

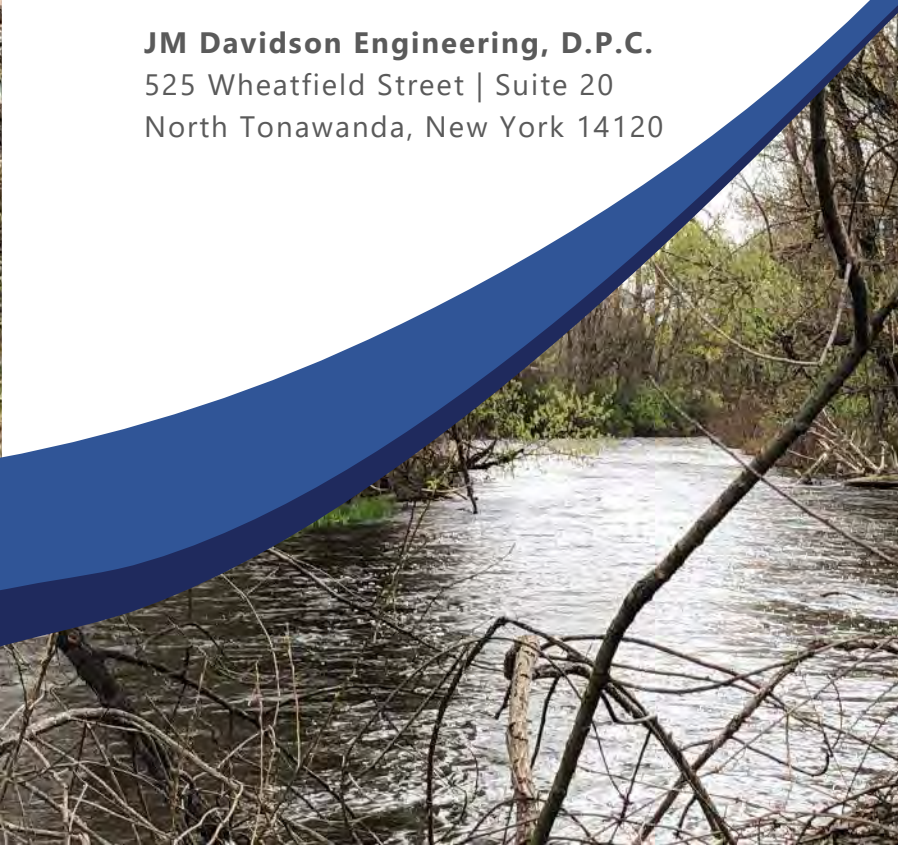
Genesee  
County  
Economic  
Development  
Center



STAMP Discharge Analysis to Oak  
Orchard Creek

May 22, 2020

**JM Davidson Engineering, D.P.C.**  
525 Wheatfield Street | Suite 20  
North Tonawanda, New York 14120



**JM Davidson**  
Engineering, D.P.C.

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# 1 Introduction

JM Davidson Engineering, D.P.C. (JMD) was contracted by CPL to perform a hydraulic analysis of Oak Orchard Creek in the Town of Shelby, New York. The hydraulic analysis is part of the design and impact analysis for the Western New York Science and Technology Advanced Manufacturing Park (STAMP) facility proposed by the Genesee County Economic Development Center (GCEDC). As part of the design, the STAMP facility is proposed to provide its own, individual wastewater treatment facility (WWTF). While the STAMP facility is proposed to be constructed in Genesee County in the Town of Alabama, the WWTF is proposed to discharge, via a force main, into Oak Orchard Creek in the Town of Shelby, Orleans County, approximately 2,500 ft downstream of the Main Street bridge (Figure 1).

The purpose of this hydraulic analysis is to determine the impact to flooding, if any, that the additional WWTF effluent discharge will have on Oak Orchard Creek in the vicinity of the anticipated force main discharge location ("Project Area").

## 2 Hydrologic Analysis

### 2.1 FEMA

Within the Town of Shelby, there is no Special Flood Hazard Area (SFHA) associated with Oak Orchard Creek. Oak Orchard Creek, in the vicinity of the Project Area, is located on FIRM map panel 361258B03, effective December 23, 1983; however, this panel is not individually printed as the entire area is categorized as Zone C. The Map Index for the Town of Shelby is included in **Appendix A**.

Within the Village of Medina, at the downstream limits of the hydraulic analysis study area, Oak Orchard Creek is shown with an approximate floodplain categorized as a Zone A, as depicted on FIRM map panel 3606440001B, effective March 28, 1980. The FIRM panel for the Village of Medina is included in **Appendix A**.

Since Oak Orchard Creek was not studied in detail by FEMA for the development of the FIRMs in the Town of Shelby or the Village of Medina, no detailed information on the anticipated flood levels or discharges is available from FEMA.

### 2.2 USGS Stream Stats

A USGS Stream Stats analysis was run for Oak Orchard Creek at a location downstream of the Main Street bridge crossing, near the anticipated force main discharge location. The drainage area at this point is approximately 153 square miles. Table 1 provides the Stream Stats estimated peak discharges. The Stream Stats report is included in **Appendix B**.

### 2.3 USGS Gage Data

Within the vicinity of the Project Area, two USGS gages were identified as sources of potential discharge data:

- USGS 04220045 Oak Orchard Creek Near Shelby, NY – This is an inactive station, located upstream of the study area, just upstream of the Harrison Road bridge crossing. This station has a 13 year period of record of peak discharges including 1977, 1978, 2009-2019. The drainage area at this location is reported as 146 square miles.
- USGS 04220150 Oak Orchard Creek C at Medina, NY – This is an inactive station, located within the hydraulic study area just upstream of the Maple Ridge Road bridge crossing. The station has a 15 year period of

record of peak discharges ranging from 1962 to 1976. The drainage area at this location is reported as 157 square miles.

Log Pearson Type III (LPIII) analyses were conducted for the peak discharge data at both gages to determine the statistical peak discharge for various return periods. These peak discharges were then compared to the peak discharges estimated using Stream Stats at the same location. While the period of record for both gages is relatively short, the LPIII analyses show that the Stream Stats, which uses regression equation analyses, seems to be over estimating the anticipated peak discharges throughout Oak Orchard Creek – and therefore is not recommended to be utilized as the design discharges in the hydraulic model. The LPIII data is provided in Table 1 .

Since the USGS gage data has a limited period of record, a secondary analysis was conducted in accordance with USGS SIR 2006-5112 *Magnitude and Frequency of Floods in New York*, which determines peak discharges using regression equations; however, the data is weighted with the nearby gage LPIII data. This data is shown in Table 1.

Table 1: Oak Orchard Creek Peak Discharge Analysis Summary

Oak Orchard Discharges							
Drainage Area (Sq. Mi.):	146	146	146	153	153	157	157
Return Period	Stream Stats @ Harrison Road	LPIII @ Harrison Road	Weighted LPIII @ Harrison Road	Stream Stats @ Main Street	Stream Stats @ Medina Gage	LPIII @ Medina Gage	Weighted LPIII @ Medina Gage
10-yr	2,540	1,128	1,375	2,570	2,570	1,460	1,640
50-yr	3,480	1,388	1,785	3,500	3,500	1,810	2,200
100-yr	3,870	1,493	1,955	3,890	3,890	1,940	2,420
500-yr	4,850	1,750	2,369	4,850	4,850	2,210	2,910

## 2.4 Recommended Discharges

It is recommended that the gage weighted LPIII data be utilized as the most reliable indicator of potential peak flood discharges since the regression equations appear too conservative and since the period of record for the two USGS gages is relatively short. The weighted LPIII data provides a more conservative discharge value than the LPIII data alone; however, is not as conservative as the regression equations alone. Since there is very little drainage area increase between the Main Street bridge and the USGS gage near Maple Ridge Road bridge on Oak Orchard Creek, it is recommended that the weighted LPIII data from the downstream gage be used in the hydraulic design analysis. Table 2 shows the recommended discharges for the hydraulic analysis.

Table 2: Recommended Discharges

Recommended Peak Discharges	
Return Interval	Discharge (cfs)
10-yr	1,640
50-yr	2,200
100-yr	2,420
500-yr	2,910



## 3 Hydraulic Analysis

A hydraulic model was built for Oak Orchard creek using HEC-RAS version 5.0.7. The model extends from just downstream of the Shelby Center Dam, upstream of the Main Street bridge crossing, to the downstream end of John E. Butts Memorial Park in the Village of Medina. The model is approximately 10,000 feet in length (Figure 2).

### 3.1 Geometry

The hydraulic model was built using available 1m LiDAR data from the NYSDEC GIS Database. Since the proposed model will not change any geometry, only discharge, it was assumed that the utilization of LiDAR data would be sufficient for this model.

JMD staff conducted a field visit on May 4, 2020 to take field measurements of the Main Street bridge and the Maple Ridge Road bridge, including channel depths in the vicinity of the bridges. This data was incorporated into the model. Channel modifications were made to the LiDAR cross-sections to mimic the channel depths measured in the field, while maintaining a similar profile to that of the original hydro-flattened LiDAR sections.

Photos from the field visit are included in **Appendix C**.

### 3.2 Existing Hydraulic Conditions

Oak Orchard flows from south to north. Upstream of the Project Area, a small run of river dam controls water levels upstream of Main Street. The dam is a Class B dam that looks to have been a former mill dam. The mill race is still active along the left side of the creek. The mill race re-enters the main channel downstream of Main Street. The project proposes no changes to the function or discharges at the dam; therefore, the model begins just downstream of the dam.

Between the dam and the Main Street bridge, the channel is moderately steep. Approaching the bridge, the channel is comprised of bedrock. The channel takes a significant drop just upstream of the bridge, where a small hydraulic jump occurs. Under the bridge and a short distance downstream, the bedrock channel is relatively flat with a moderate grade.

The Main Street bridge is a single span concrete bridge with vertical abutments. The footings are exposed at both abutments. A pipe bridge is located just upstream of the roadway bridge. The pipe bridge is comprised of two I-beams. The low chord of the pipe bridge appears to be the same or slightly higher than the roadway bridge. The bridges are skewed 26° from the flow direction of the channel, thus reducing the effective width of the bridge opening.

Based on the existing conditions modeling, the Main Street bridge has over 4 feet of freeboard to passing the 100-yr event.

Approximately 75 feet downstream of the bridge, the bedrock channel begins to steepen significantly. The channel meanders to the right slightly and the bed elevation drops over 30 feet over the next 875 feet, with the steepest fall in the first 200 feet. This drop in elevation brings the channel down into a gully running parallel to S Gravel Road.

It is probable that portions of the upper reach of the study area achieve supercritical flow during some events. Since true supercritical flow is rare in natural conditions, and would result in lower water surface elevations, the model was run using subcritical flow only. This allows portions of the model to reach critical depth but does not calculate the lower potential supercritical flow depths. This provides a more conservative water depth and flood inundation level for the reach.

Near the end of Mill Street is where the channel begins to flatten out again, as evidenced by the braided channels visible in the aerial imagery and the LiDAR data. The channel is nearly 50 feet below the surrounding ground elevation along S Gravel Road to the west and the agricultural fields to the east. It is in this area that the force main is proposed to discharge.

The channel and gully meanders south through a densely wooded area until nearing Maple Ridge Road. Approaching Maple Ridge Road, the channel is much flatter with a defined stream and banks. Near the roadway, several maintained properties bound the channel and the floodplain is significantly less wooded than upstream.

Maple Ridge Road bridge is a single span girder bridge perpendicular to the channel with vertical abutments. The channel bottom is gravel and silt. At the time of the site visit the channel flow width extended from abutment to abutment.

Based on the existing conditions modeling, the Maple Ridge Road bridge has just under 2 feet of freeboard for the 50-yr event and approximately 1.7 ft of freeboard for the 100-yr event. NYSDOT criteria requires bridges to maintain 2 feet of freeboard for the 50-yr event, thus supporting the approximate conditions of this model.

Approaching Maple Ridge Road and downstream of the bridge, the channel is no longer in a gully and flow is allowed to expand to the adjacent floodplains.

The hydraulic modeling shows that no structures are impacted by the existing 100-yr flood elevations and both bridges in the study area are able to pass the 100-yr event with freeboard.

### 3.3 Proposed Conditions

Currently, the STAMP WWTF is proposing a maximum discharge of 6 MGD (9.3 cfs) through the force main into Oak Orchard Creek at the proposed force main discharge location resulting in a 0.4% increase to the 100-yr discharge.

In order to determine the impacts of the slight increase in flow, the proposed model was developed utilizing the existing condition geometry and increasing the peak discharges by 9.3 cfs beginning roughly 2,000 feet downstream of the Main Street bridge (XS 7887). Table 3 shows a comparison of the water surface elevations for the 100-yr event for both the existing and proposed conditions within the hydraulic study area. Figure 3 shows the 100-yr flood extents within the hydraulic study area. Documentation from the hydraulic model is included in **Appendix D**.

Table 3: Comparison of 100-yr WSELs from Existing to Proposed

River Sta	Profile	Existing WSEL (ft)	Proposed WSEL (ft)	Difference
10530	100-yr	597.02	597.02	0.00
10316	100-yr	593.65	593.65	0.00
10148	100-yr	592.35	592.35	0.00
10079	100-yr	590.90	590.90	0.00
10055	100-yr	590.89	590.89	0.00
10023	Main Street Bridge			
9983	100-yr	589.22	589.22	0.00
9908	100-yr	587.20	587.20	0.00

River Sta	Profile	Existing WSEL (ft)	Proposed WSEL (ft)	Difference
9843	100-yr	576.53	576.53	0.00
9737	100-yr	567.77	567.77	0.00
9614	100-yr	563.61	563.61	0.00
9393	100-yr	557.70	557.70	0.00
9052	100-yr	551.56	551.56	0.00
8678	100-yr	547.16	547.16	0.00
8379	100-yr	544.16	544.16	0.00
7887	100-yr	542.08	542.09	0.01
7518	100-yr	541.72	541.73	0.01
7013	100-yr	541.13	541.14	0.01
6428	100-yr	540.99	541.01	0.02
5965	100-yr	540.80	540.81	0.01
5304	100-yr	540.36	540.38	0.02
4450	100-yr	539.67	539.68	0.01
3779	100-yr	538.95	538.96	0.01
3345	100-yr	538.52	538.53	0.01
3031	100-yr	538.29	538.30	0.01
2757	100-yr	538.02	538.03	0.01
2444	100-yr	537.31	537.32	0.01
2349	100-yr	536.83	536.84	0.01
2316	Maple Ridge Road Bridge			
2274	100-yr	536.28	536.27	-0.01
2158	100-yr	536.07	536.06	-0.01
1835	100-yr	535.13	535.14	0.01
1407	100-yr	533.05	533.06	0.01
1009	100-yr	531.94	531.95	0.01
634	100-yr	529.50	529.52	0.02
276	100-yr	526.47	526.47	0.00
116	100-yr	523.20	523.21	0.01

## 4 Summary

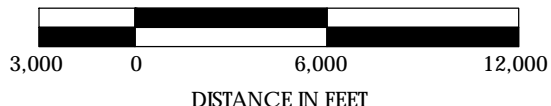
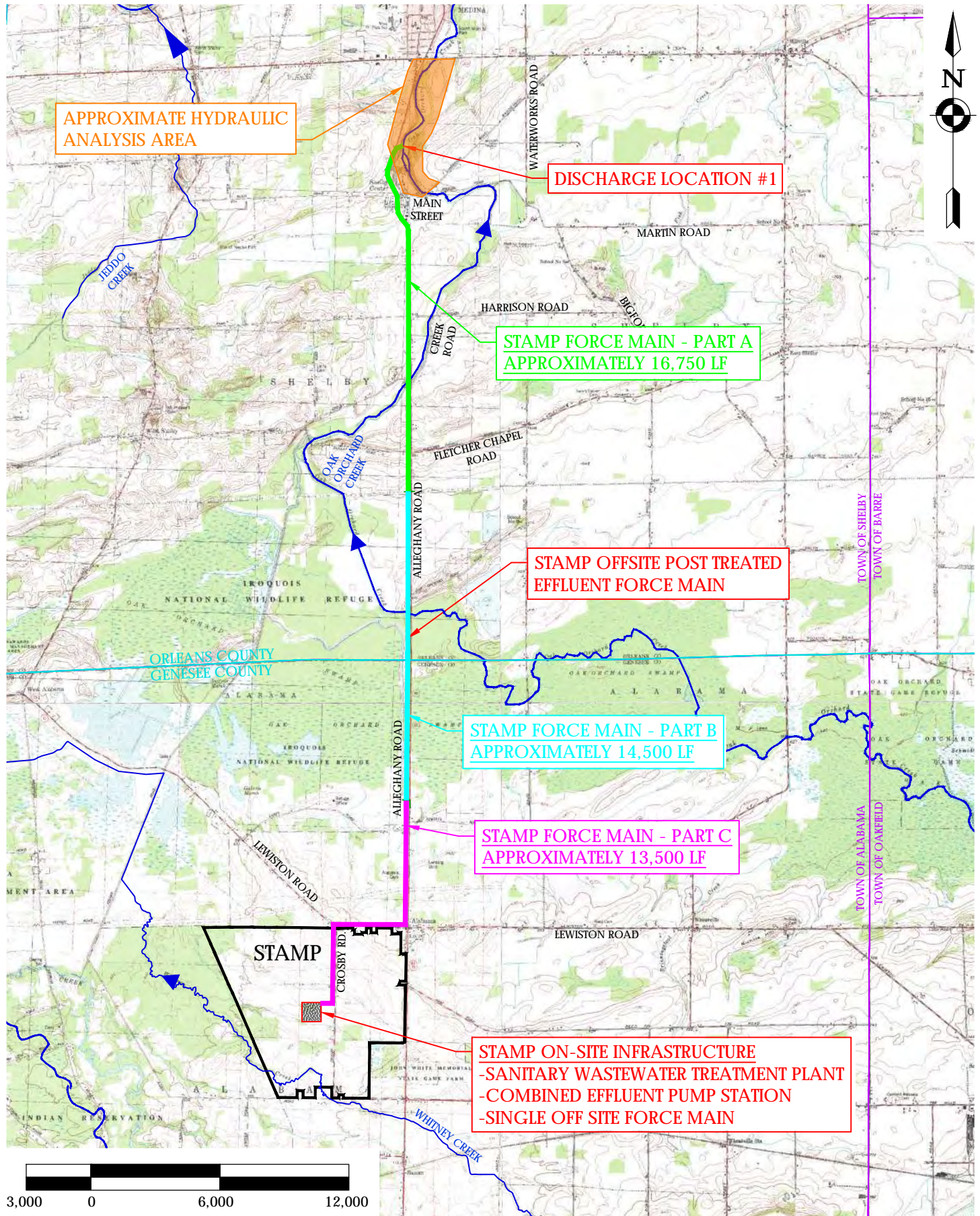
The 9.3 cfs (6 MGD) anticipated increased peak discharge to Oak Orchard Creek is a very small quantity compared to the overall statistical peak discharges. The hydraulic modeling indicates that the increased discharge will have a negligible effect on the flood elevations in Oak Orchard Creek. There will be no impact to the existing bridge hydraulics at Maple Ridge Road bridge and no structures will be impacted by the increased discharge. The discharge will have a greater impact on lesser storms since the peak WWTF discharge has the potential to be a larger percentage of the riverine peak discharge (i.e., 0.6% increase to the 10-yr); however, the increase is still very small and would not result in significant observable changes to the anticipated water surface elevations. Therefore, no mitigation is recommended.

Since there is no detailed FEMA analysis for this area of Oak Orchard Creek, floodplain regulations do not require a no-rise analysis, nor would a Letter of Map revision be required. No structures are impacted by the increased discharge. As such, the discharge point is in compliance with FEMA regulations.

Figures







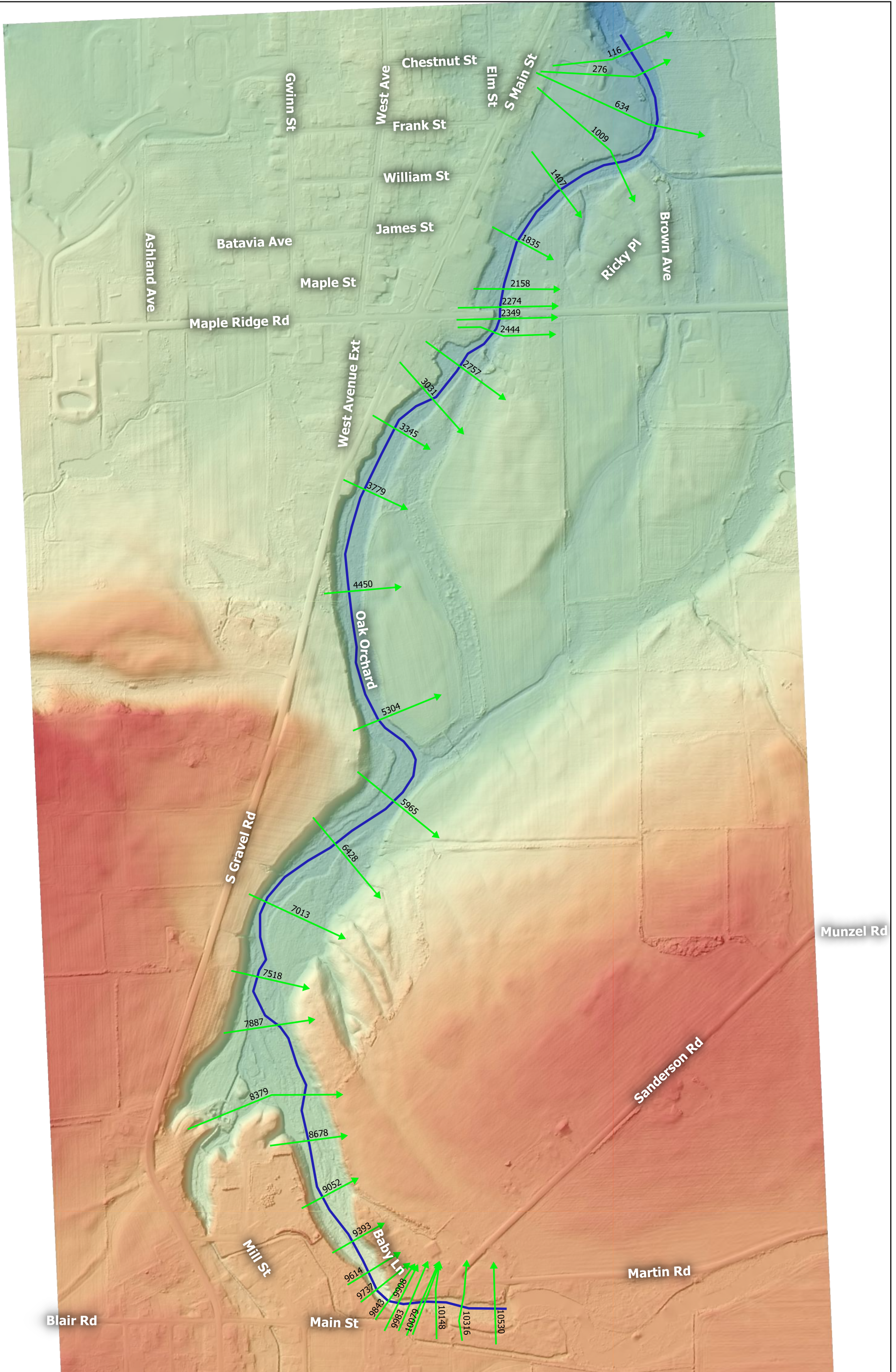
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DATE: 1/2/20  
 DRAWN: NLC  
 CHECKED: XXX  
 SCALE: 1"=6,000'  
 PROJ. #: XXXX.XX

**SANITARY EFFLUENT DISCHARGE LOCATION MAP**  
**GENESEE COUNTY ECONOMIC DEVELOPMENT CENTER**  
**STAMP OFFSITE POST TREATED EFFLUENT FORCE MAIN**  
 TOWN OF ALABAMA, NEW YORK STATE



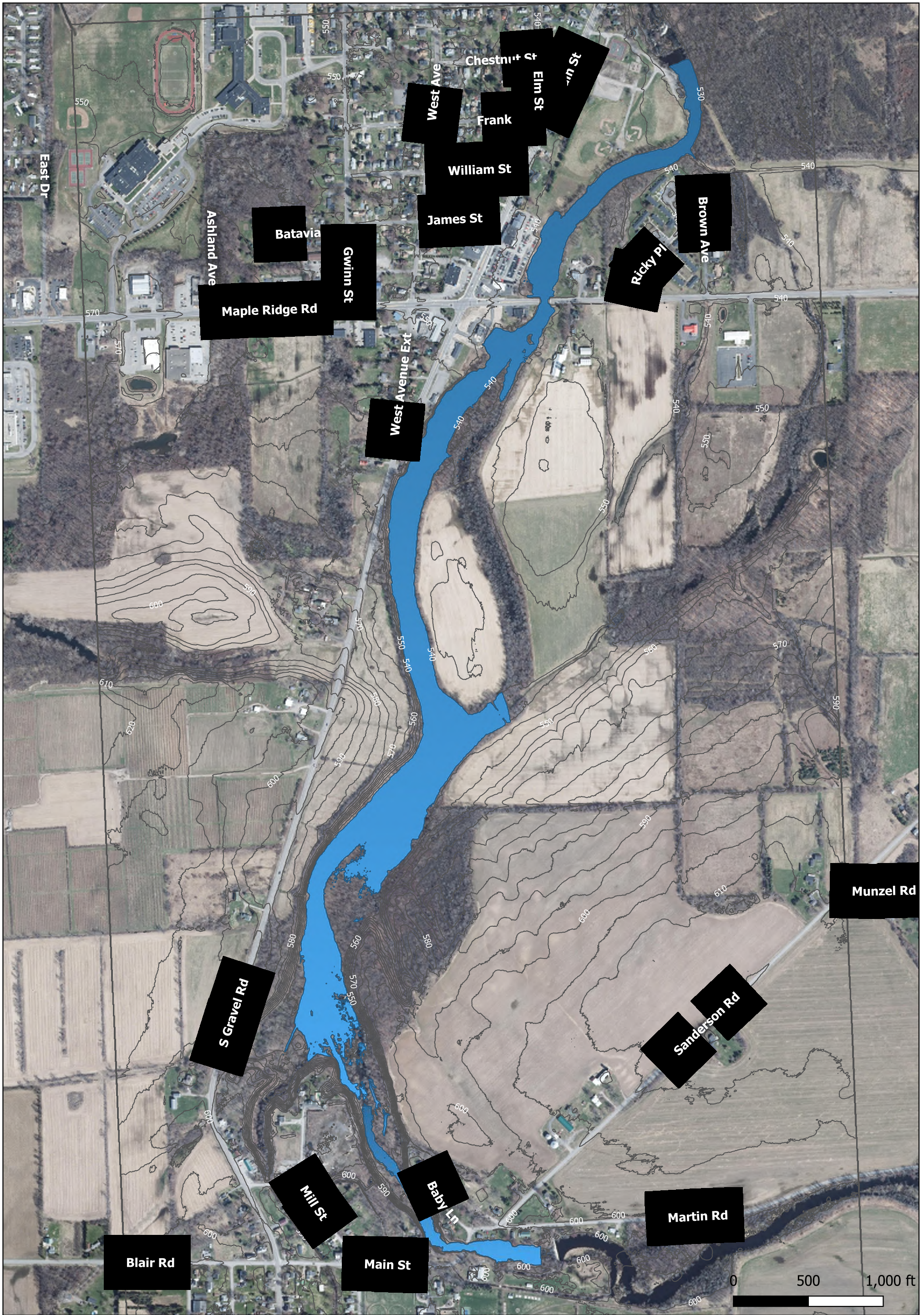
East Dr



GENESEE COUNTY IDA - STAMP DISCHARGE ANALYSIS







GENESEE COUNTY IDA - STAMP DISCHARGE ANALYSIS

100-YR FLOOD INUNDATION

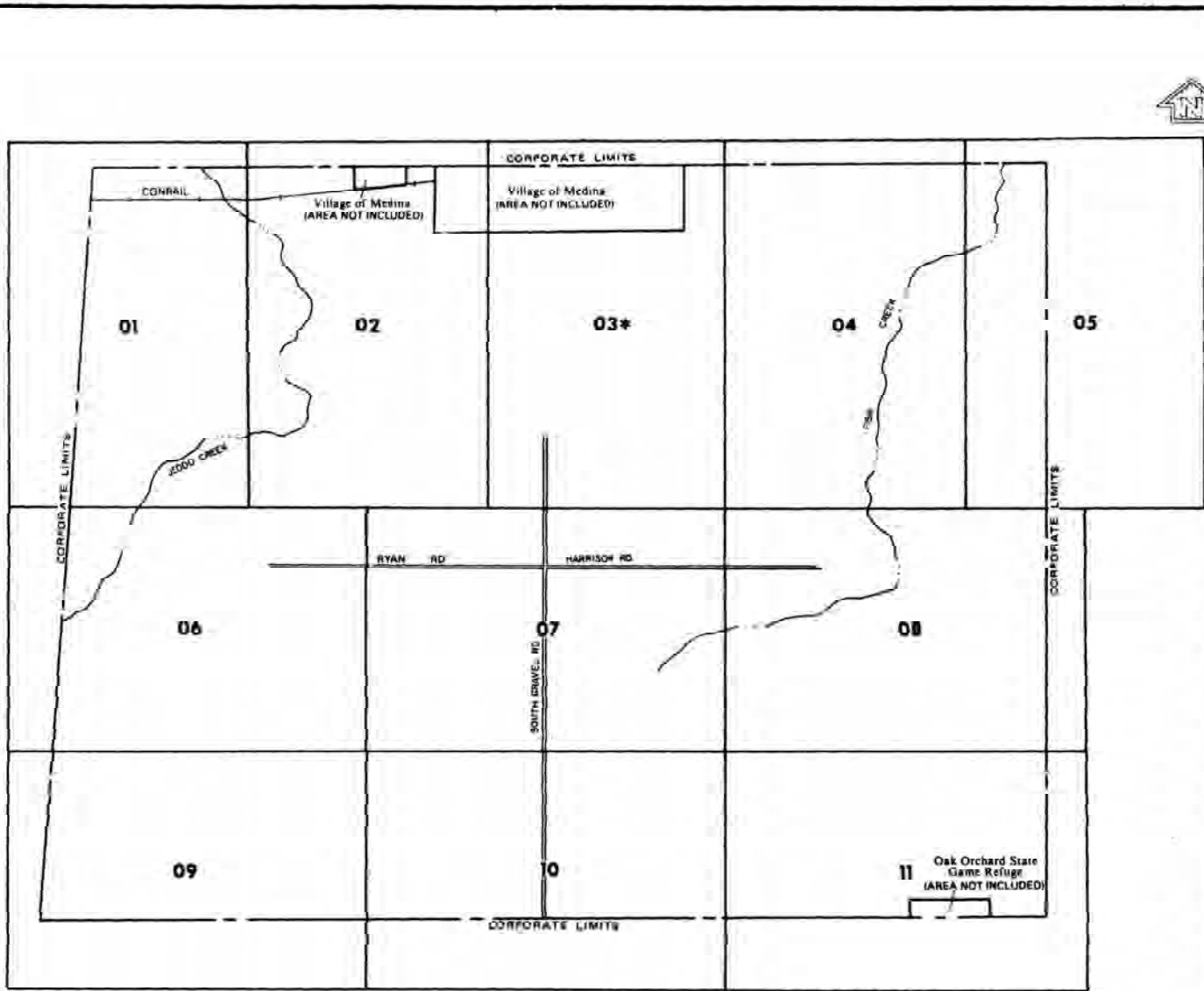




# Appendix A:

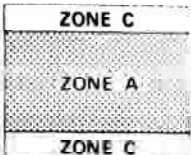
FEMA Documentation





\*PANEL NOT PRINTED - AREA ALL IN ZONE C

**KEY TO SYMBOLS**



**ZONE DESIGNATIONS\***

- Base Flood Elevation line with elevation in feet — 513 —
- Base Flood Elevation where uniform within zone (EL 087)
- Elevation Reference Mark RM7<sub>N</sub>
- River Mile 148.8

**\*EXPLANATION OF ZONE DESIGNATIONS**

A flood insurance map displays the zone designations for a community according to areas of designated flood hazards. The zone designations used by FEMA are:

- | Zone   | Explanation  |
|--------|--|
| A      | Areas of 100-year flood, base flood elevations and flood hazard factors not determined.  |
| AO     | Areas of 100-year shallow flooding, flood depth 1 to 3 feet, product of flood depth (feet) and velocity (feet per second) less than 15.                              |
| AH     | Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet, base flood elevations are shown, but no flood hazard factors are determined. |
| A1-A30 | Areas of 100-year flood, base flood elevations and flood hazard factors determined.  |
| ABR    | Areas of 100-year flood to be protected by a flood protection system under construction; base flood elevations and flood hazard factors not determined.              |
| B      | Area between limits of 100-year flood and 500-year flood; areas of 100-year shallow flooding where depths less than 1 foot.  |
| C      | Areas outside 500-year flood.  |
| D      | Areas of undetermined, but possible, 1000 hazards.   |
| V      | Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.  |
| V1-V30 | Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.  |

**NOTES TO USER**

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.  
 This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.  
 Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on the map to determine when actual rates apply to structures in the zones where elevations or depths have been established.  
 To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

INITIAL IDENTIFICATION: NOVEMBER 8, 1974  
 FLOOD HAZARD BOUNDARY MAP REVISIONS: DECEMBER 12, 1978  
 FLOOD INSURANCE RATE MAP EFFECTIVE: DECEMBER 23, 1983  
 FLOOD INSURANCE RATE MAP REVISIONS

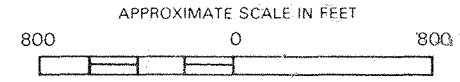
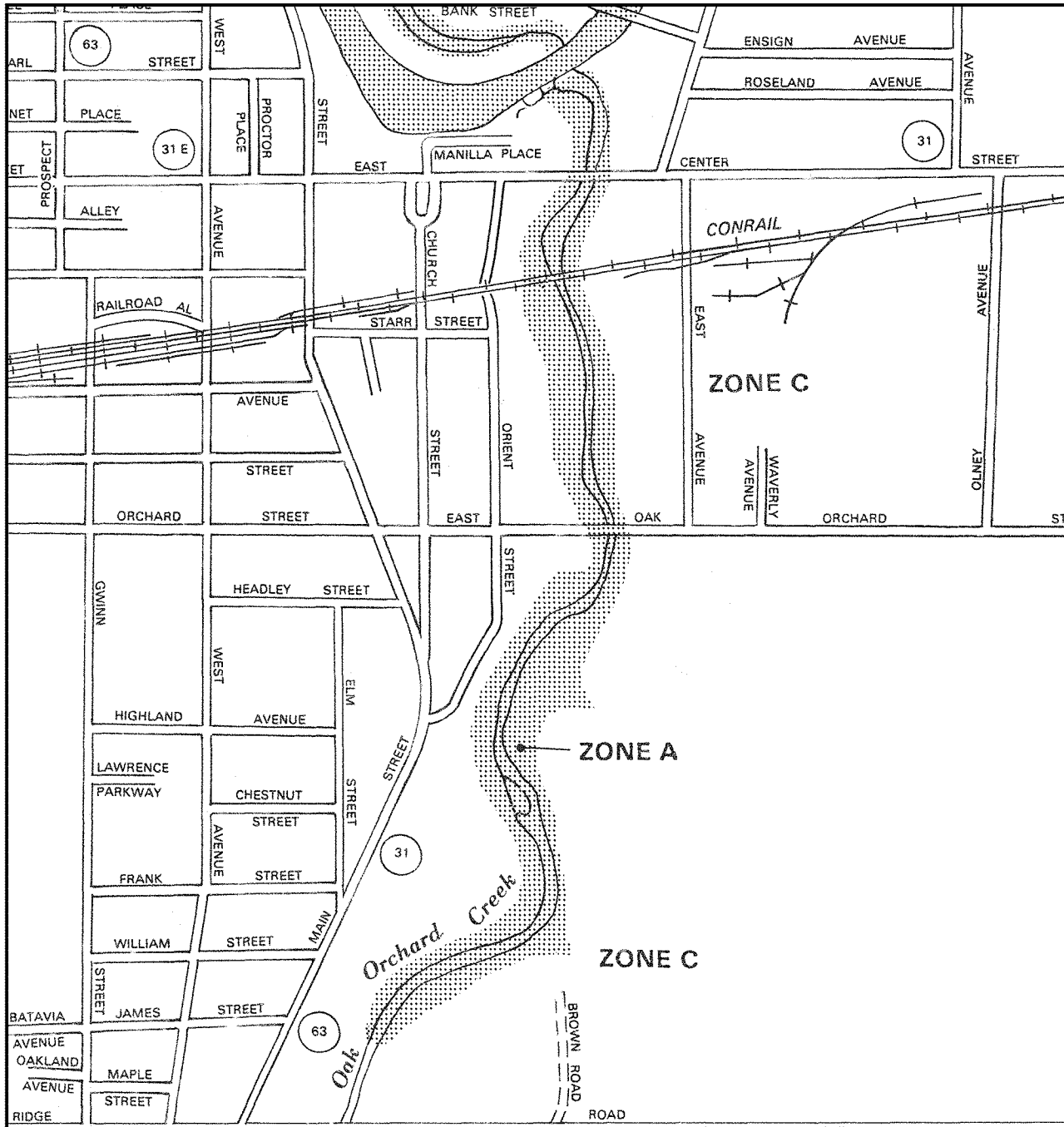
federal emergency management agency



**FIRM**  
**FLOOD INSURANCE RATE MAP 01-11**  
**MAP INDEX**

**TOWN OF SHELBY, NY**  
**ORLEANS COUNTY**

COMMUNITY NUMBER 361268 B



NATIONAL FLOOD INSURANCE PROGRAM

**FIRM  
FLOOD INSURANCE  
RATE MAP**

VILLAGE OF  
**MEDINA,**  
NEW YORK  
ORLEANS COUNTY

ONLY PANEL PRINTED

COMMUNITY-PANEL NUMBER:  
360644 0001 B

EFFECTIVE DATE:  
MARCH 28, 1980



U.S. DEPARTMENT OF HOUSING  
AND URBAN DEVELOPMENT  
FEDERAL INSURANCE ADMINISTRATION

CORPORATE LIMITS

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)

# Appendix B:

## Stream Stats Reports





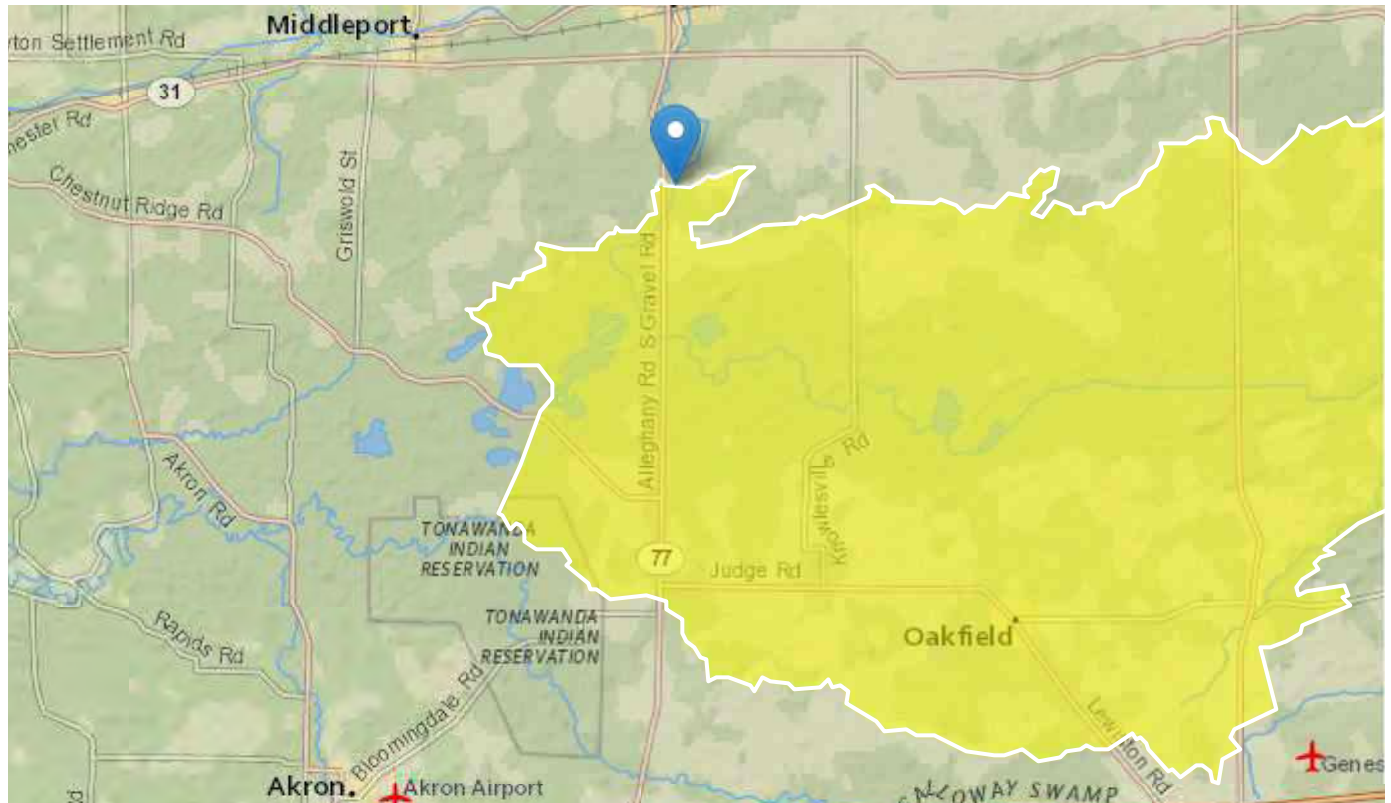
# StreamStats Report - Upstream Gage At Harrison Road

Region ID: NY

Workspace ID: NY20200410130707221000

Clicked Point (Latitude, Longitude): 43.17442, -78.38661

Time: 2020-04-10 09:07:24 -0400



## Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	146	square miles
SLOPERATIO	Ratio of main channel slope to basin slope as defined in SIR 2006-5112	0.0871	dimensionless
EL1200	Percentage of basin at or above 1200 ft elevation	0	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	3.21	percent

<b>Parameter Code</b>	<b>Parameter Description</b>	<b>Value</b>	<b>Unit</b>
MAR	Mean annual runoff for the period of record in inches	14.2	inches
BSLOPCM	Mean basin slope determined by summing lengths of all contours in basin multiplying by contour interval and dividing product by drainage area	57.2	feet per mi
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	234729.5	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	4778923.9	meters
CONTOUR	Total length of all elevation contours in drainage area in miles	83.87	miles
CSL1085LO	10-85 slope of lower half of main channel in feet per mile.	1.45	feet per mi
CSL1085UP	10-85 slope of upper half of main channel in feet per mile.	12	feet per mi
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	4.98	feet per mi
FOREST	Percentage of area covered by forest	24.4	percent
JULAVPRE	Mean July Precipitation	3.1	inches
JUNAVPRE	Mean June Precipitation	3.77	inches
JUNMAXTMP	Maximum June Temperature, in degrees F	77.4	degrees F
LAGFACTOR	Lag Factor as defined in SIR 2006-5112	6.07	dimensionless
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	5.06	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	1.04	percent
LENGTH	Length along the main channel from the measuring location extended to the basin divide	34.3	miles
MAYAVPRE	Mean May Precipitation	3.14	inches
MXSNO	50th percentile of seasonal maximum snow depth from Northeast Regional Climate Center atlas by Cember and Wilks, 1993	15.3	inches

Parameter Code	Parameter Description	Value	Unit
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	224735	feet
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	4785755	feet
PRECIP	Mean Annual Precipitation	34.2	inches
PRJUNAUG00	Basin average mean precip for June to August from PRISM 1971-2000	10.3	inches
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	1.37	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	36.5	percent

Peak-Flow Statistics Parameters<sup>[2006 Full Region 6]</sup>

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	146	square miles	0.58	2467
SLOPERATIO	Slope Ratio NY	0.0871	dimensionless	0.019	0.698
EL1200	Percentage of Basin Above 1200 ft	0	percent	0	100
STORAGE	Percent Storage	3.21	percent	0	5.98
MAR	Mean Annual Runoff in inches	14.2	inches	9.49	22.77

Peak-Flow Statistics Flow Report<sup>[2006 Full Region 6]</sup>

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp	Equiv. Yrs.
1.25 Year Peak Flood	1110	ft <sup>3</sup> /s	34.7	34.7	2.3
1.5 Year Peak Flood	1300	ft <sup>3</sup> /s	33.3	33.3	2
2 Year Peak Flood	1530	ft <sup>3</sup> /s	32.3	32.3	1.9
5 Year Peak Flood	2130	ft <sup>3</sup> /s	32.2	32.2	2.4
10 Year Peak Flood	2540	ft <sup>3</sup> /s	32.9	32.9	3.1
25 Year Peak Flood	3080	ft <sup>3</sup> /s	34.4	34.4	3.9

Statistic	Value	Unit	SE	SEp	Equiv. Yrs.
50 Year Peak Flood	3480	ft <sup>3</sup> /s	35.8	35.8	4.5
100 Year Peak Flood	3870	ft <sup>3</sup> /s	37.2	37.2	4.9
200 Year Peak Flood	4310	ft <sup>3</sup> /s	39	39	5.2
500 Year Peak Flood	4850	ft <sup>3</sup> /s	41.4	41.4	5.5

*Peak-Flow Statistics Citations*

**Lumia, Richard, Freehafer, D.A., and Smith, M.J.,2006, Magnitude and Frequency of Floods in New York: U.S. Geological Survey Scientific Investigations Report 2006–5112, 152 p. (<http://pubs.usgs.gov/sir/2006/5112/>)**

Bankfull Statistics Parameters[100 Percent (146 square miles) Bankfull Region 7 SIR2009 5144]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	146	square miles	1.07	349

Bankfull Statistics Flow Report[100 Percent (146 square miles) Bankfull Region 7 SIR2009 5144]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu
Bankfull Area	418	ft <sup>2</sup>	154	1140
Bankfull Depth	3.96	ft	1.34	11.7
Bankfull Streamflow	1680	ft <sup>3</sup> /s	239	11800
Bankfull Width	106	ft	37.6	298

*Bankfull Statistics Citations*

**Mulvihill, C.I., Baldigo, B.P., Miller, S.J. , and DeKoskie, Douglas,2009, Bankfull Discharge and Channel Characteristics of Streams in New York State: U.S. Geological Survey Scientific Investigations Report 2009-5144, 51 p. (<http://pubs.usgs.gov/sir/2009/5144/>)**

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Application Version: 4.3.11

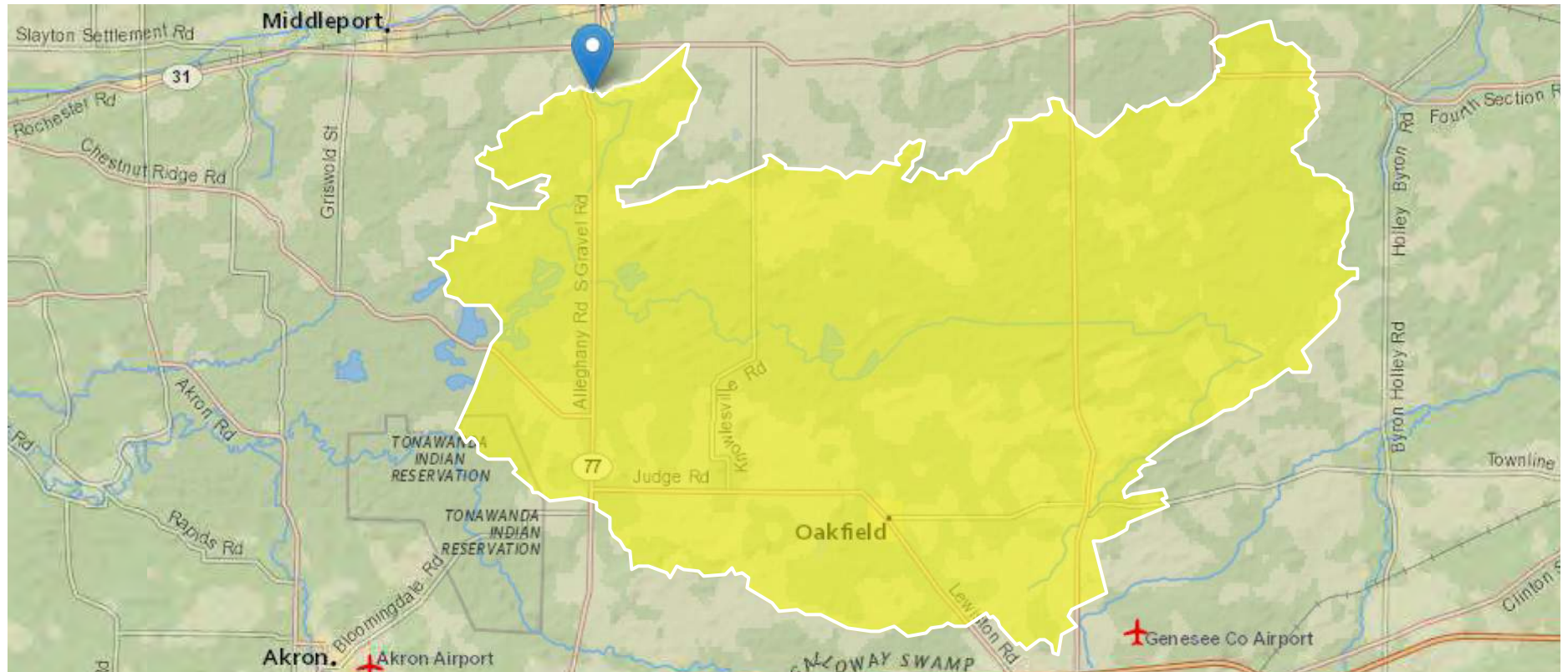
# StreamStats Report - Oak Orchard, d/s of Mill Race/Ag Discharge

Region ID: NY

Workspace ID: NY20200312122246831000

Clicked Point (Latitude, Longitude): 43.19379, -78.39136

Time: 2020-03-12 08:23:07 -0400



Basin Characteristics



<b>Parameter Code</b>	<b>Parameter Description</b>	<b>Value</b>	<b>Unit</b>
DRNAREA	Area that drains to a point on a stream	153	square miles
SLOPERATIO	Ratio of main channel slope to basin slope as defined in SIR 2006-5112	0.0763	dimensionless
EL1200	Percentage of basin at or above 1200 ft elevation	0	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	3.13	percent
MAR	Mean annual runoff for the period of record in inches	14.3	inches
BSLOPCM	Mean basin slope determined by summing lengths of all contours in basin multiplying by contour interval and dividing product by drainage area	61.4	feet per mi
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	234303.3	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	4779244.2	meters
CONTOUR	Total length of all elevation contours in drainage area in miles	93.83	miles
CSL1085LO	10-85 slope of lower half of main channel in feet per mile.	1.73	feet per mi
CSL1085UP	10-85 slope of upper half of main channel in feet per mile.	11	feet per mi
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	4.68	feet per mi
FOREST	Percentage of area covered by forest	24.4	percent
JULAVPRE	Mean July Precipitation	3.1	inches
JUNAVPRE	Mean June Precipitation	3.76	inches
JUNMAXTMP	Maximum June Temperature, in degrees F	77.4	degrees F
LAGFACTOR	Lag Factor as defined in SIR 2006-5112	6.44	dimensionless
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	5.06	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	1.03	percent

Parameter Code	Parameter Description	Value	Unit
LENGTH	Length along the main channel from the measuring location extended to the basin divide	36.8	miles
MAYAVPRE	Mean May Precipitation	3.13	inches
MXSNO	50th percentile of seasonal maximum snow depth from Northeast Regional Climate Center atlas by Cember and Wilks, 1993	15.3	inches
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	224435	feet
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	4787925	feet
PRECIP	Mean Annual Precipitation	34.2	inches
PRJUNAUG00	Basin average mean precip for June to August from PRISM 1971-2000	10.3	inches
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	1.44	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	37.3	percent

Peak-Flow Statistics Parameters<sup>[2006 Full Region 6]</sup>

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	153	square miles	0.58	2467
SLOPERATIO	Slope Ratio NY	0.0763	dimensionless	0.019	0.698
EL1200	Percentage of Basin Above 1200 ft	0	percent	0	100
STORAGE	Percent Storage	3.13	percent	0	5.98
MAR	Mean Annual Runoff in inches	14.3	inches	9.49	22.77

Peak-Flow Statistics Flow Report<sup>[2006 Full Region 6]</sup>

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

<b>Statistic</b>	<b>Value</b>	<b>Unit</b>	<b>SE</b>	<b>SEp</b>	<b>Equiv. Yrs.</b>
1.25 Year Peak Flood	1140	ft <sup>3</sup> /s	34.7	34.7	2.3
1.5 Year Peak Flood	1330	ft <sup>3</sup> /s	33.3	33.3	2
2 Year Peak Flood	1560	ft <sup>3</sup> /s	32.3	32.3	1.9
5 Year Peak Flood	2160	ft <sup>3</sup> /s	32.2	32.2	2.4
10 Year Peak Flood	2570	ft <sup>3</sup> /s	32.9	32.9	3.1
25 Year Peak Flood	3110	ft <sup>3</sup> /s	34.4	34.4	3.9
50 Year Peak Flood	3500	ft <sup>3</sup> /s	35.8	35.8	4.5
100 Year Peak Flood	3890	ft <sup>3</sup> /s	37.2	37.2	4.9
200 Year Peak Flood	4320	ft <sup>3</sup> /s	39	39	5.2
500 Year Peak Flood	4850	ft <sup>3</sup> /s	41.4	41.4	5.5

*Peak-Flow Statistics Citations*

**Lumia, Richard, Freehafer, D.A., and Smith, M.J.,2006, Magnitude and Frequency of Floods in New York: U.S. Geological Survey Scientific Investigations Report 2006–5112, 152 p. (<http://pubs.usgs.gov/sir/2006/5112/>)**

Bankfull Statistics Parameters<sup>[100 Percent (153 square miles) Bankfull Region 7 SIR2009 5144]</sup>

<b>Parameter Code</b>	<b>Parameter Name</b>	<b>Value</b>	<b>Units</b>	<b>Min Limit</b>	<b>Max Limit</b>
DRNAREA	Drainage Area	153	square miles	1.07	349

Bankfull Statistics Flow Report<sup>[100 Percent (153 square miles) Bankfull Region 7 SIR2009 5144]</sup>

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

<b>Statistic</b>	<b>Value</b>	<b>Unit</b>	<b>PII</b>	<b>Plu</b>
Bankfull Area	431	ft <sup>2</sup>	157	1190

<b>Statistic</b>	<b>Value</b>	<b>Unit</b>	<b>PII</b>	<b>Plu</b>
Bankfull Depth	4	ft	1.34	11.9
Bankfull Streamflow	1740	ft <sup>3</sup> /s	242	12500
Bankfull Width	108	ft	38	307

*Bankfull Statistics Citations*

**Mulvihill, C.I., Baldigo, B.P., Miller, S.J. , and DeKoskie, Douglas,2009, Bankfull Discharge and Channel Characteristics of Streams in New York State: U.S. Geological Survey Scientific Investigations Report 2009-5144, 51 p. (<http://pubs.usgs.gov/sir/2009/5144/>)**

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Application Version: 4.3.11

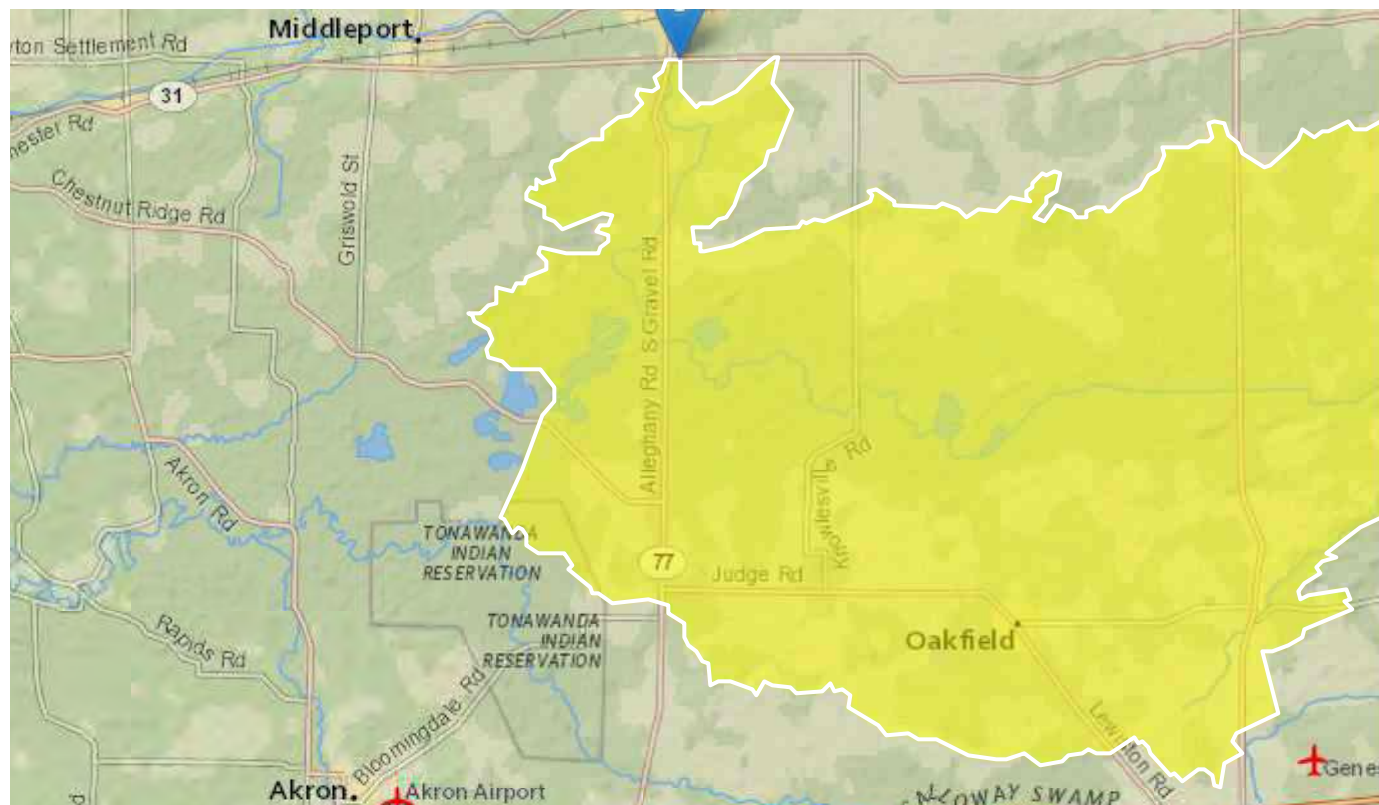
# StreamStats Report - Downstream USGS Gage at Medina

Region ID: NY

Workspace ID: NY20200410131458794000

Clicked Point (Latitude, Longitude): 43.20719, -78.38584

Time: 2020-04-10 09:15:16 -0400



### Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	153	square miles
SLOPERATIO	Ratio of main channel slope to basin slope as defined in SIR 2006-5112	0.0753	dimensionless
EL1200	Percentage of basin at or above 1200 ft elevation	0	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	3.11	percent

<b>Parameter Code</b>	<b>Parameter Description</b>	<b>Value</b>	<b>Unit</b>
MAR	Mean annual runoff for the period of record in inches	14.3	inches
BSLOPCM	Mean basin slope determined by summing lengths of all contours in basin multiplying by contour interval and dividing product by drainage area	61.9	feet per mi
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	234271.1	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	4779274.8	meters
CONTOUR	Total length of all elevation contours in drainage area in miles	94.82	miles
CSL1085LO	10-85 slope of lower half of main channel in feet per mile.	1.82	feet per mi
CSL1085UP	10-85 slope of upper half of main channel in feet per mile.	10.3	feet per mi
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	4.66	feet per mi
FOREST	Percentage of area covered by forest	24.3	percent
JULAVPRE	Mean July Precipitation	3.1	inches
JUNAVPRE	Mean June Precipitation	3.76	inches
JUNMAXTMP	Maximum June Temperature, in degrees F	77.4	degrees F
LAGFACTOR	Lag Factor as defined in SIR 2006-5112	6.73	dimensionless
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	5.08	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	1.03	percent
LENGTH	Length along the main channel from the measuring location extended to the basin divide	38	miles
MAYAVPRE	Mean May Precipitation	3.13	inches
MXSNO	50th percentile of seasonal maximum snow depth from Northeast Regional Climate Center atlas by Cember and Wilks, 1993	15.3	inches



Parameter Code	Parameter Description	Value	Unit
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	224945	feet
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	4789395	feet
PRECIP	Mean Annual Precipitation	34.2	inches
PRJUNAUG00	Basin average mean precip for June to August from PRISM 1971-2000	10.3	inches
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	1.44	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	37.4	percent

Peak-Flow Statistics Parameters<sup>[2006 Full Region 6]</sup>

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	153	square miles	0.58	2467
SLOPERATIO	Slope Ratio NY	0.0753	dimensionless	0.019	0.698
EL1200	Percentage of Basin Above 1200 ft	0	percent	0	100
STORAGE	Percent Storage	3.11	percent	0	5.98
MAR	Mean Annual Runoff in inches	14.3	inches	9.49	22.77

Peak-Flow Statistics Flow Report<sup>[2006 Full Region 6]</sup>

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp	Equiv. Yrs.
1.25 Year Peak Flood	1140	ft <sup>3</sup> /s	34.7	34.7	2.3
1.5 Year Peak Flood	1330	ft <sup>3</sup> /s	33.3	33.3	2
2 Year Peak Flood	1560	ft <sup>3</sup> /s	32.3	32.3	1.9
5 Year Peak Flood	2150	ft <sup>3</sup> /s	32.2	32.2	2.4
10 Year Peak Flood	2570	ft <sup>3</sup> /s	32.9	32.9	3.1
25 Year Peak Flood	3100	ft <sup>3</sup> /s	34.4	34.4	3.9

Statistic	Value	Unit	SE	SEp	Equiv. Yrs.
50 Year Peak Flood	3490	ft <sup>3</sup> /s	35.8	35.8	4.5
100 Year Peak Flood	3880	ft <sup>3</sup> /s	37.2	37.2	4.9
200 Year Peak Flood	4300	ft <sup>3</sup> /s	39	39	5.2
500 Year Peak Flood	4830	ft <sup>3</sup> /s	41.4	41.4	5.5

*Peak-Flow Statistics Citations*

**Lumia, Richard, Freehafer, D.A., and Smith, M.J.,2006, Magnitude and Frequency of Floods in New York: U.S. Geological Survey Scientific Investigations Report 2006-5112, 152 p. (<http://pubs.usgs.gov/sir/2006/5112/>)**

Bankfull Statistics Parameters[100 Percent (153 square miles) Bankfull Region 7 SIR2009 5144]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	153	square miles	1.07	349

Bankfull Statistics Flow Report[100 Percent (153 square miles) Bankfull Region 7 SIR2009 5144]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu
Bankfull Area	431	ft <sup>2</sup>	157	1190
Bankfull Depth	4	ft	1.34	11.9
Bankfull Streamflow	1740	ft <sup>3</sup> /s	242	12500
Bankfull Width	108	ft	38	307

*Bankfull Statistics Citations*

**Mulvihill, C.I., Baldigo, B.P., Miller, S.J. , and DeKoskie, Douglas,2009, Bankfull Discharge and Channel Characteristics of Streams in New York State: U.S. Geological Survey Scientific Investigations Report 2009-5144, 51 p. (<http://pubs.usgs.gov/sir/2009/5144/>)**

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Application Version: 4.3.11

# Appendix C:

Photos







Photo 1: Looking upstream from Main Street bridge.



Photo 2: Looking downstream from right bank at Main Street bridge and upstream attached pipe bridge.





Photo 3: Looking upstream from left bank at Main Street bridge.



Photo 4: Looking downstream from Main Street bridge.





Photo 5: Looking downstream at meander and steep drop just downstream of Main Street bridge.



Photo 6: Looking upstream from Maple Ridge Road bridge.





Photo 7: Looking downstream from right bank at Maple Ridge Road bridge.



Photo 8: Looking upstream at Maple Ridge Road bridge.





Photo 9: Looking downstream from Maple Ridge Road bridge.

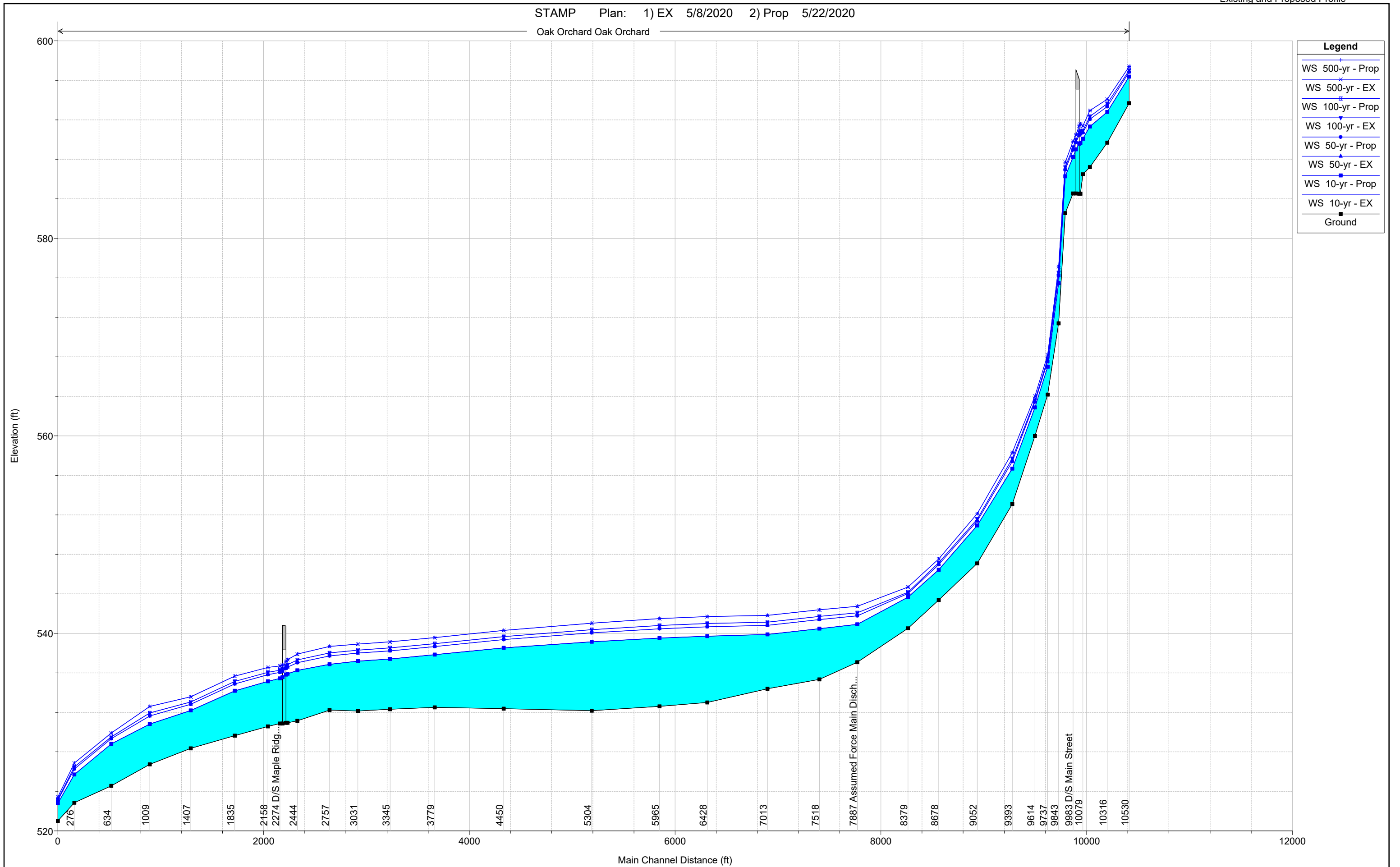
# Appendix D:

## Hydraulic Model Documentation



STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

Oak Orchard Oak Orchard



STAMP Oak Orchard Discharge Analysis  
Standard Table 1 - 10-YR

HEC-RAS River: Oak Orchard Reach: Oak Orchard Profile: 10-yr

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Oak Orchard	10530	10-yr	EX	1640.00	593.69	596.37	596.37	597.45	0.012167	8.58	226.95	116.41	0.96
Oak Orchard	10530	10-yr	Prop	1640.00	593.69	596.37	596.37	597.45	0.012167	8.58	226.95	116.41	0.96
Oak Orchard	10316	10-yr	EX	1640.00	589.69	592.79	592.79	594.05	0.011619	9.11	199.91	96.44	0.95
Oak Orchard	10316	10-yr	Prop	1640.00	589.69	592.79	592.79	594.05	0.011619	9.11	199.91	96.44	0.95
Oak Orchard	10148	10-yr	EX	1640.00	587.21	591.32	590.65	592.09	0.005214	7.49	294.38	100.71	0.67
Oak Orchard	10148	10-yr	Prop	1640.00	587.21	591.32	590.65	592.09	0.005214	7.49	294.38	100.71	0.67
Oak Orchard	10079	10-yr	EX	1640.00	586.48	590.09	590.09	591.47	0.013078	9.42	174.70	65.76	1.00
Oak Orchard	10079	10-yr	Prop	1640.00	586.48	590.09	590.09	591.47	0.013078	9.42	174.70	65.76	1.00
Oak Orchard	10055	10-yr	EX	1640.00	584.52	589.67	588.10	590.41	0.003634	6.90	239.34	53.09	0.56
Oak Orchard	10055	10-yr	Prop	1640.00	584.52	589.67	588.10	590.41	0.003634	6.90	239.34	53.09	0.56
Oak Orchard	10023			Bridge									
Oak Orchard	9983	10-yr	EX	1640.00	584.55	588.22	588.22	589.90	0.013286	10.37	158.10	47.59	1.00
Oak Orchard	9983	10-yr	Prop	1640.00	584.55	588.22	588.22	589.90	0.013286	10.37	158.10	47.59	1.00
Oak Orchard	9908	10-yr	EX	1640.00	582.56	586.28	586.28	587.80	0.011932	9.96	173.41	61.98	0.98
Oak Orchard	9908	10-yr	Prop	1640.00	582.56	586.28	586.28	587.80	0.011932	9.96	173.41	61.98	0.98
Oak Orchard	9843	10-yr	EX	1640.00	571.40	575.49	575.49	577.22	0.012500	10.55	155.99	47.17	1.00
Oak Orchard	9843	10-yr	Prop	1640.00	571.40	575.49	575.49	577.22	0.012500	10.55	155.99	47.17	1.00
Oak Orchard	9737	10-yr	EX	1640.00	564.18	567.00	567.00	568.27	0.013692	9.03	181.60	72.45	1.01
Oak Orchard	9737	10-yr	Prop	1640.00	564.18	567.00	567.00	568.27	0.013693	9.03	181.59	72.45	1.01
Oak Orchard	9614	10-yr	EX	1640.00	560.00	562.88	562.88	564.12	0.014080	8.92	183.87	75.54	1.01
Oak Orchard	9614	10-yr	Prop	1640.00	560.00	562.88	562.88	564.12	0.014072	8.92	183.90	75.54	1.01
Oak Orchard	9393	10-yr	EX	1640.00	553.09	556.69	556.69	558.32	0.013837	10.25	160.04	49.61	1.01
Oak Orchard	9393	10-yr	Prop	1640.00	553.09	556.69	556.69	558.32	0.013838	10.25	160.04	49.61	1.01
Oak Orchard	9052	10-yr	EX	1640.00	547.08	550.92	550.68	552.17	0.010439	8.96	182.95	58.37	0.89
Oak Orchard	9052	10-yr	Prop	1640.00	547.08	550.92	550.68	552.17	0.010444	8.97	182.93	58.37	0.89
Oak Orchard	8678	10-yr	EX	1640.00	543.37	546.44	546.44	547.56	0.014480	8.47	193.66	88.64	1.01
Oak Orchard	8678	10-yr	Prop	1640.00	543.37	546.44	546.44	547.56	0.014469	8.47	193.71	88.64	1.01
Oak Orchard	8379	10-yr	EX	1640.00	540.51	543.67	543.15	544.43	0.007289	6.99	240.42	110.50	0.74
Oak Orchard	8379	10-yr	Prop	1640.00	540.51	543.67	543.15	544.43	0.007270	6.99	240.66	110.62	0.74
Oak Orchard	7887	10-yr	EX	1640.00	537.08	540.90	539.90	541.56	0.004677	6.53	281.61	203.76	0.61
Oak Orchard	7887	10-yr	Prop	1649.30	537.08	540.92	539.91	541.57	0.004647	6.53	285.14	205.89	0.61
Oak Orchard	7518	10-yr	EX	1640.00	535.34	540.47		540.69	0.001105	3.80	483.69	192.29	0.31
Oak Orchard	7518	10-yr	Prop	1649.30	535.34	540.48		540.71	0.001107	3.81	486.84	193.37	0.31
Oak Orchard	7013	10-yr	EX	1640.00	534.39	539.89		540.14	0.001080	4.04	456.23	126.99	0.31
Oak Orchard	7013	10-yr	Prop	1649.30	534.39	539.90		540.15	0.001080	4.05	458.33	127.09	0.31
Oak Orchard	6428	10-yr	EX	1640.00	533.00	539.71		539.80	0.000289	2.45	899.02	369.86	0.17
Oak Orchard	6428	10-yr	Prop	1649.30	533.00	539.72		539.81	0.000289	2.45	905.30	370.20	0.17
Oak Orchard	5965	10-yr	EX	1640.00	532.61	539.52		539.63	0.000422	2.91	832.84	271.52	0.21
Oak Orchard	5965	10-yr	Prop	1649.30	532.61	539.53		539.65	0.000422	2.91	837.43	271.63	0.21
Oak Orchard	5304	10-yr	EX	1640.00	532.17	539.14		539.31	0.000575	3.50	656.86	147.38	0.24
Oak Orchard	5304	10-yr	Prop	1649.30	532.17	539.16		539.33	0.000576	3.50	659.23	147.45	0.24
Oak Orchard	4450	10-yr	EX	1640.00	532.38	538.53		538.73	0.000810	3.83	595.57	153.42	0.28
Oak Orchard	4450	10-yr	Prop	1649.30	532.38	538.54		538.74	0.000811	3.84	597.87	153.59	0.28
Oak Orchard	3779	10-yr	EX	1640.00	532.50	537.84		538.07	0.001214	4.21	557.10	169.68	0.33
Oak Orchard	3779	10-yr	Prop	1649.30	532.50	537.85		538.09	0.001214	4.21	559.58	169.80	0.33
Oak Orchard	3345	10-yr	EX	1640.00	532.32	537.40		537.59	0.000975	3.65	575.92	166.49	0.30
Oak Orchard	3345	10-yr	Prop	1649.30	532.32	537.42		537.60	0.000975	3.65	578.36	166.57	0.30
Oak Orchard	3031	10-yr	EX	1640.00	532.14	537.18		537.33	0.000665	3.10	569.94	140.55	0.25
Oak Orchard	3031	10-yr	Prop	1649.30	532.14	537.20		537.34	0.000666	3.10	571.98	140.60	0.25
Oak Orchard	2757	10-yr	EX	1640.00	532.23	536.86		537.08	0.001245	4.03	587.57	234.09	0.33
Oak Orchard	2757	10-yr	Prop	1649.30	532.23	536.87		537.09	0.001242	4.03	591.08	234.42	0.33
Oak Orchard	2444	10-yr	EX	1640.00	531.15	536.25		536.60	0.001809	4.75	356.00	91.60	0.40

STAMP Oak Orchard Discharge Analysis  
Standard Table 1 - 10-YR

HEC-RAS River: Oak Orchard Reach: Oak Orchard Profile: 10-yr (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Oak Orchard	2444	10-yr	Prop	1649.30	531.15	536.27		536.62	0.001811	4.76	357.26	91.67	0.40
Oak Orchard	2349	10-yr	EX	1640.00	530.94	535.90	534.12	536.39	0.002464	5.68	308.64	77.57	0.47
Oak Orchard	2349	10-yr	Prop	1649.30	530.94	535.91	534.13	536.40	0.002469	5.70	309.56	77.60	0.47
Oak Orchard	2316			Bridge									
Oak Orchard	2274	10-yr	EX	1640.00	530.87	535.43		536.12	0.004529	6.65	255.07	125.68	0.61
Oak Orchard	2274	10-yr	Prop	1649.30	530.87	535.45		536.13	0.004532	6.66	255.94	125.89	0.62
Oak Orchard	2158	10-yr	EX	1640.00	530.58	535.14	533.85	535.68	0.003080	6.13	346.01	150.02	0.51
Oak Orchard	2158	10-yr	Prop	1649.30	530.58	535.15	533.87	535.69	0.003082	6.14	347.52	150.49	0.52
Oak Orchard	1835	10-yr	EX	1640.00	529.64	534.18		534.69	0.002965	5.95	363.15	158.43	0.51
Oak Orchard	1835	10-yr	Prop	1649.30	529.64	534.19		534.70	0.002963	5.96	365.15	158.61	0.51
Oak Orchard	1407	10-yr	EX	1640.00	528.35	532.18		532.96	0.005573	7.17	255.20	105.14	0.68
Oak Orchard	1407	10-yr	Prop	1649.30	528.35	532.19		532.98	0.005573	7.19	256.35	105.21	0.68
Oak Orchard	1009	10-yr	EX	1640.00	526.74	530.81		531.27	0.003027	5.48	320.23	117.37	0.50
Oak Orchard	1009	10-yr	Prop	1649.30	526.74	530.82		531.28	0.003020	5.49	321.92	117.44	0.50
Oak Orchard	634	10-yr	EX	1640.00	524.56	528.81		529.73	0.005486	7.80	230.13	71.08	0.69
Oak Orchard	634	10-yr	Prop	1649.30	524.56	528.81		529.74	0.005504	7.82	230.79	71.12	0.69
Oak Orchard	276	10-yr	EX	1640.00	522.85	525.70	525.70	526.90	0.012151	8.81	196.44	107.80	0.95
Oak Orchard	276	10-yr	Prop	1649.30	522.85	525.71	525.71	526.91	0.012112	8.81	197.66	108.08	0.95
Oak Orchard	116	10-yr	EX	1640.00	521.01	522.80	522.80	523.48	0.016517	6.66	246.39	182.49	1.01
Oak Orchard	116	10-yr	Prop	1649.30	521.01	522.80	522.80	523.49	0.016488	6.67	247.37	182.50	1.01

STAMP Oak Orchard Discharge Analysis  
Standard Table 1 - 50YR

HEC-RAS River: Oak Orchard Reach: Oak Orchard Profile: 50-yr

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Oak Orchard	10530	50-yr	EX	2200.00	593.69	596.85	596.85	598.13	0.011667	9.45	283.74	120.21	0.97
Oak Orchard	10530	50-yr	Prop	2200.00	593.69	596.85	596.85	598.13	0.011667	9.45	283.74	120.21	0.97
Oak Orchard	10316	50-yr	EX	2200.00	589.69	593.34	593.34	594.84	0.011134	10.04	259.95	121.65	0.96
Oak Orchard	10316	50-yr	Prop	2200.00	589.69	593.34	593.34	594.84	0.011134	10.04	259.95	121.65	0.96
Oak Orchard	10148	50-yr	EX	2200.00	587.21	592.07		592.95	0.004912	8.17	369.84	102.70	0.67
Oak Orchard	10148	50-yr	Prop	2200.00	587.21	592.07		592.95	0.004912	8.17	369.84	102.70	0.67
Oak Orchard	10079	50-yr	EX	2200.00	586.48	590.70	590.70	592.35	0.012026	10.33	215.40	67.91	0.99
Oak Orchard	10079	50-yr	Prop	2200.00	586.48	590.70	590.70	592.35	0.012026	10.33	215.40	67.91	0.99
Oak Orchard	10055	50-yr	EX	2200.00	584.52	590.57	588.84	591.50	0.003648	7.77	288.24	55.14	0.58
Oak Orchard	10055	50-yr	Prop	2200.00	584.52	590.57	588.84	591.50	0.003648	7.77	288.24	55.14	0.58
Oak Orchard	10023			Bridge									
Oak Orchard	9983	50-yr	EX	2200.00	584.55	588.95	588.95	590.97	0.012416	11.41	193.60	50.53	1.00
Oak Orchard	9983	50-yr	Prop	2200.00	584.55	588.95	588.95	590.97	0.012416	11.41	193.60	50.53	1.00
Oak Orchard	9908	50-yr	EX	2200.00	582.56	586.94	586.94	588.77	0.011249	10.97	214.95	63.40	0.99
Oak Orchard	9908	50-yr	Prop	2200.00	582.56	586.94	586.94	588.77	0.011249	10.97	214.95	63.40	0.99
Oak Orchard	9843	50-yr	EX	2200.00	571.40	576.25	576.25	578.33	0.011527	11.57	192.76	49.67	1.00
Oak Orchard	9843	50-yr	Prop	2200.00	571.40	576.25	576.25	578.33	0.011527	11.57	192.76	49.67	1.00
Oak Orchard	9737	50-yr	EX	2200.00	564.18	567.56	567.56	569.08	0.012985	9.88	222.77	74.45	1.01
Oak Orchard	9737	50-yr	Prop	2200.00	564.18	567.56	567.56	569.08	0.012985	9.88	222.77	74.45	1.01
Oak Orchard	9614	50-yr	EX	2200.00	560.00	563.43	563.43	564.91	0.013135	9.76	225.33	76.08	1.00
Oak Orchard	9614	50-yr	Prop	2200.00	560.00	563.43	563.43	564.91	0.013135	9.76	225.33	76.08	1.00
Oak Orchard	9393	50-yr	EX	2200.00	553.09	557.42	557.42	559.36	0.013287	11.18	196.85	51.30	1.01
Oak Orchard	9393	50-yr	Prop	2200.00	553.09	557.42	557.42	559.36	0.013287	11.18	196.85	51.30	1.01
Oak Orchard	9052	50-yr	EX	2200.00	547.08	551.38	551.33	553.09	0.012236	10.50	209.44	58.85	0.98
Oak Orchard	9052	50-yr	Prop	2200.00	547.08	551.38	551.33	553.09	0.012241	10.51	209.42	58.85	0.98
Oak Orchard	8678	50-yr	EX	2200.00	543.37	546.97	546.94	548.27	0.012858	9.14	242.11	100.17	0.98
Oak Orchard	8678	50-yr	Prop	2200.00	543.37	546.97	546.94	548.27	0.012883	9.14	241.95	100.12	0.98
Oak Orchard	8379	50-yr	EX	2200.00	540.51	544.04	543.69	545.08	0.008610	8.21	295.81	225.47	0.82
Oak Orchard	8379	50-yr	Prop	2200.00	540.51	544.04	543.69	545.08	0.008590	8.20	296.29	226.34	0.82
Oak Orchard	7887	50-yr	EX	2200.00	537.08	541.77		542.37	0.003501	6.52	470.97	230.32	0.55
Oak Orchard	7887	50-yr	Prop	2209.30	537.08	541.78		542.39	0.003485	6.51	474.12	230.84	0.55
Oak Orchard	7518	50-yr	EX	2200.00	535.34	541.39		541.64	0.001009	4.10	666.93	203.00	0.31
Oak Orchard	7518	50-yr	Prop	2209.30	535.34	541.40		541.65	0.001008	4.10	669.81	203.11	0.31
Oak Orchard	7013	50-yr	EX	2200.00	534.39	540.80		541.11	0.001090	4.52	580.07	191.84	0.32
Oak Orchard	7013	50-yr	Prop	2209.30	534.39	540.82		541.12	0.001091	4.52	582.84	199.24	0.32
Oak Orchard	6428	50-yr	EX	2200.00	533.00	540.65		540.75	0.000287	2.67	1263.54	398.68	0.17
Oak Orchard	6428	50-yr	Prop	2209.30	533.00	540.67		540.77	0.000287	2.68	1269.37	399.93	0.17
Oak Orchard	5965	50-yr	EX	2200.00	532.61	540.46		540.59	0.000416	3.17	1092.45	279.99	0.21
Oak Orchard	5965	50-yr	Prop	2209.30	532.61	540.47		540.60	0.000416	3.18	1096.52	280.14	0.21
Oak Orchard	5304	50-yr	EX	2200.00	532.17	540.04		540.25	0.000636	4.00	791.10	151.39	0.26
Oak Orchard	5304	50-yr	Prop	2209.30	532.17	540.06		540.27	0.000637	4.01	793.20	151.45	0.26
Oak Orchard	4450	50-yr	EX	2200.00	532.38	539.37		539.62	0.000879	4.35	727.20	159.92	0.29
Oak Orchard	4450	50-yr	Prop	2209.30	532.38	539.38		539.63	0.000880	4.36	729.28	159.99	0.29
Oak Orchard	3779	50-yr	EX	2200.00	532.50	538.65		538.93	0.001213	4.65	697.91	175.21	0.34
Oak Orchard	3779	50-yr	Prop	2209.30	532.50	538.67		538.95	0.001213	4.66	700.16	175.29	0.34
Oak Orchard	3345	50-yr	EX	2200.00	532.32	538.22		538.45	0.000968	4.05	714.40	170.54	0.30
Oak Orchard	3345	50-yr	Prop	2209.30	532.32	538.24		538.46	0.000968	4.05	716.61	170.60	0.30
Oak Orchard	3031	50-yr	EX	2200.00	532.14	537.99		538.18	0.000699	3.52	685.48	143.45	0.26
Oak Orchard	3031	50-yr	Prop	2209.30	532.14	538.01		538.20	0.000700	3.53	687.32	143.50	0.26
Oak Orchard	2757	50-yr	EX	2200.00	532.23	537.70		537.94	0.001120	4.28	797.98	273.01	0.33
Oak Orchard	2757	50-yr	Prop	2209.30	532.23	537.72		537.95	0.001118	4.29	801.63	274.42	0.33
Oak Orchard	2444	50-yr	EX	2200.00	531.15	537.03		537.47	0.001887	5.40	428.32	95.50	0.42



STAMP Oak Orchard Discharge Analysis  
Standard Table 1 - 50YR

HEC-RAS River: Oak Orchard Reach: Oak Orchard Profile: 50-yr (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Oak Orchard	2444	50-yr	Prop	2209.30	531.15	537.04		537.49	0.001888	5.41	429.48	95.56	0.42
Oak Orchard	2349	50-yr	EX	2200.00	530.94	536.58	534.74	537.24	0.002754	6.59	360.75	79.47	0.51
Oak Orchard	2349	50-yr	Prop	2209.30	530.94	536.59	534.75	537.25	0.002758	6.60	361.57	79.50	0.51
Oak Orchard	2316			Bridge									
Oak Orchard	2274	50-yr	EX	2200.00	530.87	536.05		536.93	0.004779	7.58	302.59	132.07	0.65
Oak Orchard	2274	50-yr	Prop	2209.30	530.87	536.06		536.95	0.004785	7.59	303.30	132.15	0.65
Oak Orchard	2158	50-yr	EX	2200.00	530.58	535.81	534.57	536.47	0.003202	6.87	430.40	195.21	0.54
Oak Orchard	2158	50-yr	Prop	2209.30	530.58	535.82	534.58	536.48	0.003204	6.89	431.69	195.78	0.54
Oak Orchard	1835	50-yr	EX	2200.00	529.64	534.88		535.46	0.002891	6.50	478.48	170.65	0.51
Oak Orchard	1835	50-yr	Prop	2209.30	529.64	534.89		535.47	0.002890	6.51	480.33	170.84	0.51
Oak Orchard	1407	50-yr	EX	2200.00	528.35	532.81		533.76	0.005501	7.97	322.65	108.50	0.69
Oak Orchard	1407	50-yr	Prop	2209.30	528.35	532.82		533.77	0.005499	7.98	323.74	108.54	0.69
Oak Orchard	1009	50-yr	EX	2200.00	526.74	531.63		532.15	0.002671	5.89	418.45	121.14	0.49
Oak Orchard	1009	50-yr	Prop	2209.30	526.74	531.64		532.17	0.002667	5.90	420.00	121.20	0.49
Oak Orchard	634	50-yr	EX	2200.00	524.56	529.33		530.59	0.006440	9.16	267.87	73.16	0.76
Oak Orchard	634	50-yr	Prop	2209.30	524.56	529.34		530.61	0.006451	9.18	268.51	73.19	0.76
Oak Orchard	276	50-yr	EX	2200.00	522.85	526.27	526.27	527.64	0.010985	9.52	260.07	114.19	0.94
Oak Orchard	276	50-yr	Prop	2209.30	522.85	526.27	526.27	527.65	0.010982	9.54	260.97	114.24	0.94
Oak Orchard	116	50-yr	EX	2200.00	521.01	523.09	523.09	523.92	0.015466	7.32	300.42	183.33	1.01
Oak Orchard	116	50-yr	Prop	2209.30	521.01	523.10	523.10	523.93	0.015456	7.33	301.24	183.34	1.01

STAMP Oak Orchard Discharge Analysis  
Standard Table 1 - 100-YR

HEC-RAS River: Oak Orchard Reach: Oak Orchard Profile: 100-yr

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Oak Orchard	10530	100-yr	EX	2420.00	593.69	597.02	597.02	598.38	0.011570	9.76	304.27	121.41	0.97
Oak Orchard	10530	100-yr	Prop	2420.00	593.69	597.02	597.02	598.38	0.011570	9.76	304.27	121.41	0.97
Oak Orchard	10316	100-yr	EX	2420.00	589.69	593.65	593.65	595.12	0.009826	9.99	298.35	126.82	0.92
Oak Orchard	10316	100-yr	Prop	2420.00	589.69	593.65	593.65	595.12	0.009826	9.99	298.35	126.82	0.92
Oak Orchard	10148	100-yr	EX	2420.00	587.21	592.35		593.27	0.004777	8.38	399.05	103.41	0.67
Oak Orchard	10148	100-yr	Prop	2420.00	587.21	592.35		593.27	0.004777	8.38	399.05	103.41	0.67
Oak Orchard	10079	100-yr	EX	2420.00	586.48	590.90	590.90	592.68	0.011925	10.70	229.40	68.83	1.00
Oak Orchard	10079	100-yr	Prop	2420.00	586.48	590.90	590.90	592.68	0.011925	10.70	229.40	68.83	1.00
Oak Orchard	10055	100-yr	EX	2420.00	584.52	590.89	589.08	591.90	0.003659	8.07	306.06	55.77	0.58
Oak Orchard	10055	100-yr	Prop	2420.00	584.52	590.89	589.08	591.90	0.003659	8.07	306.06	55.77	0.58
Oak Orchard	10023			Bridge									
Oak Orchard	9983	100-yr	EX	2420.00	584.55	589.22	589.22	591.37	0.012073	11.76	207.52	51.66	1.00
Oak Orchard	9983	100-yr	Prop	2420.00	584.55	589.22	589.22	591.37	0.012073	11.76	207.52	51.66	1.00
Oak Orchard	9908	100-yr	EX	2420.00	582.56	587.20	587.20	589.13	0.010878	11.27	231.54	63.95	0.98
Oak Orchard	9908	100-yr	Prop	2420.00	582.56	587.20	587.20	589.13	0.010878	11.27	231.54	63.95	0.98
Oak Orchard	9843	100-yr	EX	2420.00	571.40	576.53	576.53	578.73	0.011267	11.94	206.50	50.43	1.00
Oak Orchard	9843	100-yr	Prop	2420.00	571.40	576.53	576.53	578.73	0.011267	11.94	206.50	50.43	1.00
Oak Orchard	9737	100-yr	EX	2420.00	564.18	567.77	567.77	569.37	0.012606	10.16	238.37	75.09	1.00
Oak Orchard	9737	100-yr	Prop	2420.00	564.18	567.77	567.77	569.37	0.012606	10.16	238.37	75.09	1.00
Oak Orchard	9614	100-yr	EX	2420.00	560.00	563.61	563.61	565.20	0.013067	10.11	239.47	76.27	1.01
Oak Orchard	9614	100-yr	Prop	2420.00	560.00	563.61	563.61	565.20	0.013067	10.11	239.47	76.27	1.01
Oak Orchard	9393	100-yr	EX	2420.00	553.09	557.70	557.70	559.74	0.013064	11.45	211.27	52.25	1.00
Oak Orchard	9393	100-yr	Prop	2420.00	553.09	557.70	557.70	559.74	0.013066	11.46	211.26	52.25	1.00
Oak Orchard	9052	100-yr	EX	2420.00	547.08	551.56	551.56	553.44	0.012583	10.97	220.52	59.05	1.00
Oak Orchard	9052	100-yr	Prop	2420.00	547.08	551.56	551.56	553.44	0.012581	10.97	220.53	59.05	1.00
Oak Orchard	8678	100-yr	EX	2420.00	543.37	547.16	547.12	548.52	0.012394	9.36	262.06	105.04	0.97
Oak Orchard	8678	100-yr	Prop	2420.00	543.37	547.16	547.12	548.52	0.012426	9.37	261.82	104.99	0.97
Oak Orchard	8379	100-yr	EX	2420.00	540.51	544.16	543.91	545.30	0.009115	8.64	326.14	271.65	0.85
Oak Orchard	8379	100-yr	Prop	2420.00	540.51	544.16	543.92	545.30	0.009086	8.64	326.90	272.14	0.84
Oak Orchard	7887	100-yr	EX	2420.00	537.08	542.08		542.66	0.003162	6.48	545.60	248.91	0.53
Oak Orchard	7887	100-yr	Prop	2429.30	537.08	542.09		542.68	0.003150	6.48	548.83	250.68	0.53
Oak Orchard	7518	100-yr	EX	2420.00	535.34	541.72		541.97	0.000982	4.20	733.45	205.56	0.30
Oak Orchard	7518	100-yr	Prop	2429.30	535.34	541.73		541.99	0.000981	4.20	736.19	205.66	0.30
Oak Orchard	7013	100-yr	EX	2420.00	534.39	541.13		541.45	0.001086	4.66	666.59	321.99	0.32
Oak Orchard	7013	100-yr	Prop	2429.30	534.39	541.14		541.46	0.001086	4.67	670.96	325.87	0.32
Oak Orchard	6428	100-yr	EX	2420.00	533.00	540.99		541.09	0.000285	2.74	1399.84	405.44	0.17
Oak Orchard	6428	100-yr	Prop	2429.30	533.00	541.01		541.11	0.000285	2.75	1405.46	405.68	0.17
Oak Orchard	5965	100-yr	EX	2420.00	532.61	540.80		540.93	0.000414	3.26	1187.28	282.64	0.21
Oak Orchard	5965	100-yr	Prop	2429.30	532.61	540.81		540.95	0.000414	3.27	1191.18	282.72	0.21
Oak Orchard	5304	100-yr	EX	2420.00	532.17	540.36		540.59	0.000657	4.18	839.85	153.12	0.26
Oak Orchard	5304	100-yr	Prop	2429.30	532.17	540.38		540.60	0.000658	4.19	841.87	153.20	0.26
Oak Orchard	4450	100-yr	EX	2420.00	532.38	539.67		539.93	0.000901	4.53	775.55	161.52	0.30
Oak Orchard	4450	100-yr	Prop	2429.30	532.38	539.68		539.95	0.000901	4.54	777.56	161.58	0.30
Oak Orchard	3779	100-yr	EX	2420.00	532.50	538.95		539.24	0.001213	4.81	749.99	177.62	0.34
Oak Orchard	3779	100-yr	Prop	2429.30	532.50	538.96		539.26	0.001213	4.81	752.17	177.73	0.34
Oak Orchard	3345	100-yr	EX	2420.00	532.32	538.52		538.76	0.000966	4.19	765.24	172.10	0.31
Oak Orchard	3345	100-yr	Prop	2429.30	532.32	538.53		538.77	0.000966	4.19	767.35	172.17	0.31
Oak Orchard	3031	100-yr	EX	2420.00	532.14	538.29		538.49	0.000710	3.67	727.85	144.80	0.26
Oak Orchard	3031	100-yr	Prop	2429.30	532.14	538.30		538.50	0.000711	3.67	729.61	144.85	0.27
Oak Orchard	2757	100-yr	EX	2420.00	532.23	538.01		538.25	0.001076	4.36	884.70	284.70	0.32
Oak Orchard	2757	100-yr	Prop	2429.30	532.23	538.03		538.27	0.001074	4.36	888.33	285.41	0.32
Oak Orchard	2444	100-yr	EX	2420.00	531.15	537.31		537.79	0.001910	5.62	455.30	96.84	0.42



STAMP Oak Orchard Discharge Analysis  
Standard Table 1 - 100-YR

HEC-RAS River: Oak Orchard Reach: Oak Orchard Profile: 100-yr (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Oak Orchard	2444	100-yr	Prop	2429.30	531.15	537.32		537.80	0.001910	5.63	456.43	96.90	0.42
Oak Orchard	2349	100-yr	EX	2420.00	530.94	536.83	534.96	537.55	0.002850	6.91	379.62	80.20	0.52
Oak Orchard	2349	100-yr	Prop	2429.30	530.94	536.84	534.97	537.56	0.002854	6.92	380.40	80.23	0.52
Oak Orchard	2316			Bridge									
Oak Orchard	2274	100-yr	EX	2420.00	530.87	536.26		537.23	0.004898	7.93	318.97	133.84	0.66
Oak Orchard	2274	100-yr	Prop	2429.30	530.87	536.27		537.24	0.004903	7.94	319.64	133.91	0.66
Oak Orchard	2158	100-yr	EX	2420.00	530.58	536.05	534.78	536.75	0.003249	7.14	460.64	203.08	0.55
Oak Orchard	2158	100-yr	Prop	2429.30	530.58	536.06	534.77	536.76	0.003251	7.15	461.88	203.32	0.55
Oak Orchard	1835	100-yr	EX	2420.00	529.64	535.13		535.73	0.002860	6.68	522.11	175.46	0.51
Oak Orchard	1835	100-yr	Prop	2429.30	529.64	535.14		535.75	0.002859	6.69	523.94	175.69	0.51
Oak Orchard	1407	100-yr	EX	2420.00	528.35	533.05		534.05	0.005424	8.21	348.69	109.43	0.69
Oak Orchard	1407	100-yr	Prop	2429.30	528.35	533.06		534.06	0.005421	8.22	349.78	109.47	0.69
Oak Orchard	1009	100-yr	EX	2420.00	526.74	531.94		532.48	0.002552	6.02	456.19	122.53	0.48
Oak Orchard	1009	100-yr	Prop	2429.30	526.74	531.95		532.50	0.002549	6.03	457.69	122.58	0.48
Oak Orchard	634	100-yr	EX	2420.00	524.56	529.50	528.93	530.92	0.006865	9.70	280.74	76.54	0.79
Oak Orchard	634	100-yr	Prop	2429.30	524.56	529.52	528.94	530.94	0.006820	9.70	282.26	77.03	0.79
Oak Orchard	276	100-yr	EX	2420.00	522.85	526.47	526.47	527.90	0.010621	9.76	283.82	115.50	0.93
Oak Orchard	276	100-yr	Prop	2429.30	522.85	526.47	526.47	527.91	0.010769	9.82	283.15	115.47	0.94
Oak Orchard	116	100-yr	EX	2420.00	521.01	523.20	523.20	524.09	0.015102	7.55	320.64	183.64	1.01
Oak Orchard	116	100-yr	Prop	2429.30	521.01	523.21	523.21	524.09	0.015109	7.56	321.35	183.65	1.01

STAMP Oak Orchard Discharge Analysis  
Standard Table 1 - 500-YR

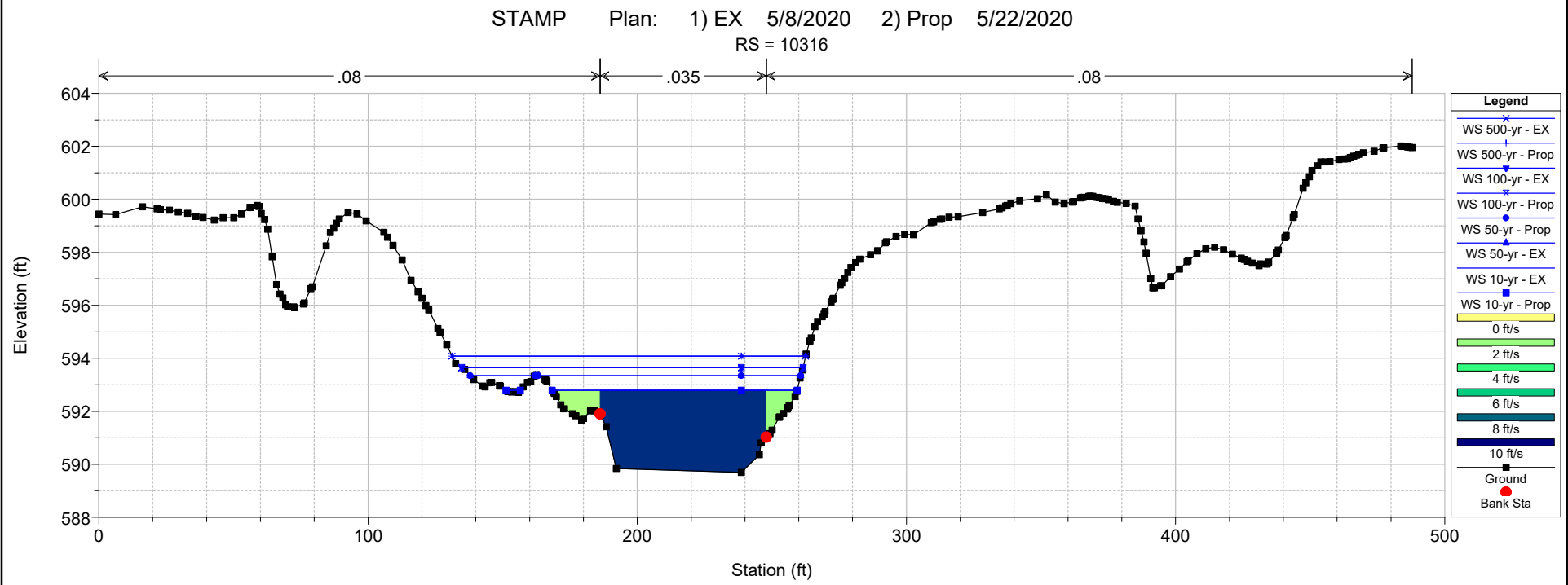
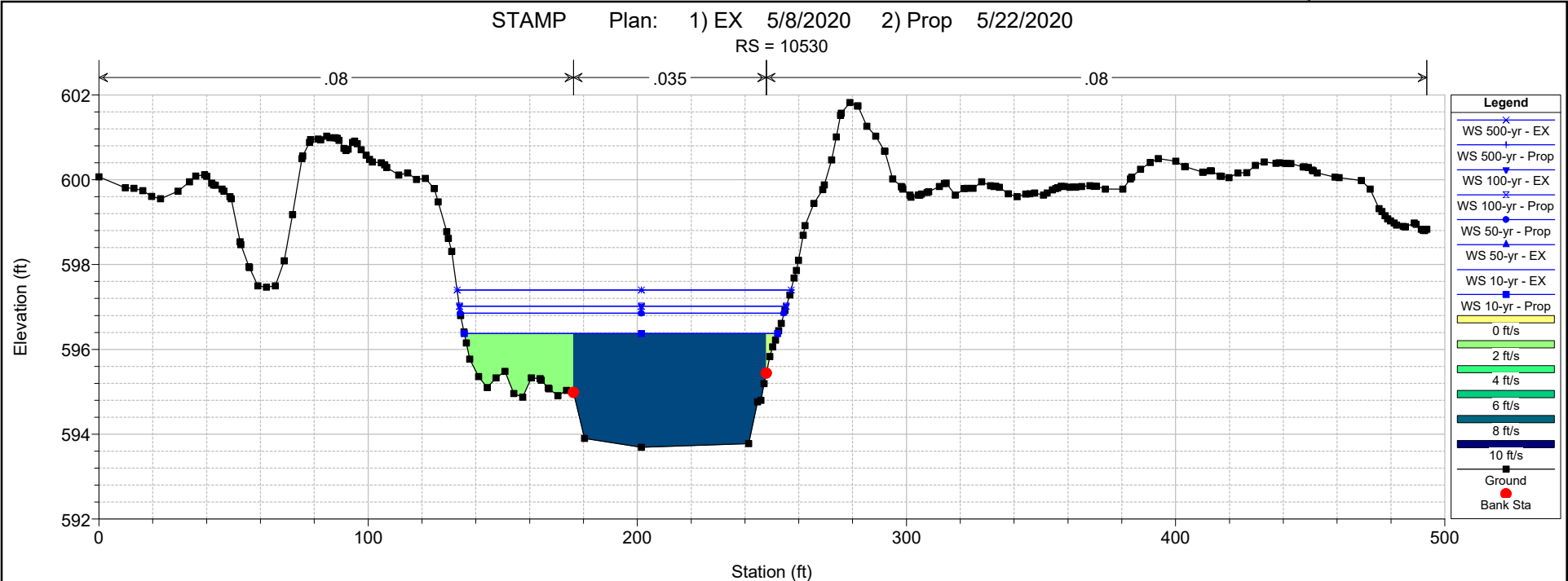
HEC-RAS River: Oak Orchard Reach: Oak Orchard Profile: 500-yr

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Oak Orchard	10530	500-yr	EX	2910.00	593.69	597.40	597.40	598.90	0.011150	10.34	350.65	124.05	0.97
Oak Orchard	10530	500-yr	Prop	2910.00	593.69	597.40	597.40	598.90	0.011150	10.34	350.65	124.05	0.97
Oak Orchard	10316	500-yr	EX	2910.00	589.69	594.08	594.08	595.68	0.009393	10.52	354.28	131.35	0.91
Oak Orchard	10316	500-yr	Prop	2910.00	589.69	594.08	594.08	595.68	0.009393	10.52	354.28	131.35	0.91
Oak Orchard	10148	500-yr	EX	2910.00	587.21	592.94		593.95	0.004554	8.83	460.69	104.79	0.67
Oak Orchard	10148	500-yr	Prop	2910.00	587.21	592.94		593.95	0.004554	8.83	460.69	104.79	0.67
Oak Orchard	10079	500-yr	EX	2910.00	586.48	591.37	591.37	593.37	0.011365	11.34	262.23	70.97	1.00
Oak Orchard	10079	500-yr	Prop	2910.00	586.48	591.37	591.37	593.37	0.011365	11.34	262.23	70.97	1.00
Oak Orchard	10055	500-yr	EX	2910.00	584.52	591.59	589.63	592.75	0.003657	8.68	344.44	57.16	0.59
Oak Orchard	10055	500-yr	Prop	2910.00	584.52	591.59	589.63	592.75	0.003657	8.68	344.44	57.16	0.59
Oak Orchard	10023			Bridge									
Oak Orchard	9983	500-yr	EX	2910.00	584.55	589.81	589.81	592.20	0.011341	12.41	238.74	54.10	0.99
Oak Orchard	9983	500-yr	Prop	2910.00	584.55	589.81	589.81	592.20	0.011341	12.41	238.74	54.10	0.99
Oak Orchard	9908	500-yr	EX	2910.00	582.56	587.70	587.70	589.89	0.010641	12.03	263.59	65.05	0.99
Oak Orchard	9908	500-yr	Prop	2910.00	582.56	587.70	587.70	589.89	0.010641	12.03	263.59	65.05	0.99
Oak Orchard	9843	500-yr	EX	2910.00	571.40	577.13	577.13	579.59	0.010595	12.61	237.63	51.87	0.99
Oak Orchard	9843	500-yr	Prop	2910.00	571.40	577.13	577.13	579.59	0.010595	12.61	237.63	51.87	0.99
Oak Orchard	9737	500-yr	EX	2910.00	564.18	568.20	568.20	570.00	0.012234	10.76	270.97	77.32	1.00
Oak Orchard	9737	500-yr	Prop	2910.00	564.18	568.20	568.20	570.00	0.012234	10.76	270.97	77.32	1.00
Oak Orchard	9614	500-yr	EX	2910.00	560.00	564.03	564.03	565.82	0.012686	10.73	271.13	76.68	1.01
Oak Orchard	9614	500-yr	Prop	2910.00	560.00	564.03	564.03	565.82	0.012686	10.73	271.13	76.68	1.01
Oak Orchard	9393	500-yr	EX	2910.00	553.09	558.31	558.31	560.52	0.012555	11.92	244.86	62.77	1.00
Oak Orchard	9393	500-yr	Prop	2910.00	553.09	558.31	558.31	560.52	0.012555	11.92	244.86	62.77	1.00
Oak Orchard	9052	500-yr	EX	2910.00	547.08	552.12	552.12	554.16	0.012540	11.45	254.07	63.40	1.01
Oak Orchard	9052	500-yr	Prop	2910.00	547.08	552.12	552.12	554.16	0.012540	11.45	254.07	63.40	1.01
Oak Orchard	8678	500-yr	EX	2910.00	543.37	547.54	547.54	549.06	0.012027	9.93	302.65	115.71	0.97
Oak Orchard	8678	500-yr	Prop	2910.00	543.37	547.54	547.54	549.06	0.012027	9.93	302.65	115.71	0.97
Oak Orchard	8379	500-yr	EX	2910.00	540.51	544.70	544.70	545.72	0.007173	8.41	502.72	384.77	0.77
Oak Orchard	8379	500-yr	Prop	2910.00	540.51	544.70	544.70	545.72	0.007173	8.41	502.72	384.77	0.77
Oak Orchard	7887	500-yr	EX	2910.00	537.08	542.74		543.27	0.002594	6.41	719.90	269.62	0.49
Oak Orchard	7887	500-yr	Prop	2919.30	537.08	542.75		543.29	0.002587	6.41	722.91	269.69	0.49
Oak Orchard	7518	500-yr	EX	2910.00	535.34	542.39		542.66	0.000937	4.41	873.12	210.92	0.30
Oak Orchard	7518	500-yr	Prop	2919.30	535.34	542.40		542.67	0.000937	4.41	875.45	211.03	0.30
Oak Orchard	7013	500-yr	EX	2910.00	534.39	541.81		542.16	0.001061	4.92	949.48	466.79	0.32
Oak Orchard	7013	500-yr	Prop	2919.30	534.39	541.83		542.17	0.001059	4.92	955.49	467.15	0.32
Oak Orchard	6428	500-yr	EX	2910.00	533.00	541.70		541.80	0.000279	2.88	1689.39	418.19	0.17
Oak Orchard	6428	500-yr	Prop	2919.30	533.00	541.71		541.82	0.000279	2.88	1694.72	418.39	0.17
Oak Orchard	5965	500-yr	EX	2910.00	532.61	541.50		541.64	0.000410	3.45	1386.99	288.22	0.21
Oak Orchard	5965	500-yr	Prop	2919.30	532.61	541.51		541.66	0.000410	3.45	1390.67	288.35	0.21
Oak Orchard	5304	500-yr	EX	2910.00	532.17	541.03		541.29	0.000698	4.54	943.00	156.87	0.27
Oak Orchard	5304	500-yr	Prop	2919.30	532.17	541.04		541.31	0.000699	4.55	944.89	156.94	0.27
Oak Orchard	4450	500-yr	EX	2910.00	532.38	540.29		540.60	0.000942	4.90	877.98	165.13	0.31
Oak Orchard	4450	500-yr	Prop	2919.30	532.38	540.31		540.61	0.000943	4.91	879.85	165.19	0.31
Oak Orchard	3779	500-yr	EX	2910.00	532.50	539.57		539.89	0.001212	5.12	861.17	182.47	0.35
Oak Orchard	3779	500-yr	Prop	2919.30	532.50	539.58		539.91	0.001212	5.13	863.22	182.56	0.35
Oak Orchard	3345	500-yr	EX	2910.00	532.32	539.14		539.41	0.000964	4.48	875.89	189.65	0.31
Oak Orchard	3345	500-yr	Prop	2919.30	532.32	539.15		539.42	0.000964	4.48	878.04	194.43	0.31
Oak Orchard	3031	500-yr	EX	2910.00	532.14	538.90		539.14	0.000730	3.97	828.65	183.43	0.27
Oak Orchard	3031	500-yr	Prop	2919.30	532.14	538.92		539.15	0.000730	3.97	830.69	183.76	0.27
Oak Orchard	2757	500-yr	EX	2910.00	532.23	538.67		538.91	0.000985	4.49	1078.65	302.19	0.31
Oak Orchard	2757	500-yr	Prop	2919.30	532.23	538.68		538.92	0.000984	4.49	1082.25	302.26	0.31
Oak Orchard	2444	500-yr	EX	2910.00	531.15	537.89		538.46	0.001951	6.08	513.11	100.26	0.43

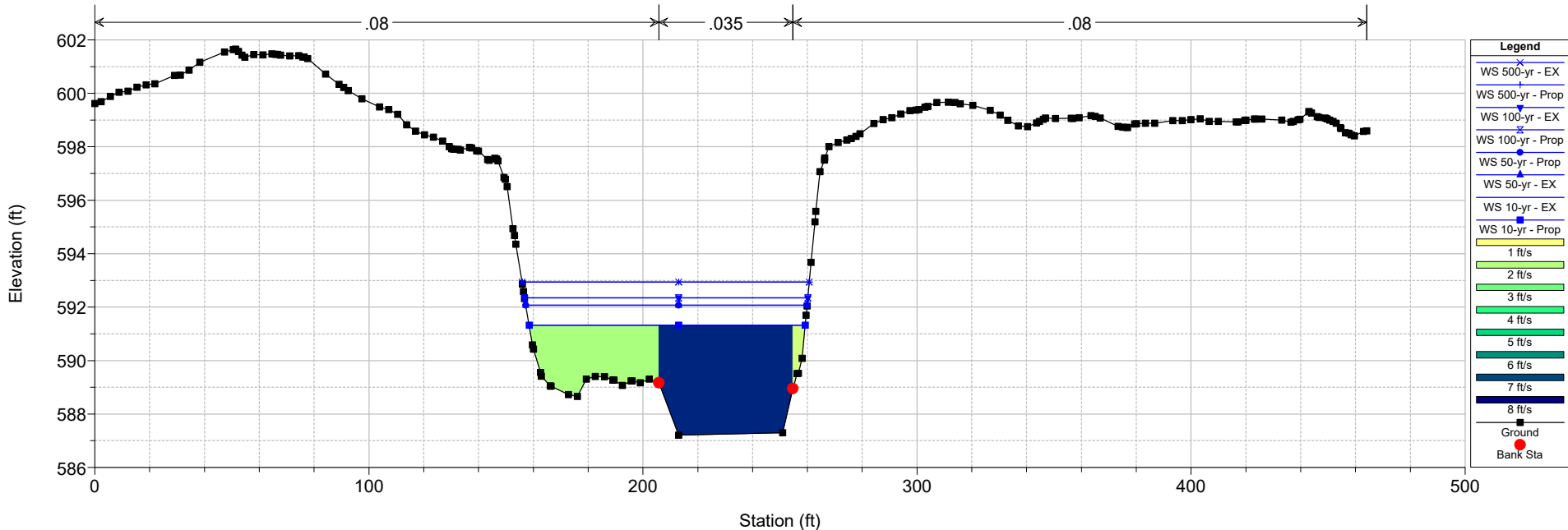
STAMP Oak Orchard Discharge Analysis  
Standard Table 1 - 500-YR

HEC-RAS River: Oak Orchard Reach: Oak Orchard Profile: 500-yr (Continued)

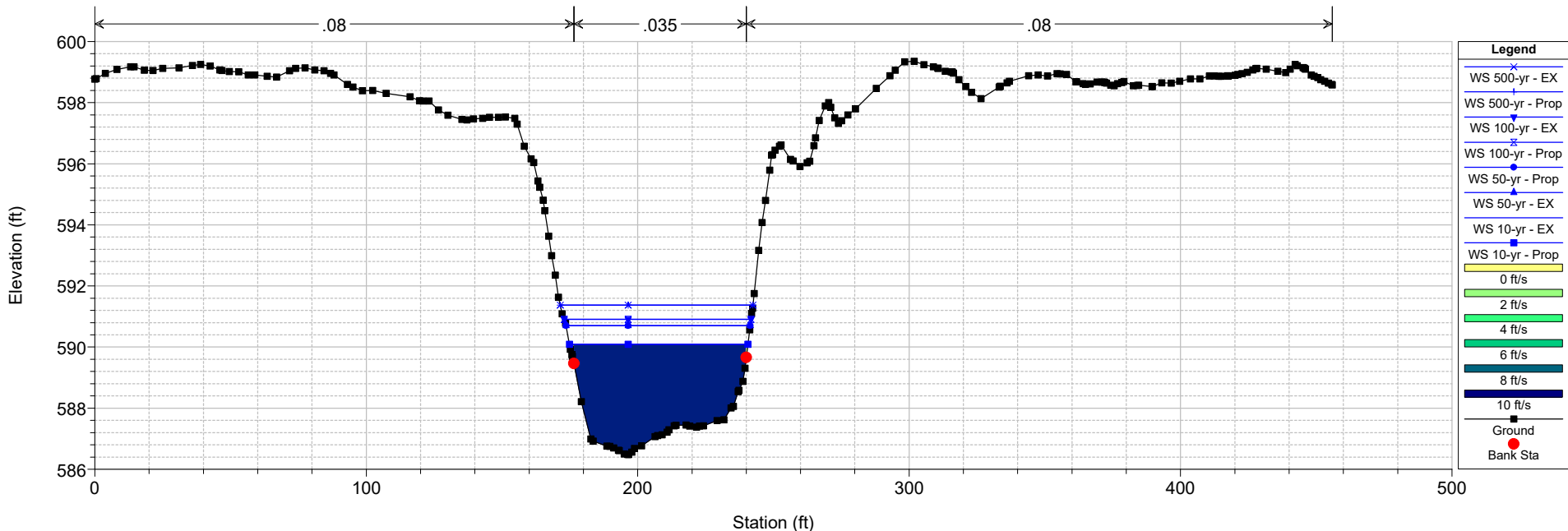
Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Oak Orchard	2444	500-yr	Prop	2919.30	531.15	537.90		538.47	0.001952	6.09	514.18	100.35	0.43
Oak Orchard	2349	500-yr	EX	2910.00	530.94	537.34	535.42	538.20	0.003045	7.57	418.97	82.11	0.54
Oak Orchard	2349	500-yr	Prop	2919.30	530.94	537.34	535.43	538.21	0.003049	7.58	419.68	82.15	0.54
Oak Orchard	2316			Bridge									
Oak Orchard	2274	500-yr	EX	2910.00	530.87	536.70		537.84	0.005171	8.66	352.25	139.54	0.69
Oak Orchard	2274	500-yr	Prop	2919.30	530.87	536.70		537.86	0.005177	8.68	352.84	139.65	0.69
Oak Orchard	2158	500-yr	EX	2910.00	530.58	536.55	535.20	537.34	0.003339	7.68	524.33	222.70	0.56
Oak Orchard	2158	500-yr	Prop	2919.30	530.58	536.56	535.21	537.36	0.003341	7.69	525.48	222.81	0.56
Oak Orchard	1835	500-yr	EX	2910.00	529.64	535.66		536.31	0.002792	7.04	619.37	191.39	0.52
Oak Orchard	1835	500-yr	Prop	2919.30	529.64	535.67		536.32	0.002790	7.04	621.24	191.68	0.52
Oak Orchard	1407	500-yr	EX	2910.00	528.35	533.57		534.67	0.005204	8.68	406.27	111.58	0.69
Oak Orchard	1407	500-yr	Prop	2919.30	528.35	533.58		534.68	0.005200	8.68	407.35	111.62	0.69
Oak Orchard	1009	500-yr	EX	2910.00	526.74	532.59		533.18	0.002347	6.29	537.34	125.48	0.47
Oak Orchard	1009	500-yr	Prop	2919.30	526.74	532.61		533.19	0.002343	6.29	538.84	125.53	0.47
Oak Orchard	634	500-yr	EX	2910.00	524.56	529.91	529.36	531.62	0.007477	10.69	314.48	89.93	0.83
Oak Orchard	634	500-yr	Prop	2919.30	524.56	529.91	529.37	531.63	0.007490	10.71	315.10	90.20	0.83
Oak Orchard	276	500-yr	EX	2910.00	522.85	526.86	526.86	528.46	0.010403	10.38	329.27	117.79	0.94
Oak Orchard	276	500-yr	Prop	2919.30	522.85	526.87	526.87	528.47	0.010394	10.39	330.17	117.84	0.94
Oak Orchard	116	500-yr	EX	2910.00	521.01	523.43	523.43	524.43	0.014569	8.02	362.66	184.29	1.01
Oak Orchard	116	500-yr	Prop	2919.30	521.01	523.43	523.43	524.44	0.014552	8.03	363.49	184.30	1.01

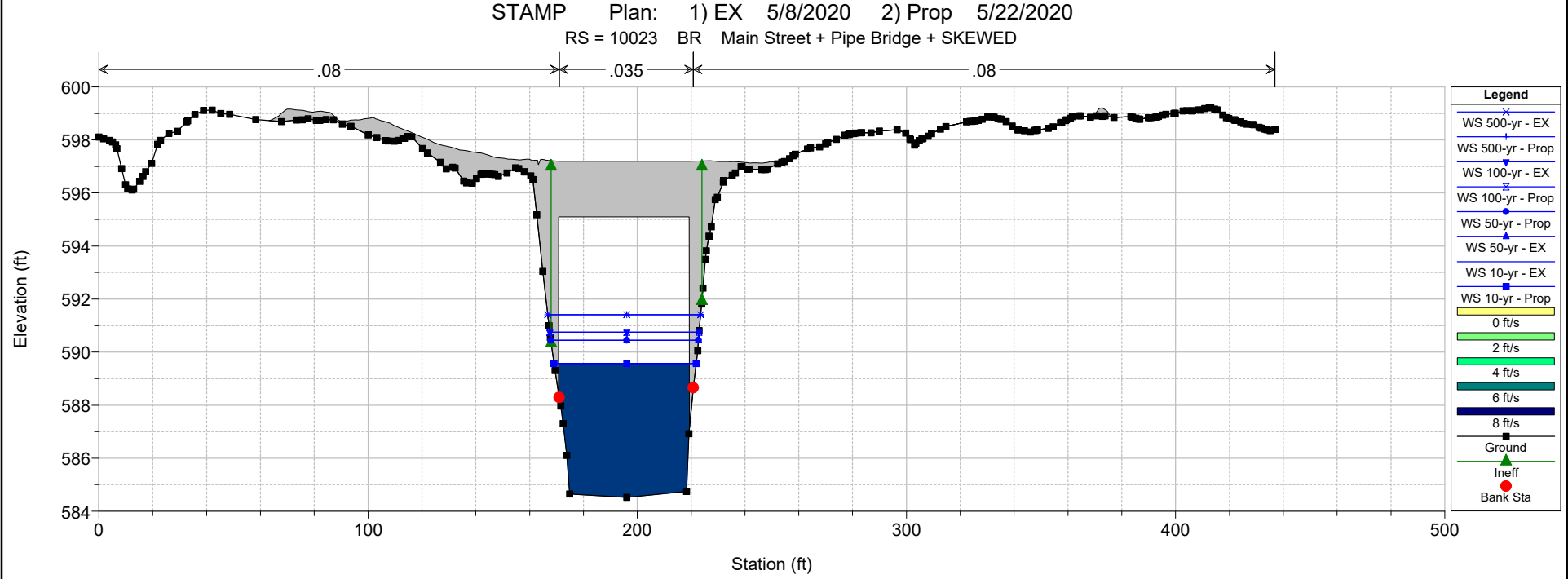
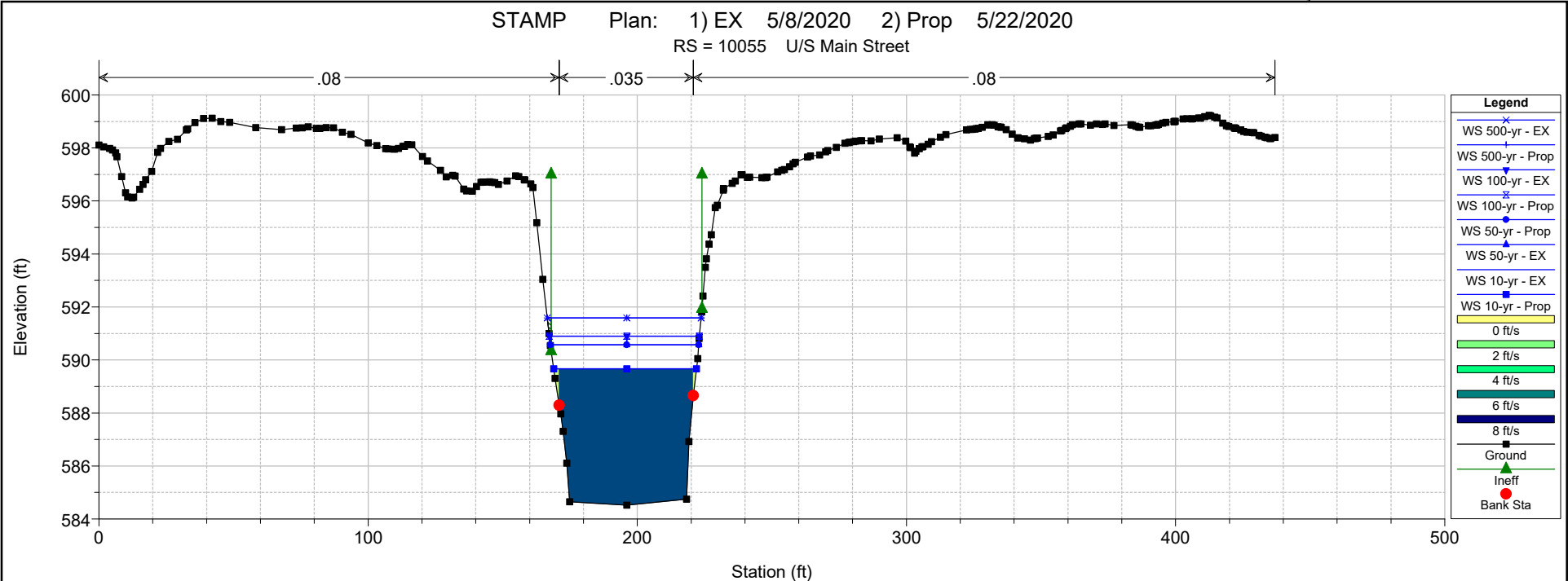


STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
 RS = 10148



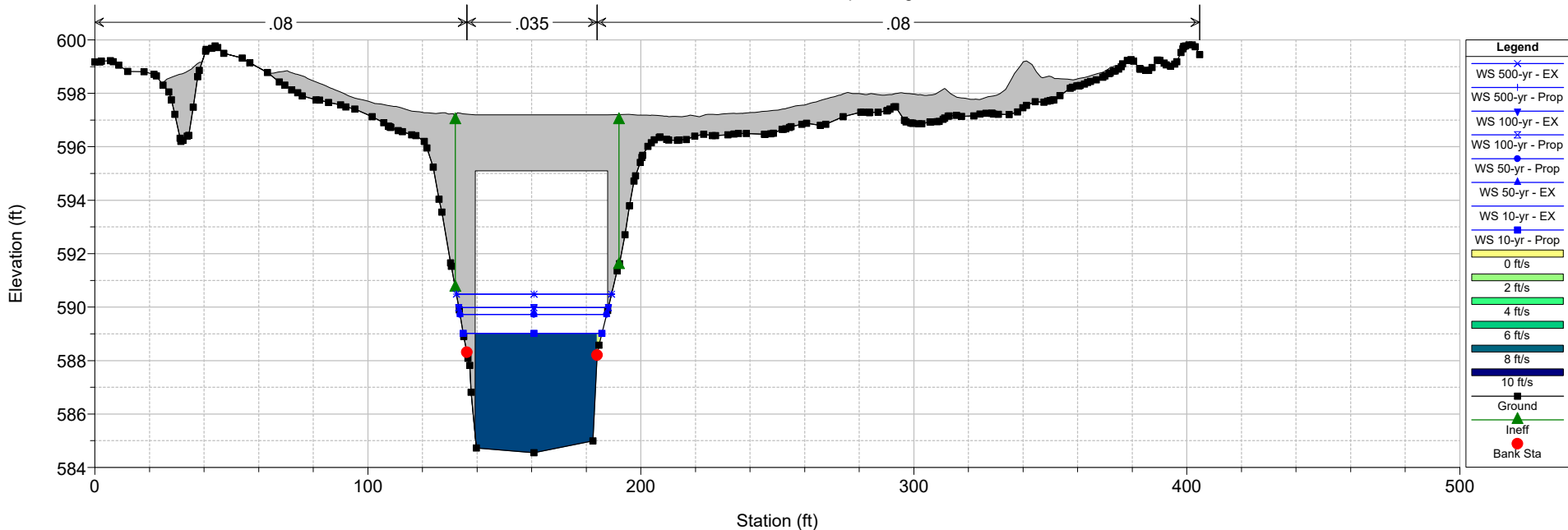
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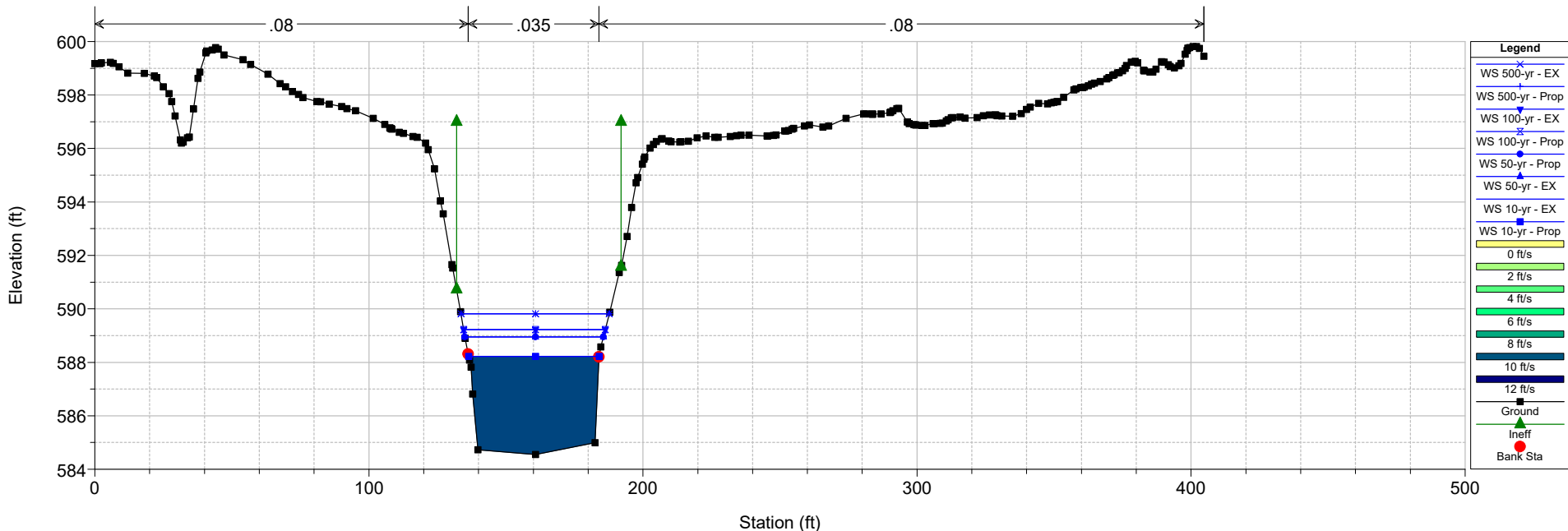




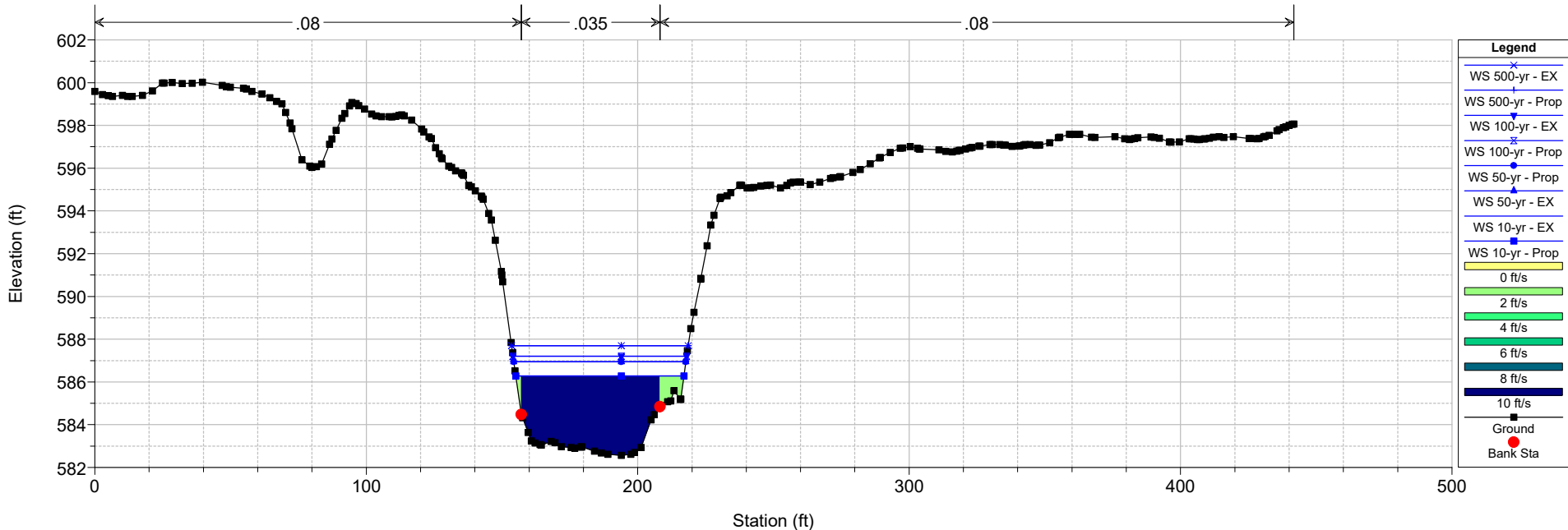
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RS = 10023 BR Main Street + Pipe Bridge + SKEWED



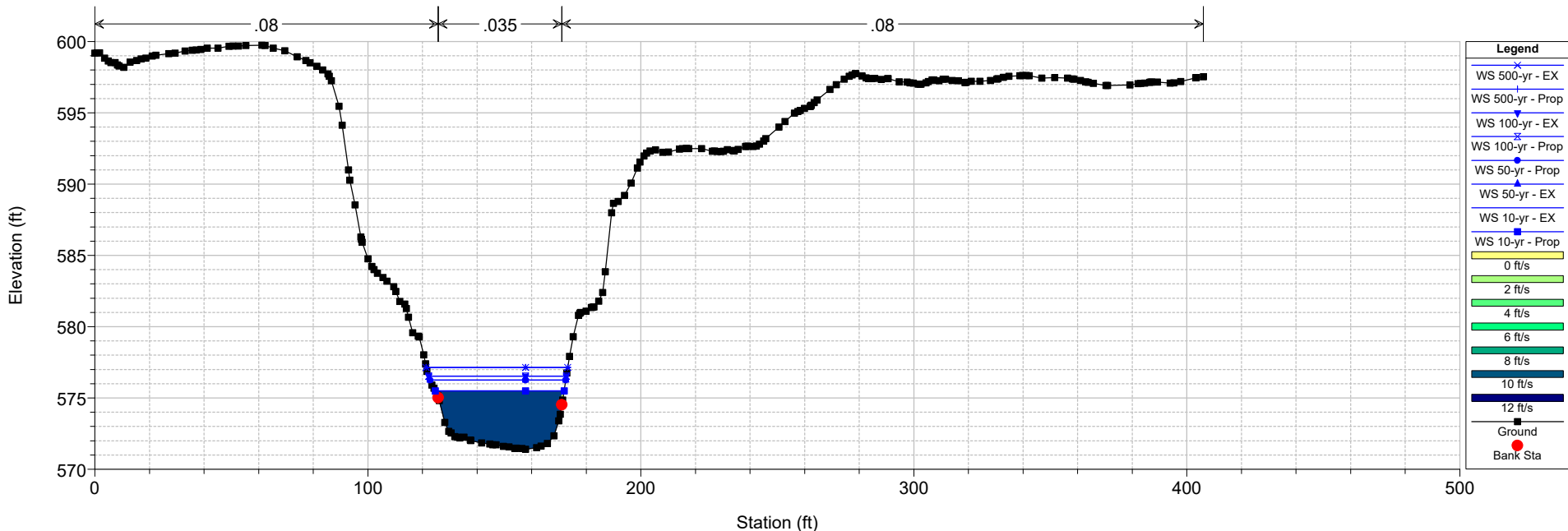
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RS = 9983 D/S Main Street



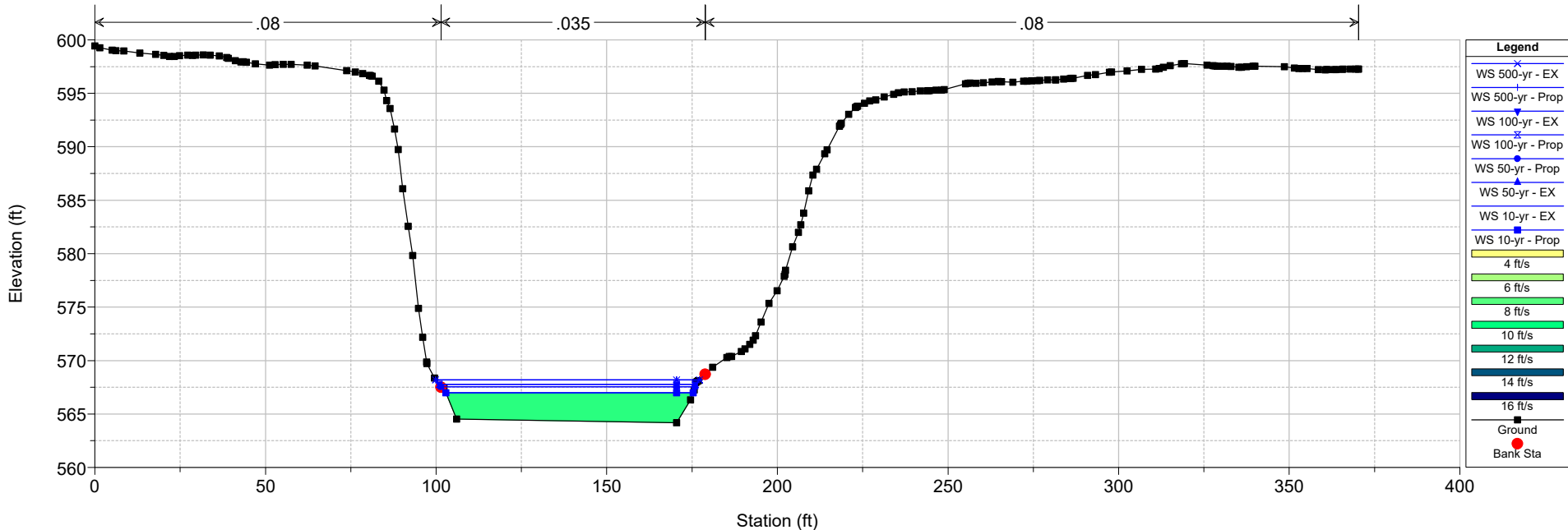
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RS = 9908



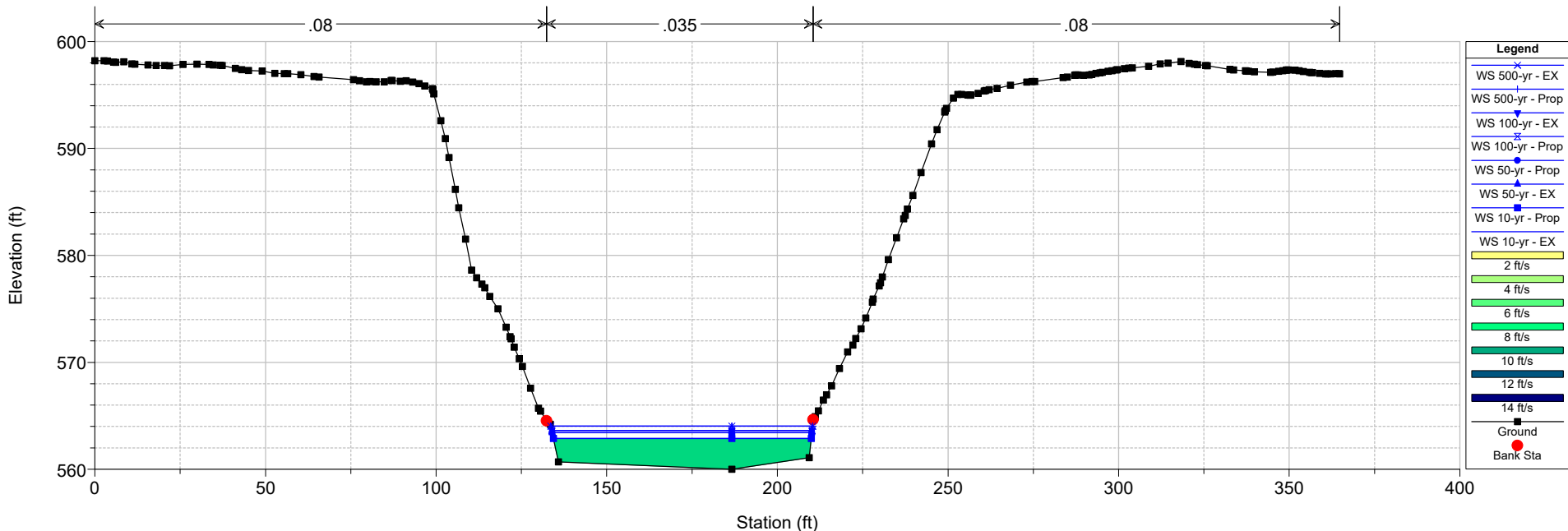
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RS = 9843



STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 9737

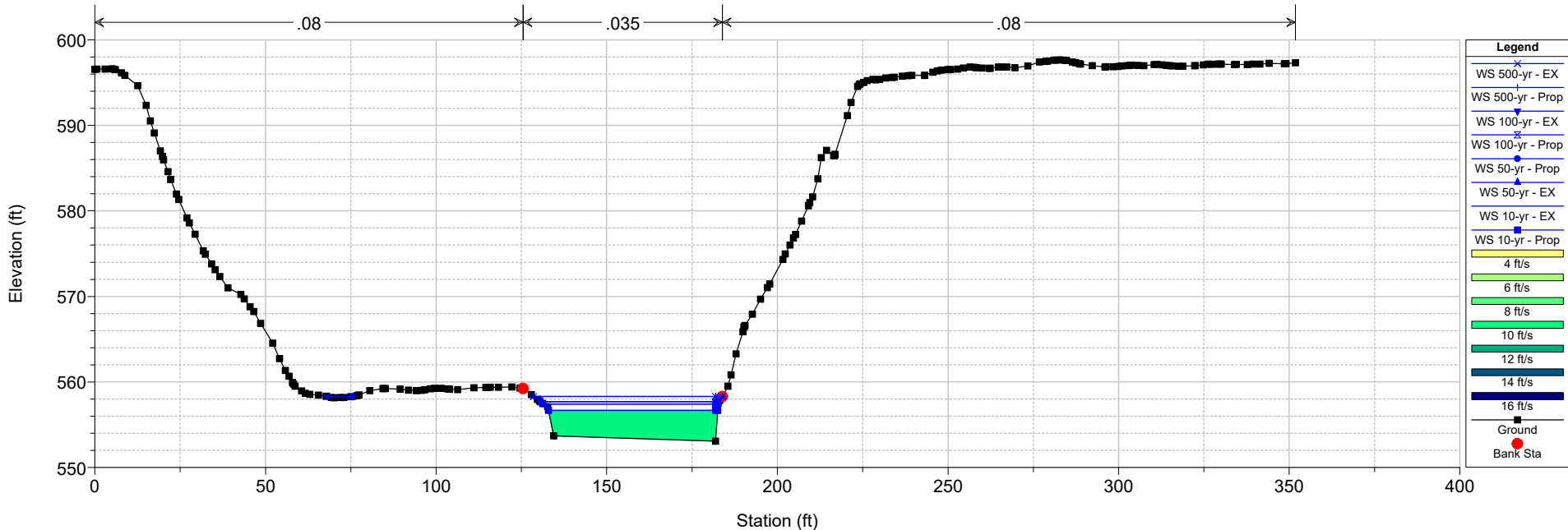


STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 9614



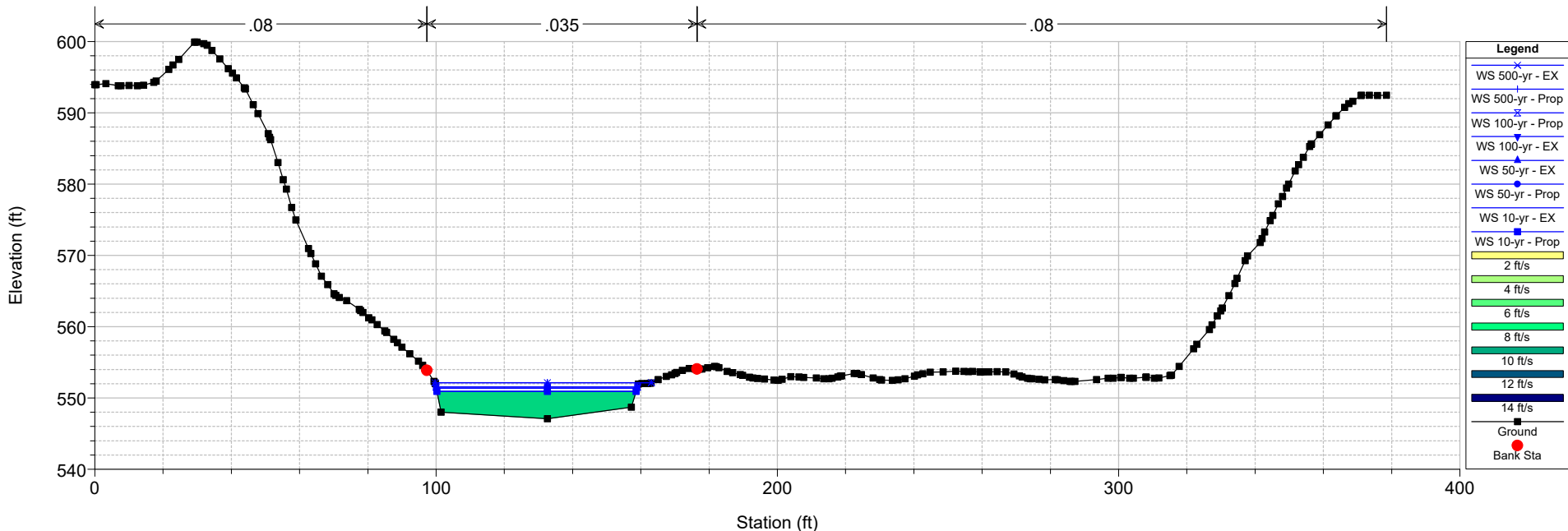
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RS = 9393



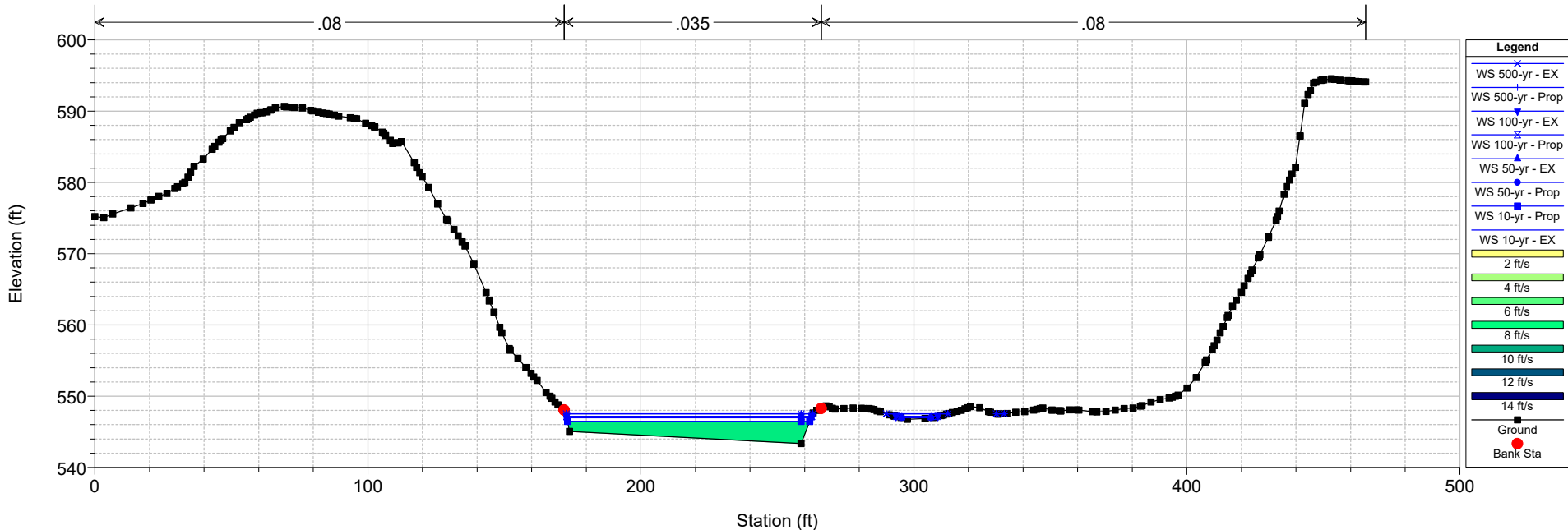
STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

RS = 9052



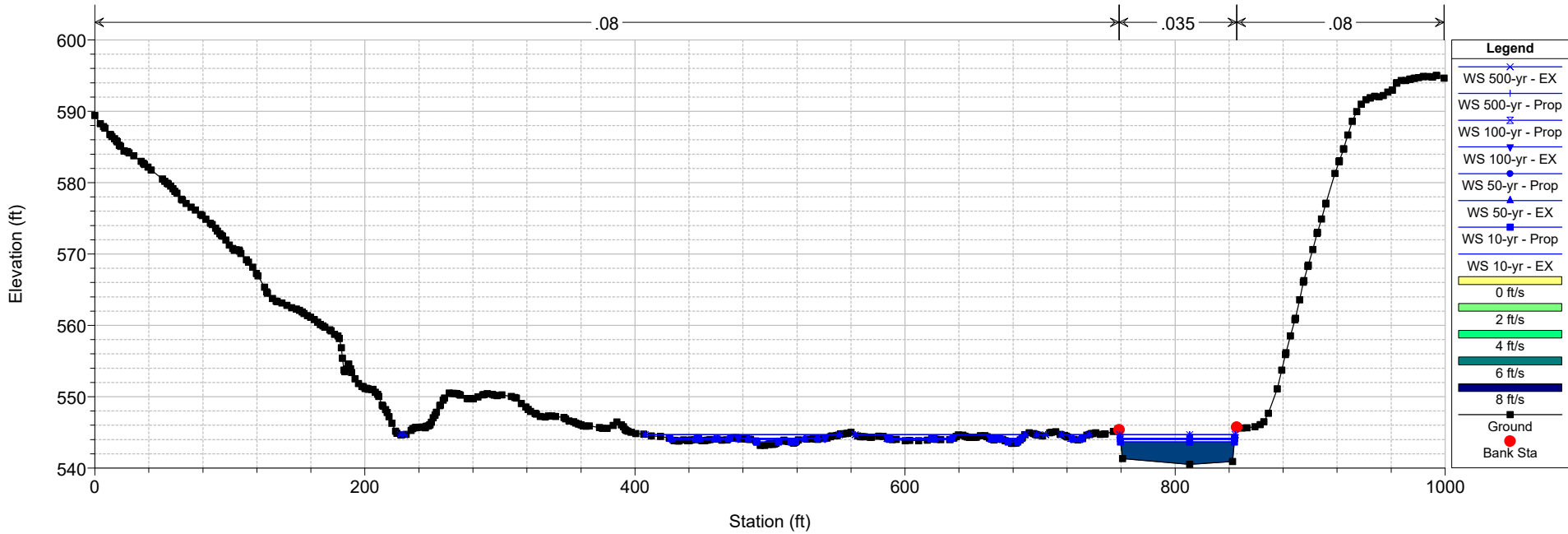
STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

RS = 8678

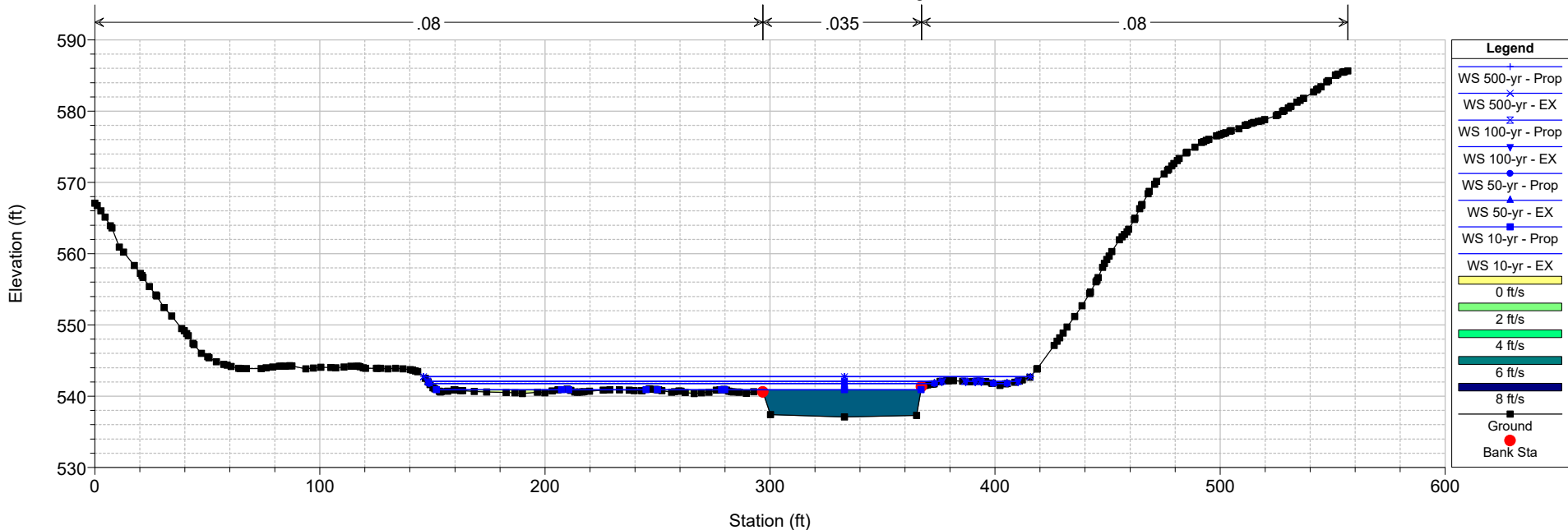


STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

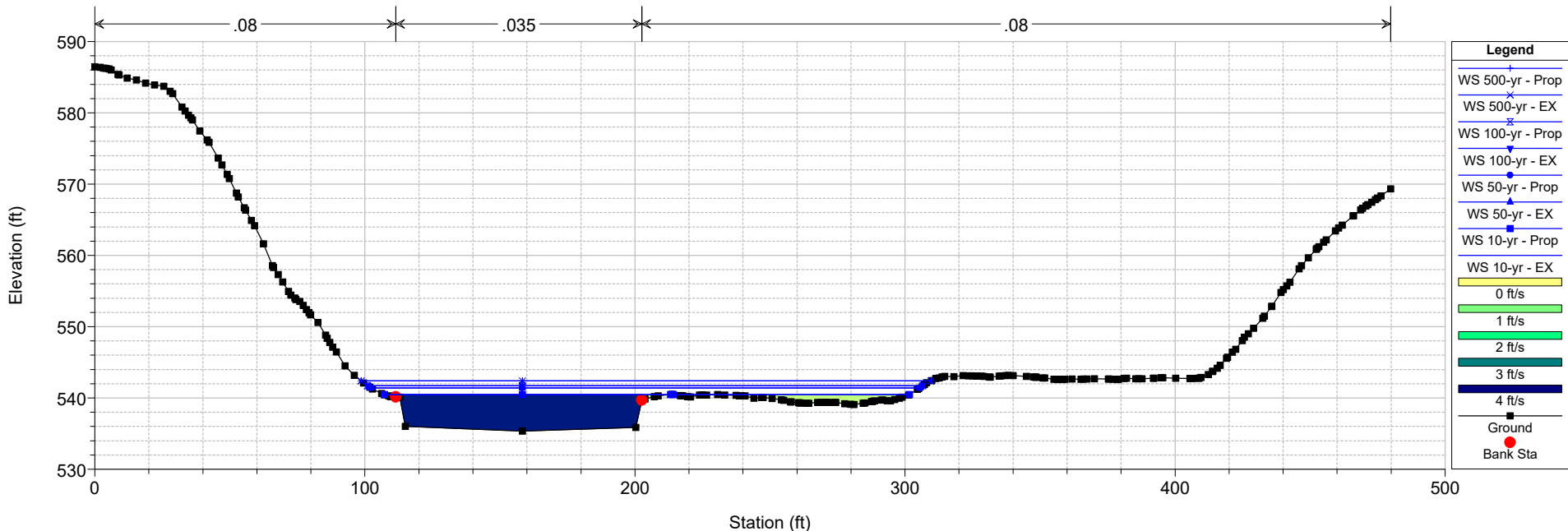
RS = 8379



STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 7887 Assumed Force Main Discharge Location

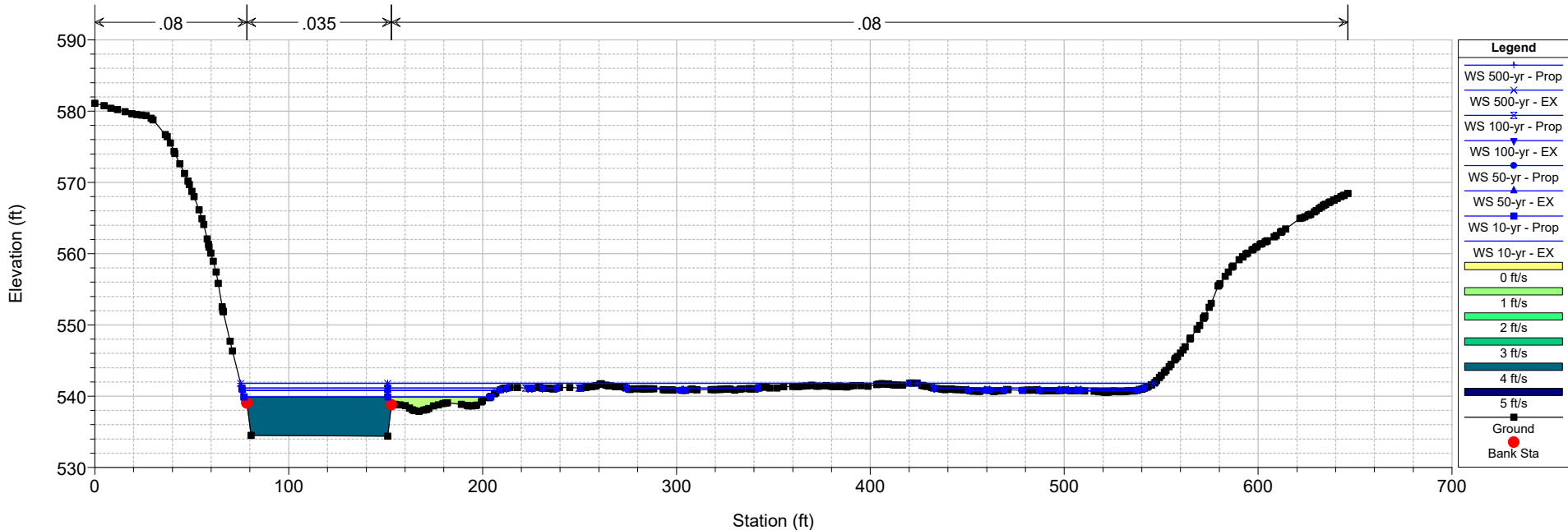


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RS = 7518

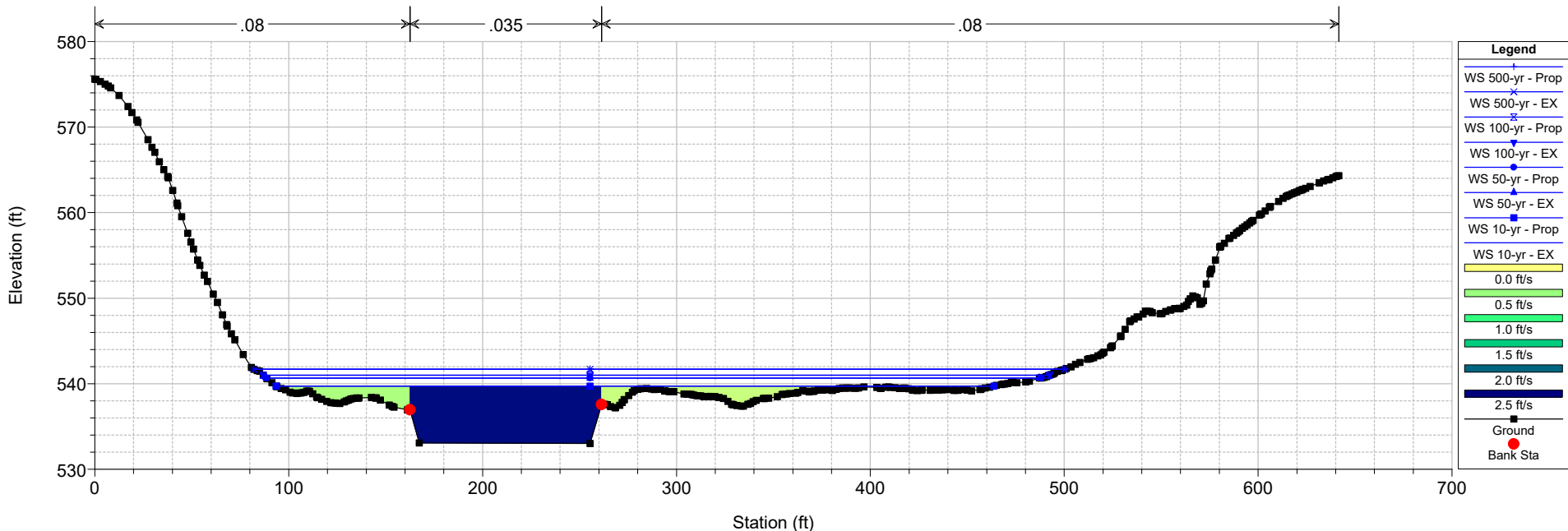




STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 7013

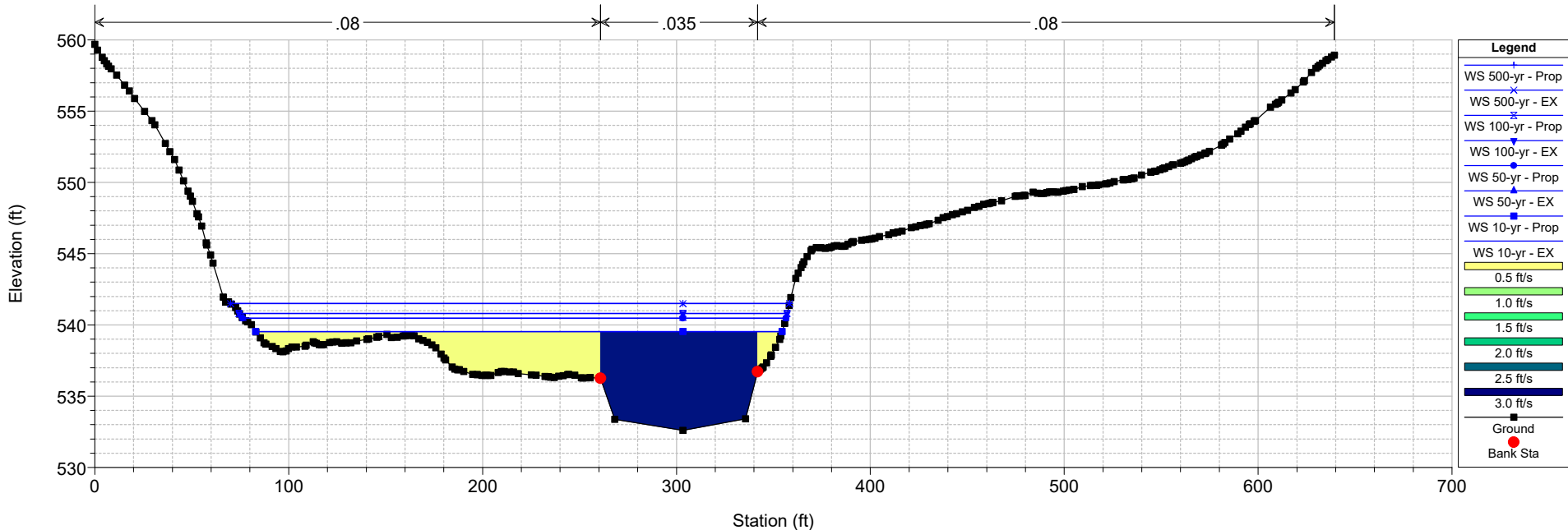


STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 6428



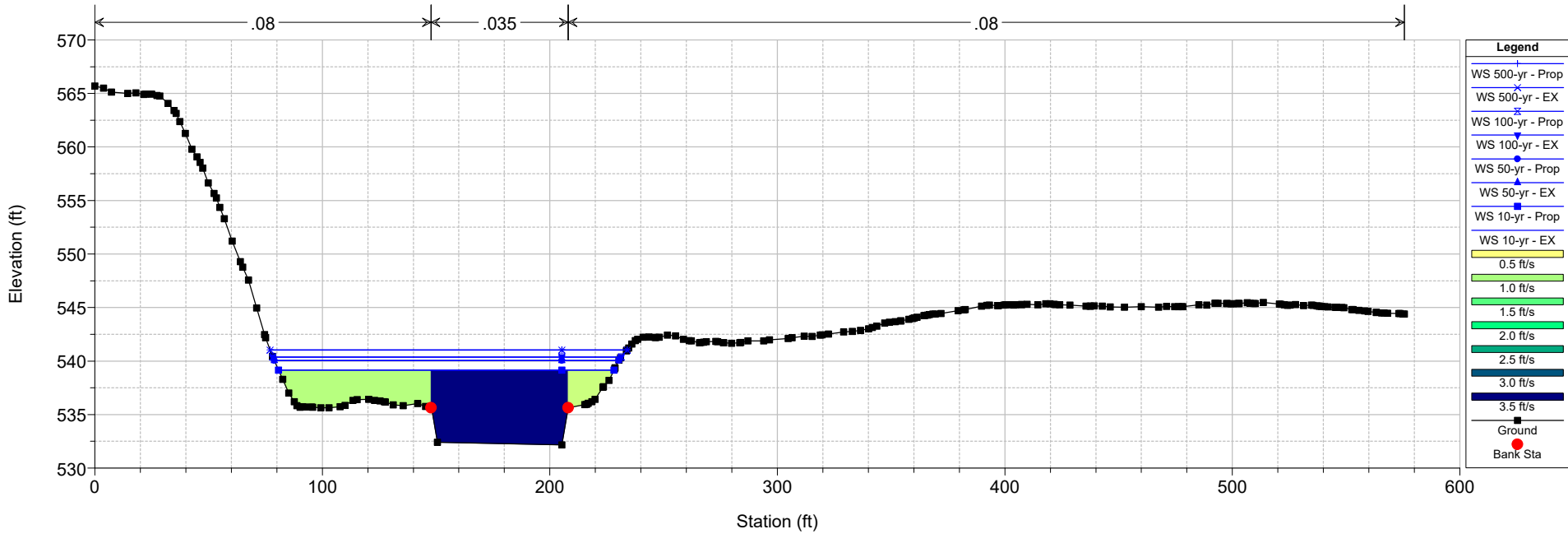
STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

RS = 5965

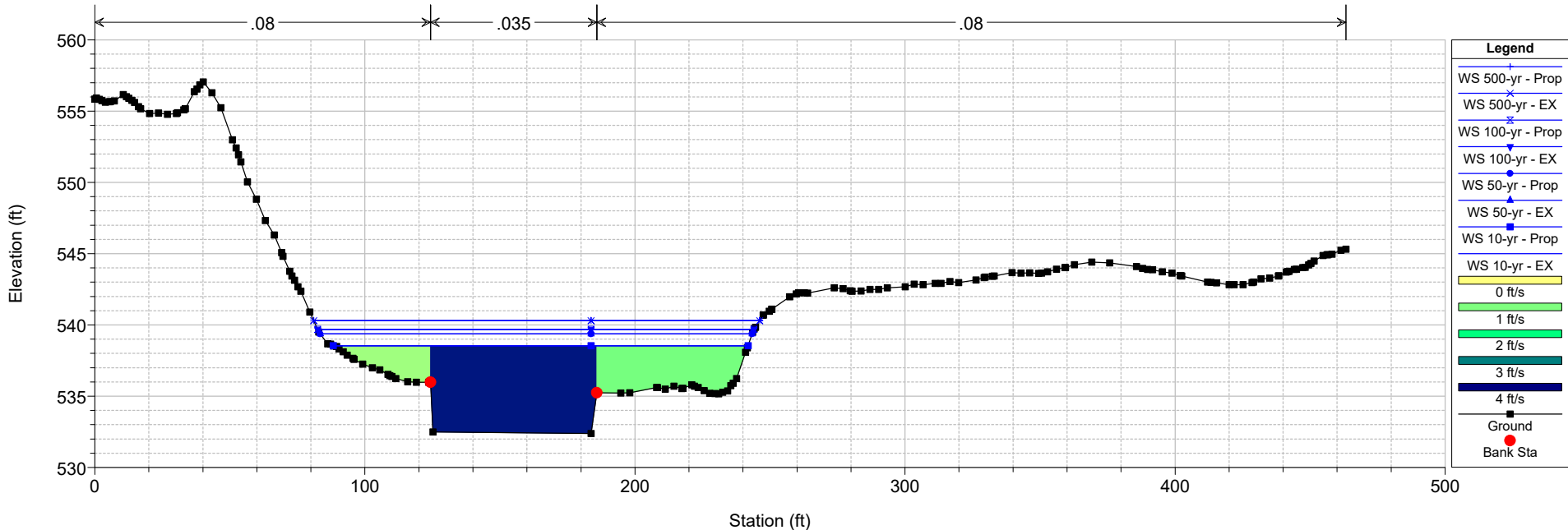


STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

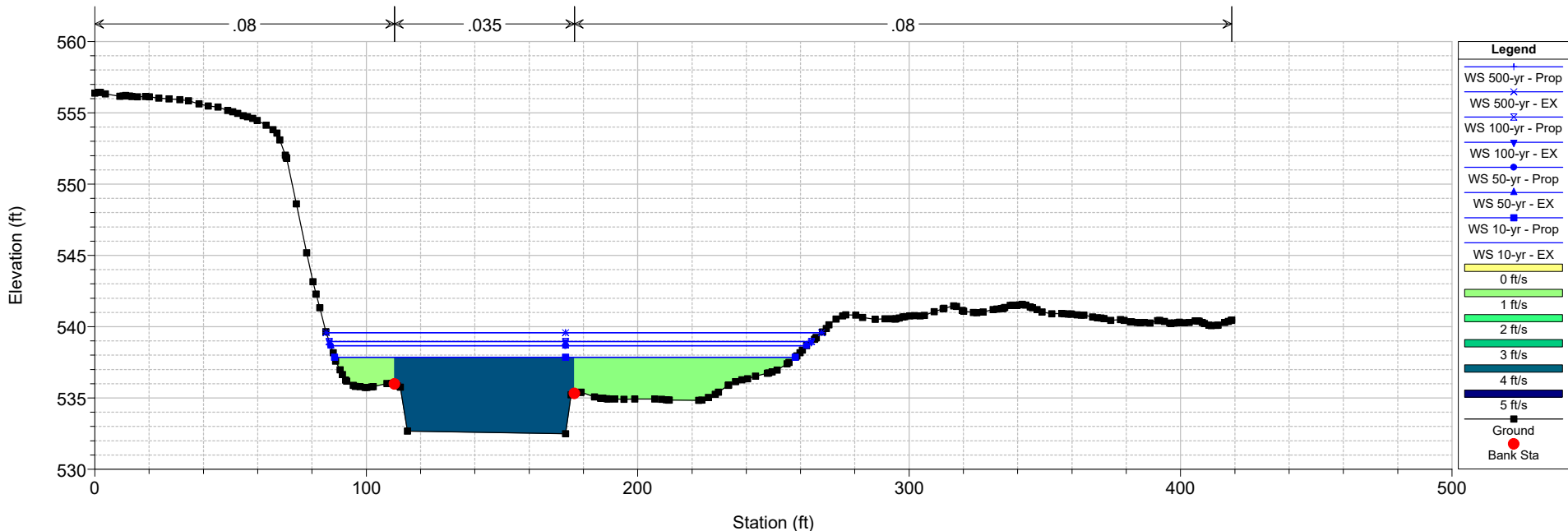
RS = 5304



STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 4450

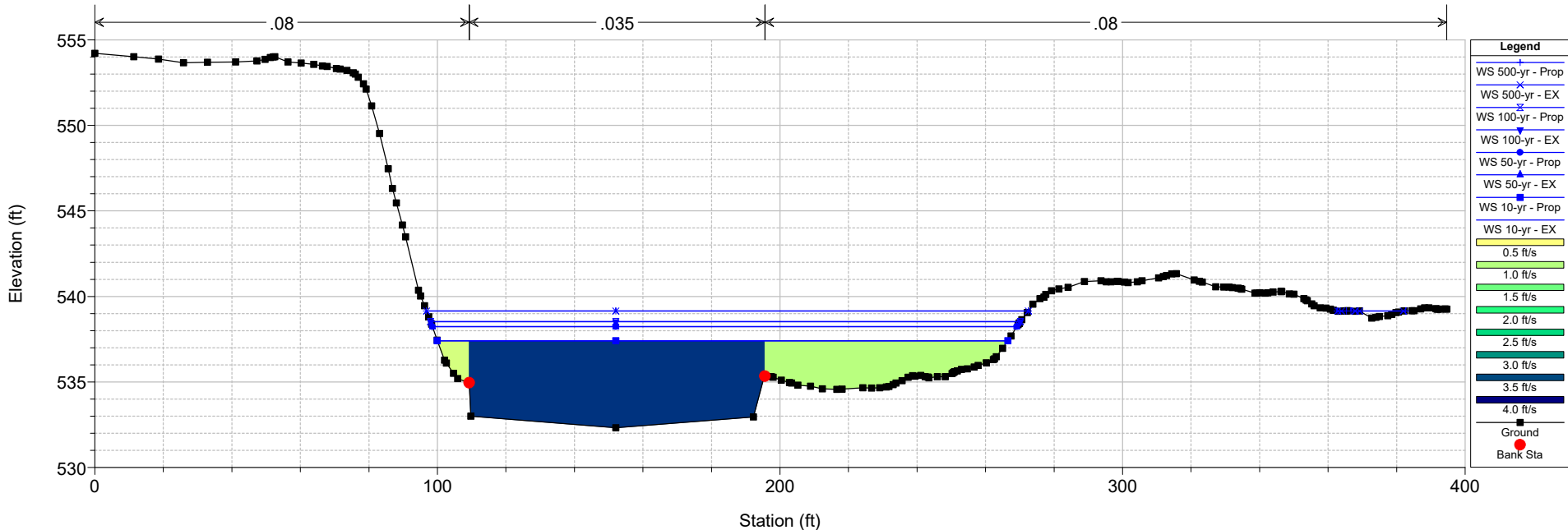


STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 3779



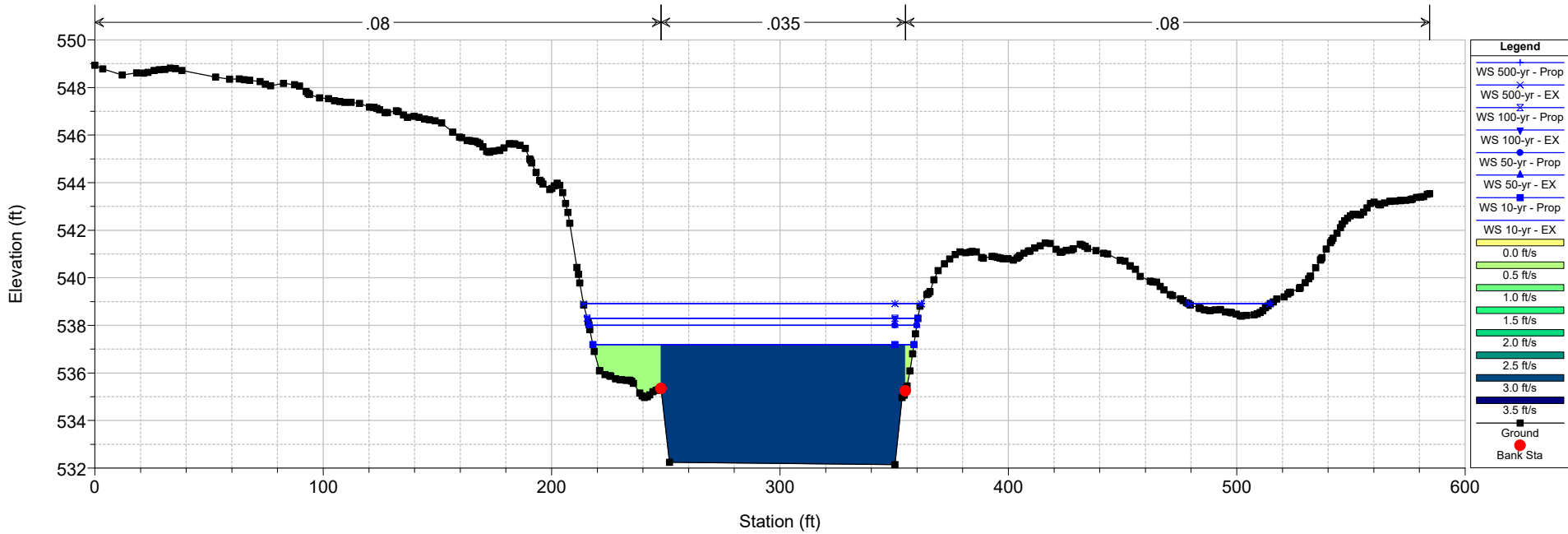
STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

RS = 3345

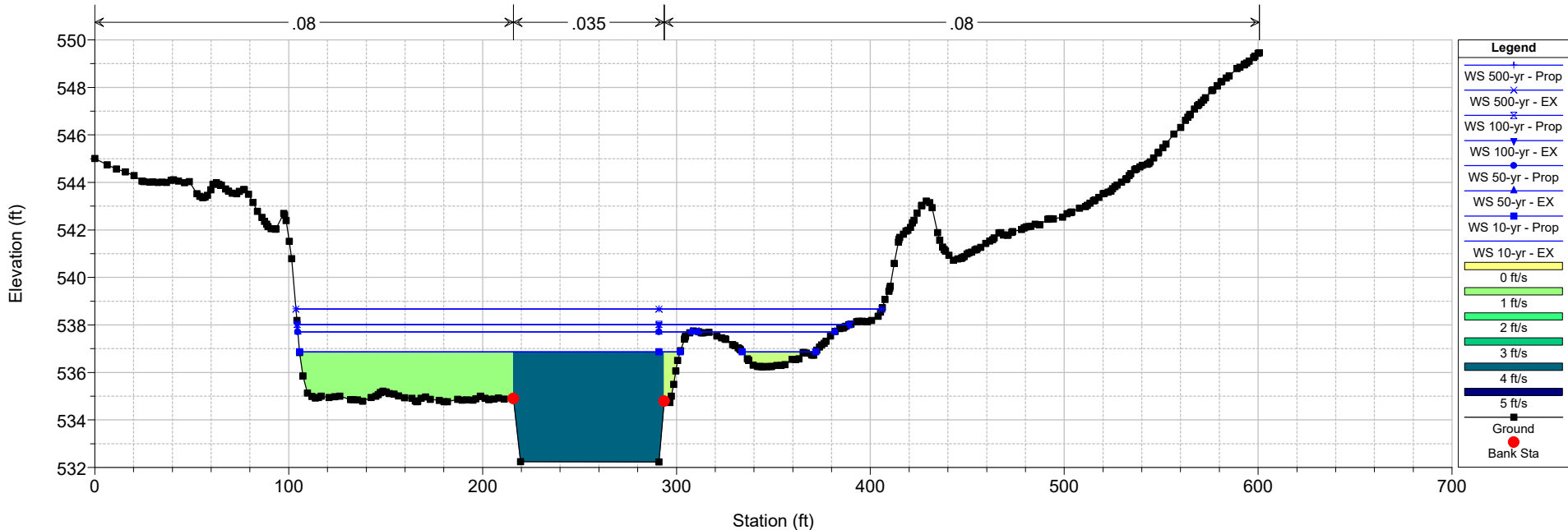


STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

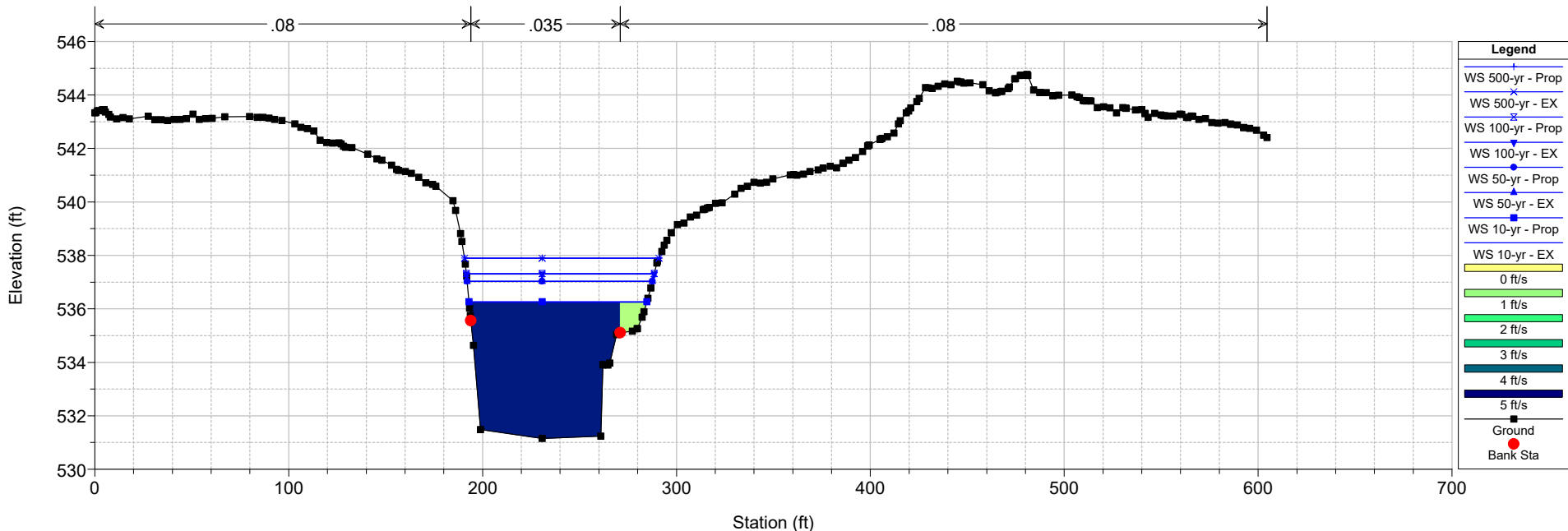
RS = 3031



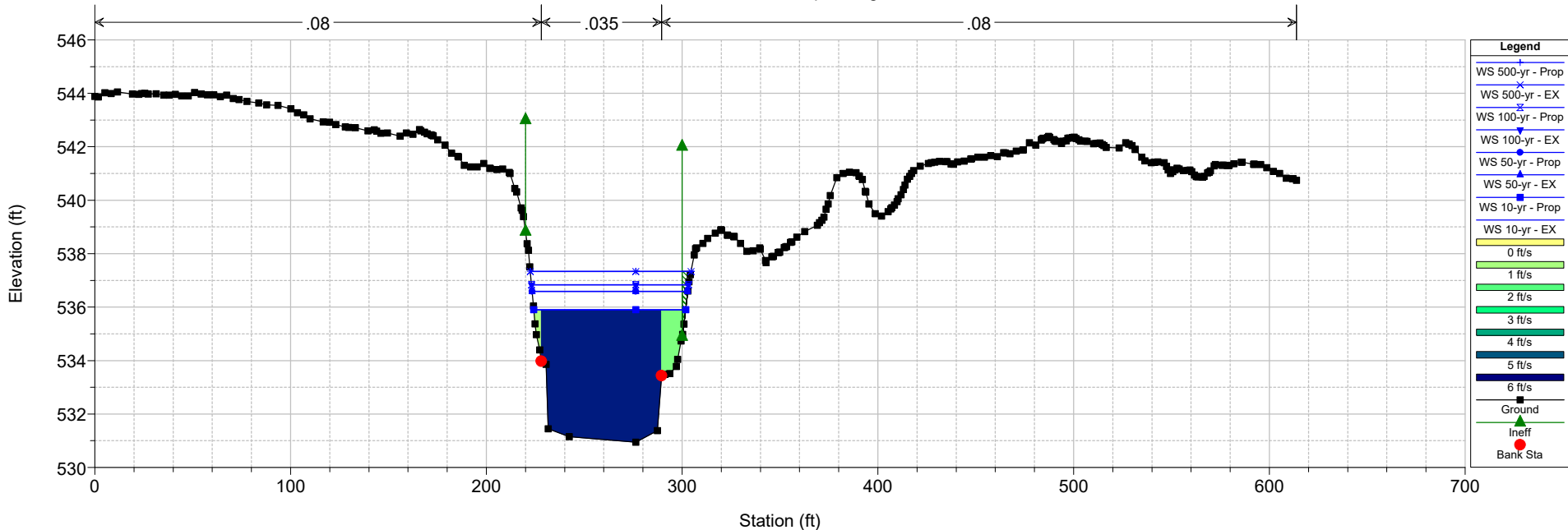
STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 2757



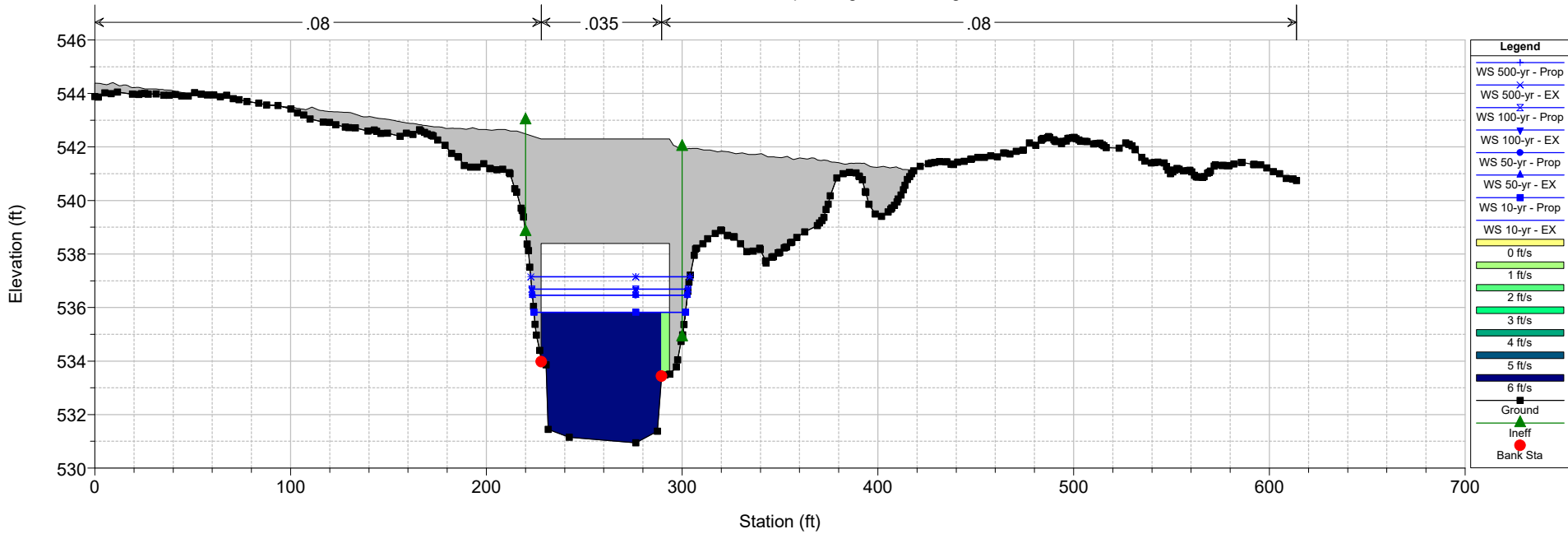
STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 2444



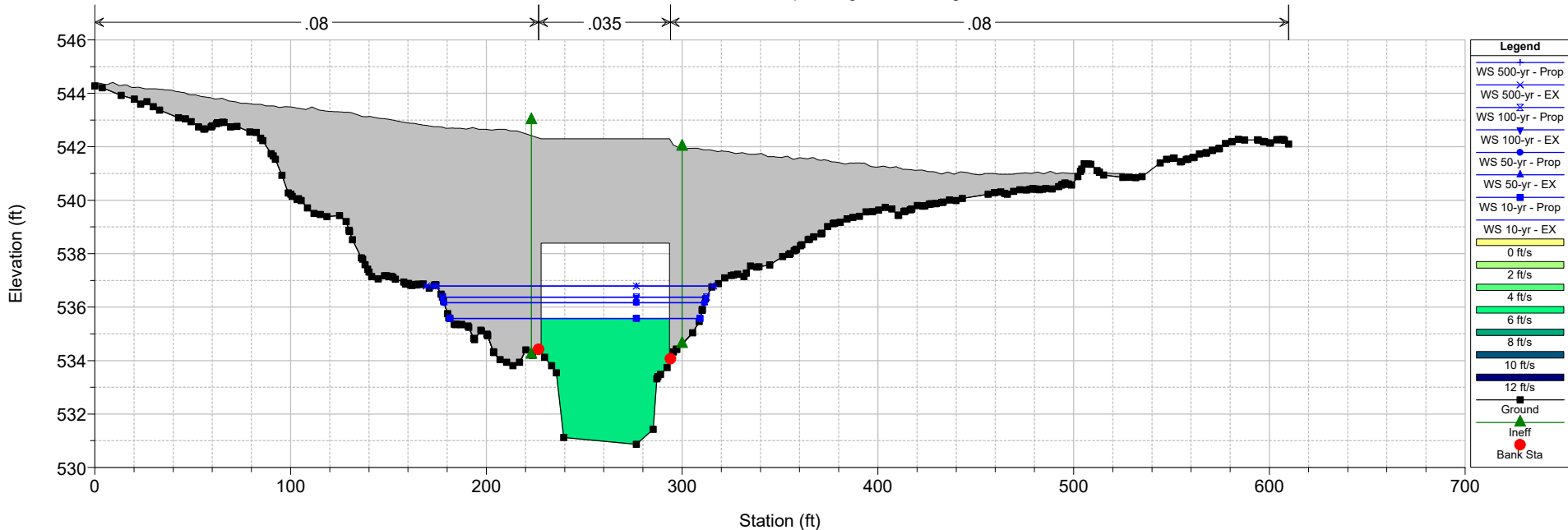
STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 2349 U/S Maple Ridge Road



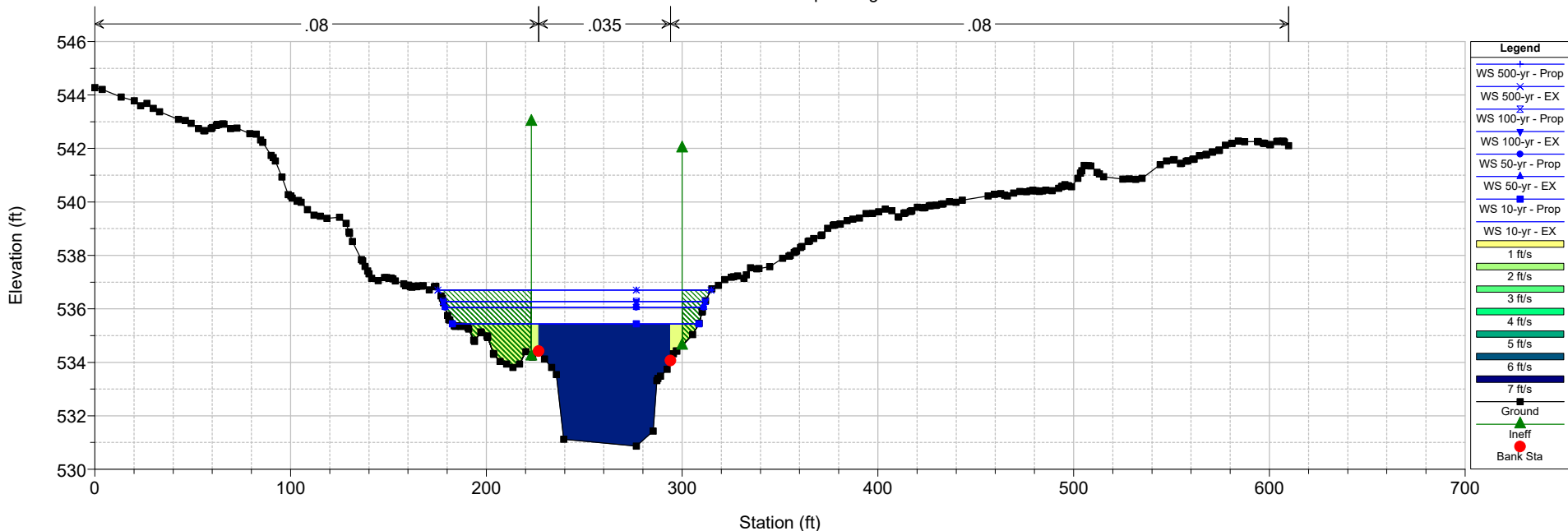
STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 2316 BR Maple Ridge Road Bridge



STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 2316 BR Maple Ridge Road Bridge

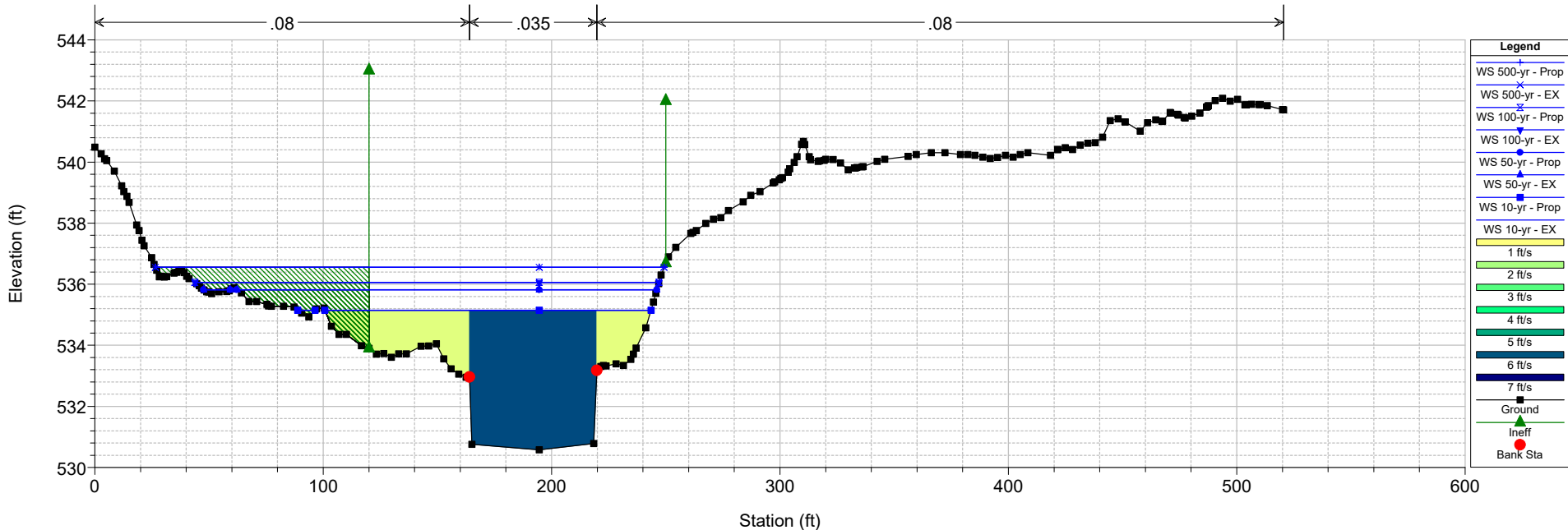


STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 2274 D/S Maple Ridge Road



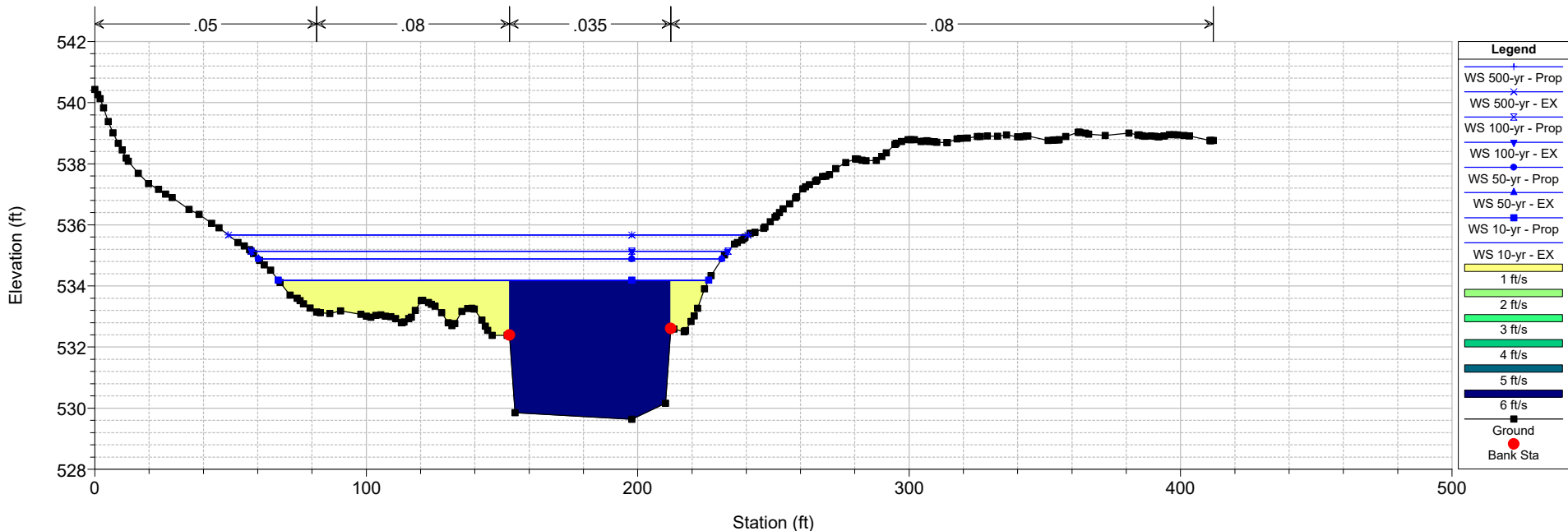


STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 2158



- Legend**
- WS 500-yr - Prop
  - WS 500-yr - EX
  - WS 100-yr - Prop
  - WS 100-yr - EX
  - WS 50-yr - Prop
  - WS 50-yr - EX
  - WS 10-yr - Prop
  - WS 10-yr - EX
  - 1 ft/s
  - 2 ft/s
  - 3 ft/s
  - 4 ft/s
  - 5 ft/s
  - 6 ft/s
  - 7 ft/s
  - Ground
  - Ineff
  - Bank Sta

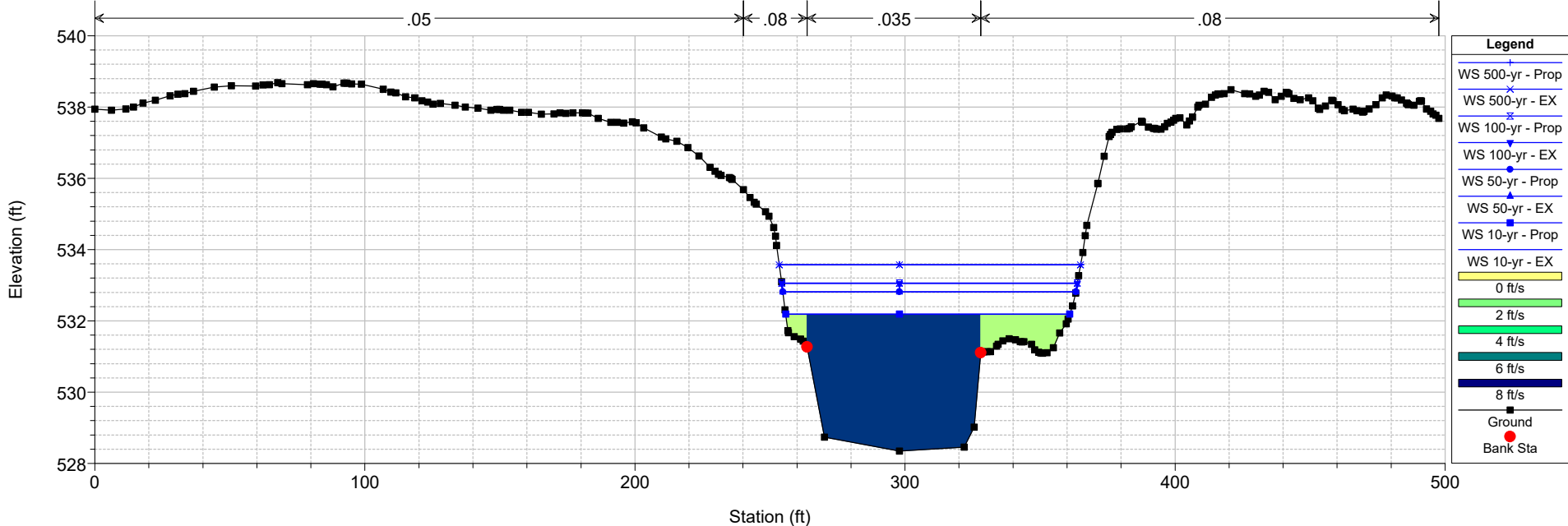
STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 1835



- Legend**
- WS 500-yr - Prop
  - WS 500-yr - EX
  - WS 100-yr - Prop
  - WS 100-yr - EX
  - WS 50-yr - Prop
  - WS 50-yr - EX
  - WS 10-yr - Prop
  - WS 10-yr - EX
  - 1 ft/s
  - 2 ft/s
  - 3 ft/s
  - 4 ft/s
  - 5 ft/s
  - 6 ft/s
  - 7 ft/s
  - Ground
  - Ineff
  - Bank Sta

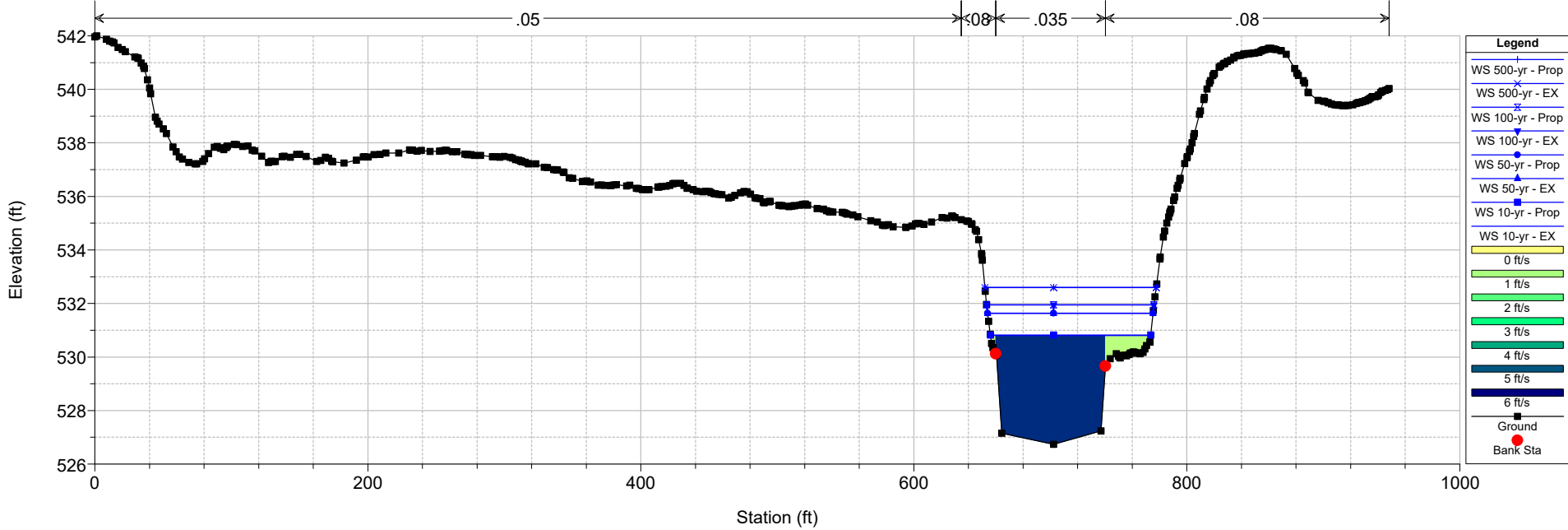
STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

RS = 1407

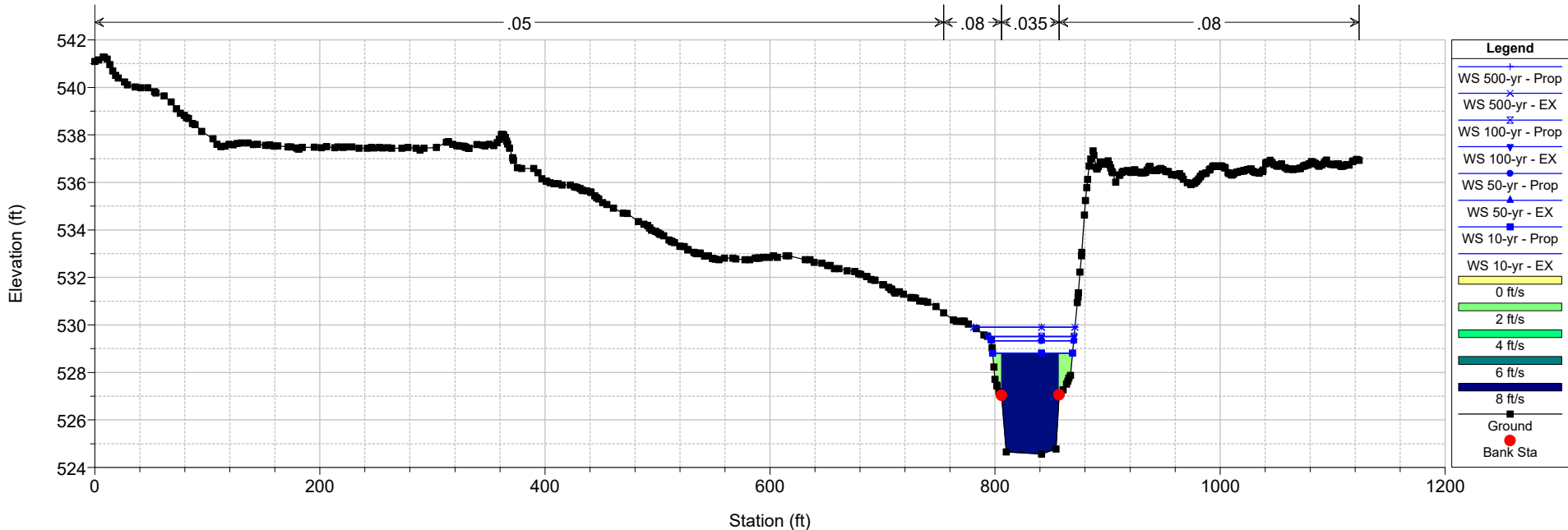


STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

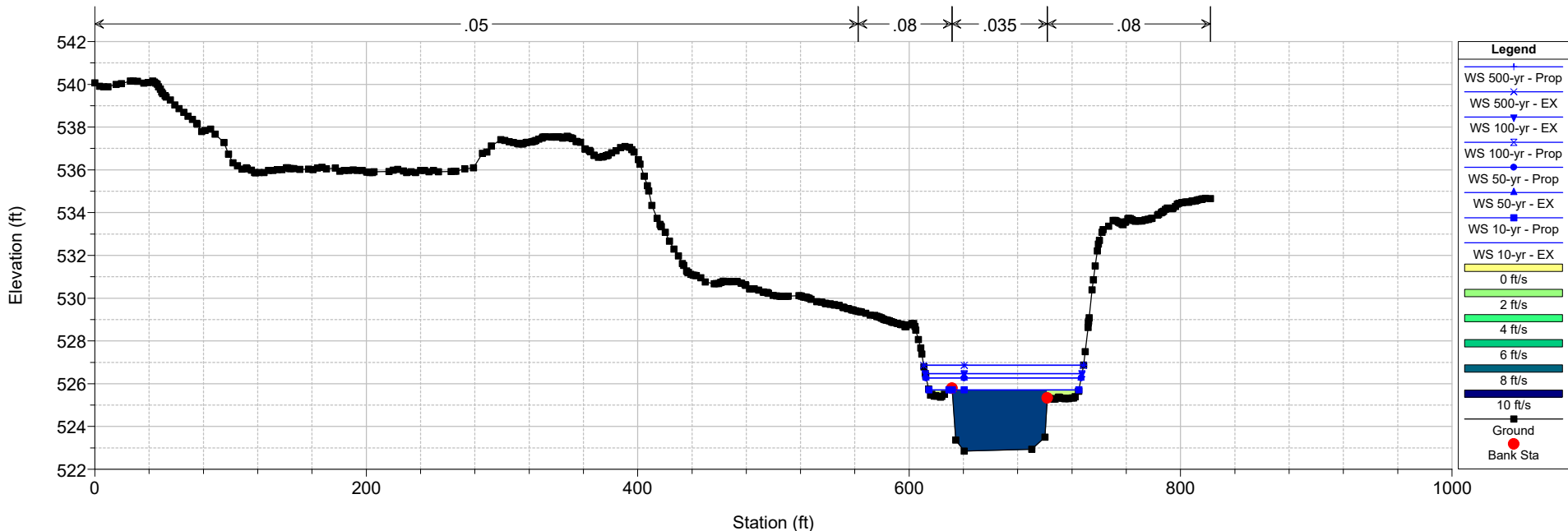
RS = 1009



STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 634



STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020  
RS = 276



STAMP Plan: 1) EX 5/8/2020 2) Prop 5/22/2020

RS = 116

