.03 | Wt. n-Val. | 0.033 | 0.065 | 0.100 |
| W.S. Elev (ft) | 829.28 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 825.56 | Flow Area (sq ft) | 271.13 | 214.43 | 24.58 |
| E.G. Slope (ft/ft) | 0.000458 | Area (sq ft) | 271.13 | 214.43 | 87.59 |
| Q Total (cfs) | 620.00 | Flow (cfs) | 311.61 | 300.89 | 7.50 |
| Top Width (ft) | 376.21 | Top Width (ft) | 204.25 | 41.02 | 130.94 |
| Vel Total (ft/s) | 1.22 | Avg. Vel. (ft/s) | 1.15 | 1.40 | 0.31 |
| Max Chl Dpth (ft) | 6.67 | Hydr. Depth (ft) | 1.33 | 5.23 | 0.94 |
| Conv. Total (cfs) | 28974.6 | Conv. (cfs) | 14562.5 | 14061.7 | 350.4 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 204.66 | 44.45 | 26.15 |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.04 | 0.14 | 0.03 |
| Alpha | 1.10 | Stream Power (lb/ft s) | 0.04 | 0.19 | 0.01 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.11 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.034 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.07 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 826.56 | Flow Area (sq ft) | 434.42 | 246.83 | 49.82 |
| E.G. Slope (ft/ft) | 0.000458 | Area (sq ft) | 434.42 | 246.83 | 240.86 |
| Q Total (cfs) | 1070.00 | Flow (cfs) | 670.67 | 380.34 | 18.98 |
| Top Width (ft) | 521.82 | Top Width (ft) | 208.58 | 41.02 | 272.22 |
| Vel Total (ft/s) | 1.46 | Avg. Vel. (ft/s) | 1.54 | 1.54 | 0.38 |
| Max Chl Dpth (ft) | 7.46 | Hydr. Depth (ft) | 2.08 | 6.02 | 1.32 |
| Conv. Total (cfs) | 50012.1 | Conv. (cfs) | 31347.4 | 17777.4 | 887.3 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 209.08 | 44.45 | 37.97 |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.06 | 0.16 | 0.04 |
| Alpha | 1.09 | Stream Power (lb/ft s) | 0.09 | 0.24 | 0.01 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
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) | 830.28 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.034 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.24 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 826.79 | Flow Area (sq ft) | 469.23 | 253.66 | 56.34 |
| E.G. Slope (ft/ft) | 0.000457 | Area (sq ft) | 469.23 | 253.66 | 287.22 |
| Q Total (cfs) | 1180.00 | Flow (cfs) | 760.02 | 397.67 | 22.31 |
| Top Width (ft) | 534.90 | Top Width (ft) | 209.17 | 41.02 | 284.71 |
| Vel Total (ft/s) | 1.51 | Avg. Vel. (ft/s) | 1.62 | 1.57 | 0.40 |
| Max Chl Dpth (ft) | 7.63 | Hydr. Depth (ft) | 2.24 | 6.18 | 1.40 |
| Conv. Total (cfs) | 55207.5 | Conv. (cfs) | 35558.2 | 18605.4 | 1043.9 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 209.69 | 44.45 | 40.46 |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.06 | 0.16 | 0.04 |
| Alpha | 1.10 | Stream Power (lb/ft s) | 0.10 | 0.26 | 0.02 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #25-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.71 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.034 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.66 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 827.31 | Flow Area (sq ft) | 558.42 | 270.96 | 74.68 |
| E.G. Slope (ft/ft) | 0.000457 | Area (sq ft) | 558.42 | 270.96 | |

| | | | | |
|---|---|---|---|---|
| 416.54 | | | | |
| Q Total (cfs) | 1465.00 | Flow (cfs) | 988.45 | 444.13 |
| 32.42 | | | | |
| Top Width (ft) | 578.01 | Top Width (ft) | 217.09 | 41.02 |
| 319.90 | | | | |
| Vel Total (ft/s) | 1.62 | Avg. Vel. (ft/s) | 1.77 | 1.64 |
| 0.43 | | | | |
| Max Chl Dpth (ft) | 8.05 | Hydr. Depth (ft) | 2.57 | 6.61 |
| 1.60 | | | | |
| Conv. Total (cfs) | 68506.0 | Conv. (cfs) | 46221.4 | 20768.3 |
| 1516.2 | | | | |
| Length Wtd. (ft) | | Wetted Per. (ft) | 217.64 | 44.45 |
| 46.76 | | | | |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.07 | 0.17 |
| 0.05 | | | | |
| Alpha | 1.12 | Stream Power (lb/ft s) | 0.13 | 0.29 |
| 0.02 | | | | |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | |
| C & E Loss (ft) | | Cum SA (acres) | | |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-yr

| | | | | |
|---|---|---|---|---|
| E.G. Elev (ft) | 831.08 | Element | Left OB | Channel |
| Right OB | | | | |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.034 | 0.065 |
| 0.100 | | | | |
| W.S. Elev (ft) | 831.03 | Reach Len. (ft) | | |
| Crit W.S. (ft) | 828.59 | Flow Area (sq ft) | 639.36 | 285.88 |
| 92.62 | | | | |
| E.G. Slope (ft/ft) | 0.000458 | Area (sq ft) | 639.36 | 285.88 |
| 537.50 | | | | |
| Q Total (cfs) | 1740.00 | Flow (cfs) | 1211.09 | 485.75 |
| 43.16 | | | | |
| Top Width (ft) | 614.04 | Top Width (ft) | 224.21 | 41.02 |
| 348.81 | | | | |
| Vel Total (ft/s) | 1.71 | Avg. Vel. (ft/s) | 1.89 | 1.70 |
| 0.47 | | | | |
| Max Chl Dpth (ft) | 8.42 | Hydr. Depth (ft) | 2.85 | 6.97 |
| 1.78 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Conv. Total (cfs) | 81342.6 | Conv. (cfs) | 56616.8 | 22708.3 | 2017.5 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 224.80 | 44.45 | 52.19 |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.08 | 0.18 | 0.05 |
| Alpha | 1.13 | Stream Power (lb/ft s) | 0.15 | 0.31 | 0.02 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
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) | 831.36 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.034 | 0.065 | 0.100 |
| W.S. Elev (ft) | 831.30 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 828.71 | Flow Area (sq ft) | 701.15 | 297.14 | 107.47 |
| E.G. Slope (ft/ft) | 0.000469 | Area (sq ft) | 701.15 | 297.14 | 636.81 |
| Q Total (cfs) | 2000.00 | Flow (cfs) | 1422.10 | 524.65 | 53.25 |
| Top Width (ft) | 643.55 | Top Width (ft) | 226.25 | 41.02 | 376.27 |
| Vel Total (ft/s) | 1.81 | Avg. Vel. (ft/s) | 2.03 | 1.77 | 0.50 |
| Max Chl Dpth (ft) | 8.69 | Hydr. Depth (ft) | 3.10 | 7.24 | 1.91 |
| Conv. Total (cfs) | 92320.1 | Conv. (cfs) | 65644.4 | 24218.0 | 2457.8 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 226.86 | 44.45 | 56.28 |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.09 | 0.20 | 0.06 |
| Alpha | 1.15 | Stream Power (lb/ft s) | 0.18 | 0.35 | 0.03 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |

C & E Loss (ft)  Cum SA (acres)

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

SUMMARY OF MANNING'S N VALUES

River:Oldtown Creek

| Reach | River Sta. | n1 | n2 | n3 | n4 | n5 | n6 | n7 | n8 | n9 | n10 | n11 | n12 | n13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reach | 796.1598 | .03 | .1 | .07 | .06 | .07 | .1 | .013 | .1 | .035 | .1 | .1 | | |
| Reach | 703.7970 | .013 | .03 | .1 | .07 | .06 | .07 | .1 | .013 | .1 | .035 | .1 | .1 | |
| Reach | 651.5802 | .013 | .03 | .1 | .07 | .06 | .07 | .1 | .013 | .1 | .035 | .1 | .1 | |
| Reach | 545.1257 | .03 | .1 | .07 | .06 | .07 | .1 | .013 | .1 | .035 | .1 | .013 | .1 | .1 |
| Reach | 492.3110 | .03 | .1 | .07 | .06 | .07 | .1 | .013 | .1 | .035 | .1 | .013 | .1 | .1 |

SUMMARY OF REACH LENGTHS

River: Oldtown Creek

| Reach | River Sta. | Left | Channel | Right |
|---|---|---|---|---|
| Reach | 796.1598 | 96.02 | 92.36 | 85.26 |
| Reach | 703.7970 | 56.86 | 52.22 | 53.96 |
| Reach | 651.5802 | 111.44 | 106.45 | 103.86 |
| Reach | 545.1257 | 46.6 | 52.81 | 53.82 |
| Reach | 492.3110 | 0 | 0 | 0 |

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Oldtown Creek

| Reach | River Sta. | Contr. | Expan. |
|---|---|---|---|
| Reach | 796.1598 | .1 | .3 |
| Reach | 703.7970 | .1 | .3 |
| Reach | 651.5802 | .1 | .3 |
| Reach | 545.1257 | .1 | .3 |
| Reach | 492.3110 | .1 | .3 |

Profile Output Table - Standard Table 1

| Reach | River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. |
|---|---|---|---|---|---|---|
| E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl | |
| | | | (cfs) | (ft) | (ft) | (ft) |
| (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | | |
| Reach | 796.1598 | 2xHMMF | 38.60 | 823.48 | 825.35 | 824.19 |
| 825.36 | 0.001007 | 0.94 | 40.99 | 27.53 | 0.14 | |
| Reach | 796.1598 | 2-yr | 620.00 | 823.48 | 829.48 | 826.38 |
| 829.64 | 0.003507 | 3.25 | 227.52 | 459.16 | 0.28 | |
| Reach | 796.1598 | 5-yr | 1070.00 | 823.48 | 830.36 | 827.49 |
| 830.41 | 0.001040 | 2.01 | 643.05 | 559.38 | 0.16 | |
| Reach | 796.1598 | 10-yr | 1180.00 | 823.48 | 830.53 | 827.72 |
| 830.58 | 0.000996 | 2.02 | 695.22 | 586.65 | 0.16 | |
| Reach | 796.1598 | 25-yr | 1465.00 | 823.48 | 830.95 | 828.48 |
| 831.01 | 0.000896 | 2.02 | 827.14 | 623.70 | 0.15 | |
| Reach | 796.1598 | 50-yr | 1740.00 | 823.48 | 831.32 | 829.47 |
| 831.38 | 0.000838 | 2.03 | 943.09 | 633.78 | 0.15 | |
| Reach | 796.1598 | 100-yr | 2000.00 | 823.48 | 831.61 | 829.80 |
| 831.68 | 0.000826 | 2.08 | 1034.61 | 640.49 | 0.15 | |
| Reach | 703.7970 | 2xHMMF | 38.60 | 823.18 | 825.22 | 824.25 |
| 825.24 | 0.001852 | 1.14 | 34.01 | 27.57 | 0.18 | |
| Reach | 703.7970 | 2-yr | 620.00 | 823.18 | 829.49 | 826.49 |
| 829.52 | 0.000390 | 1.21 | 552.65 | 540.50 | 0.10 | |
| Reach | 703.7970 | 5-yr | 1070.00 | 823.18 | 830.31 | 828.50 |
| 830.35 | 0.000423 | 1.40 | 766.93 | 621.47 | 0.10 | |
| Reach | 703.7970 | 10-yr | 1180.00 | 823.18 | 830.48 | 828.63 |
| 830.52 | 0.000426 | 1.43 | 812.60 | 626.10 | 0.10 | |
| Reach | 703.7970 | 25-yr | 1465.00 | 823.18 | 830.90 | 828.87 |
| 830.95 | 0.000436 | 1.51 | 928.46 | 640.72 | 0.11 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Reach | 703.7970 | 50-yr | 1740.00 | 823.18 | 831.27 | 829.07 |
| 831.33 | 0.000446 | 1.59 | 1031.02 | 653.81 | 0.11 | |
| Reach | 703.7970 | 100-yr | 2000.00 | 823.18 | 831.55 | 829.22 |
| 831.62 | 0.000463 | 1.67 | 1112.10 | 662.24 | 0.11 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Reach | 651.5802 | 2xHMMF | 38.60 | 823.44 | 825.15 | 824.04 |
| 825.16 | 0.001118 | 1.01 | 38.24 | 26.70 | 0.15 | |
| Reach | 651.5802 | 2-yr | 620.00 | 823.44 | 829.45 | 826.29 |
| 829.49 | 0.000716 | 1.89 | 514.33 | 576.15 | 0.14 | |
| Reach | 651.5802 | 5-yr | 1070.00 | 823.44 | 830.28 | 827.83 |
| 830.32 | 0.000664 | 2.00 | 752.92 | 623.43 | 0.14 | |
| Reach | 651.5802 | 10-yr | 1180.00 | 823.44 | 830.45 | 828.03 |
| 830.49 | 0.000657 | 2.02 | 803.05 | 626.90 | 0.14 | |
| Reach | 651.5802 | 25-yr | 1465.00 | 823.44 | 830.87 | 828.44 |
| 830.92 | 0.000633 | 2.07 | 929.11 | 635.31 | 0.14 | |
| Reach | 651.5802 | 50-yr | 1740.00 | 823.44 | 831.24 | 828.78 |
| 831.30 | 0.000626 | 2.13 | 1039.00 | 644.73 | 0.14 | |
| Reach | 651.5802 | 100-yr | 2000.00 | 823.44 | 831.53 | 829.17 |
| 831.59 | 0.000641 | 2.21 | 1125.61 | 653.82 | 0.14 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Reach | 545.1257 | 2xHMMF | 38.60 | 823.35 | 825.02 | 824.04 |
| 825.04 | 0.001176 | 0.94 | 40.96 | 31.76 | 0.15 | |
| Reach | 545.1257 | 2-yr | 620.00 | 823.35 | 829.28 | 826.05 |
| 829.37 | 0.001772 | 2.57 | 356.51 | 464.10 | 0.20 | |
| Reach | 545.1257 | 5-yr | 1070.00 | 823.35 | 830.05 | 827.04 |
| 830.18 | 0.002466 | 3.34 | 520.55 | 519.74 | 0.25 | |
| Reach | 545.1257 | 10-yr | 1180.00 | 823.35 | 830.22 | 827.25 |
| 830.36 | 0.002573 | 3.47 | 557.16 | 528.15 | 0.25 | |
| Reach | 545.1257 | 25-yr | 1465.00 | 823.35 | 830.63 | 827.79 |
| 830.79 | 0.002738 | 3.75 | 653.05 | 552.31 | 0.26 | |
| Reach | 545.1257 | 50-yr | 1740.00 | 823.35 | 830.99 | 828.26 |
| 831.16 | 0.002868 | 3.98 | 738.77 | 565.85 | 0.27 | |
| Reach | 545.1257 | 100-yr | 2000.00 | 823.35 | 831.26 | 828.69 |
| 831.44 | 0.003076 | 4.24 | 805.03 | 590.48 | 0.28 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Reach | 492.3110 | 2xHMMF | 38.60 | 822.61 | 824.99 | 823.47 |
| 825.00 | 0.000458 | 0.70 | 54.99 | 32.27 | 0.09 | |
| Reach | 492.3110 | 2-yr | 620.00 | 822.61 | 829.28 | 825.56 |
| 829.31 | 0.000458 | 1.40 | 510.14 | 376.21 | 0.11 | |
| Reach | 492.3110 | 5-yr | 1070.00 | 822.61 | 830.07 | 826.56 |
| 830.11 | 0.000458 | 1.54 | 731.07 | 521.82 | 0.11 | |
| Reach | 492.3110 | 10-yr | 1180.00 | 822.61 | 830.24 | 826.79 |
| 830.28 | 0.000457 | 1.57 | 779.22 | 534.90 | 0.11 | |
| Reach | 492.3110 | 25-yr | 1465.00 | 822.61 | 830.66 | 827.31 |
| 830.71 | 0.000457 | 1.64 | 904.07 | 578.01 | 0.11 | |
| Reach | 492.3110 | 50-yr | 1740.00 | 822.61 | 831.03 | 828.59 |
| 831.08 | 0.000458 | 1.70 | 1017.86 | 614.04 | 0.11 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Reach | 492.3110 | 100-yr | 2000.00 | 822.61 | 831.30 | 828.71 |
| 831.36 | 0.000469 | 1.77 | 1105.75 | 643.55 | 0.12 | |

Profile Output Table - Bridge Only

| Reach | River Sta | Profile | E.G. US. | Min El Prs | BR Open Area | Prs O |
|---|---|---|---|---|---|---|
| WS | Q Total | Min El Weir Flow | Q Weir | Delta EG | BR Sluice Coef | |
| | | | | (ft) | (ft) | (sq ft) |
| (ft) | (cfs) | | (ft) | (cfs) | (ft) | |

# APPENDIX 5: HEC-RAS OUTPUT – PROPOSED CONDITIONS

HEC-RAS HEC-RAS 6.4.1 June 2023
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
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: GRE-68-12.65 TAF
Project File : GRE-68TAF.prj
Run Date and Time: 1/2/2024 5:10:24 PM

Project in English units

PLAN DATA

Plan Title: ProposedTAF
Plan File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\TAF\HEC-RAS\GRE-68TAF.p02

Geometry Title: ProposedTAF2
Geometry File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\TAF\HEC-RAS\GRE-68TAF.g03

Flow Title : TAF
Flow File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\TAF\HEC-RAS\GRE-68TAF.f01

Plan Summary Information:

| | | | | | |
|---|---|---|---|---|---|
| Number of: | Cross Sections | = 5 | Multiple Openings | = | 0 |
| | Culverts | = 1 | Inline Structures | = | 0 |
| | Bridges | = 0 | 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: TAF
Flow File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\TAF\HEC-RAS\GRE-68TAF.f01

Flow Data (cfs)

| River | Reach | RS | 2xHMMF | 2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr |
|---|---|---|---|---|---|---|---|---|---|
| Oldtown Creek | Reach | 796.1598 | 38.6 | 620 | 1070 | 1180 | 1465 | 1740 | 2000 |

Boundary Conditions

| River | Reach | Profile | Upstream | Downstream |
|---|---|---|---|---|
| Oldtown Creek | Reach | 2xHMMF | Normal S = 0.000457 | |
| Oldtown Creek | Reach | 2-yr | Normal S = 0.000457 | |
| Oldtown Creek | Reach | 5-yr | Normal S = 0.000457 | |
| Oldtown Creek | Reach | 10-yr | Normal S = 0.000457 | |
| Oldtown Creek | Reach | 25-yr | Normal S = 0.000457 | |

```
  Oldtown Creek   Reach           50-yr
Normal S = 0.000457
  Oldtown Creek   Reach           100-yr
 Known WS = 831.3
```

GEOMETRY DATA

Geometry Title: ProposedTAF2
Geometry File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\TAF\HEC-RAS\GRE-68TAF.g03

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 796.1598

INPUT
Description:
Station Elevation Data num= 433

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 836.01 | 1.45 | 836.07 | 2.69 | 836 | 3.2 | 835.99 | 6.46 | 836.1 |
| 7.7 | 836.01 | 8.73 | 835.91 | 10.73 | 836.09 | 12.12 | 836.25 | 12.72 | 836.27 |
| 14.25 | 836.26 | 15.61 | 836.29 | 18.8 | 836.08 | 20.26 | 836.05 | 24.07 | 836.11 |
| 27.45 | 836.21 | 36.65 | 836.08 | 38.65 | 836.12 | 43.25 | 835.87 | 47.57 | 836.07 |
| 50.18 | 836.08 | 62.2 | 835.63 | 63.21 | 835.5 | 66.04 | 835.32 | 67.52 | 835.15 |
| 72.05 | 834.6 | 73.39 | 834.48 | 74.27 | 834.32 | 74.99 | 834.29 | 76.28 | 834.22 |
| 79.4 | 833.75 | 79.91 | 833.69 | 80.29 | 833.54 | 81.87 | 833.07 | 85.04 | 831.89 |
| 85.44 | 831.76 | 85.6 | 831.72 | 87.41 | 831.45 | 90.35 | 831.1 | 91.17 | 831.01 |
| 91.51 | 830.99 | 93 | 830.86 | 95.35 | 830.53 | 98.65 | 830.04 | 101.16 | 829.86 |
| 102.53 | 829.86 | 103.13 | 829.76 | 104.27 | 829.69 | 107.27 | 829.69 | 108.09 | 829.65 |
| 108.53 | 829.61 | 110.04 | 829.36 | 112.22 | 829.42 | 114.32 | 829.3 | 115.62 | 829.21 |
| 117.99 | 829.15 | 119.49 | 829.05 | 120.88 | 829.09 | 121.2 | 829.11 | 121.97 | 829.1 |
| 125.2 | 829.04 | 126.64 | 828.97 | 130.7 | 829.02 | 132.48 | 829.04 | 132.69 | 829.04 |
| 138.23 | 829.01 | 139.81 | 828.98 | 141.93 | 828.94 | 142.96 | 828.94 | 143.86 | 828.93 |
| 146.49 | 828.94 | 147.55 | 828.93 | 148.97 | 828.95 | 149.27 | 828.95 | 150.04 | 828.93 |
| 153.19 | 828.93 | 154.68 | 829.14 | 154.86 | 829.15 | 157.28 | 829.12 | 158.66 | 829.1 |
| 158.73 | 829.09 | 160.48 | 828.77 | 161.95 | 828.86 | 164.21 | 828.93 | 165.63 | 828.94 |
| 166.11 | 828.9 | 166.81 | 828.93 | 169.73 | 829.1 | 171.68 | 829.14 | 171.72 | 829.15 |
| 171.81 | 829.14 | 177.2 | 828.42 | 177.77 | 828.43 | 181.06 | 828.58 | 181.4 | 828.58 |
| 182.74 | 828.51 | 184.17 | 828.51 | 186.63 | 828.52 | 187.65 | 828.42 | 190.82 | 828.41 |
| 192.23 | 828.38 | 192.53 | 828.35 | 194.04 | 828.27 | 197.24 | 828.37 | 197.86 | 828.34 |
| 199.42 | 828.12 | 199.57 | 828.12 | 200.11 | 828.14 | 203.47 | 828.19 | 204.95 | 828.04 |
| 205.1 | 828.03 | 205.31 | 828.03 | 207.07 | 828.06 | 210.7 | 828.16 | 210.87 | 828.15 |
| 211.29 | 828.15 | 214.54 | 828.18 | 215.31 | 828.17 | 216.42 | 828.23 | 217.69 | 828.14 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 220.1 | 828.15 | 221.35 | 828.01 | 222 | 828.02 | 225.45 | 827.9 | 226.18 | 827.9 |
| 227.54 | 827.97 | 228.37 | 828.02 | 231.44 | 828.2 | 231.49 | 828.2 | 232.68 | 828.24 |
| 233.03 | 828.22 | 234.79 | 828.13 | 237.74 | 828.09 | 238.94 | 828.12 | 241.14 | 827.9 |
| 242.45 | 827.87 | 243.93 | 827.87 | 244.44 | 827.85 | 247.35 | 827.82 | 248.08 | 827.84 |
| 249.75 | 827.92 | 249.98 | 827.94 | 251.03 | 827.97 | 253.85 | 828.07 | 254.46 | 828.1 |
| 255.56 | 828.03 | 260.86 | 828.29 | 261.35 | 828.3 | 262.29 | 828.32 | 264.03 | 828.36 |
| 269.19 | 828.5 | 270.84 | 828.64 | 272.62 | 828.79 | 272.63 | 828.79 | 276.57 | 829.85 |
| 277.23 | 829.88 | 278.33 | 830 | 280.67 | 829.06 | 282.02 | 828.75 | 282.39 | 828.37 |
| 282.61 | 828.14 | 283.42 | 827.31 | 283.77 | 826.95 | 284.12 | 826.59 | 284.48 | 826.22 |
| 284.6 | 826.09 | 284.98 | 825.7 | 285.01 | 825.68 | 285.09 | 825.59 | 285.85 | 823.48 |
| 290.56 | 823.6 | 301.27 | 823.88 | 305.92 | 823.99 | 310.63 | 823.91 | 312.07 | 824.9 |
| 313.03 | 825.57 | 313.39 | 825.8 | 313.57 | 825.92 | 314.61 | 826.59 | 314.64 | 826.6 |
| 315.39 | 827.09 | 317.02 | 828.13 | 317.55 | 828.2 | 326.57 | 829.14 | 327.07 | 829.19 |
| 328.71 | 829.18 | 330.77 | 829.09 | 338.31 | 829.33 | 341.05 | 829.38 | 342.33 | 829.19 |
| 345.84 | 828.86 | 351.07 | 828.5 | 351.16 | 828.49 | 352.09 | 828.44 | 353.87 | 828.42 |
| 357.9 | 828.31 | 358.86 | 828.22 | 359.77 | 828.16 | 362.84 | 828.22 | 365.64 | 828.27 |
| 370.99 | 828.96 | 371.65 | 829.01 | 371.79 | 829.01 | 377.07 | 828.82 | 377.48 | 828.84 |
| 381.11 | 829.14 | 381.65 | 829.12 | 384 | 829.15 | 393.33 | 828.95 | 397.1 | 829.11 |
| 398.65 | 829.25 | 399.44 | 829.47 | 400.22 | 829.58 | 402.19 | 830.19 | 404.65 | 830.84 |
| 406.18 | 831.49 | 406.23 | 831.52 | 406.7 | 831.62 | 409.71 | 832.3 | 411.42 | 832.54 |
| 412.23 | 832.6 | 412.78 | 832.62 | 417.56 | 832.65 | 418.01 | 832.69 | 420.47 | 833.11 |
| 421.92 | 833.34 | 422.64 | 833.35 | 423.82 | 833.29 | 427.54 | 833.42 | 427.79 | 833.43 |
| 427.95 | 833.42 | 429.57 | 833.28 | 433.37 | 832.75 | 433.59 | 832.71 | 433.88 | 832.64 |
| 435.51 | 832.23 | 436.59 | 832.03 | 439.31 | 831.4 | 440.83 | 830.96 | 441.32 | 830.83 |
| 444.18 | 830.59 | 444.97 | 830.53 | 445.19 | 830.51 | 445.83 | 830.52 | 447.82 | 830.52 |
| 456.36 | 830.61 | 457.07 | 830.51 | 458.72 | 830.45 | 458.95 | 830.44 | 462.02 | 830.61 |
| 468.45 | 830.47 | 468.8 | 830.48 | 470.64 | 830.67 | 472.4 | 830.53 | 475.19 | 830.37 |
| 479.22 | 830.47 | 487.09 | 830.65 | 488.27 | 830.57 | 491.08 | 830.47 | 492.79 | 830.45 |
| 494.23 | 830.35 | 495.46 | 830.21 | 498.31 | 830.01 | 499.03 | 829.94 | 500.2 | 829.96 |
| 502.52 | 829.92 | 505.08 | 829.8 | 506.1 | 829.7 | 508.44 | 829.79 | 510.16 | 829.85 |
| 511.83 | 829.84 | 512.13 | 829.85 | 512.83 | 829.83 | 516.21 | 829.73 | 517.08 | 829.68 |
| 518.13 | 829.67 | 520.59 | 829.6 | 522.2 | 829.54 | 523.11 | 829.58 | 523.97 | 829.61 |
| 525.22 | 829.59 | 529.74 | 829.35 | 530.06 | 829.34 | 530.12 | 829.34 | 531.02 | 829.33 |
| 535.96 | 829.3 | 536.14 | 829.29 | 539.57 | 829.5 | 540.12 | 829.5 | 541.15 | 829.35 |
| 542.06 | 829.22 | 544.88 | 829.19 | 547.62 | 829.18 | 547.92 | 829.16 | 548.6 | 829.18 |
| 549.33 | 829.2 | 554 | 829.42 | 557.62 | 829.33 | 560.09 | 829.29 | 561.54 | 829.4 |
| 564.12 | 829.51 | 565.65 | 829.63 | 566.04 | 829.58 | 566.98 | 829.59 | 570.01 | 829.52 |
| 571.01 | 829.54 | 572.05 | 829.54 | 575.19 | 829.49 | 576.08 | 829.52 | 576.62 | 829.5 |
| 577.92 | 829.44 | 581.55 | 829.47 | 581.98 | 829.5 | 582.17 | 829.49 | 583.97 | 829.55 |
| 585.16 | 829.52 | 588 | 829.61 | 589.43 | 829.58 | 590.09 | 829.56 | 593.62 | 829.57 |
| 594.14 | 829.56 | 596.1 | 829.7 | 599.56 | 829.6 | 600.13 | 829.6 | 600.67 | 829.54 |
| 602.12 | 829.31 | 604.34 | 829.35 | 606.2 | 829.36 | 607.23 | 829.26 | 608.12 | 829.17 |
| 612 | 829.37 | 612.12 | 829.38 | 612.17 | 829.38 | 614.16 | 829.46 | 614.62 | 829.43 |
| 618.23 | 829.38 | 619.34 | 829.3 | 620.23 | 829.18 | 620.99 | 829.15 | 621.79 | 829.18 |
| 626.34 | 829.21 | 630.03 | 829.04 | 632.32 | 828.96 | 636.34 | 828.94 | 638.39 | 828.94 |
| 641.03 | 829.17 | 643.22 | 829.13 | 644.41 | 829.07 | 648.19 | 829.02 | 650.41 | 829.06 |
| 654.3 | 828.98 | 656.57 | 828.92 | 657.3 | 828.95 | 660.64 | 829.07 | 662.31 | 829.03 |
| 662.67 | 829.03 | 663.36 | 829 | 666.64 | 828.98 | 667.26 | 828.91 | 668.76 | 828.91 |
| 670.39 | 828.9 | 674.89 | 828.85 | 676.79 | 828.9 | 680.05 | 828.84 | 681.09 | 828.77 |
| 685.03 | 829.08 | 685.1 | 829.08 | 685.16 | 829.07 | 687.22 | 828.88 | 690.44 | 828.93 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 691.22 | 828.95 | 692.29 | 828.9 | 693.28 | 828.88 | 693.94 | 828.91 | 695.9 | 828.89 |
| 699.27 | 828.91 | 703.92 | 828.9 | 705.45 | 828.91 | 705.82 | 828.9 | 711.63 | 829.1 |
| 712.01 | 829.12 | 716.65 | 829.18 | 717.59 | 829.21 | 721.68 | 829.24 | 723.48 | 829.31 |
| 727.29 | 829.29 | 727.54 | 829.3 | 727.68 | 829.29 | 729.55 | 829.34 | 733.42 | 829.42 |
| 733.62 | 829.42 | 735.58 | 829.58 | 738.61 | 829.66 | 739.51 | 829.69 | 741.12 | 829.82 |
| 741.5 | 829.88 | 742.41 | 829.9 | 745.42 | 830.07 | 747.72 | 830.44 | 752.27 | 831.04 |
| 755.93 | 831.3 | 758.41 | 831.59 | 764.71 | 832.06 | 768.01 | 832.68 | 770.53 | 833.31 |
| 773.95 | 833.75 | 780.53 | 834.76 | 784.11 | 835.13 | 785.35 | 835.34 | 786.34 | 835.58 |
| 787.38 | 835.73 | 789.58 | 836.24 | 796.26 | 837.31 | 799.36 | 838.14 | 800.54 | 838.34 |
| 811.87 | 839.81 | 814.27 | 840.22 | 814.97 | 840.22 | 816.1 | 840.37 | 820.41 | 840.88 |
| 821.37 | 840.84 | 822.2 | 840.83 | 823.27 | 841.04 | 825.87 | 841.62 | 827.33 | 841.74 |
| 827.68 | 841.8 | 829.27 | 842.1 | 832.13 | 842.53 | 833.19 | 842.6 | 836.52 | 843.34 |
| 837.05 | 843.43 | 837.44 | 843.4 | 837.81 | 843.38 | | | | |

Manning's n Values num= 11

| Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|---|---|---|---|
| 0 | .03 | 237.74 | .1 | 282.39 | .07 | 290.56 | .06 | 312.07 | .07 |
| 326.57 | .1 | 418.01 | .013 | 427.95 | .1 | 492.79 | .035 | 727.29 | .1 |
| 837.81 | .1 | | | | | | | | |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 282.39 | 326.57 | 96.02 | 92.36 | 85.26 | .1 | .3 |

Ineffective Flow num= 3

| Sta L | Sta R | Elev | Permanent |
|---|---|---|---|
| 20 | 73 | 855 | T |
| 95 | 279 | 829.8 | F |
| 425 | 775 | 833.5 | F |

CROSS SECTION OUTPUT Profile #2xHMMF

| | | | | |
|---|---|---|---|---|
| E.G. Elev (ft) | 826.21 | Element | Left OB | Channel |
| Right OB | | | | |
| Vel Head (ft) | 0.01 | Wt. n-Val. | | 0.063 |
| W.S. Elev (ft) | 826.20 | Reach Len. (ft) | 96.02 | 92.36 |
| 85.26 | | | | |
| Crit W.S. (ft) | 824.19 | Flow Area (sq ft) | | 65.27 |
| E.G. Slope (ft/ft) | 0.000245 | Area (sq ft) | | 65.27 |
| Q Total (cfs) | 38.60 | Flow (cfs) | | 38.60 |
| Top Width (ft) | 29.51 | Top Width (ft) | | 29.51 |
| Vel Total (ft/s) | 0.59 | Avg. Vel. (ft/s) | | 0.59 |
| Max Chl Dpth (ft) | 2.72 | Hydr. Depth (ft) | | 2.21 |
| Conv. Total (cfs) | 2468.1 | Conv. (cfs) | | 2468.1 |

| | | | |
|---|---|---|---|
| Length Wtd. (ft) | 92.36 | Wetted Per. (ft) | 31.96 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.03 |
| Alpha | 1.00 | Stream Power (lb/ft s) | 0.02 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 0.29 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.20 |

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #2-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 829.65 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.16 | Wt. n-Val. | 0.100 | 0.066 | 0.100 |
| W.S. Elev (ft) | 829.49 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 826.38 | Flow Area (sq ft) | 1.37 | 182.25 | 45.20 |
| E.G. Slope (ft/ft) | 0.003468 | Area (sq ft) | 158.09 | 182.25 | 106.39 |
| Q Total (cfs) | 620.00 | Flow (cfs) | 0.70 | 590.62 | 28.68 |
| Top Width (ft) | 461.14 | Top Width (ft) | 168.81 | 44.18 | 248.15 |
| Vel Total (ft/s) | 2.71 | Avg. Vel. (ft/s) | 0.51 | 3.24 | 0.63 |
| Max Chl Dpth (ft) | 6.01 | Hydr. Depth (ft) | 0.49 | 4.13 | 0.62 |
| Conv. Total (cfs) | 10527.9 | Conv. (cfs) | 11.9 | 10029.0 | 487.0 |
| Length Wtd. (ft) | 92.93 | Wetted Per. (ft) | 3.08 | 48.17 | 73.20 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.10 | 0.82 | 0.13 |
| Alpha | 1.37 | Stream Power (lb/ft s) | 0.05 | 2.65 | 0.08 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 1.18 | 1.63 | 1.20 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 1.32 | 0.26 | |

1.92

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.41 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.038 | 0.066 | 0.100 |
| W.S. Elev (ft) | 830.35 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 827.49 | Flow Area (sq ft) | 312.42 | 220.29 | 109.57 |
| E.G. Slope (ft/ft) | 0.001044 | Area (sq ft) | 312.42 | 220.29 | 371.89 |
| Q Total (cfs) | 1070.00 | Flow (cfs) | 558.72 | 444.45 | 66.83 |
| Top Width (ft) | 559.30 | Top Width (ft) | 185.86 | 44.18 | 329.26 |
| Vel Total (ft/s) | 1.67 | Avg. Vel. (ft/s) | 1.79 | 2.02 | 0.61 |
| Max Chl Dpth (ft) | 6.87 | Hydr. Depth (ft) | 1.68 | 4.99 | 1.44 |
| Conv. Total (cfs) | 33116.4 | Conv. (cfs) | 17292.3 | 13755.8 | 2068.3 |
| Length Wtd. (ft) | 93.89 | Wetted Per. (ft) | 186.68 | 48.17 | 76.53 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.11 | 0.30 | 0.09 |
| Alpha | 1.22 | Stream Power (lb/ft s) | 0.20 | 0.60 | 0.06 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 2.06 | 2.08 | 2.59 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.37 | 0.26 | 2.37 |

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.
Note: Manning's n values were composited to a single value in the main channel.
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) | 830.57 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.038 | 0.066 | 0.100 |
| W.S. Elev (ft) | 830.52 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 827.72 | Flow Area (sq ft) | 342.35 | 227.39 | 121.87 |
| E.G. Slope (ft/ft) | 0.001012 | Area (sq ft) | 342.35 | 227.39 | 425.98 |
| Q Total (cfs) | 1180.00 | Flow (cfs) | 640.54 | 461.33 | 78.13 |
| Top Width (ft) | 581.37 | Top Width (ft) | 186.94 | 44.18 | 350.25 |
| Vel Total (ft/s) | 1.71 | Avg. Vel. (ft/s) | 1.87 | 2.03 | 0.64 |
| Max Chl Dpth (ft) | 7.04 | Hydr. Depth (ft) | 1.83 | 5.15 | 1.59 |
| Conv. Total (cfs) | 37093.6 | Conv. (cfs) | 20135.7 | 14502.0 | 2455.9 |
| Length Wtd. (ft) | 93.92 | Wetted Per. (ft) | 187.77 | 48.17 | 77.16 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.12 | 0.30 | 0.10 |
| Alpha | 1.21 | Stream Power (lb/ft s) | 0.22 | 0.61 | 0.06 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 2.25 | 2.17 | 2.91 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.37 | 0.26 | 2.42 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #25-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 831.01 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.038 | 0.066 | 0.100 |
| W.S. Elev (ft) | 830.95 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 828.48 | Flow Area (sq ft) | 423.94 | 246.51 | 155.47 |
| E.G. Slope (ft/ft) | 0.000900 | Area (sq ft) | 423.94 | 246.51 | 591.01 |
| Q Total (cfs) | 1465.00 | Flow (cfs) | 858.21 | 497.69 | 109.10 |
| Top Width (ft) | 623.61 | Top Width (ft) | 190.40 | 44.18 | 389.03 |
| Vel Total (ft/s) | 1.77 | Avg. Vel. (ft/s) | 2.02 | 2.02 | 0.70 |
| Max Chl Dpth (ft) | 7.47 | Hydr. Depth (ft) | 2.23 | 5.58 | 1.98 |
| Conv. Total (cfs) | 48837.5 | Conv. (cfs) | 28609.6 | 16591.0 | 3637.0 |
| Length Wtd. (ft) | 93.99 | Wetted Per. (ft) | 191.26 | 48.17 | 78.71 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.12 | 0.29 | 0.11 |
| Alpha | 1.21 | Stream Power (lb/ft s) | 0.25 | 0.58 | 0.08 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 2.72 | 2.42 | 3.76 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.40 | 0.26 | 2.55 |

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.
Note:  Manning's n values were composited to a single value in the main channel.
Note:  Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #50-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 831.38 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.037 | 0.066 | |

| | | | | | |
|---|---|---|---|---|---|
| 0.100 | | | | | |
| W.S. Elev (ft) | 831.32 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 829.47 | Flow Area (sq ft) | 495.14 | 262.87 | 184.64 |
| E.G. Slope (ft/ft) | 0.000840 | Area (sq ft) | 495.14 | 262.87 | 736.23 |
| Q Total (cfs) | 1740.00 | Flow (cfs) | 1065.68 | 535.08 | 139.24 |
| Top Width (ft) | 633.75 | Top Width (ft) | 193.87 | 44.18 | 395.70 |
| Vel Total (ft/s) | 1.85 | Avg. Vel. (ft/s) | 2.15 | 2.04 | 0.75 |
| Max Chl Dpth (ft) | 7.84 | Hydr. Depth (ft) | 2.55 | 5.95 | 2.33 |
| Conv. Total (cfs) | 60049.7 | Conv. (cfs) | 36777.9 | 18466.4 | 4805.5 |
| Length Wtd. (ft) | 94.03 | Wetted Per. (ft) | 194.75 | 48.17 | 79.65 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.13 | 0.29 | 0.12 |
| Alpha | 1.22 | Stream Power (lb/ft s) | 0.29 | 0.58 | 0.09 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 3.14 | 2.63 | 4.52 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.42 | 0.26 | 2.62 |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
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) | 831.67 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.037 | 0.066 | 0.100 |
| W.S. Elev (ft) | 831.60 | Reach Len. (ft) | 96.02 | 92.36 | 85.26 |
| Crit W.S. (ft) | 829.80 | Flow Area (sq ft) | 549.78 | 275.25 | 206.94 |
| E.G. Slope (ft/ft) | 0.000833 | Area (sq ft) | 549.78 | 275.25 | 847.72 |
| Q Total (cfs) | 2000.00 | Flow (cfs) | 1258.25 | 575.30 | 166.45 |

| | | | | |
|---|---|---|---|---|
| Top Width (ft) | 640.25 | Top Width (ft) | 195.97 | 44.18 400.10 |
| Vel Total (ft/s) | 1.94 | Avg. Vel. (ft/s) | 2.29 | 2.09 0.80 |
| Max Chl Dpth (ft) | 8.12 | Hydr. Depth (ft) | 2.81 | 6.23 2.59 |
| Conv. Total (cfs) | 69316.2 | Conv. (cfs) | 43608.5 | 19938.8 5768.9 |
| Length Wtd. (ft) | 94.07 | Wetted Per. (ft) | 196.88 | 48.17 80.53 |
| Min Ch El (ft) | 823.48 | Shear (lb/sq ft) | 0.15 | 0.30 0.13 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.33 | 0.62 0.11 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 3.46 | 2.79 5.12 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.43 | 0.26 2.71 |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 703.7970

INPUT
Description:
Station Elevation Data num= 466

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 837.63 | 14.52 | 837.16 | 17.4 | 837.14 | 20.94 | 836.95 | 22.37 | 836.92 |
| 37.71 | 836.17 | 41.1 | 836.03 | 48.57 | 835.39 | 52.88 | 835.09 | 56.33 | 835.19 |
| 58.83 | 835.24 | 64.25 | 835.33 | 71.44 | 835.38 | 77.8 | 835.27 | 82.69 | 835.16 |
| 86.27 | 835.01 | 88.91 | 834.91 | 94.17 | 835.06 | 94.22 | 835.07 | 94.25 | 835.07 |
| 94.89 | 835.1 | 95.2 | 835.12 | 95.56 | 835.14 | 95.79 | 835.15 | 95.97 | 835.16 |
| 96.25 | 835.17 | 97.13 | 835.22 | 98.86 | 835.31 | 99.35 | 835.33 | 99.99 | 835.37 |
| 101.82 | 835.46 | 103.93 | 835.58 | 104.95 | 836.19 | 104.97 | 836.2 | 104.99 | 836.2 |
| 105.93 | 835.81 | 106.69 | 835.79 | 107.62 | 835.77 | 108.83 | 835.58 | 110.47 | 835.55 |
| 111.98 | 835.78 | 112.24 | 835.78 | 114.49 | 835.54 | 115.97 | 835.51 | 116.63 | 835.49 |
| 117.45 | 835.37 | 117.7 | 835.37 | 119.38 | 835.5 | 119.68 | 835.49 | 121.62 | 835.45 |
| 122.32 | 835.43 | 122.96 | 835.41 | 123.23 | 835.41 | 125.36 | 835.47 | 126.62 | 835.44 |
| 127.06 | 835.43 | 127.29 | 835.43 | 127.49 | 835.42 | 128.37 | 835.29 | 128.91 | 835.29 |
| 130.29 | 835.27 | 131.38 | 835.13 | 132.57 | 835.11 | 133.21 | 835.2 | 133.68 | 835.19 |
| 134.5 | 835.18 | 135.65 | 835.16 | 136.78 | 835.15 | 138.23 | 835.13 | 138.53 | 835.01 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 139.07 | 835 | 139.61 | 835 | 140.64 | 834.99 | 141.09 | 834.97 | 141.85 | 834.96 |
| 145.01 | 834.92 | 148.71 | 834.86 | 149.44 | 834.87 | 150.65 | 834.85 | 151.99 | 834.82 |
| 153.99 | 834.79 | 156.97 | 834.75 | 158.33 | 834.66 | 159.9 | 834.63 | 165.32 | 834.56 |
| 166.36 | 834.44 | 167.19 | 834.35 | 168.24 | 834.32 | 170.48 | 834.08 | 171.99 | 833.91 |
| 174.87 | 833.59 | 176.32 | 833.6 | 177.71 | 833.45 | 178.72 | 833.59 | 179.18 | 833.55 |
| 179.52 | 833.51 | 181.06 | 833.35 | 183.17 | 832.72 | 183.34 | 832.7 | 184.32 | 832.83 |
| 184.36 | 832.82 | 185.28 | 832.72 | 186.31 | 832.61 | 187.86 | 832.23 | 188.97 | 832.11 |
| 190.73 | 832.37 | 190.81 | 832.36 | 190.88 | 832.35 | 191.14 | 832.35 | 194.87 | 831.62 |
| 196.38 | 831.29 | 196.39 | 831.28 | 196.43 | 831.27 | 201.59 | 830.88 | 201.92 | 830.84 |
| 202.02 | 830.83 | 202.04 | 830.83 | 202.11 | 830.82 | 205.27 | 830.63 | 205.91 | 830.57 |
| 206.08 | 830.55 | 206.99 | 830.24 | 207.71 | 830.17 | 210.55 | 830.11 | 211.25 | 830.03 |
| 211.63 | 829.99 | 211.78 | 829.98 | 212.44 | 829.74 | 213.33 | 829.66 | 215.57 | 829.47 |
| 216.2 | 829.37 | 217.2 | 829.29 | 217.41 | 829.3 | 217.82 | 829.27 | 219.08 | 829.16 |
| 219.74 | 829.11 | 221.56 | 828.96 | 223.05 | 828.85 | 224.13 | 828.77 | 226.52 | 828.6 |
| 229.69 | 828.36 | 230.17 | 828.33 | 230.47 | 828.31 | 230.91 | 828.3 | 231.96 | 828.3 |
| 234.35 | 828.29 | 235.45 | 828.28 | 236.75 | 828.28 | 239.43 | 828.27 | 240.61 | 828.26 |
| 241.66 | 828.26 | 244.34 | 828.25 | 245.08 | 828.24 | 245.91 | 828.24 | 248.31 | 828.23 |
| 249.29 | 828.23 | 250.5 | 828.22 | 251.71 | 828.22 | 254.69 | 828.21 | 255.85 | 828.2 |
| 259.95 | 828.16 | 264.16 | 828.19 | 266.43 | 828.19 | 266.96 | 828.2 | 269.36 | 828.2 |
| 271.29 | 828.21 | 272.8 | 828.21 | 275.17 | 828.22 | 277.39 | 828.22 | 279.79 | 828.23 |
| 281.69 | 828.23 | 283.94 | 828.24 | 284.53 | 828.24 | 298.46 | 828.21 | 299.23 | 828.21 |
| 299.34 | 828.2 | 301.17 | 828.19 | 301.4 | 828.18 | 302.36 | 828.18 | 303.99 | 828.16 |
| 305.03 | 828.15 | 305.76 | 828.14 | 306.45 | 828.14 | 306.71 | 828.13 | 307.18 | 828.13 |
| 308.17 | 828.12 | 308.72 | 828.11 | 309.19 | 828.11 | 309.93 | 828.1 | 310.52 | 828.1 |
| 321.99 | 828.13 | 331.27 | 828.02 | 344.85 | 827.12 | 351.49 | 826.68 | 353.32 | 826.53 |
| 355.1 | 826.38 | 369.47 | 826.61 | 378.87 | 826.79 | 378.97 | 826.79 | 379.32 | 826.8 |
| 380.19 | 826.8 | 380.33 | 826.81 | 380.88 | 826.81 | 381.08 | 826.82 | 381.23 | 826.82 |
| 382.03 | 826.84 | 382.38 | 826.85 | 383.27 | 826.87 | 388.63 | 827 | 391.7 | 827.08 |
| 392.05 | 827.28 | 392.77 | 827.71 | 392.91 | 827.75 | 392.98 | 827.6 | 393.18 | 827.18 |
| 393.57 | 827.33 | 394.53 | 827.71 | 394.68 | 827.77 | 395.18 | 827.96 | 402.62 | 829.42 |
| 409.74 | 827.79 | 410.85 | 827.54 | 415.29 | 826.7 | 415.33 | 826.65 | 415.73 | 826.03 |
| 417.35 | 823.18 | 420.29 | 823.48 | 426.47 | 824.15 | 428.51 | 824.77 | 443.35 | 823.43 |
| 443.52 | 823.54 | 444.18 | 828.05 | 444.66 | 828.15 | 444.85 | 828.11 | 449.6 | 828.04 |
| 467.2 | 827.78 | 470.55 | 827.76 | 473.4 | 827.67 | 474.13 | 827.66 | 492.65 | 827.39 |
| 503.61 | 827.55 | 509.44 | 827.68 | 517.09 | 830.37 | 519.88 | 831.29 | 527.1 | 831.9 |
| 529.41 | 832.15 | 529.7 | 832.16 | 530.03 | 832.16 | 530.18 | 832.17 | 530.8 | 832.18 |
| 531.12 | 832.18 | 531.44 | 832.19 | 531.61 | 832.2 | 531.79 | 832.2 | 532.11 | 832.21 |
| 532.42 | 832.22 | 532.93 | 832.24 | 533.52 | 832.25 | 534.43 | 832.28 | 535.9 | 832.33 |
| 538.42 | 832.4 | 540 | 832.45 | 540.61 | 832.45 | 541.92 | 832.47 | 542.94 | 832.28 |
| 543.76 | 832.12 | 544.89 | 831.82 | 547.63 | 831.16 | 548.2 | 831.12 | 549.58 | 830.89 |
| 551.56 | 830.4 | 554.39 | 830.1 | 559.1 | 830.27 | 559.56 | 830.29 | 559.73 | 830.27 |
| 565.39 | 829.85 | 566.53 | 829.64 | 572.13 | 829.72 | 575.67 | 829.89 | 577.49 | 829.9 |
| 578.84 | 829.94 | 580.71 | 829.83 | 582.93 | 830 | 587.17 | 830.12 | 589.85 | 830.12 |
| 592.29 | 830.01 | 598.55 | 830.25 | 601.4 | 830.34 | 603.33 | 830.22 | 604.06 | 830 |
| 612.3 | 829.18 | 612.58 | 829.19 | 614.31 | 829.2 | 614.61 | 829.2 | 620.38 | 829.12 |
| 623.85 | 829.15 | 624.56 | 829.16 | 626.32 | 828.96 | 626.39 | 828.95 | 626.52 | 828.94 |
| 631.96 | 828.98 | 634.34 | 829.01 | 638.33 | 829.01 | 640.14 | 828.94 | 643.42 | 828.88 |
| 644.41 | 828.93 | 646.79 | 828.89 | 648.46 | 828.93 | 649.44 | 828.72 | 650.33 | 828.62 |
| 653.5 | 828.63 | 654.6 | 828.67 | 654.85 | 828.67 | 656.21 | 828.65 | 659.59 | 828.85 |
| 660.85 | 828.88 | 662.28 | 828.78 | 662.52 | 828.8 | 667.91 | 829.11 | 668.39 | 829.07 |

```
  672.39  829.07  672.49  829.06  672.55  829.07  674.34  829.06  679.27  828.73
  680.11   828.7  680.33  828.69  681.02  828.75  683.51  828.88  686.23  829.05
  686.95  829.05  692.28  829.03   697.4  829.06   698.4  829.08   699.4  829.09
  700.87   829.1  704.41  829.13  705.39   829.2  708.52  829.26  709.68  829.02
  710.43  828.94  712.35   828.9   714.6  828.95  715.37  828.82  716.45  828.74
  718.03  828.78  720.52  828.95  721.69  828.98  722.49  829.01  725.74  829.05
  726.65  829.06  727.28  828.96  728.57  828.73  733.79  828.75  734.67  828.77
  735.22   828.8  738.73  828.85   739.3  828.85   740.4   828.8  746.51  828.71
  746.75   828.7  747.27  828.65  750.78  828.57  752.13   828.6  752.77  828.61
   754.3  828.64  758.04  828.86  758.78  828.78  761.18  828.79  763.07  828.81
  763.49  828.77  764.93  828.59  765.99  828.64   767.2  828.68  771.05  828.82
  773.74  828.81   775.1  828.74  776.74  828.54  777.15  828.53   778.1  828.52
  782.98  828.54  791.56  828.54  795.12  828.53  795.63  828.52  796.37  828.53
  799.69  828.42  800.55  828.41  801.69  828.46  804.76  828.66  805.91  828.72
  806.64  828.81   807.7  828.86  809.06  828.89  811.85  828.85  812.76  828.81
  816.34  828.98  818.29     829  820.06  828.85  825.31  828.81  825.93  828.82
  826.02  828.82  826.61  828.83  830.95  828.88  831.91  828.81  833.17  828.84
  836.07  828.95  837.67  829.17  838.01  829.16  838.92  829.22  842.11  829.27
  843.63  829.08  844.03  829.04  844.63  829.08  848.05  829.36   848.6  829.42
  849.97  829.48  853.55  829.61  853.96  829.61   854.2  829.63  855.87  829.55
  859.66  829.69  860.11  829.72  861.77  829.89  865.02  830.22  865.72  830.41
  866.11  830.45  867.61  830.79     870  830.71  872.38  830.84  873.44  830.98
   875.3  831.04  877.47  831.25  878.63  831.38  879.32  831.46   882.6  831.74
  883.31  831.79   883.8  831.81  885.14  831.83   888.1  831.85  889.08  831.87
  890.43  831.99  891.48  832.08   892.5  832.26  896.83  832.94  900.24  834.95
  900.65  835.23  900.94  835.44  902.53  836.57  908.38  838.21  912.51  839.35
  914.83   839.6  920.35  840.33  950.62  841.26  954.03   841.1  954.85   841.2
  956.48  841.09  957.87  841.17   958.1   841.2  959.55  841.21  961.58  841.21
  962.32  841.22  963.07  841.22  966.13  841.33  968.09  841.29  968.91  841.33
  971.47  841.33

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013  184.32     .03  392.91      .1  409.74     .07  415.29     .06
  443.35     .07   467.2      .1  530.18    .013     540      .1   601.4    .035
  848.05      .1  971.47      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        409.74  444.18            56.86   52.22   53.96             .1       .3
Ineffective Flow     num=       5
   Sta L   Sta R    Elev  Permanent
     133     184     855       T
     284     325     850       T
     325   402.5   829.4       F
     535     900  832.73       F
     915     971     860       T

CROSS SECTION OUTPUT  Profile #2xHMMF
```

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 826.18 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.01 | Wt. n-Val. | | 0.061 | |
| W.S. Elev (ft) | 826.17 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 824.25 | Flow Area (sq ft) | | 60.74 | |
| E.G. Slope (ft/ft) | 0.000295 | Area (sq ft) | | 60.74 | |
| Q Total (cfs) | 38.60 | Flow (cfs) | | 38.60 | |
| Top Width (ft) | 28.27 | Top Width (ft) | | 28.27 | |
| Vel Total (ft/s) | 0.64 | Avg. Vel. (ft/s) | | 0.64 | |
| Max Chl Dpth (ft) | 2.99 | Hydr. Depth (ft) | | 2.15 | |
| Conv. Total (cfs) | 2247.0 | Conv. (cfs) | | 2247.0 | |
| Length Wtd. (ft) | 52.22 | Wetted Per. (ft) | | 32.52 | |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | | 0.03 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | | 0.02 | |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | 0.16 | |
| C & E Loss (ft) | | Cum SA (acres) | | 0.14 | |

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #2-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 829.53 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.031 | 0.063 | 0.090 |
| W.S. Elev (ft) | 829.50 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 826.49 | Flow Area (sq ft) | 263.55 | 169.24 | 122.78 |
| E.G. Slope (ft/ft) | 0.000384 | Area (sq ft) | 318.47 | 169.24 | 274.22 |
| Q Total (cfs) | 620.00 | Flow (cfs) | 358.90 | 203.37 | |

| | | | | | |
|---|---|---|---|---|---|
| 57.73 | | | | | |
| Top Width (ft) | 541.09 | Top Width (ft) | 194.58 | 34.44 | 312.07 |
| Vel Total (ft/s) | 1.12 | Avg. Vel. (ft/s) | 1.36 | 1.20 | 0.47 |
| Max Chl Dpth (ft) | 6.32 | Hydr. Depth (ft) | 1.72 | 4.91 | 1.74 |
| Conv. Total (cfs) | 31650.1 | Conv. (cfs) | 18321.1 | 10381.8 | 2947.2 |
| Length Wtd. (ft) | 52.22 | Wetted Per. (ft) | 154.71 | 40.70 | 70.78 |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.04 | 0.10 | 0.04 |
| Alpha | 1.26 | Stream Power (lb/ft s) | 0.06 | 0.12 | 0.02 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | 0.66 | 1.26 | 0.83 |
| C & E Loss (ft) | | Cum SA (acres) | 0.92 | 0.18 | 1.37 |

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #5-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.34 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.031 | 0.063 | 0.089 |
| W.S. Elev (ft) | 830.30 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 828.50 | Flow Area (sq ft) | 389.40 | 196.78 | 180.03 |
| E.G. Slope (ft/ft) | 0.000424 | Area (sq ft) | 477.10 | 196.78 | 550.21 |
| Q Total (cfs) | 1070.00 | Flow (cfs) | 682.14 | 274.86 | 113.00 |
| Top Width (ft) | 621.29 | Top Width (ft) | 202.94 | 34.44 | 383.91 |
| Vel Total (ft/s) | 1.40 | Avg. Vel. (ft/s) | 1.75 | 1.40 | 0.63 |
| Max Chl Dpth (ft) | 7.12 | Hydr. Depth (ft) | 2.40 | 5.71 | 2.48 |
| Conv. Total (cfs) | 51961.3 | Conv. (cfs) | 33126.1 | 13347.9 | 5487.3 |
| Length Wtd. (ft) | 52.22 | Wetted Per. (ft) | 163.14 | 40.70 | 73.20 |

| | | | | | |
|---|---|---|---|---|---|
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.06 | 0.13 | 0.07 |
| Alpha | 1.28 | Stream Power (lb/ft s) | 0.11 | 0.18 | 0.04 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | 1.19 | 1.64 | 1.69 |
| C & E Loss (ft) | | Cum SA (acres) | 0.94 | 0.18 | 1.67 |

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) | 830.51 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.031 | 0.063 | 0.089 |
| W.S. Elev (ft) | 830.46 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 828.63 | Flow Area (sq ft) | 415.28 | 202.28 | 191.67 |
| E.G. Slope (ft/ft) | 0.000432 | Area (sq ft) | 509.53 | 202.28 | 611.93 |
| Q Total (cfs) | 1180.00 | Flow (cfs) | 763.29 | 290.54 | 126.18 |
| Top Width (ft) | 625.92 | Top Width (ft) | 203.41 | 34.44 | 388.07 |
| Vel Total (ft/s) | 1.46 | Avg. Vel. (ft/s) | 1.84 | 1.44 | 0.66 |
| Max Chl Dpth (ft) | 7.28 | Hydr. Depth (ft) | 2.56 | 5.87 | 2.62 |
| Conv. Total (cfs) | 56759.5 | Conv. (cfs) | 36715.0 | 13975.1 | 6069.4 |
| Length Wtd. (ft) | 52.22 | Wetted Per. (ft) | 163.64 | 40.70 | 73.69 |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.07 | 0.13 | 0.07 |
| Alpha | 1.29 | Stream Power (lb/ft s) | 0.13 | 0.19 | 0.05 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | 1.31 | 1.72 | 1.89 |
| C & E Loss (ft) | | Cum SA (acres) | 0.94 | 0.18 | 1.70 |

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #25-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.95 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.032 | 0.063 | 0.089 |
| W.S. Elev (ft) | 830.90 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 828.87 | Flow Area (sq ft) | 486.50 | 217.19 | 223.64 |
| E.G. Slope (ft/ft) | 0.000437 | Area (sq ft) | 598.49 | 217.19 | 781.61 |
| Q Total (cfs) | 1465.00 | Flow (cfs) | 973.52 | 329.03 | 162.45 |
| Top Width (ft) | 640.60 | Top Width (ft) | 208.38 | 34.44 | 397.78 |
| Vel Total (ft/s) | 1.58 | Avg. Vel. (ft/s) | 2.00 | 1.51 | 0.73 |
| Max Chl Dpth (ft) | 7.72 | Hydr. Depth (ft) | 2.91 | 6.31 | 3.00 |
| Conv. Total (cfs) | 70053.0 | Conv. (cfs) | 46551.6 | 15733.6 | 7767.8 |
| Length Wtd. (ft) | 52.22 | Wetted Per. (ft) | 168.63 | 40.70 | 75.08 |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.08 | 0.15 | 0.08 |
| Alpha | 1.30 | Stream Power (lb/ft s) | 0.16 | 0.22 | 0.06 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | 1.60 | 1.93 | 2.42 |
| C & E Loss (ft) | | Cum SA (acres) | 0.96 | 0.18 | 1.78 |

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 831.32 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.032 | 0.063 | 0.088 |
| W.S. Elev (ft) | 831.27 | Reach Len. (ft) | 56.86 | 52.22 | |

| | | | | | |
|---|---|---|---|---|---|
| 53.96 | | | | | |
| Crit W.S. (ft) | 829.07 | Flow Area (sq ft) | 549.30 | 229.92 | 251.40 |
| E.G. Slope (ft/ft) | 0.000447 | Area (sq ft) | 676.46 | 229.92 | 930.32 |
| Q Total (cfs) | 1740.00 | Flow (cfs) | 1176.67 | 365.62 | 197.71 |
| Top Width (ft) | 653.77 | Top Width (ft) | 213.27 | 34.44 | 406.06 |
| Vel Total (ft/s) | 1.69 | Avg. Vel. (ft/s) | 2.14 | 1.59 | 0.79 |
| Max Chl Dpth (ft) | 8.09 | Hydr. Depth (ft) | 3.19 | 6.68 | 3.32 |
| Conv. Total (cfs) | 82337.8 | Conv. (cfs) | 55680.7 | 17301.2 | 9355.9 |
| Length Wtd. (ft) | 52.22 | Wetted Per. (ft) | 173.54 | 40.70 | 76.26 |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.09 | 0.16 | 0.09 |
| Alpha | 1.30 | Stream Power (lb/ft s) | 0.19 | 0.25 | 0.07 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | 1.85 | 2.11 | 2.89 |
| C & E Loss (ft) | | Cum SA (acres) | 0.97 | 0.18 | 1.84 |

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) | 831.61 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.032 | 0.063 | 0.088 |
| W.S. Elev (ft) | 831.54 | Reach Len. (ft) | 56.86 | 52.22 | 53.96 |
| Crit W.S. (ft) | 829.22 | Flow Area (sq ft) | 597.32 | 239.49 | 272.81 |
| E.G. Slope (ft/ft) | 0.000467 | Area (sq ft) | 735.86 | 239.49 | 1044.00 |
| Q Total (cfs) | 2000.00 | Flow (cfs) | 1373.78 | 399.98 | 226.24 |
| Top Width (ft) | 661.96 | Top Width (ft) | 214.53 | 34.44 | 412.99 |
| Vel Total (ft/s) | 1.80 | Avg. Vel. (ft/s) | 2.30 | 1.67 | 0.83 |

| | | | | |
|---|---|---|---|---|
| Max Chl Dpth (ft) | 8.36 | Hydr. Depth (ft) | 3.44 | 6.95 |
| 3.47 | | | | |
| Conv. Total (cfs) | 92591.0 | Conv. (cfs) | 63599.8 | 18517.3 |
| 10473.9 | | | | |
| Length Wtd. (ft) | 52.22 | Wetted Per. (ft) | 174.83 | 40.70 |
| 79.35 | | | | |
| Min Ch El (ft) | 823.18 | Shear (lb/sq ft) | 0.10 | 0.17 |
| 0.10 | | | | |
| Alpha | 1.31 | Stream Power (lb/ft s) | 0.23 | 0.29 |
| 0.08 | | | | |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | 2.05 | 2.25 |
| 3.27 | | | | |
| C & E Loss (ft) | | Cum SA (acres) | 0.98 | 0.18 |
| 1.91 | | | | |

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: Oldtown Creek
REACH: Reach RS: 679.82

INPUT
Description:
Distance from Upstream XS = .5
Deck/Roadway Width = 51
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

| Sta Hi Cord | Lo Cord | Sta Hi Cord | Lo Cord |
|---|---|---|---|
| 402.62 827.96 | 820 | 444.18 827.96 | 820 |

Upstream Bridge Cross Section Data
Station Elevation Data num= 466

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 837.63 | 14.52 | 837.16 | 17.4 | 837.14 | 20.94 | 836.95 | 22.37 | 836.92 |
| 37.71 | 836.17 | 41.1 | 836.03 | 48.57 | 835.39 | 52.88 | 835.09 | 56.33 | 835.19 |
| 58.83 | 835.24 | 64.25 | 835.33 | 71.44 | 835.38 | 77.8 | 835.27 | 82.69 | 835.16 |
| 86.27 | 835.01 | 88.91 | 834.91 | 94.17 | 835.06 | 94.22 | 835.07 | 94.25 | 835.07 |
| 94.89 | 835.1 | 95.2 | 835.12 | 95.56 | 835.14 | 95.79 | 835.15 | 95.97 | 835.16 |
| 96.25 | 835.17 | 97.13 | 835.22 | 98.86 | 835.31 | 99.35 | 835.33 | 99.99 | 835.37 |
| 101.82 | 835.46 | 103.93 | 835.58 | 104.95 | 836.19 | 104.97 | 836.2 | 104.99 | 836.2 |
| 105.93 | 835.81 | 106.69 | 835.79 | 107.62 | 835.77 | 108.83 | 835.58 | 110.47 | 835.55 |
| 111.98 | 835.78 | 112.24 | 835.78 | 114.49 | 835.54 | 115.97 | 835.51 | 116.63 | 835.49 |
| 117.45 | 835.37 | 117.7 | 835.37 | 119.38 | 835.5 | 119.68 | 835.49 | 121.62 | 835.45 |
| 122.32 | 835.43 | 122.96 | 835.41 | 123.23 | 835.41 | 125.36 | 835.47 | 126.62 | 835.44 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 127.06 | 835.43 | 127.29 | 835.43 | 127.49 | 835.42 | 128.37 | 835.29 | 128.91 | 835.29 |
| 130.29 | 835.27 | 131.38 | 835.13 | 132.57 | 835.11 | 133.21 | 835.2 | 133.68 | 835.19 |
| 134.5 | 835.18 | 135.65 | 835.16 | 136.78 | 835.15 | 138.23 | 835.13 | 138.53 | 835.01 |
| 139.07 | 835 | 139.61 | 835 | 140.64 | 834.99 | 141.09 | 834.97 | 141.85 | 834.96 |
| 145.01 | 834.92 | 148.71 | 834.86 | 149.44 | 834.87 | 150.65 | 834.85 | 151.99 | 834.82 |
| 153.99 | 834.79 | 156.97 | 834.75 | 158.33 | 834.66 | 159.9 | 834.63 | 165.32 | 834.56 |
| 166.36 | 834.44 | 167.19 | 834.35 | 168.24 | 834.32 | 170.48 | 834.08 | 171.99 | 833.91 |
| 174.87 | 833.59 | 176.32 | 833.6 | 177.71 | 833.45 | 178.72 | 833.59 | 179.18 | 833.55 |
| 179.52 | 833.51 | 181.06 | 833.35 | 183.17 | 832.72 | 183.34 | 832.7 | 184.32 | 832.83 |
| 184.36 | 832.82 | 185.28 | 832.72 | 186.31 | 832.61 | 187.86 | 832.23 | 188.97 | 832.11 |
| 190.73 | 832.37 | 190.81 | 832.36 | 190.88 | 832.35 | 191.14 | 832.35 | 194.87 | 831.62 |
| 196.38 | 831.29 | 196.39 | 831.28 | 196.43 | 831.27 | 201.59 | 830.88 | 201.92 | 830.84 |
| 202.02 | 830.83 | 202.04 | 830.83 | 202.11 | 830.82 | 205.27 | 830.63 | 205.91 | 830.57 |
| 206.08 | 830.55 | 206.99 | 830.24 | 207.71 | 830.17 | 210.55 | 830.11 | 211.25 | 830.03 |
| 211.63 | 829.99 | 211.78 | 829.98 | 212.44 | 829.74 | 213.33 | 829.66 | 215.57 | 829.47 |
| 216.2 | 829.37 | 217.2 | 829.29 | 217.41 | 829.3 | 217.82 | 829.27 | 219.08 | 829.16 |
| 219.74 | 829.11 | 221.56 | 828.96 | 223.05 | 828.85 | 224.13 | 828.77 | 226.52 | 828.6 |
| 229.69 | 828.36 | 230.17 | 828.33 | 230.47 | 828.31 | 230.91 | 828.3 | 231.96 | 828.3 |
| 234.35 | 828.29 | 235.45 | 828.28 | 236.75 | 828.28 | 239.43 | 828.27 | 240.61 | 828.26 |
| 241.66 | 828.26 | 244.34 | 828.25 | 245.08 | 828.24 | 245.91 | 828.24 | 248.31 | 828.23 |
| 249.29 | 828.23 | 250.5 | 828.22 | 251.71 | 828.22 | 254.69 | 828.21 | 255.85 | 828.2 |
| 259.95 | 828.16 | 264.16 | 828.19 | 266.43 | 828.19 | 266.96 | 828.2 | 269.36 | 828.2 |
| 271.29 | 828.21 | 272.8 | 828.21 | 275.17 | 828.22 | 277.39 | 828.22 | 279.79 | 828.23 |
| 281.69 | 828.23 | 283.94 | 828.24 | 284.53 | 828.24 | 298.46 | 828.21 | 299.23 | 828.21 |
| 299.34 | 828.2 | 301.17 | 828.19 | 301.4 | 828.18 | 302.36 | 828.18 | 303.99 | 828.16 |
| 305.03 | 828.15 | 305.76 | 828.14 | 306.45 | 828.14 | 306.71 | 828.13 | 307.18 | 828.13 |
| 308.17 | 828.12 | 308.72 | 828.11 | 309.19 | 828.11 | 309.93 | 828.1 | 310.52 | 828.1 |
| 321.99 | 828.13 | 331.27 | 828.02 | 344.85 | 827.12 | 351.49 | 826.68 | 353.32 | 826.53 |
| 355.1 | 826.38 | 369.47 | 826.61 | 378.87 | 826.79 | 378.97 | 826.79 | 379.32 | 826.8 |
| 380.19 | 826.8 | 380.33 | 826.81 | 380.88 | 826.81 | 381.08 | 826.82 | 381.23 | 826.82 |
| 382.03 | 826.84 | 382.38 | 826.85 | 383.27 | 826.87 | 388.63 | 827 | 391.7 | 827.08 |
| 392.05 | 827.28 | 392.77 | 827.71 | 392.91 | 827.75 | 392.98 | 827.6 | 393.18 | 827.18 |
| 393.57 | 827.33 | 394.53 | 827.71 | 394.68 | 827.77 | 395.18 | 827.96 | 402.62 | 829.42 |
| 409.74 | 827.79 | 410.85 | 827.54 | 415.29 | 826.7 | 415.33 | 826.65 | 415.73 | 826.03 |
| 417.35 | 823.18 | 420.29 | 823.48 | 426.47 | 824.15 | 428.51 | 824.77 | 443.35 | 823.43 |
| 443.52 | 823.54 | 444.18 | 828.05 | 444.66 | 828.15 | 444.85 | 828.11 | 449.6 | 828.04 |
| 467.2 | 827.78 | 470.55 | 827.76 | 473.4 | 827.67 | 474.13 | 827.66 | 492.65 | 827.39 |
| 503.61 | 827.55 | 509.44 | 827.68 | 517.09 | 830.37 | 519.88 | 831.29 | 527.1 | 831.9 |
| 529.41 | 832.15 | 529.7 | 832.16 | 530.03 | 832.16 | 530.18 | 832.17 | 530.8 | 832.18 |
| 531.12 | 832.18 | 531.44 | 832.19 | 531.61 | 832.2 | 531.79 | 832.2 | 532.11 | 832.21 |
| 532.42 | 832.22 | 532.93 | 832.24 | 533.52 | 832.25 | 534.43 | 832.28 | 535.9 | 832.33 |
| 538.42 | 832.4 | 540 | 832.45 | 540.61 | 832.45 | 541.92 | 832.47 | 542.94 | 832.28 |
| 543.76 | 832.12 | 544.89 | 831.82 | 547.63 | 831.16 | 548.2 | 831.12 | 549.58 | 830.89 |
| 551.56 | 830.4 | 554.39 | 830.1 | 559.1 | 830.27 | 559.56 | 830.29 | 559.73 | 830.27 |
| 565.39 | 829.85 | 566.53 | 829.64 | 572.13 | 829.72 | 575.67 | 829.89 | 577.49 | 829.9 |
| 578.84 | 829.94 | 580.71 | 829.83 | 582.93 | 830 | 587.17 | 830.12 | 589.85 | 830.12 |
| 592.29 | 830.01 | 598.55 | 830.25 | 601.4 | 830.34 | 603.33 | 830.22 | 604.06 | 830 |
| 612.3 | 829.18 | 612.58 | 829.19 | 614.31 | 829.2 | 614.61 | 829.2 | 620.38 | 829.12 |
| 623.85 | 829.15 | 624.56 | 829.16 | 626.32 | 828.96 | 626.39 | 828.95 | 626.52 | 828.94 |
| 631.96 | 828.98 | 634.34 | 829.01 | 638.33 | 829.01 | 640.14 | 828.94 | 643.42 | 828.88 |

```
  644.41  828.93  646.79  828.89  648.46  828.93  649.44  828.72  650.33  828.62
   653.5  828.63   654.6  828.67  654.85  828.67  656.21  828.65  659.59  828.85
  660.85  828.88  662.28  828.78  662.52   828.8  667.91  829.11  668.39  829.07
  672.39  829.07  672.49  829.06  672.55  829.07  674.34  829.06  679.27  828.73
  680.11   828.7  680.33  828.69  681.02  828.75  683.51  828.88  686.23  829.05
  686.95  829.05  692.28  829.03   697.4  829.06   698.4  829.08   699.4  829.09
  700.87   829.1  704.41  829.13  705.39   829.2  708.52  829.26  709.68  829.02
  710.43  828.94  712.35   828.9   714.6  828.95  715.37  828.82  716.45  828.74
  718.03  828.78  720.52  828.95  721.69  828.98  722.49  829.01  725.74  829.05
  726.65  829.06  727.28  828.96  728.57  828.73  733.79  828.75  734.67  828.77
  735.22   828.8  738.73  828.85   739.3  828.85   740.4   828.8  746.51  828.71
  746.75   828.7  747.27  828.65  750.78  828.57  752.13   828.6  752.77  828.61
   754.3  828.64  758.04  828.86  758.78  828.78  761.18  828.79  763.07  828.81
  763.49  828.77  764.93  828.59  765.99  828.64   767.2  828.68  771.05  828.82
  773.74  828.81   775.1  828.74  776.74  828.54  777.15  828.53   778.1  828.52
  782.98  828.54  791.56  828.54  795.12  828.53  795.63  828.52  796.37  828.53
  799.69  828.42  800.55  828.41  801.69  828.46  804.76  828.66  805.91  828.72
  806.64  828.81   807.7  828.86  809.06  828.89  811.85  828.85  812.76  828.81
  816.34  828.98  818.29     829  820.06  828.85  825.31  828.81  825.93  828.82
  826.02  828.82  826.61  828.83  830.95  828.88  831.91  828.81  833.17  828.84
  836.07  828.95  837.67  829.17  838.01  829.16  838.92  829.22  842.11  829.27
  843.63  829.08  844.03  829.04  844.63  829.08  848.05  829.36   848.6  829.42
  849.97  829.48  853.55  829.61  853.96  829.61   854.2  829.63  855.87  829.55
  859.66  829.69  860.11  829.72  861.77  829.89  865.02  830.22  865.72  830.41
  866.11  830.45  867.61  830.79     870  830.71  872.38  830.84  873.44  830.98
   875.3  831.04  877.47  831.25  878.63  831.38  879.32  831.46   882.6  831.74
  883.31  831.79   883.8  831.81  885.14  831.83   888.1  831.85  889.08  831.87
  890.43  831.99  891.48  832.08   892.5  832.26  896.83  832.94  900.24  834.95
  900.65  835.23  900.94  835.44  902.53  836.57  908.38  838.21  912.51  839.35
  914.83   839.6  920.35  840.33  950.62  841.26  954.03   841.1  954.85   841.2
  956.48  841.09  957.87  841.17   958.1   841.2  959.55  841.21  961.58  841.21
  962.32  841.22  963.07  841.22  966.13  841.33  968.09  841.29  968.91  841.33
  971.47  841.33

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013  184.32     .03  392.91      .1  409.74     .07  415.29     .06
  443.35     .07   467.2      .1  530.18    .013     540      .1   601.4    .035
  848.05      .1  971.47      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
        409.74  444.18            .1       .3
Ineffective Flow     num=       5
   Sta L   Sta R    Elev  Permanent
     133     184     855       T
     284     325     850       T
     325   402.5   829.4       F
     535     900  832.73       F
     915     971     860       T
```

Downstream  Deck/Roadway Coordinates

num=  3

| Sta | Hi Cord | Lo Cord | Sta | Hi Cord | Lo Cord | Sta | Hi Cord | Lo Cord |
|---|---|---|---|---|---|---|---|---|
| 394.87 | 827.96 | 820 | 438.42 | 827.96 | 820 | 460 | 827.46 | 820 |

Downstream Bridge Cross Section Data

Station Elevation Data  num=  382

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 837.66 | 23.61 | 836.41 | 23.99 | 836.42 | 29.77 | 835.87 | 31.57 | 835.7 |
| 31.87 | 835.7 | 32.1 | 835.71 | 34.22 | 835.63 | 34.44 | 835.62 | 34.45 | 835.62 |
| 34.62 | 835.61 | 34.98 | 835.6 | 38.26 | 835.48 | 38.9 | 835.36 | 40.51 | 835.27 |
| 40.91 | 835.04 | 40.98 | 835.01 | 41.14 | 834.9 | 41.27 | 834.98 | 41.34 | 835 |
| 41.48 | 835 | 41.58 | 835.01 | 41.81 | 835.02 | 42.2 | 835.04 | 43.44 | 835.1 |
| 47.46 | 835.24 | 51.88 | 835.31 | 58.9 | 835.41 | 63.41 | 835.3 | 70.49 | 835.15 |
| 74.44 | 834.97 | 77.03 | 834.86 | 79 | 834.91 | 79.88 | 834.95 | 82.96 | 835.02 |
| 83.9 | 835.04 | 83.97 | 835.01 | 87.67 | 834.9 | 90.8 | 834.93 | 97.73 | 834.9 |
| 111.4 | 834.81 | 125.83 | 834.5 | 134.86 | 834.35 | 136.1 | 834.33 | 148.95 | 834.07 |
| 154.14 | 834.05 | 154.81 | 834.11 | 160.1 | 834.09 | 171.28 | 834.16 | 172.35 | 834.16 |
| 176.92 | 833.98 | 191.05 | 834.76 | 192.25 | 834.76 | 192.78 | 834.74 | 196.11 | 834.46 |
| 196.87 | 834.44 | 202.06 | 834.04 | 202.74 | 833.88 | 204.07 | 833.57 | 205.77 | 833.18 |
| 207.94 | 832.15 | 212.3 | 831.14 | 213.49 | 831.1 | 214.81 | 830.66 | 217.27 | 829.97 |
| 219.65 | 829.27 | 220.96 | 829.18 | 224.95 | 828.67 | 226.73 | 828.54 | 232 | 828.69 |
| 232.18 | 828.73 | 235.83 | 828.81 | 236.35 | 828.81 | 237.87 | 828.74 | 239.1 | 828.72 |
| 242.82 | 828.77 | 243.48 | 828.75 | 246.98 | 828.74 | 247.35 | 828.74 | 248.89 | 828.73 |
| 249.04 | 828.74 | 254.47 | 828.34 | 257.06 | 828.37 | 259.18 | 828.23 | 265.14 | 828.52 |
| 265.42 | 828.53 | 265.95 | 828.53 | 270.85 | 828.45 | 272.32 | 828.49 | 276.52 | 828.46 |
| 277.47 | 828.45 | 282.21 | 828.36 | 282.35 | 828.36 | 286.25 | 828.16 | 286.43 | 828.15 |
| 289 | 828.18 | 292.51 | 828.45 | 296.15 | 828.84 | 297.56 | 828.82 | 297.93 | 828.87 |
| 301.25 | 828.65 | 303.17 | 828.46 | 305.22 | 828.48 | 314.23 | 828.42 | 315.96 | 828.45 |
| 316.02 | 828.45 | 316.25 | 828.43 | 319.78 | 828.12 | 321.19 | 828.07 | 321.58 | 828.07 |
| 321.86 | 828.08 | 326.54 | 828.13 | 329.33 | 828.02 | 332.6 | 827.99 | 335.55 | 828.2 |
| 336.66 | 828.3 | 337.04 | 828.27 | 338.52 | 828.24 | 340.98 | 828.08 | 346.63 | 827.91 |
| 348.27 | 827.85 | 349.54 | 827.92 | 351.43 | 827.89 | 351.82 | 827.89 | 353.51 | 827.93 |
| 354.14 | 827.93 | 355.1 | 827.84 | 358.59 | 827.79 | 359.28 | 827.77 | 360.77 | 827.72 |
| 360.83 | 827.72 | 364.75 | 827.78 | 364.86 | 827.79 | 366.39 | 827.82 | 369.89 | 828.28 |
| 370.42 | 828.3 | 370.76 | 828.35 | 372.08 | 828.47 | 374.6 | 828.43 | 376.04 | 828.48 |
| 377.41 | 828.55 | 377.67 | 828.57 | 380.99 | 828.94 | 382.07 | 829.04 | 387.32 | 828.34 |
| 394.87 | 829.08 | 402.89 | 826.86 | 403.31 | 826.75 | 406.18 | 826.24 | 406.56 | 826.27 |
| 407.14 | 827.12 | 409.03 | 825.48 | 411.51 | 823.71 | 411.6 | 823.77 | 419.38 | 823.64 |
| 420.78 | 823.62 | 434.17 | 823.44 | 434.37 | 823.63 | 436.99 | 825.8 | 437.6 | 826.3 |
| 438.42 | 826.95 | 440.53 | 826.98 | 460.6 | 827.46 | 464.08 | 827.6 | 466.79 | 827.68 |
| 471.83 | 827.62 | 475.29 | 827.58 | 481.99 | 827.5 | 487.56 | 827.36 | 497.94 | 826.97 |
| 506.69 | 829.56 | 511.62 | 831.08 | 520.34 | 831.87 | 521.87 | 832.01 | 523.03 | 832.02 |
| 531.91 | 832.09 | 531.95 | 832.09 | 532.06 | 832.38 | 532.28 | 832.37 | 533.85 | 832.24 |
| 537.35 | 831.4 | 537.75 | 831.28 | 539.31 | 830.77 | 539.63 | 830.65 | 539.75 | 830.63 |
| 543.58 | 829.76 | 548.77 | 829.68 | 549.57 | 829.63 | 550.39 | 829.6 | 555.43 | 829.49 |
| 556.24 | 829.37 | 559.28 | 829.35 | 561.88 | 829.33 | 566.53 | 829.29 | 568.55 | 829.34 |
| 571.23 | 829.29 | 574.41 | 829.27 | 576.46 | 829.31 | 578.84 | 829.39 | 584.31 | 829.54 |
| 584.64 | 829.54 | 584.91 | 829.55 | 587.97 | 829.74 | 590.68 | 829.91 | 591.37 | 829.87 |
| 592.54 | 829.79 | 593.47 | 829.69 | 596.92 | 829.33 | 599.98 | 829 | 602.47 | 828.88 |

```
  603.39  828.96  604.17  828.86  608.15  828.73  608.35  828.72   608.4  828.72
  610.18  828.69  615.74  828.63  616.19  828.62  620.16  828.69  620.39  828.68
  620.52  828.68  622.02  828.75  624.51  828.82  628.08  828.83  628.12  828.83
  632.22  828.75  634.09  828.52  634.15  828.51  638.02  828.62   638.4  828.58
  640.03  828.32  644.17  828.23  645.91  828.23  649.41  828.38  650.66  828.38
  651.97  828.31  654.12  828.48  656.21  828.63  656.77  828.65  658.05  828.63
  660.47  828.68  663.68  828.71  663.98  828.69   664.5  828.66  668.07  828.54
  669.53  828.51  669.95  828.51  671.14  828.49  675.83  828.49  677.47  828.58
  680.03  828.58  681.21  828.66  681.87  828.67  686.62  828.72  687.97  828.73
   688.9  828.76  693.96  828.81  697.01  828.84  698.13  828.87  698.85  828.78
  699.96  828.62  703.26  828.77  704.59  828.76  705.98  828.64  708.57  828.73
  710.12  828.77  711.03  828.73     712   828.7  714.56  828.65  718.07  828.62
  720.83  828.61  723.09  828.71  724.15  828.73  726.94   828.8  728.28  828.77
  728.69  828.79  730.13  828.66  731.78  828.59   736.2  828.51  740.35  828.51
   742.2  828.34  744.69  828.36  747.31   828.5   748.2  828.52  752.15  828.43
  752.54  828.42  754.22  828.43  754.33  828.44  754.64  828.44  758.57  828.56
  759.79  828.54  760.43  828.53   761.5  828.52  764.57  828.45  765.29  828.43
  766.53  828.37  768.86   828.4     772   828.4  772.66  828.42  775.62  828.38
  776.97  828.36  778.19  828.33  778.84  828.31  779.23  828.31  779.88  828.34
  784.96  828.41  786.94  828.41   789.1  828.35  790.77  828.37  791.01  828.37
  791.92  828.38   796.5  828.43  797.02  828.43  798.94  828.45  803.18   828.5
  805.92  828.56  809.34  828.65  813.32  828.74  814.95  828.77   815.3  828.78
  818.53  828.87   819.4  828.87  821.16  828.73  823.93  828.82  825.42  828.88
  826.05  828.85  827.27  828.93   830.2  829.07  831.44  829.08  832.35  829.05
  833.28  828.96  835.98  828.84  837.36  828.78  838.99  828.78  839.18  828.79
  840.08  828.77  845.06   828.8  848.27  829.12  849.17  829.18  850.17  829.22
  850.96  829.23   852.4  829.29     855  829.37  856.66  829.32  856.79  829.31
  856.87  829.31  860.84  829.57  861.89  829.62  862.61  829.63  863.21  829.64
   866.7  829.75  868.19  829.86  868.46  829.89  869.03  829.96  876.83  830.82
  879.25  831.01  882.65  831.45  885.84  831.57  885.96  831.57  886.17   831.6
  891.58  832.72  891.97  832.75  895.61  832.71  897.18  833.01  897.65  833.05
  901.18  833.05  901.31  833.06  904.82   833.4   906.6  833.66  909.57  833.91
  912.42  834.04  912.93   834.1  916.04  834.39   919.4  834.66  919.75   834.7
  920.57   834.7  923.55  834.88  924.87  834.98  926.38  835.13  929.49  835.43
   933.8  835.46  934.24  835.46

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013  191.05     .03  349.54      .1  407.14     .07  411.51     .06
  438.42     .07  440.53      .1  520.34    .013  531.91      .1  584.31    .035
  850.17      .1  934.24      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
        407.14  438.42            .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     200     395   829.3       F
     526     891  832.46       F

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
```

```
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular     2.5     2.5
FHWA Chart # 2 - Corrugated Metal Pipe Culvert
FHWA Scale # 3 - Pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                  1      51     .019     .019        0                  .9
      1
Number of Barrels =  2
Upstream   Elevation =  823.5
Centerline Stations
    Sta.    Sta.
     418     439
Downstream Elevation =  823.5
Centerline Stations
    Sta.    Sta.
     412     431

CULVERT OUTPUT  Profile #2xHMMF  Culv Group:  Culvert #1

  Q Culv Group (cfs)         38.60    Culv Full Len (ft)
  # Barrels                     2    Culv Vel US (ft/s)          4.34
  Q Barrel (cfs)             19.30    Culv Vel DS (ft/s)          5.63
  E.G. US. (ft)             826.18    Culv Inv El Up (ft)       823.50
  W.S. US. (ft)             826.17    Culv Inv El Dn (ft)       823.50
  E.G. DS (ft)              825.16    Culv Frctn Ls (ft)          0.28
  W.S. DS (ft)              825.15    Culv Exit Loss (ft)         0.48
  Delta EG (ft)               1.02    Culv Entr Loss (ft)         0.26
  Delta WS (ft)               1.03    Q Weir (cfs)
  E.G. IC (ft)              825.95    Weir Sta Lft (ft)
  E.G. OC (ft)              826.18    Weir Sta Rgt (ft)
  Culvert Control           Outlet    Weir Submerg
  Culv WS Inlet (ft)        825.62    Weir Max Depth (ft)
  Culv WS Outlet (ft)       825.15    Weir Avg Depth (ft)
  Culv Nml Depth (ft)                 Weir Flow Area (sq ft)
  Culv Crt Depth (ft)         1.49    Min El Weir Flow (ft)     827.40


CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1
```

| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 11.37 | Culv Full Len (ft) | 51.00 |
| # Barrels | 2 | Culv Vel US (ft/s) | 1.16 |
| Q Barrel (cfs) | 5.69 | Culv Vel DS (ft/s) | 1.16 |
| E.G. US. (ft) | 829.53 | Culv Inv El Up (ft) | 823.50 |
| W.S. US. (ft) | 829.50 | Culv Inv El Dn (ft) | 823.50 |
| E.G. DS (ft) | 829.49 | Culv Frctn Ls (ft) | 0.02 |
| W.S. DS (ft) | 829.45 | Culv Exit Loss (ft) | 0.00 |
| Delta EG (ft) | 0.04 | Culv Entr Loss (ft) | 0.02 |
| Delta WS (ft) | 0.05 | Q Weir (cfs) | 608.63 |
| E.G. IC (ft) | 829.50 | Weir Sta Lft (ft) | 215.19 |
| E.G. OC (ft) | 829.53 | Weir Sta Rgt (ft) | 514.62 |
| Culvert Control | Outlet | Weir Submerg | 0.99 |
| Culv WS Inlet (ft) | 826.00 | Weir Max Depth (ft) | 3.12 |
| Culv WS Outlet (ft) | 826.00 | Weir Avg Depth (ft) | 1.70 |
| Culv Nml Depth (ft) | | Weir Flow Area (sq ft) | 438.76 |
| Culv Crt Depth (ft) | 0.79 | Min El Weir Flow (ft) | 827.40 |

Warning: The weir over culvert is submerged.
Warning: During the culvert inlet control computations, the program could not balance the culvert/weir flow. The reported
inlet energy grade answer may not be valid.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 9.20 | Culv Full Len (ft) | 51.00 |
| # Barrels | 2 | Culv Vel US (ft/s) | 0.94 |
| Q Barrel (cfs) | 4.60 | Culv Vel DS (ft/s) | 0.94 |
| E.G. US. (ft) | 830.34 | Culv Inv El Up (ft) | 823.50 |
| W.S. US. (ft) | 830.30 | Culv Inv El Dn (ft) | 823.50 |
| E.G. DS (ft) | 830.32 | Culv Frctn Ls (ft) | 0.01 |
| W.S. DS (ft) | 830.28 | Culv Exit Loss (ft) | 0.00 |
| Delta EG (ft) | 0.03 | Culv Entr Loss (ft) | 0.01 |
| Delta WS (ft) | 0.03 | Q Weir (cfs) | 1241.22 |
| E.G. IC (ft) | 824.50 | Weir Sta Lft (ft) | 206.69 |
| E.G. OC (ft) | 830.34 | Weir Sta Rgt (ft) | 517.01 |
| Culvert Control | Outlet | Weir Submerg | 0.99 |
| Culv WS Inlet (ft) | 826.00 | Weir Max Depth (ft) | 3.96 |
| Culv WS Outlet (ft) | 826.00 | Weir Avg Depth (ft) | 2.45 |
| Culv Nml Depth (ft) | | Weir Flow Area (sq ft) | 660.55 |
| Culv Crt Depth (ft) | 0.71 | Min El Weir Flow (ft) | 827.40 |

Warning: The weir over culvert is submerged.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 7.28 | Culv Full Len (ft) | 51.00 |
| # Barrels | 2 | Culv Vel US (ft/s) | 0.74 |
| Q Barrel (cfs) | 3.64 | Culv Vel DS (ft/s) | 0.74 |

| | | | |
|---|---|---|---|
| E.G. US. (ft) | 830.51 | Culv Inv El Up (ft) | 823.50 |
| W.S. US. (ft) | 830.46 | Culv Inv El Dn (ft) | 823.50 |
| E.G. DS (ft) | 830.49 | Culv Frctn Ls (ft) | 0.01 |
| W.S. DS (ft) | 830.45 | Culv Exit Loss (ft) | 0.00 |
| Delta EG (ft) | 0.02 | Culv Entr Loss (ft) | 0.01 |
| Delta WS (ft) | 0.02 | Q Weir (cfs) | 1086.50 |
| E.G. IC (ft) | 824.38 | Weir Sta Lft (ft) | 206.21 |
| E.G. OC (ft) | 830.51 | Weir Sta Rgt (ft) | 517.50 |
| Culvert Control | Outlet | Weir Submerg | 0.99 |
| Culv WS Inlet (ft) | 826.00 | Weir Max Depth (ft) | 4.13 |
| Culv WS Outlet (ft) | 826.00 | Weir Avg Depth (ft) | 2.61 |
| Culv Nml Depth (ft) | | Weir Flow Area (sq ft) | 704.42 |
| Culv Crt Depth (ft) | 0.63 | Min El Weir Flow (ft) | 827.40 |

Warning: The weir over culvert is submerged.

CULVERT OUTPUT  Profile #25-yr  Culv Group:  Culvert #1

| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 9.04 | Culv Full Len (ft) | 51.00 |
| # Barrels | 2 | Culv Vel US (ft/s) | 0.92 |
| Q Barrel (cfs) | 4.52 | Culv Vel DS (ft/s) | 0.92 |
| E.G. US. (ft) | 830.95 | Culv Inv El Up (ft) | 823.50 |
| W.S. US. (ft) | 830.90 | Culv Inv El Dn (ft) | 823.50 |
| E.G. DS (ft) | 830.92 | Culv Frctn Ls (ft) | 0.01 |
| W.S. DS (ft) | 830.87 | Culv Exit Loss (ft) | 0.00 |
| Delta EG (ft) | 0.03 | Culv Entr Loss (ft) | 0.01 |
| Delta WS (ft) | 0.02 | Q Weir (cfs) | 1540.19 |
| E.G. IC (ft) | 824.49 | Weir Sta Lft (ft) | 200.71 |
| E.G. OC (ft) | 830.95 | Weir Sta Rgt (ft) | 518.84 |
| Culvert Control | Outlet | Weir Submerg | 0.99 |
| Culv WS Inlet (ft) | 826.00 | Weir Max Depth (ft) | 4.57 |
| Culv WS Outlet (ft) | 826.00 | Weir Avg Depth (ft) | 2.98 |
| Culv Nml Depth (ft) | | Weir Flow Area (sq ft) | 824.93 |
| Culv Crt Depth (ft) | 0.70 | Min El Weir Flow (ft) | 827.40 |

Warning: The weir over culvert is submerged.

CULVERT OUTPUT  Profile #50-yr  Culv Group:  Culvert #1

| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 9.65 | Culv Full Len (ft) | 51.00 |
| # Barrels | 2 | Culv Vel US (ft/s) | 0.98 |
| Q Barrel (cfs) | 4.83 | Culv Vel DS (ft/s) | 0.98 |
| E.G. US. (ft) | 831.32 | Culv Inv El Up (ft) | 823.50 |
| W.S. US. (ft) | 831.27 | Culv Inv El Dn (ft) | 823.50 |
| E.G. DS (ft) | 831.30 | Culv Frctn Ls (ft) | 0.02 |
| W.S. DS (ft) | 831.24 | Culv Exit Loss (ft) | 0.00 |
| Delta EG (ft) | 0.03 | Culv Entr Loss (ft) | 0.01 |
| Delta WS (ft) | 0.02 | Q Weir (cfs) | 1866.57 |

| | | | |
|---|---|---|---|
| E.G. IC (ft) | 824.53 | Weir Sta Lft (ft) | 196.22 |
| E.G. OC (ft) | 831.32 | Weir Sta Rgt (ft) | 520.29 |
| Culvert Control | Outlet | Weir Submerg | 0.99 |
| Culv WS Inlet (ft) | 826.00 | Weir Max Depth (ft) | 4.94 |
| Culv WS Outlet (ft) | 826.00 | Weir Avg Depth (ft) | 3.29 |
| Culv Nml Depth (ft) | | Weir Flow Area (sq ft) | 930.85 |
| Culv Crt Depth (ft) | 0.72 | Min El Weir Flow (ft) | 827.40 |

Warning: The weir over culvert is submerged.

CULVERT OUTPUT  Profile #100-yr  Culv Group:  Culvert #1

| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 8.69 | Culv Full Len (ft) | 51.00 |
| # Barrels | 2 | Culv Vel US (ft/s) | 0.88 |
| Q Barrel (cfs) | 4.34 | Culv Vel DS (ft/s) | 0.88 |
| E.G. US. (ft) | 831.61 | Culv Inv El Up (ft) | 823.50 |
| W.S. US. (ft) | 831.54 | Culv Inv El Dn (ft) | 823.50 |
| E.G. DS (ft) | 831.59 | Culv Frctn Ls (ft) | 0.01 |
| W.S. DS (ft) | 831.53 | Culv Exit Loss (ft) | 0.00 |
| Delta EG (ft) | 0.02 | Culv Entr Loss (ft) | 0.01 |
| Delta WS (ft) | 0.02 | Q Weir (cfs) | 1922.06 |
| E.G. IC (ft) | 824.47 | Weir Sta Lft (ft) | 194.91 |
| E.G. OC (ft) | 831.61 | Weir Sta Rgt (ft) | 523.68 |
| Culvert Control | Outlet | Weir Submerg | 0.99 |
| Culv WS Inlet (ft) | 826.00 | Weir Max Depth (ft) | 5.23 |
| Culv WS Outlet (ft) | 826.00 | Weir Avg Depth (ft) | 3.52 |
| Culv Nml Depth (ft) | | Weir Flow Area (sq ft) | 1012.71 |
| Culv Crt Depth (ft) | 0.69 | Min El Weir Flow (ft) | 827.40 |

Warning: The weir over culvert is submerged.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach  RS: 651.5802

INPUT
Description:
Station Elevation Data  num=  382

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 837.66 | 23.61 | 836.41 | 23.99 | 836.42 | 29.77 | 835.87 | 31.57 | 835.7 |
| 31.87 | 835.7 | 32.1 | 835.71 | 34.22 | 835.63 | 34.44 | 835.62 | 34.45 | 835.62 |
| 34.62 | 835.61 | 34.98 | 835.6 | 38.26 | 835.48 | 38.9 | 835.36 | 40.51 | 835.27 |
| 40.91 | 835.04 | 40.98 | 835.01 | 41.14 | 834.9 | 41.27 | 834.98 | 41.34 | 835 |
| 41.48 | 835 | 41.58 | 835.01 | 41.81 | 835.02 | 42.2 | 835.04 | 43.44 | 835.1 |
| 47.46 | 835.24 | 51.88 | 835.31 | 58.9 | 835.41 | 63.41 | 835.3 | 70.49 | 835.15 |
| 74.44 | 834.97 | 77.03 | 834.86 | 79 | 834.91 | 79.88 | 834.95 | 82.96 | 835.02 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 83.9 | 835.04 | 83.97 | 835.01 | 87.67 | 834.9 | 90.8 | 834.93 | 97.73 | 834.9 |
| 111.4 | 834.81 | 125.83 | 834.5 | 134.86 | 834.35 | 136.1 | 834.33 | 148.95 | 834.07 |
| 154.14 | 834.05 | 154.81 | 834.11 | 160.1 | 834.09 | 171.28 | 834.16 | 172.35 | 834.16 |
| 176.92 | 833.98 | 191.05 | 834.76 | 192.25 | 834.76 | 192.78 | 834.74 | 196.11 | 834.46 |
| 196.87 | 834.44 | 202.06 | 834.04 | 202.74 | 833.88 | 204.07 | 833.57 | 205.77 | 833.18 |
| 207.94 | 832.15 | 212.3 | 831.14 | 213.49 | 831.1 | 214.81 | 830.66 | 217.27 | 829.97 |
| 219.65 | 829.27 | 220.96 | 829.18 | 224.95 | 828.67 | 226.73 | 828.54 | 232 | 828.69 |
| 232.18 | 828.73 | 235.83 | 828.81 | 236.35 | 828.81 | 237.87 | 828.74 | 239.1 | 828.72 |
| 242.82 | 828.77 | 243.48 | 828.75 | 246.98 | 828.74 | 247.35 | 828.74 | 248.89 | 828.73 |
| 249.04 | 828.74 | 254.47 | 828.34 | 257.06 | 828.37 | 259.18 | 828.23 | 265.14 | 828.52 |
| 265.42 | 828.53 | 265.95 | 828.53 | 270.85 | 828.45 | 272.32 | 828.49 | 276.52 | 828.46 |
| 277.47 | 828.45 | 282.21 | 828.36 | 282.35 | 828.36 | 286.25 | 828.16 | 286.43 | 828.15 |
| 289 | 828.18 | 292.51 | 828.45 | 296.15 | 828.84 | 297.56 | 828.82 | 297.93 | 828.87 |
| 301.25 | 828.65 | 303.17 | 828.46 | 305.22 | 828.48 | 314.23 | 828.42 | 315.96 | 828.45 |
| 316.02 | 828.45 | 316.25 | 828.43 | 319.78 | 828.12 | 321.19 | 828.07 | 321.58 | 828.07 |
| 321.86 | 828.08 | 326.54 | 828.13 | 329.33 | 828.02 | 332.6 | 827.99 | 335.55 | 828.2 |
| 336.66 | 828.3 | 337.04 | 828.27 | 338.52 | 828.24 | 340.98 | 828.08 | 346.63 | 827.91 |
| 348.27 | 827.85 | 349.54 | 827.92 | 351.43 | 827.89 | 351.82 | 827.89 | 353.51 | 827.93 |
| 354.14 | 827.93 | 355.1 | 827.84 | 358.59 | 827.79 | 359.28 | 827.77 | 360.77 | 827.72 |
| 360.83 | 827.72 | 364.75 | 827.78 | 364.86 | 827.79 | 366.39 | 827.82 | 369.89 | 828.28 |
| 370.42 | 828.3 | 370.76 | 828.35 | 372.08 | 828.47 | 374.6 | 828.43 | 376.04 | 828.48 |
| 377.41 | 828.55 | 377.67 | 828.57 | 380.99 | 828.94 | 382.07 | 829.04 | 387.32 | 828.34 |
| 394.87 | 829.08 | 402.89 | 826.86 | 403.31 | 826.75 | 406.18 | 826.24 | 406.56 | 826.27 |
| 407.14 | 827.12 | 409.03 | 825.48 | 411.51 | 823.71 | 411.6 | 823.77 | 419.38 | 823.64 |
| 420.78 | 823.62 | 434.17 | 823.44 | 434.37 | 823.63 | 436.99 | 825.8 | 437.6 | 826.3 |
| 438.42 | 826.95 | 440.53 | 826.98 | 460.6 | 827.46 | 464.08 | 827.6 | 466.79 | 827.68 |
| 471.83 | 827.62 | 475.29 | 827.58 | 481.99 | 827.5 | 487.56 | 827.36 | 497.94 | 826.97 |
| 506.69 | 829.56 | 511.62 | 831.08 | 520.34 | 831.87 | 521.87 | 832.01 | 523.03 | 832.02 |
| 531.91 | 832.09 | 531.95 | 832.09 | 532.06 | 832.38 | 532.28 | 832.37 | 533.85 | 832.24 |
| 537.35 | 831.4 | 537.75 | 831.28 | 539.31 | 830.77 | 539.63 | 830.65 | 539.75 | 830.63 |
| 543.58 | 829.76 | 548.77 | 829.68 | 549.57 | 829.63 | 550.39 | 829.6 | 555.43 | 829.49 |
| 556.24 | 829.37 | 559.28 | 829.35 | 561.88 | 829.33 | 566.53 | 829.29 | 568.55 | 829.34 |
| 571.23 | 829.29 | 574.41 | 829.27 | 576.46 | 829.31 | 578.84 | 829.39 | 584.31 | 829.54 |
| 584.64 | 829.54 | 584.91 | 829.55 | 587.97 | 829.74 | 590.68 | 829.91 | 591.37 | 829.87 |
| 592.54 | 829.79 | 593.47 | 829.69 | 596.92 | 829.33 | 599.98 | 829 | 602.47 | 828.88 |
| 603.39 | 828.96 | 604.17 | 828.86 | 608.15 | 828.73 | 608.35 | 828.72 | 608.4 | 828.72 |
| 610.18 | 828.69 | 615.74 | 828.63 | 616.19 | 828.62 | 620.16 | 828.69 | 620.39 | 828.68 |
| 620.52 | 828.68 | 622.02 | 828.75 | 624.51 | 828.82 | 628.08 | 828.83 | 628.12 | 828.83 |
| 632.22 | 828.75 | 634.09 | 828.52 | 634.15 | 828.51 | 638.02 | 828.62 | 638.4 | 828.58 |
| 640.03 | 828.32 | 644.17 | 828.23 | 645.91 | 828.23 | 649.41 | 828.38 | 650.66 | 828.38 |
| 651.97 | 828.31 | 654.12 | 828.48 | 656.21 | 828.63 | 656.77 | 828.65 | 658.05 | 828.63 |
| 660.47 | 828.68 | 663.68 | 828.71 | 663.98 | 828.69 | 664.5 | 828.66 | 668.07 | 828.54 |
| 669.53 | 828.51 | 669.95 | 828.51 | 671.14 | 828.49 | 675.83 | 828.49 | 677.47 | 828.58 |
| 680.03 | 828.58 | 681.21 | 828.66 | 681.87 | 828.67 | 686.62 | 828.72 | 687.97 | 828.73 |
| 688.9 | 828.76 | 693.96 | 828.81 | 697.01 | 828.84 | 698.13 | 828.87 | 698.85 | 828.78 |
| 699.96 | 828.62 | 703.26 | 828.77 | 704.59 | 828.76 | 705.98 | 828.64 | 708.57 | 828.73 |
| 710.12 | 828.77 | 711.03 | 828.73 | 712 | 828.7 | 714.56 | 828.65 | 718.07 | 828.62 |
| 720.83 | 828.61 | 723.09 | 828.71 | 724.15 | 828.73 | 726.94 | 828.8 | 728.28 | 828.77 |
| 728.69 | 828.79 | 730.13 | 828.66 | 731.78 | 828.59 | 736.2 | 828.51 | 740.35 | 828.51 |
| 742.2 | 828.34 | 744.69 | 828.36 | 747.31 | 828.5 | 748.2 | 828.52 | 752.15 | 828.43 |

```
  752.54  828.42  754.22  828.43  754.33  828.44  754.64  828.44  758.57  828.56
  759.79  828.54  760.43  828.53   761.5  828.52  764.57  828.45  765.29  828.43
  766.53  828.37  768.86   828.4     772   828.4  772.66  828.42  775.62  828.38
  776.97  828.36  778.19  828.33  778.84  828.31  779.23  828.31  779.88  828.34
  784.96  828.41  786.94  828.41   789.1  828.35  790.77  828.37  791.01  828.37
  791.92  828.38   796.5  828.43  797.02  828.43  798.94  828.45  803.18   828.5
  805.92  828.56  809.34  828.65  813.32  828.74  814.95  828.77   815.3  828.78
  818.53  828.87   819.4  828.87  821.16  828.73  823.93  828.82  825.42  828.88
  826.05  828.85  827.27  828.93   830.2  829.07  831.44  829.08  832.35  829.05
  833.28  828.96  835.98  828.84  837.36  828.78  838.99  828.78  839.18  828.79
  840.08  828.77  845.06   828.8  848.27  829.12  849.17  829.18  850.17  829.22
  850.96  829.23   852.4  829.29     855  829.37  856.66  829.32  856.79  829.31
  856.87  829.31  860.84  829.57  861.89  829.62  862.61  829.63  863.21  829.64
   866.7  829.75  868.19  829.86  868.46  829.89  869.03  829.96  876.83  830.82
  879.25  831.01  882.65  831.45  885.84  831.57  885.96  831.57  886.17   831.6
  891.58  832.72  891.97  832.75  895.61  832.71  897.18  833.01  897.65  833.05
  901.18  833.05  901.31  833.06  904.82   833.4   906.6  833.66  909.57  833.91
  912.42  834.04  912.93   834.1  916.04  834.39   919.4  834.66  919.75   834.7
  920.57   834.7  923.55  834.88  924.87  834.98  926.38  835.13  929.49  835.43
   933.8  835.46  934.24  835.46

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013  191.05     .03  349.54      .1  407.14     .07  411.51     .06
  438.42     .07  440.53      .1  520.34    .013  531.91      .1  584.31    .035
  850.17      .1  934.24      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        407.14  438.42           111.44  106.45  103.86             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     200     395   829.3       F
     526     891  832.46       F

CROSS SECTION OUTPUT  Profile #2xHMMF


  E.G. Elev (ft)            825.16    Element                   Left OB    Channel
Right OB
  Vel Head (ft)               0.02    Wt. n-Val.                            0.061

  W.S. Elev (ft)            825.15    Reach Len. (ft)           111.44     106.45
 103.86
  Crit W.S. (ft)            824.04    Flow Area (sq ft)                     38.24

  E.G. Slope (ft/ft)      0.001119    Area (sq ft)                          38.24

  Q Total (cfs)               38.60    Flow (cfs)                            38.60

  Top Width (ft)              26.70    Top Width (ft)                        26.70
```

| | | | |
|---|---|---|---|
| Vel Total (ft/s) | 1.01 | Avg. Vel. (ft/s) | 1.01 |
| Max Chl Dpth (ft) | 1.71 | Hydr. Depth (ft) | 1.43 |
| Conv. Total (cfs) | 1153.7 | Conv. (cfs) | 1153.7 |
| Length Wtd. (ft) | 106.45 | Wetted Per. (ft) | 27.80 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.10 |
| Alpha | 1.00 | Stream Power (lb/ft s) | 0.10 |
| Frctn Loss (ft) | 0.12 | Cum Volume (acre-ft) | 0.15 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.11 |

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #2-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 829.49 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.03 | Wt. n-Val. | 0.042 | 0.062 | 0.098 |
| W.S. Elev (ft) | 829.45 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 826.31 | Flow Area (sq ft) | 210.12 | 168.73 | 135.50 |
| E.G. Slope (ft/ft) | 0.000716 | Area (sq ft) | 210.12 | 168.73 | 349.28 |
| Q Total (cfs) | 620.00 | Flow (cfs) | 215.20 | 317.98 | 86.81 |
| Top Width (ft) | 576.16 | Top Width (ft) | 188.12 | 31.28 | 356.76 |
| Vel Total (ft/s) | 1.21 | Avg. Vel. (ft/s) | 1.02 | 1.88 | 0.64 |
| Max Chl Dpth (ft) | 6.01 | Hydr. Depth (ft) | 1.12 | 5.39 | 2.00 |
| Conv. Total (cfs) | 23168.7 | Conv. (cfs) | 8041.9 | 11882.7 | 3244.1 |
| Length Wtd. (ft) | 107.36 | Wetted Per. (ft) | 189.29 | 33.74 | 68.29 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.05 | 0.22 | |

| | | | | | |
|---|---|---|---|---|---|
| 0.09 | | | | | |
| Alpha | 1.54 | Stream Power (lb/ft s) | 0.05 | 0.42 | |
| 0.06 | | | | | |
| Frctn Loss (ft) | 0.11 | Cum Volume (acre-ft) | 0.66 | 0.71 | |
| 0.83 | | | | | |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.67 | 0.14 | |
| 0.96 | | | | | |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #5-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.32 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.040 | 0.062 | 0.098 |
| W.S. Elev (ft) | 830.28 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 827.84 | Flow Area (sq ft) | 366.00 | 194.46 | 192.46 |
| E.G. Slope (ft/ft) | 0.000664 | Area (sq ft) | 366.00 | 194.46 | 667.56 |
| Q Total (cfs) | 1070.00 | Flow (cfs) | 536.18 | 387.98 | 145.84 |
| Top Width (ft) | 623.43 | Top Width (ft) | 190.96 | 31.28 | 401.19 |
| Vel Total (ft/s) | 1.42 | Avg. Vel. (ft/s) | 1.46 | 2.00 | 0.76 |
| Max Chl Dpth (ft) | 6.84 | Hydr. Depth (ft) | 1.92 | 6.22 | 2.73 |
| Conv. Total (cfs) | 41515.7 | Conv. (cfs) | 20803.8 | 15053.5 | 5658.4 |
| Length Wtd. (ft) | 107.94 | Wetted Per. (ft) | 192.26 | 33.74 | 71.10 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.08 | 0.24 | 0.11 |
| Alpha | 1.29 | Stream Power (lb/ft s) | 0.12 | 0.48 | 0.09 |
| Frctn Loss (ft) | 0.12 | Cum Volume (acre-ft) | 1.19 | 0.82 | 1.69 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.68 | 0.14 | |

1.19

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.
Note: Manning's n values were composited to a single value in the main channel.
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) | 830.49 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.040 | 0.062 | 0.098 |
| W.S. Elev (ft) | 830.45 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 828.03 | Flow Area (sq ft) | 398.69 | 199.80 | 204.58 |
| E.G. Slope (ft/ft) | 0.000658 | Area (sq ft) | 398.69 | 199.80 | 736.37 |
| Q Total (cfs) | 1180.00 | Flow (cfs) | 616.40 | 403.87 | 159.73 |
| Top Width (ft) | 626.90 | Top Width (ft) | 191.57 | 31.28 | 404.05 |
| Vel Total (ft/s) | 1.47 | Avg. Vel. (ft/s) | 1.55 | 2.02 | 0.78 |
| Max Chl Dpth (ft) | 7.01 | Hydr. Depth (ft) | 2.08 | 6.39 | 2.88 |
| Conv. Total (cfs) | 46015.5 | Conv. (cfs) | 24037.2 | 15749.6 | 6228.8 |
| Length Wtd. (ft) | 108.03 | Wetted Per. (ft) | 192.89 | 33.74 | 71.68 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.08 | 0.24 | 0.12 |
| Alpha | 1.26 | Stream Power (lb/ft s) | 0.13 | 0.49 | 0.09 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.31 | 0.84 | 1.89 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.69 | 0.14 | 1.21 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #25-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.92 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.040 | 0.062 | 0.098 |
| W.S. Elev (ft) | 830.87 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 828.45 | Flow Area (sq ft) | 480.74 | 213.15 | 235.23 |
| E.G. Slope (ft/ft) | 0.000633 | Area (sq ft) | 480.74 | 213.15 | 910.27 |
| Q Total (cfs) | 1465.00 | Flow (cfs) | 828.59 | 441.35 | 195.06 |
| Top Width (ft) | 635.32 | Top Width (ft) | 192.97 | 31.28 | 411.06 |
| Vel Total (ft/s) | 1.58 | Avg. Vel. (ft/s) | 1.72 | 2.07 | 0.83 |
| Max Chl Dpth (ft) | 7.43 | Hydr. Depth (ft) | 2.49 | 6.81 | 3.24 |
| Conv. Total (cfs) | 58228.0 | Conv. (cfs) | 32933.4 | 17541.8 | 7752.8 |
| Length Wtd. (ft) | 108.22 | Wetted Per. (ft) | 194.35 | 33.74 | 73.13 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.10 | 0.25 | 0.13 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.17 | 0.52 | 0.11 |
| Frctn Loss (ft) | 0.12 | Cum Volume (acre-ft) | 1.60 | 0.90 | 2.42 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.70 | 0.14 | 1.28 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT  Profile #50-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 831.30 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.040 | 0.062 | 0.098 |
| W.S. Elev (ft) | 831.24 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 828.78 | Flow Area (sq ft) | 552.09 | 224.66 | 262.24 |
| E.G. Slope (ft/ft) | 0.000626 | Area (sq ft) | 552.09 | 224.66 | 1062.79 |
| Q Total (cfs) | 1740.00 | Flow (cfs) | 1033.71 | 479.00 | 227.30 |
| Top Width (ft) | 644.73 | Top Width (ft) | 195.28 | 31.28 | 418.17 |
| Vel Total (ft/s) | 1.67 | Avg. Vel. (ft/s) | 1.87 | 2.13 | 0.87 |
| Max Chl Dpth (ft) | 7.80 | Hydr. Depth (ft) | 2.83 | 7.18 | 3.50 |
| Conv. Total (cfs) | 69559.7 | Conv. (cfs) | 41324.3 | 19148.8 | 9086.6 |
| Length Wtd. (ft) | 108.35 | Wetted Per. (ft) | 196.71 | 33.74 | 75.62 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.11 | 0.26 | 0.14 |
| Alpha | 1.22 | Stream Power (lb/ft s) | 0.21 | 0.55 | 0.12 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.85 | 0.95 | 2.89 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.71 | 0.14 | 1.33 |

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.
Note:  Manning's n values were composited to a single value in the main channel.
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) | 831.59 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.039 | 0.062 | |

| | | | | | |
|---|---|---|---|---|---|
| 0.098 | | | | | |
| W.S. Elev (ft) | 831.53 | Reach Len. (ft) | 111.44 | 106.45 | 103.86 |
| Crit W.S. (ft) | 829.08 | Flow Area (sq ft) | 607.97 | 233.58 | 284.08 |
| E.G. Slope (ft/ft) | 0.000641 | Area (sq ft) | 607.97 | 233.58 | 1183.01 |
| Q Total (cfs) | 2000.00 | Flow (cfs) | 1227.05 | 517.18 | 255.77 |
| Top Width (ft) | 653.82 | Top Width (ft) | 196.51 | 31.28 | 426.03 |
| Vel Total (ft/s) | 1.78 | Avg. Vel. (ft/s) | 2.02 | 2.21 | 0.90 |
| Max Chl Dpth (ft) | 8.09 | Hydr. Depth (ft) | 3.09 | 7.47 | 3.64 |
| Conv. Total (cfs) | 79016.1 | Conv. (cfs) | 48478.2 | 20432.9 | 10105.1 |
| Length Wtd. (ft) | 108.43 | Wetted Per. (ft) | 197.97 | 33.74 | 78.78 |
| Min Ch El (ft) | 823.44 | Shear (lb/sq ft) | 0.12 | 0.28 | 0.14 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.25 | 0.61 | 0.13 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 2.05 | 0.99 | 3.27 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.71 | 0.14 | 1.39 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 545.1257

INPUT
Description:
Station Elevation Data num= 497

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 834.56 | 2.59 | 834.64 | 2.98 | 834.65 | 3.42 | 834.66 | 6.59 | 834.79 |
| 14.07 | 834.9 | 20.59 | 835.19 | 25 | 835.78 | 25.3 | 835.78 | 30.33 | 835.8 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 31.09 | 835.82 | 34.68 | 836.03 | 36.23 | 835.92 | 36.42 | 835.92 | 40.34 | 835.98 |
| 41.58 | 835.97 | 41.84 | 835.99 | 42.43 | 835.98 | 48.72 | 835.97 | 51.24 | 835.87 |
| 52.16 | 835.83 | 54.76 | 835.72 | 56.87 | 835.51 | 57.39 | 835.39 | 58.55 | 835.25 |
| 60.21 | 834.95 | 69.67 | 834.27 | 77.73 | 833.03 | 83.36 | 833.52 | 89.24 | 833.57 |
| 91.35 | 833.49 | 92.14 | 833.47 | 93.68 | 833.39 | 96.23 | 833.13 | 97.73 | 833.15 |
| 97.92 | 833.13 | 98.92 | 833.07 | 101.84 | 832.84 | 102.68 | 832.78 | 103.67 | 832.73 |
| 105.05 | 832.69 | 107.46 | 832.58 | 109 | 832.52 | 109.25 | 832.5 | 109.62 | 832.52 |
| 113.02 | 832.47 | 113.17 | 832.45 | 120.4 | 832.16 | 120.42 | 832.16 | 123.91 | 832.25 |
| 125.56 | 832.33 | 130.52 | 832.65 | 135 | 832.22 | 135.71 | 832.15 | 135.74 | 832.14 |
| 135.8 | 832.14 | 147.04 | 831.57 | 147.79 | 831.55 | 148.28 | 831.41 | 149.78 | 831.32 |
| 152.77 | 831 | 153.53 | 830.86 | 154.2 | 830.74 | 157.7 | 830.04 | 158.21 | 829.97 |
| 158.53 | 829.92 | 159.47 | 829.78 | 163.42 | 829.18 | 163.79 | 829.19 | 169.74 | 829.26 |
| 173.31 | 829.04 | 176.37 | 828.89 | 182.09 | 828.73 | 182.74 | 828.83 | 187.72 | 829.36 |
| 192.47 | 828.69 | 200.72 | 829.06 | 208.28 | 829.09 | 210.13 | 829 | 214.83 | 829.12 |
| 218.49 | 829.18 | 223.71 | 828.8 | 225.86 | 828.63 | 229.93 | 828.77 | 233.82 | 828.42 |
| 235.45 | 828.19 | 239.95 | 827.75 | 243.14 | 827.88 | 243.7 | 827.89 | 245.06 | 827.95 |
| 248.94 | 828.08 | 249.48 | 828.07 | 252.99 | 828.36 | 253.82 | 828.45 | 259.55 | 828.18 |
| 262.68 | 827.88 | 264.21 | 827.94 | 264.69 | 828 | 266.96 | 828.1 | 269.68 | 828.32 |
| 271.12 | 828.5 | 271.49 | 828.5 | 272.28 | 828.56 | 278.43 | 828.5 | 283.72 | 828.59 |
| 287.73 | 828.49 | 288.26 | 828.49 | 292.22 | 828.35 | 292.29 | 828.35 | 292.37 | 828.34 |
| 293.85 | 828.15 | 294.36 | 828.16 | 297.75 | 828.21 | 298.03 | 828.21 | 299.51 | 828.12 |
| 301.73 | 828.11 | 303.54 | 828.13 | 304.85 | 828.08 | 305.08 | 828.06 | 307.61 | 828.02 |
| 310.29 | 827.9 | 310.8 | 827.92 | 311.89 | 828.01 | 314.89 | 828.15 | 315.52 | 828.21 |
| 316.54 | 828.18 | 319.26 | 828.11 | 320.65 | 828.14 | 321.48 | 828.01 | 322.32 | 827.94 |
| 325.96 | 828.18 | 326.42 | 828.18 | 326.87 | 828.2 | 327.77 | 828.18 | 330.32 | 828.49 |
| 333.77 | 827.99 | 335.39 | 827.76 | 337.97 | 828.86 | 338.01 | 828.94 | 339.82 | 826.54 |
| 340.42 | 825.6 | 342.39 | 827.13 | 342.86 | 824.13 | 343.56 | 824.09 | 349.28 | 823.83 |
| 350.77 | 823.8 | 361.33 | 823.58 | 371.76 | 823.35 | 371.82 | 823.55 | 374.28 | 824.94 |
| 379.35 | 827.04 | 407.06 | 828.78 | 427.33 | 829.98 | 452.06 | 831.44 | 456.72 | 831.47 |
| 461.46 | 831.5 | 462.46 | 831.51 | 462.61 | 831.49 | 465.2 | 831.37 | 466.64 | 831.03 |
| 467 | 831.01 | 468.59 | 830.75 | 471.04 | 830.28 | 471.95 | 830.17 | 472.74 | 829.95 |
| 473.81 | 829.8 | 477.72 | 829.35 | 483.11 | 829.32 | 485.23 | 829.32 | 488.78 | 828.76 |
| 490.92 | 828.81 | 495.92 | 828.88 | 496.05 | 828.88 | 496.14 | 828.89 | 496.18 | 828.89 |
| 496.66 | 828.86 | 500.35 | 828.69 | 500.75 | 828.66 | 504.25 | 828.77 | 508.03 | 828.85 |
| 512.44 | 828.98 | 513.48 | 828.98 | 513.79 | 828.99 | 514.83 | 828.97 | 518.13 | 828.79 |
| 523.55 | 828.52 | 523.75 | 828.5 | 524 | 828.49 | 524.17 | 828.49 | 525.69 | 828.4 |
| 528.42 | 828.41 | 529.94 | 828.49 | 531.22 | 828.37 | 531.55 | 828.33 | 532.97 | 828.39 |
| 535.83 | 828.56 | 536.66 | 828.54 | 537.57 | 828.56 | 539.79 | 828.3 | 541.88 | 828.19 |
| 543.03 | 828.15 | 543.59 | 828.12 | 544.93 | 828.13 | 547.89 | 828.21 | 548.64 | 828.13 |
| 549.42 | 828.08 | 553.16 | 828.13 | 553.79 | 828.12 | 553.92 | 828.12 | 555.5 | 827.93 |
| 556.91 | 827.95 | 559.71 | 828.05 | 560.98 | 827.99 | 561.56 | 828.01 | 562.87 | 828 |
| 565.73 | 828.02 | 566.65 | 828.01 | 567.45 | 827.96 | 569.74 | 828.01 | 572.38 | 827.93 |
| 573.34 | 827.91 | 575.74 | 828.17 | 578.62 | 828.32 | 579.41 | 828.28 | 582.56 | 828.38 |
| 583.74 | 828.44 | 584.28 | 828.44 | 585.49 | 828.34 | 589.35 | 828.18 | 591.41 | 828.13 |
| 596.37 | 828.23 | 597.39 | 828.27 | 598.52 | 828.31 | 601.7 | 828.38 | 603.24 | 828.39 |
| 603.3 | 828.38 | 609.24 | 828.43 | 609.46 | 828.43 | 613.59 | 828.68 | 614.35 | 828.74 |
| 615.44 | 828.78 | 618.54 | 828.68 | 620.88 | 828.6 | 621.43 | 828.56 | 624.62 | 828.61 |
| 625.69 | 828.63 | 625.82 | 828.61 | 627.44 | 828.43 | 629.97 | 828.38 | 631.8 | 828.48 |
| 632.47 | 828.52 | 635.03 | 828.57 | 637.71 | 828.66 | 639.45 | 828.62 | 639.51 | 828.63 |
| 639.73 | 828.63 | 643.81 | 828.75 | 645.42 | 828.75 | 645.58 | 828.76 | 647.2 | 828.74 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 649.95 | 828.7 | 650.38 | 828.68 | 651.67 | 828.63 | 653.75 | 828.6 | 655.87 | 828.6 |
| 657.45 | 828.59 | 657.65 | 828.59 | 658.09 | 828.61 | 663.64 | 828.62 | 663.74 | 828.62 |
| 664.08 | 828.63 | 667.94 | 828.75 | 669.6 | 828.62 | 669.75 | 828.62 | 673.95 | 828.87 |
| 674.09 | 828.87 | 675.74 | 828.82 | 676.83 | 828.82 | 681.14 | 828.73 | 681.9 | 828.77 |
| 684.52 | 828.91 | 686.22 | 828.92 | 687.2 | 828.97 | 688 | 829.1 | 690.4 | 829.09 |
| 692.26 | 829.13 | 693.88 | 829.18 | 694.13 | 829.19 | 697.39 | 829.26 | 698.67 | 829.3 |
| 700.27 | 829.36 | 701.71 | 829.34 | 705.06 | 829.39 | 708.67 | 829.46 | 711.58 | 829.56 |
| 712.6 | 829.61 | 713.31 | 829.65 | 717.93 | 829.95 | 722.37 | 830.09 | 722.65 | 830.11 |
| 723.58 | 830.15 | 726.27 | 830.26 | 729.01 | 830.4 | 730.32 | 830.43 | 730.86 | 830.48 |
| 732.33 | 830.49 | 735.31 | 830.5 | 736.66 | 830.5 | 737.03 | 830.58 | 737.25 | 830.57 |
| 742.33 | 831.1 | 749.29 | 831.17 | 754.99 | 831.08 | 758.09 | 831.31 | 759.83 | 831.36 |
| 761.49 | 831.37 | 765.2 | 831.84 | 765.78 | 831.91 | 768.21 | 832.02 | 773.44 | 832.32 |
| 776.44 | 832.29 | 777.02 | 832.34 | 782.35 | 832.09 | 784.43 | 832.36 | 786.72 | 832.66 |
| 789.66 | 832.82 | 793.25 | 833 | 796.27 | 833.07 | 797.42 | 833.15 | 800.43 | 833.35 |
| 801.39 | 833.45 | 802.1 | 833.47 | 803.24 | 833.53 | 806.23 | 833.91 | 807.23 | 834.01 |
| 810.93 | 834.16 | 812.04 | 834.17 | 813.78 | 834.1 | 817.35 | 834.41 | 817.72 | 834.42 |
| 819.4 | 834.52 | 821.16 | 834.6 | 824.48 | 834.68 | 825.18 | 834.73 | 827.12 | 834.77 |
| 829.09 | 834.9 | 830.31 | 834.81 | 830.73 | 834.78 | 834.51 | 835 | 834.78 | 835.01 |
| 835.04 | 835.02 | 836.52 | 835.06 | 839.49 | 835.09 | 840.35 | 835.13 | 841.94 | 835.22 |
| 842.06 | 835.22 | 842.87 | 835.24 | 847.12 | 835.34 | 847.59 | 835.35 | 850.47 | 835.47 |
| 851.47 | 835.44 | 851.92 | 835.44 | 853.04 | 835.42 | 857.07 | 835.56 | 857.08 | 835.56 |
| 858.54 | 835.65 | 859.27 | 835.66 | 862.66 | 835.69 | 864.13 | 835.64 | 864.38 | 835.64 |
| 868.55 | 835.79 | 869.77 | 835.83 | 872.03 | 835.74 | 874.92 | 835.7 | 878.74 | 835.91 |
| 878.92 | 835.9 | 878.95 | 835.9 | 880.39 | 835.67 | 883.74 | 835.48 | 885.68 | 835.31 |
| 889.11 | 835.12 | 891.27 | 835.01 | 892.12 | 834.97 | 894.86 | 835.12 | 896.07 | 835.04 |
| 896.56 | 835.06 | 897.48 | 835.14 | 900.24 | 835.43 | 902.16 | 835.54 | 905.76 | 835.76 |
| 910.04 | 835.96 | 912.24 | 836.15 | 916 | 836.66 | 916.66 | 836.73 | 917.93 | 836.73 |
| 919.12 | 836.71 | 921.73 | 836.92 | 922.47 | 836.92 | 924.88 | 837.22 | 928.02 | 837.06 |
| 929.63 | 837.33 | 933.16 | 838.3 | 936.11 | 839.19 | 939.63 | 839.76 | 942.57 | 840.34 |
| 943.74 | 840.56 | 945.77 | 840.98 | 948.76 | 841.61 | 949.61 | 841.87 | 952.25 | 842.43 |
| 953.57 | 842.55 | 954.34 | 842.63 | 955.93 | 842.89 | 960.09 | 843.84 | 960.25 | 843.87 |
| 960.64 | 843.97 | 968.39 | 845.24 | 969.76 | 845.46 | 970.83 | 845.63 | 972.38 | 846.14 |
| 974.61 | 846.8 | 975.58 | 846.96 | 977.6 | 847.33 | 979.93 | 847.48 | 983.98 | 848.08 |
| 985.27 | 848.35 | 986.27 | 848.76 | 989.68 | 849.51 | 993.21 | 850.33 | 995.91 | 850.9 |
| 996.36 | 850.93 | 997.27 | 851.14 | 1001.07 | 852.19 | 1004.1 | 853.34 | 1006.36 | 854.03 |
| 1012.45 | 855.56 | 1013.54 | 855.77 | 1020.29 | 856.1 | 1022.19 | 855.93 | 1023.73 | 856.06 |
| 1026.29 | 856.29 | 1028.73 | 856.55 | 1030.44 | 856.71 | 1035.65 | 857.34 | 1037.95 | 857.73 |
| 1040.91 | 857.95 | 1044.34 | 858.34 | 1046.43 | 858.49 | 1053.17 | 859.26 | 1058.5 | 860.19 |
| 1064.29 | 860.12 | 1068.84 | 860.34 | 1072.23 | 860.9 | 1074.42 | 861.29 | 1084.7 | 862.22 |
| 1089.34 | 862.6 | 1090.78 | 862.71 | 1097.41 | 863.36 | 1098.17 | 863.5 | 1110.09 | 864.83 |
| 1113.04 | 865.27 | 1115.69 | 865.68 | 1118.35 | 866.07 | 1121.42 | 866.65 | 1123.47 | 867.02 |
| 1125.44 | 867.71 | 1126.79 | 867.97 | 1130.76 | 868.51 | 1136.15 | 868.65 | 1136.41 | 868.66 |
| 1136.74 | 868.66 | 1136.78 | 868.67 | 1142.24 | 869.26 | 1144.57 | 869.64 | 1149.06 | 869.73 |
| 1150.88 | 869.82 | 1153.02 | 869.96 | 1157.05 | 870.4 | 1159.92 | 870.86 | 1163.91 | 870.94 |
| 1165.89 | 870.57 | 1167.19 | 870.68 | 1177.05 | 871.86 | 1180.83 | 872.07 | 1183 | 872.17 |
| 1190.26 | 872.37 | 1191.27 | 872.47 | 1192.48 | 872.44 | 1205.65 | 873.38 | 1206.05 | 873.44 |
| 1208.67 | 873.86 | 1261.29 | 874.02 | 1262.86 | 874.28 | 1265.34 | 874.22 | 1265.6 | 874.1 |
| 1268.11 | 874.25 | 1269.72 | 874.37 | | | | | | |

Manning's n Values num= 13

| Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|---|---|---|---|
| 0 | .03 | 93.68 | .1 | 338.01 | .07 | 349.28 | .06 | 374.28 | .07 |
| 379.35 | .1 | 452.06 | .013 | 461.46 | .1 | 514.83 | .035 | 713.31 | .1 |
| 817.35 | .013 | 885.68 | .1 | 1269.72 | .1 | | | | |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 338.01 | 379.35 | 46.6 | 52.81 | 53.82 | .1 | .3 |

Ineffective Flow num= 4

| Sta L | Sta R | Elev | Permanent |
|---|---|---|---|
| 59 | 93 | 855 | T |
| 190 | 239 | 850 | T |
| 239 | 338 | 829.2 | F |
| 460 | 775 | 831.9 | F |

CROSS SECTION OUTPUT Profile #2xHMMF

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 825.04 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.01 | Wt. n-Val. | | 0.062 | |
| W.S. Elev (ft) | 825.02 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 824.04 | Flow Area (sq ft) | | 40.96 | |
| E.G. Slope (ft/ft) | 0.001176 | Area (sq ft) | | 40.96 | |
| Q Total (cfs) | 38.60 | Flow (cfs) | | 38.60 | |
| Top Width (ft) | 31.76 | Top Width (ft) | | 31.76 | |
| Vel Total (ft/s) | 0.94 | Avg. Vel. (ft/s) | | 0.94 | |
| Max Chl Dpth (ft) | 1.67 | Hydr. Depth (ft) | | 1.29 | |
| Conv. Total (cfs) | 1125.7 | Conv. (cfs) | | 1125.7 | |
| Length Wtd. (ft) | 52.81 | Wetted Per. (ft) | | 33.07 | |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | | 0.09 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | | 0.09 | |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | | 0.06 | |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | | 0.04 | |

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: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #2-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 829.37 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.09 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 829.28 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 826.05 | Flow Area (sq ft) | 112.85 | 203.53 | 40.13 |
| E.G. Slope (ft/ft) | 0.001772 | Area (sq ft) | 134.62 | 203.53 | 197.38 |
| Q Total (cfs) | 620.00 | Flow (cfs) | 70.87 | 522.27 | 26.86 |
| Top Width (ft) | 464.10 | Top Width (ft) | 173.97 | 41.34 | 248.79 |
| Vel Total (ft/s) | 1.74 | Avg. Vel. (ft/s) | 0.63 | 2.57 | 0.67 |
| Max Chl Dpth (ft) | 5.93 | Hydr. Depth (ft) | 0.90 | 4.92 | 1.11 |
| Conv. Total (cfs) | 14729.6 | Conv. (cfs) | 1683.7 | 12407.7 | 638.2 |
| Length Wtd. (ft) | 50.92 | Wetted Per. (ft) | 125.52 | 47.09 | 36.25 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.10 | 0.48 | 0.12 |
| Alpha | 1.86 | Stream Power (lb/ft s) | 0.06 | 1.23 | 0.08 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.22 | 0.25 | 0.18 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 0.20 | 0.05 | 0.23 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #5-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.18 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.13 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.05 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 827.05 | Flow Area (sq ft) | 212.10 | 235.40 | 73.05 |
| E.G. Slope (ft/ft) | 0.002466 | Area (sq ft) | 271.65 | 235.40 | 412.77 |
| Q Total (cfs) | 1070.00 | Flow (cfs) | 214.72 | 785.23 | 70.06 |
| Top Width (ft) | 519.74 | Top Width (ft) | 180.37 | 41.34 | 298.02 |
| Vel Total (ft/s) | 2.06 | Avg. Vel. (ft/s) | 1.01 | 3.34 | 0.96 |
| Max Chl Dpth (ft) | 6.70 | Hydr. Depth (ft) | 1.61 | 5.69 | 1.48 |
| Conv. Total (cfs) | 21547.1 | Conv. (cfs) | 4323.8 | 15812.5 | 1410.8 |
| Length Wtd. (ft) | 50.28 | Wetted Per. (ft) | 131.99 | 47.09 | 49.30 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.25 | 0.77 | 0.23 |
| Alpha | 2.00 | Stream Power (lb/ft s) | 0.25 | 2.57 | 0.22 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.38 | 0.29 | 0.40 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.21 | 0.05 | 0.35 |

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.
Note:  Manning's n values were composited to a single value in the main channel.
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) | 830.36 | Element | Left OB | Channel | Right OB |

| | | | | | |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.14 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.22 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 827.22 | Flow Area (sq ft) | 233.67 | 242.17 | 81.33 |
| E.G. Slope (ft/ft) | 0.002573 | Area (sq ft) | 301.23 | 242.17 | 462.16 |
| Q Total (cfs) | 1180.00 | Flow (cfs) | 256.65 | 840.84 | 82.51 |
| Top Width (ft) | 528.15 | Top Width (ft) | 181.19 | 41.34 | 305.61 |
| Vel Total (ft/s) | 2.12 | Avg. Vel. (ft/s) | 1.10 | 3.47 | 1.01 |
| Max Chl Dpth (ft) | 6.87 | Hydr. Depth (ft) | 1.77 | 5.86 | 1.56 |
| Conv. Total (cfs) | 23263.5 | Conv. (cfs) | 5059.8 | 16577.0 | 1626.7 |
| Length Wtd. (ft) | 50.18 | Wetted Per. (ft) | 132.83 | 47.09 | 52.08 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.28 | 0.83 | 0.25 |
| Alpha | 1.99 | Stream Power (lb/ft s) | 0.31 | 2.87 | 0.25 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.41 | 0.30 | 0.46 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.21 | 0.05 | 0.36 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #25-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.79 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.15 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.63 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 827.79 | Flow Area (sq ft) | 289.19 | 259.39 | 104.46 |

| | | | | | |
|---|---|---|---|---|---|
| E.G. Slope (ft/ft) | 0.002738 | Area (sq ft) | 377.18 | 259.39 | 594.03 |
| Q Total (cfs) | 1465.00 | Flow (cfs) | 373.71 | 972.62 | 118.67 |
| Top Width (ft) | 552.31 | Top Width (ft) | 183.28 | 41.34 | 327.69 |
| Vel Total (ft/s) | 2.24 | Avg. Vel. (ft/s) | 1.29 | 3.75 | 1.14 |
| Max Chl Dpth (ft) | 7.28 | Hydr. Depth (ft) | 2.15 | 6.27 | 1.77 |
| Conv. Total (cfs) | 27999.3 | Conv. (cfs) | 7142.5 | 18588.9 | 2268.0 |
| Length Wtd. (ft) | 49.98 | Wetted Per. (ft) | 134.95 | 47.09 | 59.15 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.37 | 0.94 | 0.30 |
| Alpha | 1.96 | Stream Power (lb/ft s) | 0.47 | 3.53 | 0.34 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.50 | 0.32 | 0.62 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.21 | 0.05 | 0.40 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 831.16 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.17 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.99 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 828.27 | Flow Area (sq ft) | 337.76 | 274.24 | 126.76 |
| E.G. Slope (ft/ft) | 0.002868 | Area (sq ft) | 443.35 | 274.24 | 713.81 |
| Q Total (cfs) | 1740.00 | Flow (cfs) | 490.71 | 1092.23 | 157.06 |
| Top Width (ft) | 565.85 | Top Width (ft) | 185.20 | 41.34 | 339.31 |

| | | | | | |
|---|---|---|---|---|---|
| Vel Total (ft/s) | 2.36 | Avg. Vel. (ft/s) | 1.45 | 3.98 | 1.24 |
| Max Chl Dpth (ft) | 7.64 | Hydr. Depth (ft) | 2.48 | 6.63 | 1.95 |
| Conv. Total (cfs) | 32492.3 | Conv. (cfs) | 9163.4 | 20396.0 | 2932.8 |
| Length Wtd. (ft) | 49.83 | Wetted Per. (ft) | 136.91 | 47.09 | 65.24 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.44 | 1.04 | 0.35 |
| Alpha | 1.93 | Stream Power (lb/ft s) | 0.64 | 4.15 | 0.43 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.58 | 0.34 | 0.77 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.22 | 0.05 | 0.43 |

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.
Note: Manning's n values were composited to a single value in the main channel.
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) | 831.44 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.18 | Wt. n-Val. | 0.100 | 0.065 | 0.100 |
| W.S. Elev (ft) | 831.26 | Reach Len. (ft) | 46.60 | 52.81 | 53.82 |
| Crit W.S. (ft) | 828.69 | Flow Area (sq ft) | 374.75 | 285.37 | 144.91 |
| E.G. Slope (ft/ft) | 0.003076 | Area (sq ft) | 493.53 | 285.37 | 808.08 |
| Q Total (cfs) | 2000.00 | Flow (cfs) | 597.05 | 1208.65 | 194.31 |
| Top Width (ft) | 590.48 | Top Width (ft) | 187.68 | 41.34 | 361.46 |
| Vel Total (ft/s) | 2.48 | Avg. Vel. (ft/s) | 1.59 | 4.24 | 1.34 |
| Max Chl Dpth (ft) | 7.91 | Hydr. Depth (ft) | 2.70 | 6.90 | 2.08 |
| Conv. Total (cfs) | 36063.2 | Conv. (cfs) | 10765.7 | 21793.9 | 3503.7 |

| | | | | | |
|---|---|---|---|---|---|
| Length Wtd. (ft) | 49.74 | Wetted Per. (ft) | 139.41 | 47.09 | 69.81 |
| Min Ch El (ft) | 823.35 | Shear (lb/sq ft) | 0.52 | 1.16 | 0.40 |
| Alpha | 1.91 | Stream Power (lb/ft s) | 0.82 | 4.93 | 0.53 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.64 | 0.35 | 0.89 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 0.22 | 0.05 | 0.46 |

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.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 492.3110

INPUT
Description:
Station Elevation Data num= 399

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 834.39 | 1.35 | 834.33 | 1.77 | 834.31 | 2.54 | 834.34 | 5.02 | 834.43 |
| 5.98 | 834.46 | 8.57 | 834.53 | 12.06 | 834.58 | 24.38 | 834.78 | 125 | 832.23 |
| 125.86 | 832.23 | 129.82 | 831.86 | 130.64 | 831.85 | 132.34 | 831.45 | 135.5 | 831.05 |
| 136.25 | 830.79 | 146.31 | 830.59 | 150.08 | 830.39 | 151.64 | 829.95 | 152.92 | 829.6 |
| 153.69 | 829.55 | 155.56 | 829.28 | 158.79 | 828.88 | 159.87 | 828.71 | 164.47 | 828.29 |
| 165.33 | 828.27 | 168.46 | 828.13 | 169.04 | 828.06 | 170.16 | 827.95 | 172.72 | 827.74 |
| 174.6 | 827.66 | 175.77 | 827.64 | 177.71 | 827.65 | 179.66 | 827.68 | 180.14 | 827.68 |
| 181.2 | 827.61 | 182.75 | 827.64 | 185.34 | 827.55 | 186.63 | 827.43 | 186.79 | 827.44 |
| 187.04 | 827.45 | 190.8 | 827.69 | 191.39 | 827.68 | 192.42 | 827.78 | 193.71 | 827.82 |
| 197.84 | 827.59 | 198.02 | 827.59 | 200.42 | 827.64 | 201.85 | 827.69 | 201.96 | 827.71 |
| 203.62 | 827.97 | 206.47 | 828.13 | 208.65 | 827.9 | 209.33 | 827.89 | 214.61 | 828.2 |
| 215.35 | 828.14 | 218.81 | 827.88 | 219.78 | 827.93 | 221.05 | 827.97 | 224.59 | 828.08 |
| 226.03 | 828.09 | 226.28 | 828.09 | 230.73 | 827.99 | 233.62 | 828.08 | 235.67 | 828.13 |
| 236.95 | 828.15 | 237.14 | 828.16 | 237.5 | 828.17 | 241.3 | 828.28 | 242 | 828.26 |
| 242.89 | 828.24 | 246.71 | 828.21 | 246.78 | 828.2 | 246.87 | 828.21 | 252.33 | 828.13 |
| 255.58 | 828 | 257.97 | 827.95 | 262.08 | 827.94 | 263.66 | 827.88 | 263.97 | 827.87 |
| 267.6 | 827.79 | 269.39 | 827.73 | 270.97 | 827.68 | 276.47 | 827.68 | 278.49 | 827.79 |
| 281.04 | 827.83 | 282.01 | 827.86 | 285.15 | 827.81 | 286.45 | 827.8 | 287.59 | 827.94 |
| 291.73 | 827.83 | 291.9 | 827.84 | 292.14 | 827.85 | 293.31 | 827.91 | 293.77 | 827.91 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 297.41 | 827.89 | 297.55 | 827.89 | 298.93 | 827.92 | 302.75 | 827.77 | 303.06 | 827.76 |
| 303.35 | 827.76 | 305.3 | 827.78 | 307.21 | 827.82 | 309.27 | 827.86 | 309.94 | 827.83 |
| 310.2 | 827.84 | 310.83 | 827.85 | 314.45 | 828.06 | 315.72 | 828.01 | 315.94 | 828 |
| 316.42 | 827.99 | 320.94 | 827.86 | 321.69 | 827.78 | 325.26 | 827.85 | 325.85 | 827.86 |
| 326.03 | 827.85 | 327.5 | 827.84 | 329.99 | 827.85 | 331.64 | 827.88 | 333.21 | 828 |
| 333.3 | 828.01 | 334.08 | 827.98 | 337.34 | 827.9 | 337.87 | 827.93 | 341.96 | 827.76 |
| 344.79 | 827.68 | 345.67 | 827.7 | 349.79 | 827.93 | 350.64 | 827.95 | 353.26 | 828.16 |
| 354.6 | 828.26 | 355.05 | 828.32 | 356.25 | 828.5 | 358.33 | 829.15 | 359.66 | 828.85 |
| 359.78 | 828.82 | 361.75 | 828.38 | 362.99 | 827.08 | 366.71 | 823.68 | 368.06 | 823.76 |
| 376.48 | 823.36 | 376.59 | 823.35 | 387.72 | 822.82 | 390.68 | 822.68 | 394.2 | 822.61 |
| 399 | 826.03 | 400.8 | 827.26 | 413.83 | 828.41 | 445.92 | 830.56 | 458.72 | 831.42 |
| 465.05 | 831.45 | 469.24 | 831.48 | 469.26 | 831.48 | 469.38 | 831.47 | 469.57 | 831.46 |
| 469.69 | 831.46 | 469.97 | 831.44 | 470.22 | 831.43 | 470.92 | 831.39 | 471.05 | 831.38 |
| 471.51 | 831.35 | 472.29 | 831.28 | 472.81 | 831.26 | 475.06 | 830.73 | 476.87 | 830.36 |
| 477.63 | 830.04 | 478.53 | 829.9 | 481.88 | 829.73 | 482.84 | 829.69 | 484.06 | 829.52 |
| 484.34 | 829.51 | 484.78 | 829.49 | 489.27 | 829.22 | 490.33 | 829.06 | 492.66 | 828.73 |
| 495.02 | 828.26 | 496.09 | 827.76 | 501.13 | 828.19 | 506.14 | 828.62 | 506.98 | 828.55 |
| 507.83 | 828.52 | 509.38 | 828.56 | 512.07 | 828.61 | 513.32 | 828.6 | 513.78 | 828.58 |
| 518.03 | 828.6 | 518.08 | 828.59 | 518.33 | 828.58 | 519.54 | 828.55 | 520.99 | 828.48 |
| 523.89 | 828.36 | 524.53 | 828.29 | 525.46 | 828.23 | 526.14 | 828.24 | 529.77 | 828.33 |
| 530.53 | 828.25 | 531.42 | 828.19 | 532.53 | 828.23 | 535.7 | 828.37 | 536.43 | 828.4 |
| 537.28 | 828.32 | 540.86 | 828.4 | 541.58 | 828.39 | 541.79 | 828.38 | 543.29 | 828.3 |
| 547.18 | 828.45 | 547.65 | 828.48 | 548.61 | 828.47 | 549.22 | 828.48 | 549.61 | 828.49 |
| 553.66 | 828.6 | 553.67 | 828.6 | 555.16 | 828.63 | 557.14 | 828.81 | 559.56 | 829.01 |
| 561.04 | 828.96 | 561.62 | 828.97 | 565.49 | 829.14 | 565.5 | 829.14 | 567.29 | 829.26 |
| 571.16 | 829.27 | 571.94 | 829.21 | 573.18 | 829.11 | 575.48 | 829.15 | 577.63 | 829.21 |
| 579 | 829.19 | 579.08 | 829.18 | 579.31 | 829.17 | 583.62 | 829.19 | 585.1 | 829.21 |
| 585.3 | 829.21 | 589.48 | 829.05 | 591.13 | 829.21 | 591.2 | 829.22 | 591.7 | 829.24 |
| 595.46 | 829.36 | 595.98 | 829.42 | 597.13 | 829.4 | 599.25 | 829.45 | 601.34 | 829.46 |
| 602.18 | 829.47 | 603.1 | 829.48 | 606.79 | 829.72 | 607.43 | 829.73 | 607.8 | 829.74 |
| 609.01 | 829.8 | 612.96 | 830.03 | 613.39 | 829.97 | 613.67 | 829.97 | 619.92 | 829.72 |
| 621.13 | 829.8 | 623.95 | 829.71 | 628.03 | 829.45 | 634.06 | 829.99 | 637.52 | 830.01 |
| 638.92 | 830.17 | 640.38 | 830.25 | 643.33 | 830.57 | 645.04 | 830.66 | 646.27 | 830.84 |
| 649.54 | 830.89 | 653.64 | 831.14 | 655.68 | 831.17 | 656.64 | 831.26 | 657.36 | 831.26 |
| 660.56 | 830.57 | 663.05 | 830.06 | 663.31 | 830 | 667.14 | 829.52 | 667.64 | 829.51 |
| 669.39 | 829.56 | 669.41 | 829.56 | 673.63 | 830.01 | 675.3 | 829.83 | 675.41 | 829.85 |
| 675.5 | 829.85 | 679.68 | 830.35 | 679.75 | 830.33 | 681.4 | 830.43 | 682.82 | 830.61 |
| 685.88 | 830.88 | 686.69 | 830.95 | 687.56 | 831.07 | 689.76 | 831.19 | 691.91 | 831.24 |
| 695.53 | 831.39 | 697.96 | 831.55 | 699.25 | 831.65 | 699.79 | 831.71 | 703.79 | 831.96 |
| 704.28 | 831.99 | 705.93 | 832.02 | 705.94 | 832.02 | 710.37 | 832.08 | 711.73 | 832.21 |
| 712.13 | 832.24 | 716.03 | 832.31 | 716.41 | 832.32 | 718.25 | 832.32 | 721.63 | 832.47 |
| 722.51 | 832.5 | 724.21 | 832.64 | 724.64 | 832.65 | 728.74 | 832.73 | 730.26 | 832.81 |
| 730.34 | 832.81 | 731.02 | 832.82 | 734.67 | 832.83 | 735.07 | 832.83 | 736.49 | 832.82 |
| 740.56 | 832.9 | 740.74 | 832.9 | 740.88 | 832.89 | 742.65 | 832.84 | 745.07 | 832.92 |
| 746.75 | 833.02 | 747.19 | 833 | 748.61 | 833.02 | 752.46 | 833.03 | 752.67 | 833.04 |
| 752.79 | 833.02 | 754.5 | 832.87 | 757.03 | 832.99 | 758.86 | 833.03 | 759.63 | 833.1 |
| 762.15 | 833.12 | 764.89 | 833.19 | 765.82 | 833.14 | 766.61 | 833.06 | 769.37 | 833.15 |
| 770.81 | 833.13 | 772.51 | 833.07 | 772.53 | 833.07 | 772.54 | 833.06 | 778.38 | 832.84 |
| 782.44 | 832.95 | 782.6 | 832.95 | 782.74 | 832.92 | 784.3 | 832.48 | 787.27 | 832.51 |
| 788.44 | 832.45 | 789.17 | 832.41 | 790.12 | 832.26 | 790.98 | 832.21 | 794.27 | 831.85 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 795.63 | 831.51 | 798.54 | 831.32 | 800.11 | 831.29 | 800.78 | 831.08 | 801.75 | 830.88 |
| 802.27 | 830.83 | 805.93 | 831.13 | 806.37 | 831.06 | 807.57 | 830.93 | 809.99 | 830.89 |
| 812.86 | 830.49 | 813.48 | 830.36 | 815.89 | 830.27 | 817.5 | 830.28 | 819.12 | 830.28 |
| 821.89 | 830.26 | 824.81 | 829.94 | 827.35 | 829.88 | 829.51 | 829.77 | 830.57 | 829.77 |
| 832.11 | 829.7 | 834.51 | 829.61 | 835.98 | 829.51 | 836.32 | 829.51 | 841.15 | 829.8 |
| 845.92 | 829.49 | 856.83 | 829.8 | 856.85 | 829.8 | 858.39 | 829.66 | 860.02 | 829.74 |
| 862.45 | 829.73 | 863.61 | 829.7 | 863.88 | 829.72 | 866.64 | 829.77 | 868.02 | 829.8 |
| 869.53 | 829.8 | 874.51 | 829.72 | 874.97 | 829.7 | 875.1 | 829.71 | 875.48 | 829.75 |
| 878.82 | 830.06 | 879.55 | 829.99 | 880.26 | 829.97 | 884.56 | 830.13 | 885.59 | 830.2 |
| 885.73 | 830.23 | 885.96 | 830.22 | 890.95 | 830.34 | 893.54 | 831.17 | 894.35 | 831.14 |
| 897.91 | 831.25 | 901.17 | 831.56 | 902.88 | 831.63 | 907.63 | 831.79 | | |

Manning's n Values num= 13

| Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|---|---|---|---|
| 0 | .03 | 327.5 | .1 | 359.78 | .07 | 366.71 | .06 | 390.68 | .07 |
| 400.8 | .1 | 458.72 | .013 | 471.51 | .1 | 513.78 | .035 | 649.54 | .1 |
| 703.79 | .013 | 782.74 | .1 | 907.63 | .1 | | | | |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 359.78 | 400.8 | 0 | 0 | 0 | .1 | .3 |

Ineffective Flow num= 2

| Sta L | Sta R | Elev | Permanent |
|---|---|---|---|
| 465 | 705 | 831.8 | F |
| 765 | 907.82 | 833.2 | T |

CROSS SECTION OUTPUT Profile #2xHMMF

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 825.00 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.01 | Wt. n-Val. | | 0.063 | |
| W.S. Elev (ft) | 824.99 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 823.47 | Flow Area (sq ft) | | 54.99 | |
| E.G. Slope (ft/ft) | 0.000458 | Area (sq ft) | | 54.99 | |
| Q Total (cfs) | 38.60 | Flow (cfs) | | 38.60 | |
| Top Width (ft) | 32.27 | Top Width (ft) | | 32.27 | |
| Vel Total (ft/s) | 0.70 | Avg. Vel. (ft/s) | | 0.70 | |
| Max Chl Dpth (ft) | 2.38 | Hydr. Depth (ft) | | 1.70 | |
| Conv. Total (cfs) | 1804.5 | Conv. (cfs) | | 1804.5 | |
| Length Wtd. (ft) | | Wetted Per. (ft) | | 33.57 | |

| | | | |
|---|---|---|---|
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.05 |
| Alpha | 1.00 | Stream Power (lb/ft s) | 0.03 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | |
| C & E Loss (ft) | | Cum SA (acres) | |

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #2-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 829.31 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.03 | Wt. n-Val. | 0.033 | 0.065 | 0.100 |
| W.S. Elev (ft) | 829.28 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 825.56 | Flow Area (sq ft) | 271.13 | 214.43 | 24.58 |
| E.G. Slope (ft/ft) | 0.000458 | Area (sq ft) | 271.13 | 214.43 | 87.59 |
| Q Total (cfs) | 620.00 | Flow (cfs) | 311.61 | 300.89 | 7.50 |
| Top Width (ft) | 376.21 | Top Width (ft) | 204.25 | 41.02 | 130.94 |
| Vel Total (ft/s) | 1.22 | Avg. Vel. (ft/s) | 1.15 | 1.40 | 0.31 |
| Max Chl Dpth (ft) | 6.67 | Hydr. Depth (ft) | 1.33 | 5.23 | 0.94 |
| Conv. Total (cfs) | 28974.6 | Conv. (cfs) | 14562.5 | 14061.7 | 350.4 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 204.66 | 44.45 | 26.15 |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.04 | 0.14 | 0.03 |
| Alpha | 1.10 | Stream Power (lb/ft s) | 0.04 | 0.19 | 0.01 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.11 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.034 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.07 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 826.56 | Flow Area (sq ft) | 434.42 | 246.83 | 49.82 |
| E.G. Slope (ft/ft) | 0.000458 | Area (sq ft) | 434.42 | 246.83 | 240.86 |
| Q Total (cfs) | 1070.00 | Flow (cfs) | 670.67 | 380.34 | 18.98 |
| Top Width (ft) | 521.82 | Top Width (ft) | 208.58 | 41.02 | 272.22 |
| Vel Total (ft/s) | 1.46 | Avg. Vel. (ft/s) | 1.54 | 1.54 | 0.38 |
| Max Chl Dpth (ft) | 7.46 | Hydr. Depth (ft) | 2.08 | 6.02 | 1.32 |
| Conv. Total (cfs) | 50012.1 | Conv. (cfs) | 31347.4 | 17777.4 | 887.3 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 209.08 | 44.45 | 37.97 |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.06 | 0.16 | 0.04 |
| Alpha | 1.09 | Stream Power (lb/ft s) | 0.09 | 0.24 | 0.01 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
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) | 830.28 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.034 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.24 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 826.79 | Flow Area (sq ft) | 469.23 | 253.66 | 56.34 |
| E.G. Slope (ft/ft) | 0.000457 | Area (sq ft) | 469.23 | 253.66 | 287.22 |
| Q Total (cfs) | 1180.00 | Flow (cfs) | 760.02 | 397.67 | 22.31 |
| Top Width (ft) | 534.90 | Top Width (ft) | 209.17 | 41.02 | 284.71 |
| Vel Total (ft/s) | 1.51 | Avg. Vel. (ft/s) | 1.62 | 1.57 | 0.40 |
| Max Chl Dpth (ft) | 7.63 | Hydr. Depth (ft) | 2.24 | 6.18 | 1.40 |
| Conv. Total (cfs) | 55207.5 | Conv. (cfs) | 35558.2 | 18605.4 | 1043.9 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 209.69 | 44.45 | 40.46 |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.06 | 0.16 | 0.04 |
| Alpha | 1.10 | Stream Power (lb/ft s) | 0.10 | 0.26 | 0.02 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #25-yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 830.71 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.034 | 0.065 | 0.100 |
| W.S. Elev (ft) | 830.66 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 827.31 | Flow Area (sq ft) | 558.42 | 270.96 | 74.68 |
| E.G. Slope (ft/ft) | 0.000457 | Area (sq ft) | 558.42 | 270.96 | |

| | | | | |
|---|---|---|---|---|
| 416.54 | | | | |
| Q Total (cfs) | 1465.00 | Flow (cfs) | 988.45 | 444.13 |
| 32.42 | | | | |
| Top Width (ft) | 578.01 | Top Width (ft) | 217.09 | 41.02 |
| 319.90 | | | | |
| Vel Total (ft/s) | 1.62 | Avg. Vel. (ft/s) | 1.77 | 1.64 |
| 0.43 | | | | |
| Max Chl Dpth (ft) | 8.05 | Hydr. Depth (ft) | 2.57 | 6.61 |
| 1.60 | | | | |
| Conv. Total (cfs) | 68506.0 | Conv. (cfs) | 46221.4 | 20768.3 |
| 1516.2 | | | | |
| Length Wtd. (ft) | | Wetted Per. (ft) | 217.64 | 44.45 |
| 46.76 | | | | |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.07 | 0.17 |
| 0.05 | | | | |
| Alpha | 1.12 | Stream Power (lb/ft s) | 0.13 | 0.29 |
| 0.02 | | | | |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | |
| C & E Loss (ft) | | Cum SA (acres) | | |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-yr

| | | | | |
|---|---|---|---|---|
| E.G. Elev (ft) | 831.08 | Element | Left OB | Channel |
| Right OB | | | | |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.034 | 0.065 |
| 0.100 | | | | |
| W.S. Elev (ft) | 831.03 | Reach Len. (ft) | | |
| Crit W.S. (ft) | 828.59 | Flow Area (sq ft) | 639.36 | 285.88 |
| 92.62 | | | | |
| E.G. Slope (ft/ft) | 0.000458 | Area (sq ft) | 639.36 | 285.88 |
| 537.50 | | | | |
| Q Total (cfs) | 1740.00 | Flow (cfs) | 1211.09 | 485.75 |
| 43.16 | | | | |
| Top Width (ft) | 614.04 | Top Width (ft) | 224.21 | 41.02 |
| 348.81 | | | | |
| Vel Total (ft/s) | 1.71 | Avg. Vel. (ft/s) | 1.89 | 1.70 |
| 0.47 | | | | |
| Max Chl Dpth (ft) | 8.42 | Hydr. Depth (ft) | 2.85 | 6.97 |
| 1.78 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Conv. Total (cfs) | 81342.6 | Conv. (cfs) | 56616.8 | 22708.3 | 2017.5 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 224.80 | 44.45 | 52.19 |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.08 | 0.18 | 0.05 |
| Alpha | 1.13 | Stream Power (lb/ft s) | 0.15 | 0.31 | 0.02 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
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) | 831.36 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.034 | 0.065 | 0.100 |
| W.S. Elev (ft) | 831.30 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 828.71 | Flow Area (sq ft) | 701.15 | 297.14 | 107.47 |
| E.G. Slope (ft/ft) | 0.000469 | Area (sq ft) | 701.15 | 297.14 | 636.81 |
| Q Total (cfs) | 2000.00 | Flow (cfs) | 1422.10 | 524.65 | 53.25 |
| Top Width (ft) | 643.55 | Top Width (ft) | 226.25 | 41.02 | 376.27 |
| Vel Total (ft/s) | 1.81 | Avg. Vel. (ft/s) | 2.03 | 1.77 | 0.50 |
| Max Chl Dpth (ft) | 8.69 | Hydr. Depth (ft) | 3.10 | 7.24 | 1.91 |
| Conv. Total (cfs) | 92320.1 | Conv. (cfs) | 65644.4 | 24218.0 | 2457.8 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 226.86 | 44.45 | 56.28 |
| Min Ch El (ft) | 822.61 | Shear (lb/sq ft) | 0.09 | 0.20 | 0.06 |
| Alpha | 1.15 | Stream Power (lb/ft s) | 0.18 | 0.35 | 0.03 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |

C & E Loss (ft)  Cum SA (acres)

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

SUMMARY OF MANNING'S N VALUES

River:Oldtown Creek

| Reach | River Sta. | n1 | n2 | n3 | n4 | n5 | n6 | n7 | n8 | n9 | n10 | n11 | n12 | n13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reach | 796.1598 | .03 | .1 | .07 | .06 | .07 | .1 | .013 | .1 | .035 | .1 | .1 | | |
| Reach | 703.7970 | .013 | .03 | .1 | .07 | .06 | .07 | .1 | .013 | .1 | .035 | .1 | .1 | |
| Reach | 679.82 | Culvert | | | | | | | | | | | | |
| Reach | 651.5802 | .013 | .03 | .1 | .07 | .06 | .07 | .1 | .013 | .1 | .035 | .1 | .1 | |
| Reach | 545.1257 | .03 | .1 | .07 | .06 | .07 | .1 | .013 | .1 | .035 | .1 | .013 | .1 | .1 |
| Reach | 492.3110 | .03 | .1 | .07 | .06 | .07 | .1 | .013 | .1 | .035 | .1 | .013 | .1 | .1 |

SUMMARY OF REACH LENGTHS

River: Oldtown Creek

| Reach | River Sta. | Left | Channel | Right |
|---|---|---|---|---|
| Reach | 796.1598 | 96.02 | 92.36 | 85.26 |
| Reach | 703.7970 | 56.86 | 52.22 | 53.96 |
| Reach | 679.82 | Culvert | | |
| Reach | 651.5802 | 111.44 | 106.45 | 103.86 |
| Reach | 545.1257 | 46.6 | 52.81 | 53.82 |

| | | | | |
|---|---|---|---|---|
| Reach | 492.3110 | 0 | 0 | 0 |

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Oldtown Creek

| Reach | River Sta. | Contr. | Expan. |
|---|---|---|---|
| Reach | 796.1598 | .1 | .3 |
| Reach | 703.7970 | .1 | .3 |
| Reach | 679.82 | Culvert | |
| Reach | 651.5802 | .1 | .3 |
| Reach | 545.1257 | .1 | .3 |
| Reach | 492.3110 | .1 | .3 |

Profile Output Table - Standard Table 1

| Reach | River Sta | Profile | Plan | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| Reach | 796.1598 | 2xHMMF | Exist | 38.60 | 823.48 | 825.35 | 824.19 | 825.36 | 0.001007 | 0.94 | 40.99 | 27.53 | 0.14 |
| Reach | 796.1598 | 2xHMMF | PropTAF | 38.60 | 823.48 | 826.20 | 824.19 | 826.21 | 0.000245 | 0.59 | 65.27 | 29.51 | 0.07 |
| Reach | 796.1598 | 2-yr | Exist | 620.00 | 823.48 | 829.48 | 826.38 | 829.64 | 0.003507 | 3.25 | 227.52 | 459.16 | 0.28 |
| Reach | 796.1598 | 2-yr | PropTAF | 620.00 | 823.48 | 829.49 | 826.38 | 829.65 | 0.003468 | 3.24 | 228.82 | 461.14 | 0.28 |
| Reach | 796.1598 | 5-yr | Exist | 1070.00 | 823.48 | 830.36 | 827.49 | 830.41 | 0.001040 | 2.01 | 643.05 | 559.38 | 0.16 |
| Reach | 796.1598 | 5-yr | PropTAF | 1070.00 | 823.48 | 830.35 | 827.49 | 830.41 | 0.001044 | 2.02 | 642.29 | 559.30 | 0.16 |

```
  Reach         796.1598      10-yr         Exist     1180.00      823.48
830.53      827.72      830.58     0.000996       2.02      695.22      586.65
    0.16
  Reach         796.1598      10-yr         PropTAF   1180.00      823.48
830.52      827.72      830.57     0.001012       2.03      691.61      581.37
    0.16
  Reach         796.1598      25-yr         Exist     1465.00      823.48
830.95      828.48      831.01     0.000896       2.02      827.14      623.70
    0.15
  Reach         796.1598      25-yr         PropTAF   1465.00      823.48
830.95      828.48      831.01     0.000900       2.02      825.92      623.61
    0.15
  Reach         796.1598      50-yr         Exist     1740.00      823.48
831.32      829.47      831.38     0.000838       2.03      943.09      633.78
    0.15
  Reach         796.1598      50-yr         PropTAF   1740.00      823.48
831.32      829.47      831.38     0.000840       2.04      942.65      633.75
    0.15
  Reach         796.1598      100-yr        Exist     2000.00      823.48
831.61      829.80      831.68     0.000826       2.08     1034.61      640.49
    0.15
  Reach         796.1598      100-yr        PropTAF   2000.00      823.48
831.60      829.80      831.67     0.000833       2.09     1031.97      640.25
    0.15



  Reach         703.7970      2xHMMF        Exist       38.60      823.18
825.22      824.25      825.24     0.001852       1.14       34.01       27.57
    0.18
  Reach         703.7970      2xHMMF        PropTAF     38.60      823.18
826.17      824.25      826.18     0.000295       0.64       60.74       28.27
    0.08
  Reach         703.7970      2-yr          Exist      620.00      823.18
829.49      826.49      829.52     0.000390       1.21      552.65      540.50
    0.10
  Reach         703.7970      2-yr          PropTAF    620.00      823.18
829.50      826.49      829.53     0.000384       1.20      555.57      541.09
    0.10
  Reach         703.7970      5-yr          Exist     1070.00      823.18
830.31      828.50      830.35     0.000423       1.40      766.93      621.47
    0.10
  Reach         703.7970      5-yr          PropTAF   1070.00      823.18
830.30      828.50      830.34     0.000424       1.40      766.21      621.29
    0.10
  Reach         703.7970      10-yr         Exist     1180.00      823.18
830.48      828.63      830.52     0.000426       1.43      812.60      626.10
    0.10
  Reach         703.7970      10-yr         PropTAF   1180.00      823.18
830.46      828.63      830.51     0.000432       1.44      809.23      625.92
```

```
    0.10
  Reach         703.7970      25-yr         Exist     1465.00      823.18
830.90      828.87      830.95     0.000436       1.51      928.46      640.72
    0.11
  Reach         703.7970      25-yr         PropTAF   1465.00      823.18
830.90      828.87      830.95     0.000437       1.51      927.33      640.60
    0.11
  Reach         703.7970      50-yr         Exist     1740.00      823.18
831.27      829.07      831.33     0.000446       1.59     1031.02      653.81
    0.11
  Reach         703.7970      50-yr         PropTAF   1740.00      823.18
831.27      829.07      831.32     0.000447       1.59     1030.63      653.77
    0.11
  Reach         703.7970      100-yr        Exist     2000.00      823.18
831.55      829.22      831.62     0.000463       1.67     1112.10      662.24
    0.11
  Reach         703.7970      100-yr        PropTAF   2000.00      823.18
831.54      829.22      831.61     0.000467       1.67     1109.61      661.96
    0.11



  Reach         651.5802      2xHMMF        Exist       38.60      823.44
825.15      824.04      825.16     0.001118       1.01       38.24       26.70
    0.15
  Reach         651.5802      2xHMMF        PropTAF     38.60      823.44
825.15      824.04      825.16     0.001119       1.01       38.24       26.70
    0.15
  Reach         651.5802      2-yr          Exist      620.00      823.44
829.45      826.29      829.49     0.000716       1.89      514.33      576.15
    0.14
  Reach         651.5802      2-yr          PropTAF    620.00      823.44
829.45      826.31      829.49     0.000716       1.88      514.34      576.16
    0.14
  Reach         651.5802      5-yr          Exist     1070.00      823.44
830.28      827.83      830.32     0.000664       2.00      752.92      623.43
    0.14
  Reach         651.5802      5-yr          PropTAF   1070.00      823.44
830.28      827.84      830.32     0.000664       2.00      752.92      623.43
    0.14
  Reach         651.5802      10-yr         Exist     1180.00      823.44
830.45      828.03      830.49     0.000657       2.02      803.05      626.90
    0.14
  Reach         651.5802      10-yr         PropTAF   1180.00      823.44
830.45      828.03      830.49     0.000658       2.02      803.07      626.90
    0.14
  Reach         651.5802      25-yr         Exist     1465.00      823.44
830.87      828.44      830.92     0.000633       2.07      929.11      635.31
    0.14
  Reach         651.5802      25-yr         PropTAF   1465.00      823.44
```

```
830.87      828.45      830.92     0.000633       2.07      929.12      635.32
    0.14
  Reach         651.5802      50-yr         Exist     1740.00      823.44
831.24      828.78      831.30     0.000626       2.13     1039.00      644.73
    0.14
  Reach         651.5802      50-yr         PropTAF   1740.00      823.44
831.24      828.78      831.30     0.000626       2.13     1039.00      644.73
    0.14
  Reach         651.5802      100-yr        Exist     2000.00      823.44
831.53      829.17      831.59     0.000641       2.21     1125.61      653.82
    0.14
  Reach         651.5802      100-yr        PropTAF   2000.00      823.44
831.53      829.08      831.59     0.000641       2.21     1125.63      653.82
    0.14



  Reach         545.1257      2xHMMF        Exist       38.60      823.35
825.02      824.04      825.04     0.001176       0.94       40.96       31.76
    0.15
  Reach         545.1257      2xHMMF        PropTAF     38.60      823.35
825.02      824.04      825.04     0.001176       0.94       40.96       31.76
    0.15
  Reach         545.1257      2-yr          Exist      620.00      823.35
829.28      826.05      829.37     0.001772       2.57      356.51      464.10
    0.20
  Reach         545.1257      2-yr          PropTAF    620.00      823.35
829.28      826.05      829.37     0.001772       2.57      356.51      464.10
    0.20
  Reach         545.1257      5-yr          Exist     1070.00      823.35
830.05      827.04      830.18     0.002466       3.34      520.55      519.74
    0.25
  Reach         545.1257      5-yr          PropTAF   1070.00      823.35
830.05      827.05      830.18     0.002466       3.34      520.55      519.74
    0.25
  Reach         545.1257      10-yr         Exist     1180.00      823.35
830.22      827.25      830.36     0.002573       3.47      557.16      528.15
    0.25
  Reach         545.1257      10-yr         PropTAF   1180.00      823.35
830.22      827.22      830.36     0.002573       3.47      557.16      528.15
    0.25
  Reach         545.1257      25-yr         Exist     1465.00      823.35
830.63      827.79      830.79     0.002738       3.75      653.05      552.31
    0.26
  Reach         545.1257      25-yr         PropTAF   1465.00      823.35
830.63      827.79      830.79     0.002738       3.75      653.05      552.31
    0.26
  Reach         545.1257      50-yr         Exist     1740.00      823.35
830.99      828.26      831.16     0.002868       3.98      738.77      565.85
    0.27
```

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reach | 545.1257 | 50-yr | PropTAF | 1740.00 | 823.35 | | | | |
| 830.99 | 828.27 | 831.16 | 0.002868 | 3.98 | 738.77 | 565.85 | 0.27 | | |
| Reach | 545.1257 | 100-yr | Exist | 2000.00 | 823.35 | | | | |
| 831.26 | 828.69 | 831.44 | 0.003076 | 4.24 | 805.03 | 590.48 | 0.28 | | |
| Reach | 545.1257 | 100-yr | PropTAF | 2000.00 | 823.35 | | | | |
| 831.26 | 828.69 | 831.44 | 0.003076 | 4.24 | 805.03 | 590.48 | 0.28 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reach | 492.3110 | 2xHMMF | Exist | 38.60 | 822.61 | | | | |
| 824.99 | 823.47 | 825.00 | 0.000458 | 0.70 | 54.99 | 32.27 | 0.09 | | |
| Reach | 492.3110 | 2xHMMF | PropTAF | 38.60 | 822.61 | | | | |
| 824.99 | 823.47 | 825.00 | 0.000458 | 0.70 | 54.99 | 32.27 | 0.09 | | |
| Reach | 492.3110 | 2-yr | Exist | 620.00 | 822.61 | | | | |
| 829.28 | 825.56 | 829.31 | 0.000458 | 1.40 | 510.14 | 376.21 | 0.11 | | |
| Reach | 492.3110 | 2-yr | PropTAF | 620.00 | 822.61 | | | | |
| 829.28 | 825.56 | 829.31 | 0.000458 | 1.40 | 510.14 | 376.21 | 0.11 | | |
| Reach | 492.3110 | 5-yr | Exist | 1070.00 | 822.61 | | | | |
| 830.07 | 826.56 | 830.11 | 0.000458 | 1.54 | 731.07 | 521.82 | 0.11 | | |
| Reach | 492.3110 | 5-yr | PropTAF | 1070.00 | 822.61 | | | | |
| 830.07 | 826.56 | 830.11 | 0.000458 | 1.54 | 731.07 | 521.82 | 0.11 | | |
| Reach | 492.3110 | 10-yr | Exist | 1180.00 | 822.61 | | | | |
| 830.24 | 826.79 | 830.28 | 0.000457 | 1.57 | 779.22 | 534.90 | 0.11 | | |
| Reach | 492.3110 | 10-yr | PropTAF | 1180.00 | 822.61 | | | | |
| 830.24 | 826.79 | 830.28 | 0.000457 | 1.57 | 779.22 | 534.90 | 0.11 | | |
| Reach | 492.3110 | 25-yr | Exist | 1465.00 | 822.61 | | | | |
| 830.66 | 827.31 | 830.71 | 0.000457 | 1.64 | 904.07 | 578.01 | 0.11 | | |
| Reach | 492.3110 | 25-yr | PropTAF | 1465.00 | 822.61 | | | | |
| 830.66 | 827.31 | 830.71 | 0.000457 | 1.64 | 904.07 | 578.01 | 0.11 | | |
| Reach | 492.3110 | 50-yr | Exist | 1740.00 | 822.61 | | | | |
| 831.03 | 828.59 | 831.08 | 0.000458 | 1.70 | 1017.86 | 614.04 | 0.11 | | |
| Reach | 492.3110 | 50-yr | PropTAF | 1740.00 | 822.61 | | | | |
| 831.03 | 828.59 | 831.08 | 0.000458 | 1.70 | 1017.86 | 614.04 | 0.11 | | |
| Reach | 492.3110 | 100-yr | Exist | 2000.00 | 822.61 | | | | |
| 831.30 | 828.71 | 831.36 | 0.000469 | 1.77 | 1105.75 | 643.55 | | | |

0.12
Reach 492.3110 100-yr PropTAF 2000.00 822.61
831.30 828.71 831.36 0.000469 1.77 1105.75 643.55
0.12

Profile Output Table - Bridge Only

| Reach | River Sta | Profile | Plan | E.G. US. (ft) | Min El Prs (ft) | BR Open Area (sq ft) | Prs O WS (ft) | Q Total (cfs) | Min El Weir Flow (ft) | Q Weir (cfs) | Delta EG (ft) | BR Sluice Coef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

# APPENDIX 6: ODOT TAF CHECKLIST AND WORKSHEET

# Temporary Construction, Access and Dewatering Activities Checklist

The purpose of this form is to aid the Office of Environmental Services - Waterway Permits Unit (OES-WPU) in the Permit Determination and Special Provisions processes. This form shall be completed by the project designer for each aquatic resource and reflect the anticipated temporary fill activities in the aquatic resource (including streams, impounded streams, lakes, reservoirs, rivers). If the type and amount of temporary fill is unknown, assume a reasonable and logical worst-case scenario of what could be needed. A complete copy of this form shall be provided to the District Environmental Coordinator (DEC) to be included in the Permit Determination Request submitted to OES-WPU.

| | | | |
|---|---|---|---|
| CRS: | GRE-68-12.65 | PID: | 115388 |
| Aquatic resource name* | Oldtown Creek | | |

*Provide stationing if more than one location on the same aquatic resource will be impacted

1. **During the construction of this project, the following fill activities in the aquatic resource are anticipated: (check all that apply)**

| | |
|---|---|
| ☐ | Temporary bridge or structure (CMS Item 502) |
| ☐ | Cofferdams (temporary dewatering) |
| ☐ | Demolition and debris (intentional fill) |
| ☒ | Causeways and work pads |

2. **ODOT requires that the temporary activity accommodates a minimum flow equal to twice the maximum mean monthly flow without creating a rise in backwater above the OHWM. This flow is the Standard Temporary Discharge (STD).**

| | |
|---|---|
| Yes | Is U.S. Geological Survey Stream Stats data available for this location? |
| 38.6 cfs | Provide the minimum flow (cfs) to be maintained throughout construction for this location |

3. **The method that will most likely be implemented by the Contractor to maintain this flow will be: (check all that apply)**

| | |
|---|---|
| ☒ | Conduits (Provide hydraulic calculations when the STD is 10 cfs or greater) |
| ☐ | Open channel(s)/temporary bridge (Provide hydraulic calculations when the STD is 10 cfs or greater) |
| ☐ | Pump around (No hydraulic calculations required for cofferdams with pump around scenarios) |
| Yes | Verify if the project meet flow requirements outlined in the Location & Design Manual Vol. 2 Section 1010? Attach hydraulic calculations when specified above. |

4. **Additional information**

| | |
|---|---|
| 12 months | Provide the proposed duration (weeks, months or years) of temporary fill in the aquatic resource.<br>*Note: temporary fill in a water of the U.S. longer than 2 years may be considered permanent by the USACE* |
| No | Will temporary fill occur within a flowage easement of a federal flood control facility?<br>*This item only applies to federal flood control facilities. Flowage easements associated with these facilities can occur several miles away from the facility. If uncertain that the project is in a flowage easement area, please consult the district's real estate office for assistance.* |

Click on the link below to access ODOT's Waterway Permits manual, guidance, and other resources:

https://www.transportation.ohio.gov/wps/portal/gov/odot/programs/waterway-permits-program/waterway-permits

OHIO DEPARTMENT OF TRANSPORTATION

# TAF DESIGN WORKSHEET

July 21, 2023

| | | | |
|---|---|---|---|
| **Project:** | GRE-68-12.65 | **PID:** | 115388 |
| **PERFORMED BY:** | CML | **DATE:** | 12/7/2023 |
| **CHECKED BY:** | PJP | **DATE:** | 1/2/2024 |
| **SUBJECT:** | | | |
| **STREAM:** | Oldtown Creek | | |

## TAF DESIGN

### STREAM CHARACTERISTICS AT PROPOSED TAF LOCATION (NO TAF INSTALLED)

| | |
|---|---|
| Is StreamStats data for the site available? | **Yes** |
| Is the stream's flow influenced by hydraulic controlling features (i.e. dams)? | **No** |
| Basin drainage area ($mi^2$) | **9.62** |
| Ordinary High Water Mark elevation [OHWM] (ft) | **827.0** |
| Top of bank elevation (ft) | **828.8** |
| 50% AEP flow water surface elevation (ft) | **829.0** |
| OHWM flow rate [without TAF] (cfs) | **213** |
| Maximum mean monthly flow (cfs) | **19.3** |
| 2x maximum mean monthly flow (cfs) | **38.6** |
| 2x maximum mean monthly flow water surface elevation (ft) | **825** |

### Tier 1 TAF Analysis

| | |
|---|---|
| Proposed TAF obstruction width | **Full Channel** |
| *Choose one. If Partial TAF, provide % of total channel width being obstructed.* | |
| Partial TAF obstruction width (%) | |
| *Provide % of partial TAF obstructing overall channel width as measured at OHWM elevation.* | |
| Does the site pass two-times highest monthly flow without backwater rise above OHWM with TAF in place? | **Yes** |
| **End Analysis: Proceed to Summary.** | |
| After verifying OHWM, does the site pass 2x highest monthly flow? | **Yes** |

### Tier 2 TAF Analysis

*Do not complete this section, analysis complete.*

| | |
|---|---|
| Calculated backwater elevation | |
| Modified height of TAF (backwater elevation+1' freeboard) | **1** |
| Calculated backwater from modified TAF height | |
| Calculated freeboard | **1** |
| **TAF Design acceptable (greater than 0.5-feet)** | |
| Is the TAF height acceptable based on viability considerations? | |
| **Proceed to Tier 3 TAF Design** | |
| Final top of TAF elevation (ft) | **1.0** |

# TAF DESIGN WORKSHEET

July 21, 2023

## Tier 3 TAF Analysis

*Complete if adjusted STD is necessary*

| | |
|---|---|
| Initial height of TAF (1' above OHWM or necessary to facilitate construction) | |
| Calculated STD (flow producing WSE equal to height of TAF) | |
| Is historical waterway flow available (USGS Gage data availability)? | |
| Does probability of exceedance of STD facilitate the project schedule? | |

## TAF STABILITY- Based on Bureau of Reclamation

*Suggested rock sizing and corresponding Manning's n based on hydraulic analysis velocities*

*Note: Sizing based on velocity due to unavailability of accurate point shear in 1D models*

| | |
|---|---|
| Velocity at edge of TAF corresponding to 20% AEP flow (ft/s) | **10.4** |
| Suggested dumped rock size | **ODOT Type B (n=0.042)** |

## SUMMARY

| | |
|---|---|
| Streamflow data source | **Stream Stats** |
| Stream contains hydraulic controlling features? | **No** |
| Top of TAF elevation (ft) | **827.96** |
| Channel width obstructed by TAF: | **Full Channel** |
| Suggested size for TAF dumped rock: | **ODOT Type B (n=0.042)** |
| Suggested HEC-RAS scoping (1D or 2D) | **1D Hydraulic Model** |