HYDRAULICS REPORT
ROCKY MOUTH BRANCH – WILLOW CREEK
NO-RISE CERTIFICATION

Project:

Pepperwood Cove Lot 1063 & 1064

Sandy, Utah

Project Number: 9020B

Prepared For:

Ensign Properties

716 East 4500 South #N260

Murray, Utah 84107

Date: December 30, 2020

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1.0 PROJECT OVERVIEW/LOCATION

The Pepperwood Cove Lot 1063 and Lot 1064 project is located in Sandy, Utah, in the northwest quarter of Section 23, Township 3 South, Range 1 East, Salt Lake Base and Meridian, Salt Lake County, Utah. The project is bound by Cobblewood Cove to the northeast and southeast, Lot 1013 of the Pepperwood development to the northwest and Lot 1062 to the southwest. The project will consist of the construction of a single family home with supporting surface and subsurface infrastructure.

The Rocky Mouth Branch of Big Willow Creek, which intersects the subject property along the northeast frontage, is a riverine flooding source. This flooding source was analyzed using detailed methods in the effective Letter of Map Revision (LOMR) #10-08-0446P dated June 17, 2010. The Special Flood Hazard Area (SFHA) delineated through the subject property is Zone AE with base flood elevations (BFE) established. Additionally, just upstream of the subject property and ending at cross section B on the effective FIRM, the Rocky Mouth Branch channel has been realigned to facilitate the backbone infrastructure of the residential development. This realignment was not captured in the effective LOMR. However, due to the limited scope of this development, the existing realignment was not included in this analysis.

2.0 DESIGN OBJECTIVES AND METHODOLOGY

The objective of this study is to certify that proposed improvements to the existing Rocky Mouth Branch channel will not result in an increase of more than 0.0 feet of the BFEs and will therefore satisfy requirements set forth in Section 60.3 (d)(3) of the National Flood Insurance Program (NFIP) while containing the 100-yr flood flow entirely within the proposed piped culvert system (i.e. this study serves as a No-Rise Certification for the propose improvements to the Rocky Mouth Branch). The proposed improvements include the construction of a 36" RCP culvert with concrete junction boxes at angle points on the two residential lots.

HEC-RAS was used in conjunction with topography obtained from a survey conducted on the site to model the portion of the Rocky Mouth Branch that intersects the subject property. The length of this reach totals approximately 400 feet. BFEs were interpolated from the flood profile for the Rocky Mouth Branch provided in the LOMR 10-08-0446P-490106 for the upstream and downstream limits of study.

3.0 HYDRAULIC CALCULATIONS

The base flood, or 100-year flood, flow that was used to model the channel was taken from the flow characteristics of cross section B in the effective LOMR. Cross section B, just upstream of the subject property, had a mean velocity of 6.4 feet per second and occupied a cross sectional area of 13 square feet, amounting to approximately 84 cubic feet per second.

For the proposed conditions model, the channel was analyzed to find changes in characteristics such as cross-sectional geometry, slope, roughness, downstream structures, or flow that would impact the base flood depth through the channel. No significant changes in channel geometry or characteristics, or any concentrated points of discharge, into the Rocky Mouth Branch were observed through this reach. Table 3.1 details the locations and description of each chosen cross-section.

Table 3.1: Rocky Mouth Branch Proposed Model Cross Sections

Cross Section	Description
XS-1	Downstream extents of analysis; known base flood elevation of 5061.0
XS-2	Culvert downstream point of discharge
XS-3	Change in channel slope
XS-4	Change in channel slope
XS-5	Upstream extents of analysis; discharge point of existing culvert (to be replaced with concrete junction box)

Downstream boundary conditions are set within HEC-RAS models in order to solve the continuity and momentum equations using the finite difference method for subcritical flow regimes. In this analysis, the downstream boundary condition was set to a known water surface elevation of 5061.0, coinciding with the known base flood elevation at this point in the channel.

Manning's roughness coefficients used in this analysis for the main channel and the channel overbanks, as well as for the proposed culvert, were within the ranges used in the effective LOMR of the Rocky Mouth Branch and were based on aerial imagery. Table 3.2 below details the Manning's roughness coefficients.

Table 3.2: Rocky Mouth Branch Roughness Coefficients

Channel Section	Roughness Coefficient Used in Analysis	Roughness Coefficient Range in Existing FIS	Description
Left Overbank	0.050	0.040-0.060	Scattered brush, heavy weeds
Channel	0.035	0.030-0.040	Mountain streams, no vegetation in channel, steep channel banks
Right Overbank	0.050	0.040-0.060	Scattered brush, heavy weeds
Culvert	0.013	0.011-0.015	Reinforced Concrete Pipe, Smooth Walls

The model results upstream and downstream of the subject property are listed below in Table 3.3.

Table 3.3: Study Limits Base Flood Elevations

Project Boundary Location	Existing Base Flood Elevation (feet)	Proposed Base Flood Elevation (feet)
Upstream	5098.00	5097.98
Downstream	5061.0	5061.0

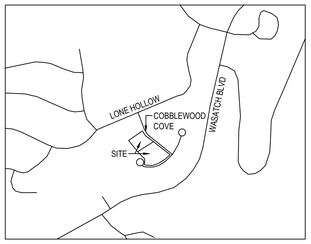
4.0 CONCLUSIONS

Based on the results of the analysis, the upstream and downstream base flood elevations are not anticipated to increase due to the construction of a 36-inch concrete pipe culvert designed to facilitate development of Lot 1063 and 1064 of Pepperwood Cove and therefore meet the requirements of a No-Rise Certification. Additionally, since the base flood is contained entirely within the proposed structures, the proposed single-family homes are reasonably safe from flooding that might occur during the 100-year flood.

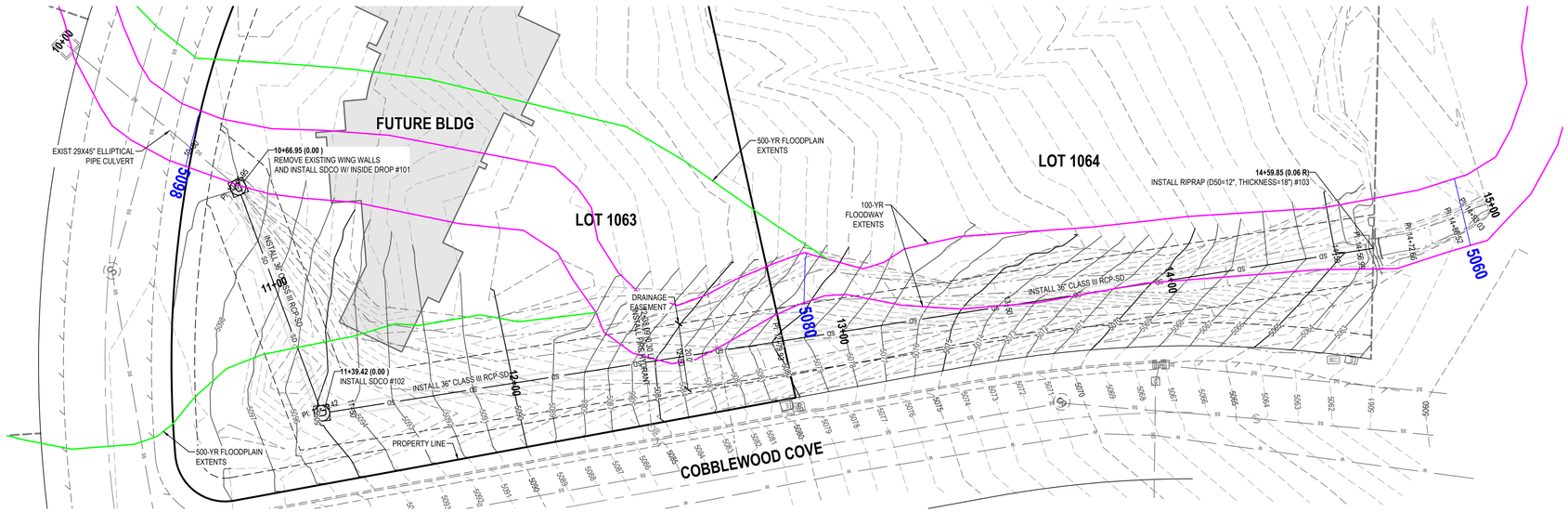
5.0 PROJECT PLAN AND PROFILE (PROPOSED CONDITIONS)

811 Know what's below. Call before you dig.

CALL BLUESTAKES @ 811 AT LEAST 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION.



VICINITY MAP
(NOT TO SCALE)

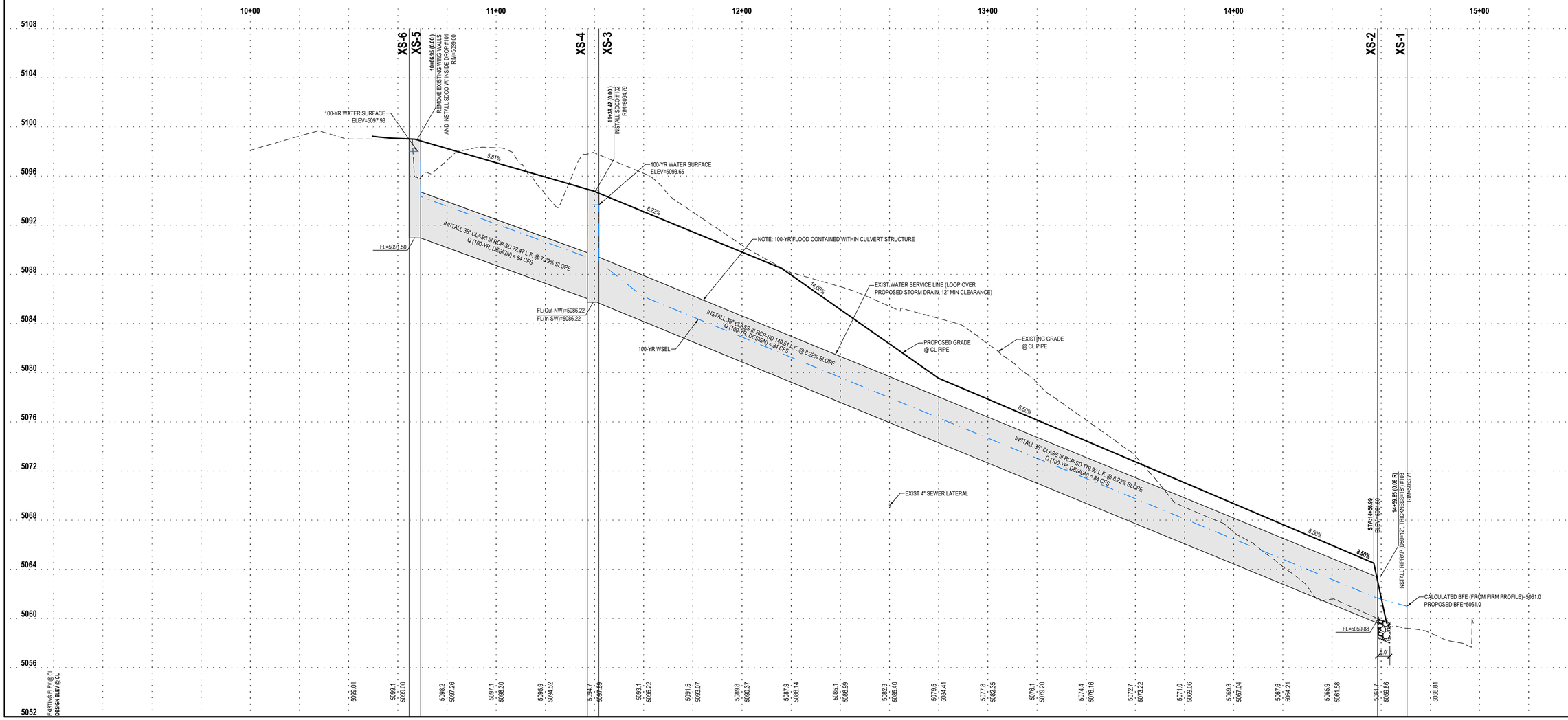


HORIZONTAL GRAPHIC SCALE

0 10 ## 40

(IN FEET)
HORZ: 1 inch = ## ft.
VERT: 1 inch = 4 ft.

ROCKY MOUTH BRANCH OF WILLOW CREEK



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PEPPERWOOD 10C
ROCKY MOUTH BRANCH - LOMR
12 & 2 S COBBLEWOOD COVE
SANDY, UTAH

CHANNEL
PLAN & PROFILE

PROJECT NUMBER 9020B
PRINT DATE 12/30/20
DRAWN BY
CHECKED BY
PROJECT MANAGER

PP-1

6.0 HEC-RAS MODEL – RESULTS

ANNOTATED BY ENSIGN ENGINEERING
DECEMBER 30, 2020

NOTE: 100-YR FLOOD WILL BE CONTAINED WITHIN CULVERT STRUCTURE WITHIN STUDY LIMITS

CALCULATED BFE=5098.0

CALCULATED BFE=5061.0

CONFLUENCE WITH WILLOW CREEK (EAST)

DOWNSTREAM STUDY LIMIT

UPSTREAM STUDY LIMIT

ELEVATION (FEET NAVD)

5140
5120
5100
5080
5060
5040
5020
5000
4980
4960

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WILLOW CREEK (EAST)

A

B

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

REVISED TO REFLECT LOMR EFFECTIVE:June 17, 2010

FLOOD PROFILES

ROCKY MOUTH BRANCH

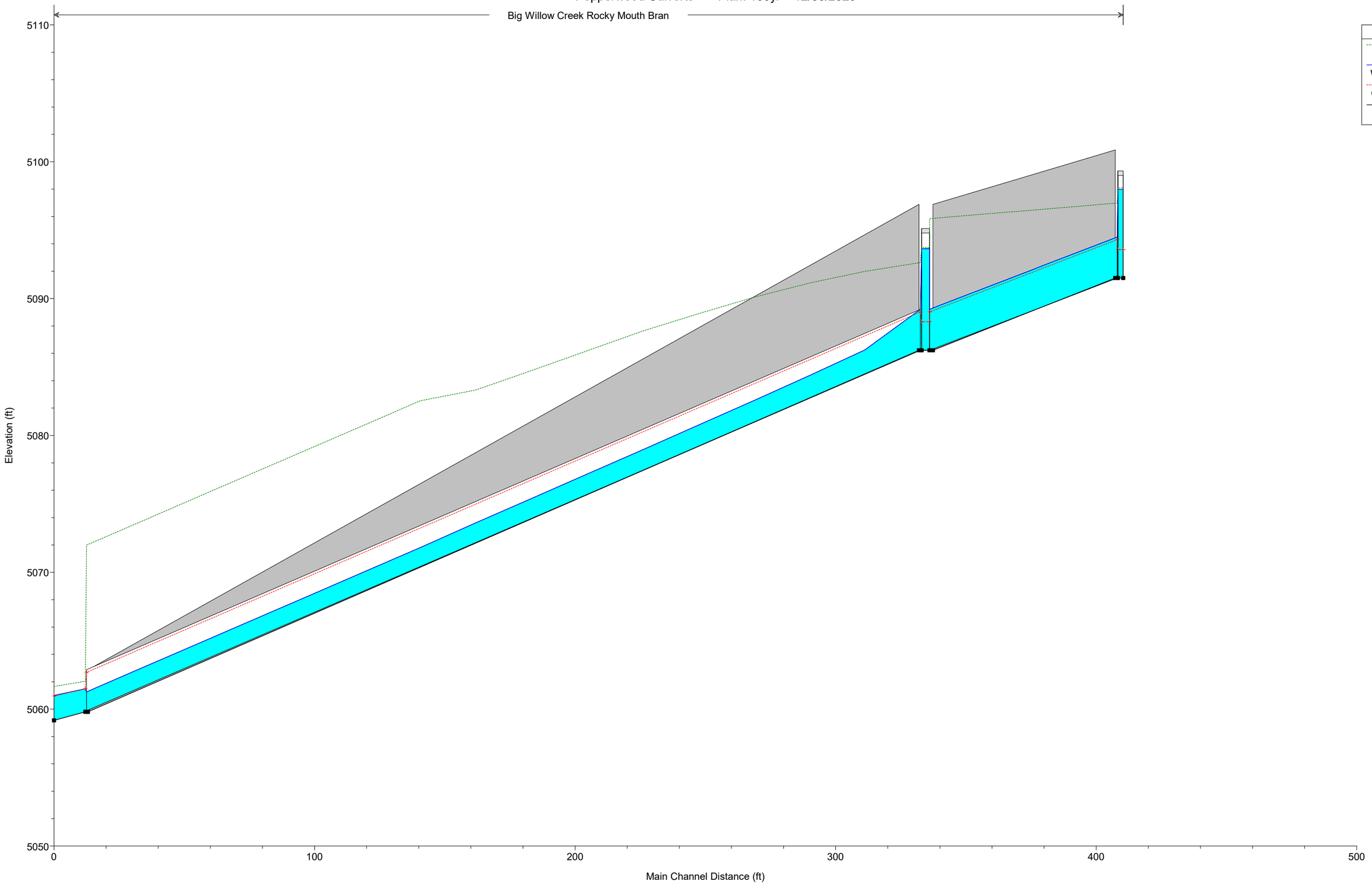
FEDERAL EMERGENCY MANAGEMENT AGENCY

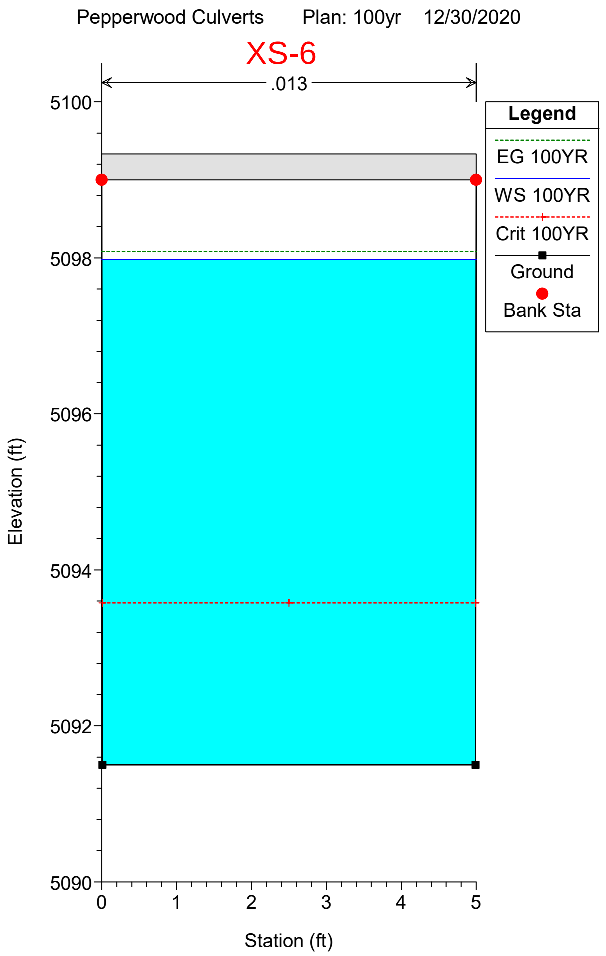
SALT LAKE COUNTY, UT
AND INCORPORATED AREAS

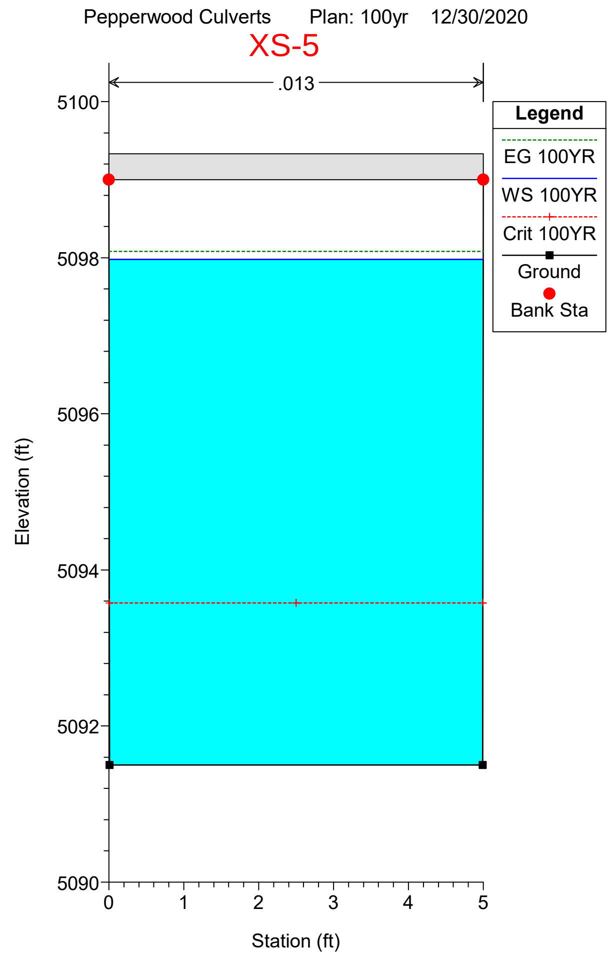
231P

Pepperwood Culverts Plan: 100yr 12/30/2020

Big Willow Creek Rocky Mouth Bran




Pepperwood Culverts Plan: 100yr 12/30/2020
XS-6
.013
Elevation (ft)
Station (ft)
Legend
EG 100YR
WS 100YR
Crit 100YR
Ground
Bank Sta


Pepperwood Culverts Plan: 100yr 12/30/2020
XS-5
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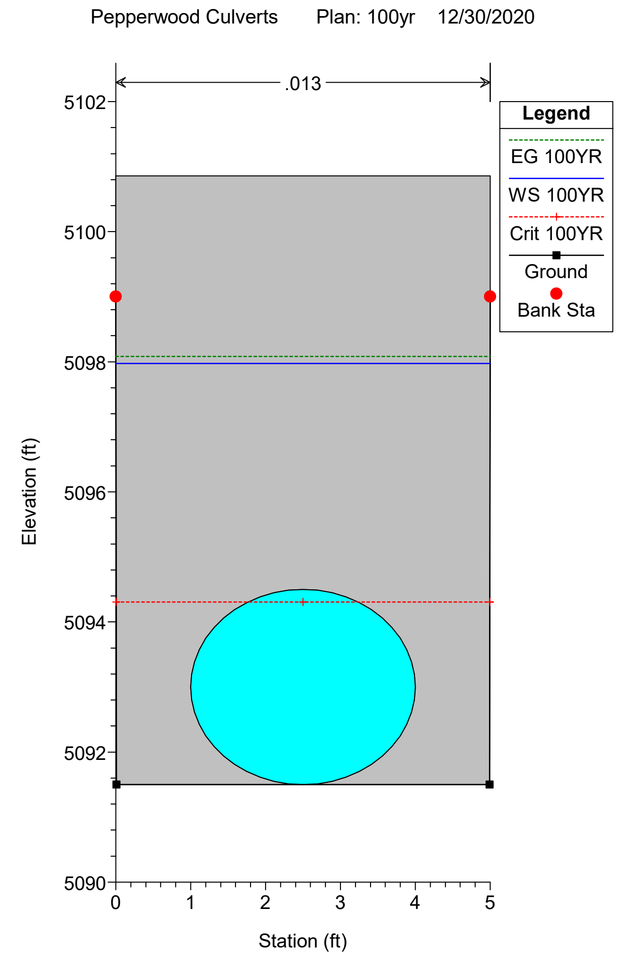
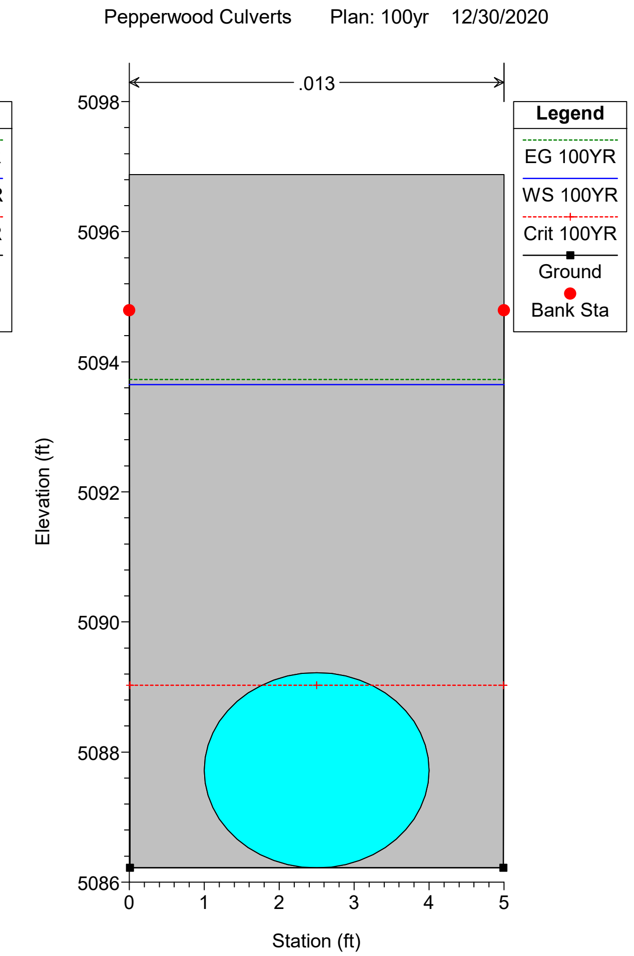
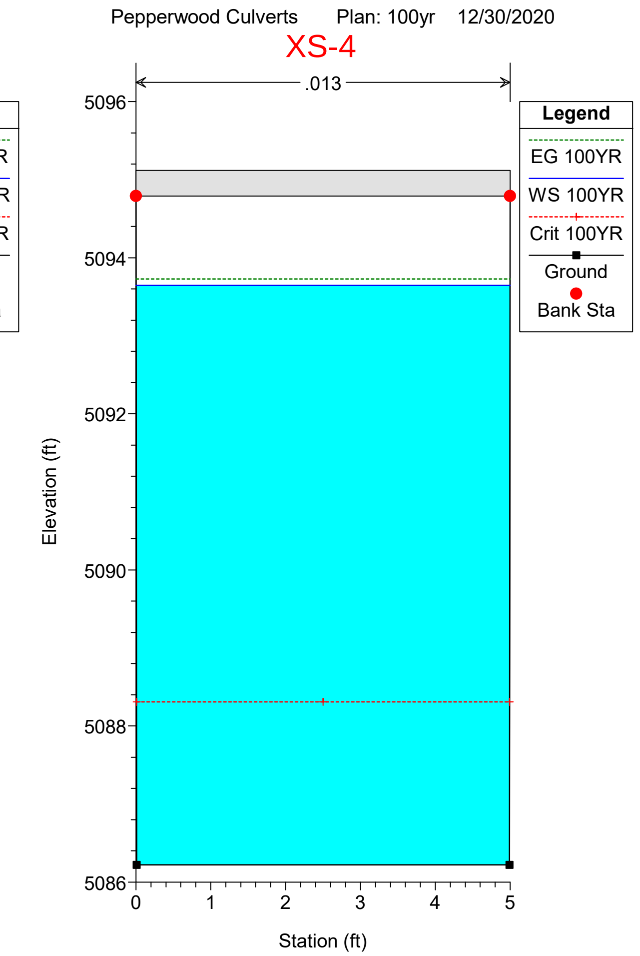
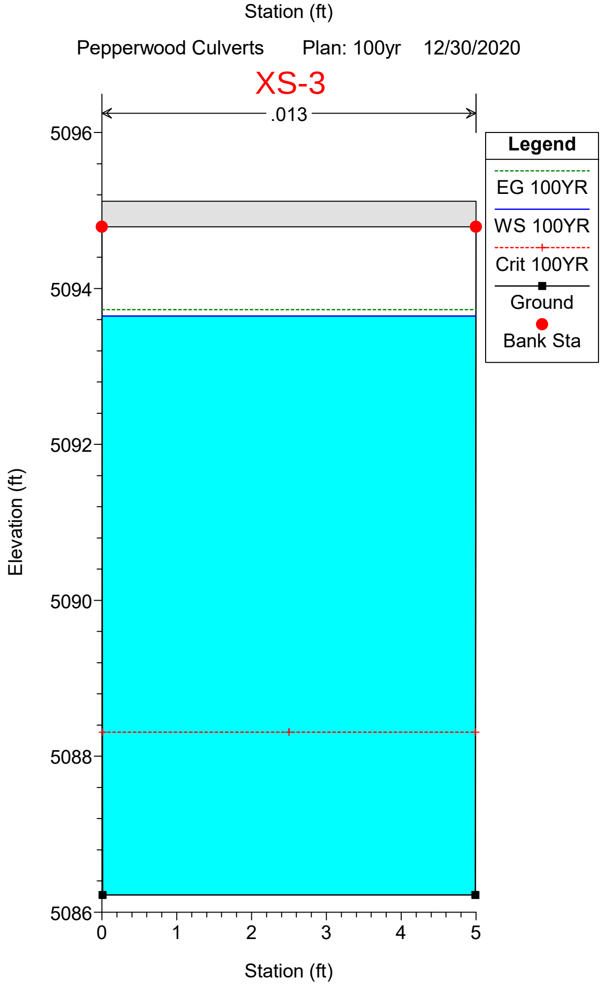
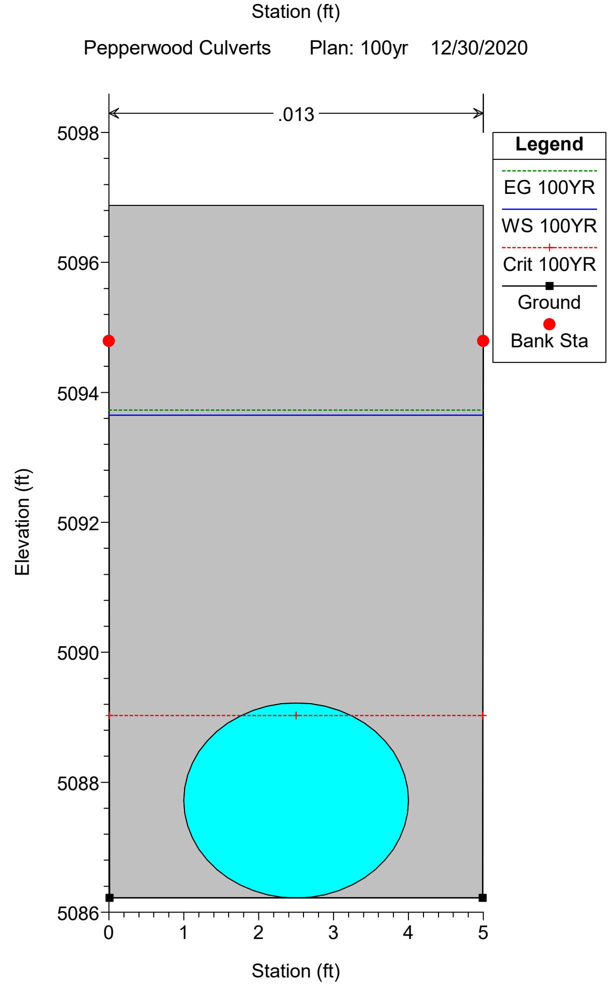
Elevation (ft)
Station (ft)
Legend
EG 100YR
WS 100YR
Crit 100YR
Ground
Bank Sta

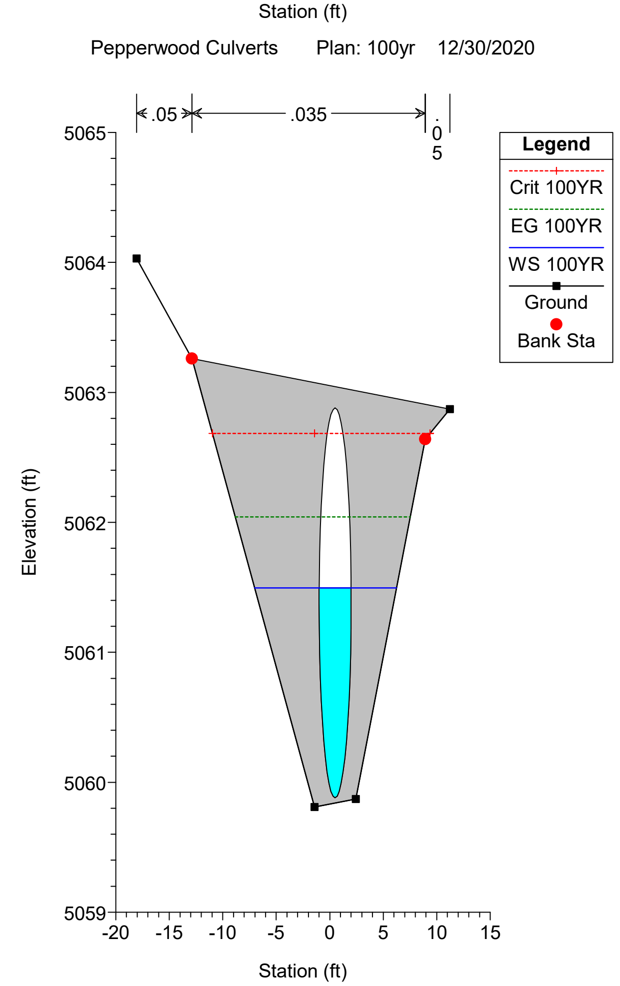

Pepperwood Culverts Plan: 100yr 12/30/2020
.013
Elevation (ft)
Station (ft)
Legend
EG 100YR
WS 100YR
Crit 100YR
Ground
Bank Sta

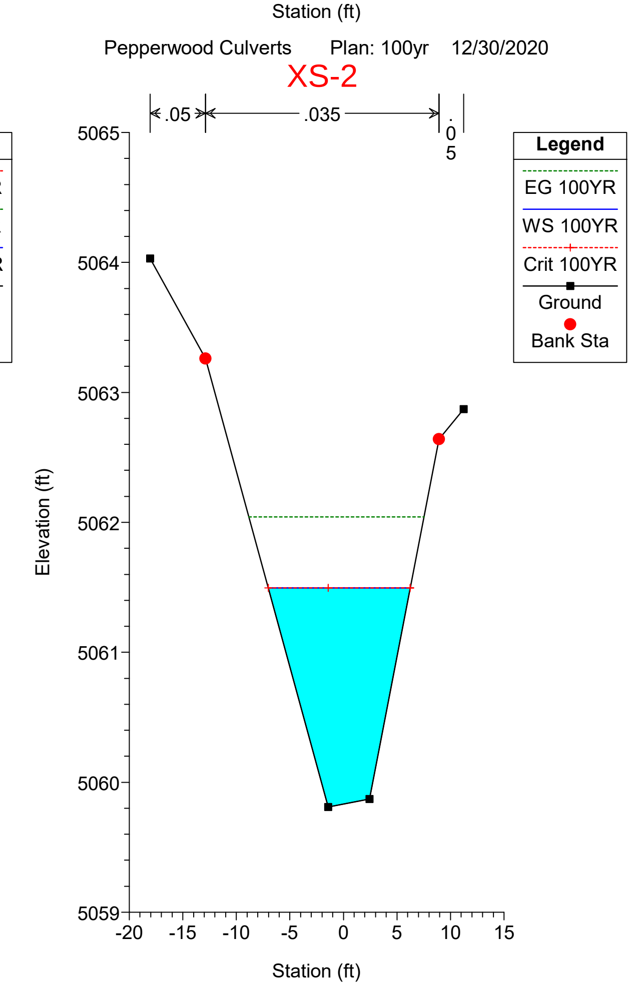

Pepperwood Culverts Plan: 100yr 12/30/2020
.013
Elevation (ft)
Station (ft)
Legend
EG 100YR
WS 100YR
Crit 100YR
Ground
Bank Sta

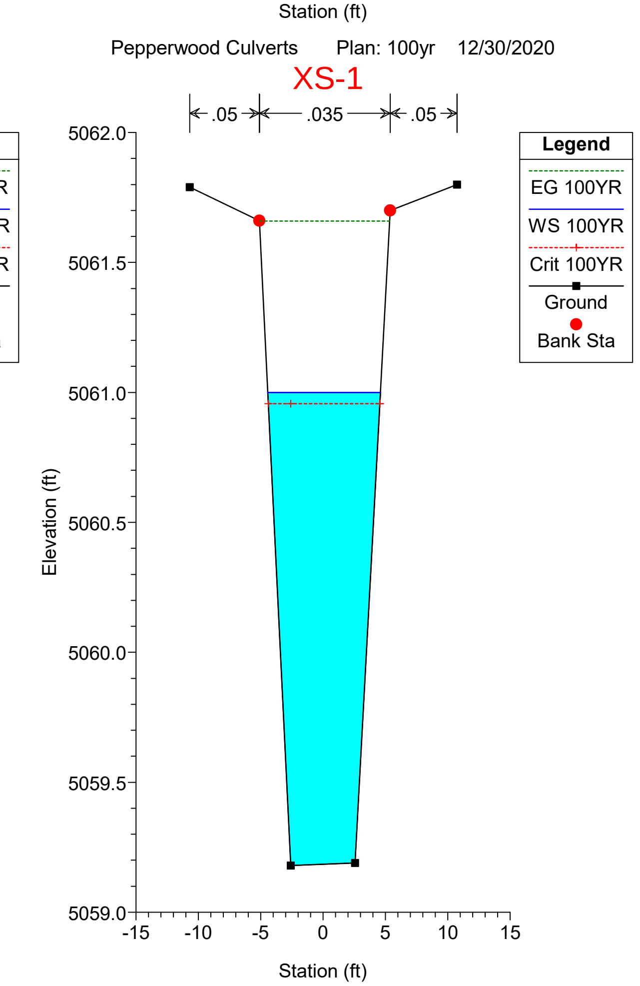

Pepperwood Culverts Plan: 100yr 12/30/2020
XS-4
.013
Elevation (ft)
Station (ft)
Legend
EG 100YR
WS 100YR
Crit 100YR
Ground
Bank Sta


Pepperwood Culverts Plan: 100yr 12/30/2020
XS-3
.013
Elevation (ft)
Station (ft)
Legend
EG 100YR
WS 100YR
Crit 100YR
Ground
Bank Sta


Pepperwood Culverts Plan: 100yr 12/30/2020
.013
Elevation (ft)
Station (ft)
Legend
EG 100YR
WS 100YR
Crit 100YR
Ground
Bank Sta


Pepperwood Culverts Plan: 100yr 12/30/2020
.05
.035
Elevation (ft)
Station (ft)
Legend
Crit 100YR
EG 100YR
WS 100YR
Ground
Bank Sta


Pepperwood Culverts Plan: 100yr 12/30/2020
XS-2
.05
.035
Elevation (ft)
Station (ft)
Legend
EG 100YR
WS 100YR
Crit 100YR
Ground
Bank Sta


Pepperwood Culverts Plan: 100yr 12/30/2020
XS-1
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 100YR
WS 100YR
Crit 100YR
Ground
Bank Sta